Sensitivity analysis of the TOXSWA model simulating fate of pesticides in surface waters

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ABSTRACT

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The TOXSWA model calculates the acute exposure concentration and the average exposure concentrations (AECs) of pesticides in ditches after 4, 21 and 28 days. In a (global) sensitivity analysis based on the Monte Carlo method, the most sensitive process parameters (pesticide properties) and the most sensitive system parameters (e.g. ditch dimensions) with respect to AECs were determined. The process parameters 'transformation rate in the water layer', 'coefficient for sorption to macrophytes' and 'Henry coefficient' were identified as contributing most to the variation in the AECs. The full range of pesticides was characterized by these three parameters and subsequently the 'flow velocity', 'water depth' and 'dry weight of macrophytes' were identified as sensitive system parameters with respect to the AECs. Analytically, the 'water depth', 'bottom width of the ditch' and 'the sorption coefficients for sorption to macrophytes and suspended solids' were identified as sensitive parameters with respect to the acute exposure concentration.

Keywords: exposure concentrations, Monte Carlo simulation, process parameters, system parameters, top and bottom marginal variance

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Preface

The TOXSWA model (TOXic substances in Surface WAters) has been developed by the DLO Winand Staring Centre (SC-DLO) to estimate exposure concentrations in ditches. The objective has been to provide the Board for the Authorization of Pesticides with an improved tool for the estimation of pesticide concentrations in ditches. To assess the accuracy of the estimations for actual situations, the model results have to be validated by field studies. Because the number of model inputs is high and quantifying them all well is often laborious, it is necessary to know which of the model inputs need to be measured with high accuracy. In other words: it is necessary to know which model inputs account for most of the variation in the output. A model analysis can be performed to answer this question. Part of a model analysis usually consists of performing a sensitivity analysis. In this report a (global) sensitivity analysis of version 1.0 of the TOXSWA model is described. This version was officially released in April 1996. Further development of the TOXSWA model is being continued. At the moment multiple applications have been incorporated in the model.

The project work took place in the framework of project 592 'Validation of TOXSWA' of the DLO programme 276 'Emissions and ecotoxicological hazards of pesticides'. It started in February 1996 and was finalized in December 1997, but the actual time needed to execute the project was ten months. The project was financed by the Dutch Ministry of Agriculture, Nature Management and Fisheries.

J.J.T.I. Boesten (SC-DLO) was actively involved in the initial orientation of this project.

The sensitivity analysis was critically monitored by a consultation group:
- H. de Heer, Department of Agriculture, part of the Ministry of Agriculture, Nature Management and Fisheries;
- J.B.H.J. Linders, Centre for Substances and Risk Assessment;
- A.M.A. van der Linden, Soil and Groundwater Research Laboratory, both at the National Institute of Public Health and the Environment (RIVM);
- R. Faasen, Institute for the Inland Water Management and Waste Water Treatment (RIZA);
- W.W.M. Brouwer, Plant Protection Service (PD);
- M.C. Lans and J.W. Tas, Board for the Authorization of Pesticides (CTB);
- P. Leeuwangh and T.C.M. Brock, DLO Winand Staring Centre (SC-DLO).

Summary

Pesticide use in agriculture may result in pesticides entering surface waters. In the Dutch pesticide registration procedure the hazards of pesticides to aquatic organisms are assessed by comparing estimated exposure concentrations with laboratory toxicity data of some standard test organisms. The TOXSWA model (TOXic substances in Surface WAters) is developed to estimate acute and chronic exposure concentrations in ditches.

In this study a global sensitivity analysis of the TOXSWA model (version 1.0) was performed. Two major steps were distinguished in this sensitivity analysis. In the first step it was identified which process parameters (pesticide properties) contribute most to the variation in the output for a standard set of system parameters (e.g. ditch dimensions). In the second step, it was identified which system parameters contribute most to the variation in the output. The output considered in both steps, was the average exposure concentration after 4, 21, and 28 days (AEC4, AEC21 and AEC28), i.e. the exposure periods for testing chronic toxicity of the three standard organisms.

In both steps, Monte Carlo methods were used to perform the sensitivity analysis. The Monte Carlo method is based on performing multiple model runs with a (probabilistically) selected sample of input parameter values. The results of these runs were used to determine the sensitivity of the input parameters to the model output. To carry out the Monte Carlo simulations, two different shells with the TOXSWA model as subroutine were written; one to perform the calculations for a sample of process parameters and one to perform the calculations for a sample of system parameters.

The sample of process parameter values was created using properties of a selection of 180 real pesticides. To obtain a sample with no mutual correlations between the process parameters, the values of each parameter were randomized over the pesticides with the help of a Genstat program. In this way a sample of hypothetical pesticides was obtained; the ranges and the distributions of the process parameters correspond to real pesticides, but the combination of process parameters for a specific pesticide are fictitious.

The sample of system parameters was created using Latin Hypercube Sampling (LHS). The LHS was carried out with the UNCSAM software package. The minimum and maximum values of the system parameters were partially taken from literature and partially they were more or less arbitrary. Over this range a uniform distribution of parameter values was assumed, because no detailed information on the distributions was available.

The sensitivity measures used to indicate sensitive parameters are the top and bottom marginal variance. The top marginal variance represents the positive characterization of the sensitivity with respect to the considered parameter(s), i.e.

assessing how well the considered output (the AECs) can be approximated by a function that depends only on the considered parameter(s). The bottom marginal variance represents the negative characterization of the sensitivity with respect to the considered parameter(s), i.e. assessing how badly the AECs are approximated by functions that do not depend on the considered parameter(s), but depend on all the other parameters. The top and bottom marginal variances are expressed as percentages of the total variance. The higher these percentages, the more sensitive the considered parameters are.

The AECs were approximated by means of a smooth additive function (smoothing spline). The quality of this approximation is expressed by the percentage variance accounted for. If this percentage is far below 100, the approximation is bad, and becomes less relevant.

Top and bottom marginal can be calculated for a single parameter (single-input sensitivity analysis) or a group of parameters (group-of-inputs sensitivity analysis). In this study, first a single-input sensitivity analysis of TOXSWA was performed. Afterwards, the sensitive inputs were subjected to a group-of-inputs sensitivity analysis. Both analyses were performed on the process parameters as well as on the system parameters. To calculate the top and bottom marginal variances two Genstat program were written: one for a single-input sensitivity analysis and one for a group-of-inputs sensitivity analysis.

For the defined standard set of system parameters, the transformation rate in the water layer, the coefficient for sorption to macrophytes and the Henry coefficient were identified as the process parameters contributing most to the variation in the AECs. So, almost all variation in the AECs can be explained by the variation of these three process parameters. This result was used to determine the sensitive system parameters.

The variation of the pesticides was characterized by ranges and distributions of the sensitive process parameters. Subsequently, the flow velocity and the water depth were identified as sensitive system parameters with respect to the AECs. The results of the sensitivity analyses with respect to the system parameters show that almost all variation in the AECs can be explained by the variation of the three sensitive process parameters and the two sensitive system parameters.

The dry weight of macrophytes did not come out as a sensitive system parameter, although the coefficient for sorption to macrophytes is shown to be a sensitive process parameter. This was not what we expected because no sorption to macrophytes is possible if there is not any substrate. This problem is analyzed analytically with the help of a simple equation, describing the relationship between the acute exposure concentration and sorption to macrophytes, while neglecting sorption to suspended solids. The result of this analysis shows that the dry weight of macrophytes is a sensitive system parameter with respect to the acute exposure concentration. Because in TOXSWA, the sorption coefficient and the dry weight of macrophytes always occur as a product of both, the explanation for the fact why the dry weight of macrophytes did not come out as a sensitive parameter in our

analysis, was found in the ranges and distributions specified for these parameters. It is shown that the effect of varying the value of the sorption coefficient is always dominant to the effect of varying the value of the dry weight.

For the standard scenarios that are currently developed for the registration procedure, the input parameters defining the environment, i.e. the system parameters, have to be determined. This sensitivity study shows that the two sensitive system parameters have a significant effect on the AECs. Therefore, the attention in defining the standard scenarios should be focussed on these two parameters.

Identification of the parameters contributing most to the variation of the acute exposure concentration was done analytically, because the acute exposure concentration can be calculated without using TOXSWA with the help of some simple equations. Assuming linear sorption to suspended solids, from these equations an explicit equation for the acute exposure concentration was obtained. From this equation the relative sensitivity function for each parameter could be derived. The relative sensitivity functions give the relative change in the acute exposure concentration with respect to the relative change in the considered parameter. From the relative sensitivity functions, the water depth and the coefficient for sorption to macrophytes were found as the most sensitive parameters with respect to the acute exposure concentration.

1 Introduction

1.1 General background

Application of pesticides to agricultural fields may result in their entry into surface waters. In the Dutch pesticide registration procedures the hazards of pesticides to aquatic organisms are commonly assessed by comparing estimated exposure concentrations in the field with laboratory toxicity data of some standard test organisms. The TOXSWA (TOXic substances in Surface WAters) model is developed to estimate acute and chronic exposure concentrations in ditches. The objective has been to provide the Board for Authorization of Pesticides (CTB) with an improved tool for estimation of pesticide concentrations in ditches.

To assess the accuracy of the estimations for actual situations, the model results can be compared with field studies (validation). However, as the number of model inputs is high and determining them all in a detailed manner is laborious, it is necessary to know which of the model inputs need to be measured with high accuracy (Boesten & Van der Linden, 1991). Therefore a model analysis should be performed. Part of a model analysis usually consists of performing a sensitivity and uncertainty analysis.

In literature definitions of sensitivity and uncertainty analysis vary. In this study they are defined as follows (Penning de Vries et al., 1995).

Sensitivity analysis is the study of model properties through – not necessarily realistically seized – changes in the model inputs and the analysis of its effect on model outputs. The questions addressed are for instance:

- whether or not some output is affected at all by some input;
- continuity, differentiability, monotonic increase or decrease of the model's response to input variation.

Often the variation of outputs is caused by a small number of inputs.

Uncertainty analysis is the study of output uncertainty as a function of a careful inventory of the different sources of uncertainty present in the model. The questions addressed are for instance:

- what is the prediction uncertainty due to all uncertainties in model inputs (total uncertainty);
- how do inputs (individual or in groups) contribute to prediction uncertainty.

Input uncertainty is caused by natural variation (e.g. weather or soil variation) as well as by imperfect data (e.g. inaccurate and insufficient measurements). The establishment of input uncertainty constitutes the most elaborate and most critical stage of an uncertainty analysis. Literature and experiments constitute the most natural source of information. Expert knowledge is another source of information.

This study deals with a global sensitivity analysis. In a global sensitivity analysis, the responses to variations over some domain of the model inputs are studied. In this way, model sensitivity is analyzed for a broader range of inputs. The more realistic the uncertainty in the inputs is represented (range as well as distribution), the more a global sensitivity analysis approaches an uncertainty analysis.

There are several other approaches to perform sensitivity analysis, e.g. one-at-a-time sensitivity analysis and local sensitivity analysis (or differential sensitivity analysis). They all have their advantages and disadvantages (Helton, 1993; Janssen et al., 1994). The global sensitivity analysis described above responds most to our needs: assessing which input parameters contribute most to the variation in the output, for input parameters with realistic values.

Different sources of sensitivity can be distinguished (Janssen et al., 1994). In the TOXSWA model the output depends on the following sources of sensitivity:

- Process parameters: coefficients (parameters) characterizing the (dynamical) behaviour of the modelled processes. In the TOXSWA model these are the parameters describing the properties of the pesticides.
- System parameters: coefficients (parameters) describing the dimensions and properties of the system. In the TOXSWA model these are the ditch and sediment characteristics and the hydrology.
- Entries: these represent the influence of the external 'environment' on the system, e.g. sources like spray drift and seepage.
- Initial conditions: e.g. at the start of the simulation the sediment does not contain pesticides.

The entries and initial conditions are not considered in this sensitivity analysis, because they are not subject to discussion in defining the standard scenarios for the registration procedure. Either choices to be made are clear, e.g. initially no pesticide is present in the system or no upward or downward seepage through the ditch bottom is considered, either they are prescribed by external conditions, e.g. drift percentages.

Sensitivity in the model structure (i.e. the form of the mathematical equations which constitute the model) or the applied computational scheme in which the model is implemented (i.e. model operation) are not considered within this sensitivity analysis of the TOXSWA model. So, it is assumed that sensitivities are solely introduced via the model inputs.

The output considered in this sensitivity analysis is the acute (0 days)[1] exposure concentration and the average exposure concentration at the end of a ditch after 4, 21 and 28 days. The periods for the average exposure concentrations represent the

[1] The acute exposure concentration is defined as the pesticide concentration in the water layer immediately after deposition, i.e. the momentary concentration. This is the concentration after instantaneous sorption to macrophytes and suspended solids. The momentary concentration can be calculated without using TOXSWA but with the help of some simple equations. The method for sensitivity analysis will therefore be different from the methodology used for the chronic exposure concentrations, see Chapter 6.

exposure periods for testing the chronic toxicity of the three standard test organisms. The average exposure concentration (AEC) is calculated as the average of the concentration in time and is calculated for that position in the ditch where the longest exposure duration is expected; for the ditch with flow this is at the downstream end of the length over which the pesticide was deposited (after spray drift). The pesticide mass flowing out of the ditch is no output considered in this sensitivity analysis, because in the risk assessment procedure for pesticides in the Netherlands, the exposure concentrations are the only interest.

1.2 Aims of the study

The TOXSWA model is going to be used to classify pesticides with respect to their AECs. Therefore a sensitivity analysis has to take all pesticides into account. For this purpose first a sensitivity analysis is performed to identify which process parameters contribute most to the variation in the model output. So, the first aim of this study is:

(1) *Identify which process parameters contribute most to the variation in the model output (the AECs). This is examined for the total domain of the pesticides properties derived from the pesticides registered in the Netherlands and given one set of system parameters, entries and initial conditions.*

We aim for a limited set of process parameters that accounts for most of the variation in model output. By varying this limited set of process parameters over the total range of these parameters of the pesticides registered in the Netherlands and by taking suitable constant values for the remaining process parameters, it is possible to determine the variation in AECs as a function of the most sensitive process parameters. This variation will be used as an approximation for all pesticides.

In the second step the system parameters are involved in the sensitivity analysis. It is identified which of the system parameters contribute most to the variation in the model output. So, it will be assessed how important the choice of the set of system parameters is. The second aim of this study therefore reads:

(2) *Identify which system parameters contribute most to the variation in the AECs. This is examined again for the total domain of the pesticide properties derived from the pesticides registered in the Netherlands (now characterized by the limited set of process parameters found in (1)).*

From (2) the system parameters are determined that contribute most to the variation in the model output. Especially, these system parameters need to be quantified properly in defining the standard scenarios for the registration procedure.

Initially, a third aim of this study was defined:

(3) *Identify the influence of the input uncertainty on the output uncertainty for a specific situation (given pesticide and 'system').*

For this third aim we are not interested in the uncertainty in process or system parameters over their entire possible range, but, for a given pesticide and system,

we are interested in the natural (spatial or temporal) variation and/or imperfect knowledge of their values. We are particularly interested in those uncertainty sources, that can be measured with a higher precision by improved measurement techniques. In this way, it is known which model inputs need to be measured with high accuracy, to diminish the uncertainty in the calculated AECs as much as possible. This is useful for performing e.g. validation experiments. However, we did not have enough time to work on this aim of the study during the study period.

1.3 Reading guide

In Chapter 2, a brief description of the TOXSWA model is given. The method and the statistical principles used to perform a global sensitivity analysis are described in Chapter 3. In Chapter 4, it is identified which process parameters contribute most to the variation in the model output and in Chapter 5 it is identified which system parameters contribute most to the model output. In Chapter 6, the sensitivity analysis for the acute exposure concentration is described. In Chapter 7 the conclusions of the sensitivity analysis are summarized and discussed.

2 Description of the TOXSWA model

2.1 Introduction

In this chapter a brief overview is presented of the concepts of the TOXSWA model. A complete description can be found in Adriaanse (1996).

The TOXSWA model describes the fate of pesticides in ditches. The modelled ditch system is two-dimensional and consists of two types of subsystems: a water layer containing suspended solids and macrophytes and a sediment layer whose properties (porosity, organic matter content and bulk density) vary with depth. In the water layer concentrations vary only in horizontal direction, while in the sediment, concentrations vary both in horizontal and vertical directions.

The cross section of the ditch is trapezium-shaped; upward or downward seepage takes place through the ditch bottom and walls. Upward or downward seepage limits and enhances respectively, the penetration depth of the substance into the sediment. No resuspension or sedimentation of suspended solids occurs in the water layer.

TOXSWA considers four processes: (i) transport, (ii) transformation, (iii) sorption and (iv) volatilization. In the water layer, pesticides are transported by advection and dispersion, including transport of pesticides sorbed to suspended solids. In the sediment pesticides are transported by diffusion as well. The transformation rate covers the combined effects of hydrolysis, photolysis and biodegradation; metabolites are not considered. Sorption to suspended solids and to sediment is described using the non-linear Freundlich equation. Sorption to macrophytes is described using a linear isotherm. Pesticides are transported across the water-sediment interface by advection (upward or downward seepage) and by diffusion.

In version 1.0 of TOXSWA two types of input of pesticide into the water subsystem are possible: (i) distributed pulse input, e.g. spray drift or a momentary runoff, (ii) point-type pulse input, e.g. spillage of pesticide or a brief release from an individual drain. At the bottom of the sediment there is an inflow or outflow of water with pesticide.

2.2 Processes in the water layer

The conservation equation for the water layer reads:

$$\frac{\partial(c^* A)}{\partial t} = - \frac{\partial(AJ)}{\partial x} - k(c^* A) + J_{wa}.O - J_{wb}.P \qquad (2.1)$$

with

A	=	cross sectional area of flow (L^2);
c^*	=	mass concentration of pesticide in the water layer ($M.L^{-3}$);
J	=	areic mass flux of pesticide in water layer by advection and dispersion ($M.L^{-2}.T^{-1}$);
J_{wa}	=	areic mass flux of pesticide across the water-air interface; the flux is negative in the upward direction ($M.L^{-2}.T^{-1}$);
J_{wb}	=	areic mass flux of pesticide across the water-sediment interface; the flux is positive in the downward direction ($M.L^{-2}.T^{-1}$);
k	=	transformation rate coefficient for pesticide in the water layer (T^{-1});
O	=	width of the water surface (L);
P	=	wetted perimeter (L).

The pesticide concentration in the water layer, c^*, is described as:

$$c^* = c + \frac{DW.P_{z=0}}{A}.X_{mp} + ss.X_{ss} \qquad (2.2)$$

with

c	=	mass concentration of pesticide in the water phase ($M.L^{-3}$);
DW	=	dry weight of macrophytes per area of sediment ($M.L^{-2}$);
$P_{z=0}$	=	wetted perimeter (L);
ss	=	mass concentration of suspended solids in the water layer ($M.L^{-3}$);
X_{mp}	=	content of pesticide sorbed to macrophytes ($M.M^{-1}$);
X_{ss}	=	content of substance sorbed to suspended solids ($M.M^{-1}$).

In the water layer pesticides are transported by advection and dispersion:

$$J = u(c + ss \cdot X_{ss}) - E_x \frac{\partial(c + ss \cdot X_{ss})}{\partial x} \qquad (2.3)$$

with

u	=	flow velocity of the water ($L.T^{-1}$);
E_x	=	dispersion coefficient in the direction of flow ($L^2.T^{-1}$).

The transformation rate coefficient, k, is a measure of the (entire) transformation of the pesticide. The pesticide may be dissolved in water or it may be sorbed to suspended solids or to macrophytes.

By analogy to sorption to soil and sorption to the solid phase of sediment, the content of substance sorbed to the suspended solids equals:

$$X_{ss} = K_{F,ss} \cdot c_{e,ss} \cdot \left(\frac{c}{c_{e,ss}}\right)^{n_{ss}} \qquad (2.4)$$

with

$K_{F,ss}$ = Freundlich coefficient for sorption to suspended solids ($L^3.M^{-1}$);
$c_{e,ss}$ = concentration c at which $K_{F,ss}$ has been estimated ($M.L^{-3}$);
n_{ss} = Freundlich exponent for sorption to suspended solids (1).

The Freundlich coefficient for sorption to suspended solids, $K_{F,ss}$, is related to the $K_{om,ss}$ in the following way:

$$K_{F,ss} = m_{om,ss} \cdot K_{om,ss} \tag{2.5}$$

with

$m_{om,ss}$ = mass fraction of organic matter in the suspended solids ($M.M^{-1}$);
$K_{om,ss}$ = slope of the sorption isotherm for suspended solids, based on the organic matter content ($L^3.M^{-1}$).

The content sorbed to macrophytes can be described as:

$$X_{mp} = K_{mp}.c \tag{2.6}$$

with

K_{mp} = distribution coefficient for pesticide between macrophytes and water, i.e. the slope of the sorption isotherm based on the mass of dry macrophytes ($L^3.M^{-1}$).

The exchange flux of the pesticide between water body and atmosphere, J_{wa}, is described by the film model of two laminar layers at an interface (Liss & Slater, 1974). If the exchanging pesticide obeys Henry's law, then J_{wa} can be described as:

$$J_{wa} = -k_{t,l}\left(c - \frac{c_a}{K_H}\right) \tag{2.7}$$

in which

$$\frac{1}{k_{t,l}} = \frac{1}{k_l} + \frac{1}{K_H \cdot k_g} \tag{2.8}$$

and

$$K_H = \frac{P.M_m}{R.T} \cdot \frac{1}{c_{sol}} \tag{2.9}$$

with

$k_{t,l}$ = overall transfer coefficient for the air-water interface based on the liquid phase ($L.T^{-1}$);
c_a = mass concentration of pesticide in the air ($M.L^{-3}$);
K_H = dimensionless Henry coefficient (1);
k_l = exchange coefficient of pesticide in the liquid phase ($L.T^{-1}$);
k_g = exchange coefficient of pesticide in the gas phase ($L.T^{-1}$);

P = saturated vapour pressure of pesticide ($L^{-1}.M.T^{-2}$);
M_m = molecular mass ($M.N^{-1}$);
R = universal gas constant ($L^2.M.T^{-2}.N^{-1}.\theta^{-1}$);
T = temperature at which the saturated vapour pressure, the solubility and the exchange coefficients in the liquid and gas phases are defined (θ);
c_{sol} = solubility of pesticide in water ($M.L^{-3}$).

The exchange flux between water layer and sediment consists of an advective and diffusive component.

$$J_{wb} = J_{wb,adv} + J_{wb,dif} \tag{2.10}$$

with
$J_{wb,adv}$ = areic mass flux by advection at the water-sediment interface ($M.L^{-2}.T^{-1}$);
$J_{wb,dif}$ = areic mass flux by diffusion at the water-sediment interface ($M.L^{-2}.T^{-1}$).

The advective component of the exchange flux consists of a supply of water with the pesticide towards the ditch because of drainage from neighbouring field lots, or of infiltrating water from the ditch into the field lots. Because of the assumption of no transport resistance across the water-sediment interface this yields:

$$J_{wb,adv} = \frac{\ell}{P_{z=0}}.q.c \tag{2.11}$$

with
ℓ = length of drained or infiltrated lot, oriented perpendicular to the ditch and extending on one or two sides of the ditch (L);
q = areic volume flux, i.e. volume of drained or supplied water divided by lot area and time ($L.T^{-1}$). The flux is positive for infiltration and negative for upward flow from the field (lot).

The diffusive component of the exchange flux is described as the areic mass flux by diffusion in the sediment at location $z = 0$.

$$J_{wb,dif} = -\left(\varepsilon . D_{lb} . \frac{\partial c_{lb}}{\partial z} \right)_{z=0} \tag{2.12}$$

with
c_{lb} = mass concentration of pesticide in the liquid phase of sediment ($M.L^{-3}$);
D_{lb} = diffusion coefficient of pesticide in the liquid phase of the sediment ($L^2.T^{-1}$);
ε = volume fraction of pore water (1);
z = depth below the water-sediment interface (L).

The diffusion coefficient of the substance in the liquid phase of the sediment, D_{lb}, is calculated as:

$$D_{lb} = \lambda . D_w \tag{2.13}$$

with

λ = tortuosity factor (1);
D_w = diffusion coefficient of pesticide in water ($L^2.T^{-1}$).

2.3 Processes in sediment

The conservation equation for the sediment reads:

$$P\frac{\partial c_b^*}{\partial t} = - \frac{\partial (P J_{lb})}{\partial z} - k_b c_b^* P \tag{2.14}$$

with

c_b^* = mass concentration of pesticide in sediment ($M.L^{-3}$);
J_{lb} = areic mass flux of pesticide in the liquid phase of the sediment by advection, dispersion and diffusion ($M.L^{-2}.T^{-1}$);
k_b = transformation rate coefficient for pesticide in the sediment (T^{-1}).

The concentration of substance in the sediment, c_b^*, is defined as:

$$c_b^* = \varepsilon c_{lb} + \rho_b X_b \tag{2.15}$$

with

ρ_b = bulk density of dry sediment material ($M.L^{-3}$);
X_b = content of pesticide sorbed to sediment ($M.M^{-1}$).

In the pore water of the sediment, the pesticide is transported by advection, dispersion and diffusion. This flux, J_{lb}, is defined as:

$$J_{lb} = \frac{\ell}{P} \cdot q \cdot c_{lb} - \varepsilon (E_{lb} + D_{lb}) \cdot \frac{\partial c_{lb}}{\partial z} \tag{2.16}$$

with

P = wetted perimeter (L);
E_{lb} = dispersion coefficient in pore water ($L^2.T^{-1}$).

The dispersion coefficient is defined as:

$$E_{lb} = L_{dis} . |w| \tag{2.17}$$

with

L_{dis} = dispersion length (L);

w = average flow velocity of pore water (i.e. $\ell q/P\varepsilon$) ($L.T^{-1}$).

The transformation rate coefficient, k_b for the pesticide in the sediment is a measure of the entire transformation of the pesticide in pore water as well as in sorbed form.

The content of pesticide sorbed to sediment, X_b, is:

$$X_b = K_{F,wb} \cdot c_{e,wb} \cdot \left(\frac{c_{lb}}{c_{e,wb}} \right)^{n_{wb}} \qquad (2.18)$$

with

$K_{F,wb}$ = Freundlich coefficient for sorption to bottom material ($L^3.M^{-1}$);

$c_{e,wb}$ = concentration c at which $K_{F,wb}$ has been estimated ($M.L^{-3}$);

n_{wb} = Freundlich exponent for sorption to bottom material (1).

The Freundlich coefficient for sorption to sediment, $K_{F,wb}$, is related to the $K_{om,wb}$ in the following way:

$$K_{F,wb} = m_{om,wb} \cdot K_{om,wb} \qquad (2.19)$$

with

$m_{om,wb}$ = mass fraction of organic matter in the sediment material ($M.M^{-1}$);

$K_{om,ss}$ = slope of the sorption isotherm for sediment, based on the organic matter content ($L^3.M^{-1}$).

3 Method of global sensitivity analysis

3.1 Monte Carlo simulation

The most commonly used method for evaluating sensitivity or uncertainty associated with parameter sensitivity or uncertainty in environmental modelling is related to Monte Carlo simulation (Kros et al., 1993). Monte Carlo based methods for (global) sensitivity analysis rely on the fact that variations in the sources can usually be characterized by their distribution functions and their correlations. Usually, a random sample is generated from these distributions, resulting in a set of values for the various parameters. Next, simulations are carried out with this randomly selected set of parameter values from the distribution functions.

As described in Chapter 1, two major steps are distinguished in the sensitivity analysis of TOXSWA. In the first step, it is identified which process parameters contribute most to the variation in the model output for a standard set of system parameters, entries and initial conditions. In the second step, the system parameters are involved in the analysis, and it is identified which system parameters contribute most to the variation in the output. Hence, two Monte Carlo simulations have to be performed and two samples must be generated; one for the process parameters and one for the system parameters.

To carry out a large number of simulations with TOXSWA in a single run, two different shells with the TOXSWA model as a subroutine were written. Both shells produce an output file with the AECs after 4, 21 and 28 days at the last node of ditch for each pesticide. The first shell was used to perform the calculations for the sample of process parameter values (pesticide properties). At the start of the run, the shell reads all the values of process parameters that are subjected to the sensitivity analysis from the sample. Then the main loop is entered: for each pesticide the shell writes the TOXSWA input file for pesticide properties, and next, the TOXSWA calculations for this pesticide are performed and the desired output, i.e. the AECs after 4, 21 and 28 days are stored. Exiting the main loop after the calculation for the last pesticide, the shell writes an output file with the stored AECs for each pesticide. In the sensitivity analysis, calculations were carried out for 180 pesticides (Section 4.1). This took about 9 hours and 30 minutes (CPU-time on an Alpha/VMS computer).

The second shell was used to perform the calculations for the sample of the system parameters in a single run. At the start of the run, the shell reads all values of the system parameters that are subjected to the sensitivity analysis from the sample, and the values of the sensitive process parameters (characterizing the variation in the pesticides) from the sample of process parameters. Then, the main loop is entered. The shell writes several TOXSWA input files for the input of hydrology, ditch and sediment characteristics. The input file for the pesticide properties is also written, but only the sensitive process parameters vary for each calculation; fixed values (median) are used for the insensitive process parameters. Also, the input file

for the input of the initial concentration, i.e. the nominal concentration, in the water layer is written, because this concentration depends on the ditch dimensions and these are different for each calculation (Section 4.2). Next, the TOXSWA calculations for this combination of system parameters (and sensitive process parameters) are performed and the desired output, i.e. the AECs after 4, 21 and 28 days is stored. Exiting the main loop after the last calculation, the shell writes an output file with the stored AECs for each combination. Again, 180 calculations were done, and this took about 9 hours and 30 minutes (CPU-time on an Alpha/VMS computer).

3.2 Schematization

In the Monte Carlo analyses, the following situation is simulated. A pesticide is deposited by spray drift onto a neighbouring ditch over the total length of the ditch except the first 20 m. The ditch has a total length of 220 m, thus the pesticide enters the ditch over a total length of 200 m. A standard deposition of 1 $mg.m^{-2}$ onto the water surface is assumed. The pesticide mixes instantaneously with the water in the ditch. Initially, the water and the sediment do not contain pesticides. There is no upward or downward seepage in the sediment.

In TOXSWA the ditch is schematized by 22 equidistant nodes. The first node is located at 5 m; the last node at 215 m. No front or end buffer is considered. The average exposure concentrations (output variable) are calculated at the last node in the ditch (node 22). This is the location where the longest exposure duration is expected.

The sediment thickness of the ditch is 0.1 m and is schematized by 15 nodes (the distance between the nodes varies from 0.0010 m in the upper layers to 0.020 m in the lower layers). The first node is located at the depth of 0.0005 m.

The total time considered is 28 days. The selected time step for the calculations is 300 s. The numerical weight factor for space is 0.5 and the numerical weight factor for time is 1.0, so, an explicit central finite-differential solution method was applied.

3.3 Sampling

The number of Monte Carlo simulations needed for accurate estimates depends on the applied sampling method and on the number of considered sources of sensitivity. An efficient sampling method often used in this kind of analyses, is the Latin Hypercube Sampling (LHS) technique (Iman & Conover, 1980). This technique uses a stratified way of sampling from the separate sources, based on a subdivision of the range of each source in N disjunct equiprobable intervals. Sampling one value in each interval according to the associated distribution, N samples for each source are obtained. The sampled values of the first source are subsequently randomly paired with the sampled values of the second source. These

pairs are furthermore randomly combined with the sampled values of the third source etc., which finally results in N combinations of p sources. This set of p-tuples is the Latin Hypercube sample. The LHS technique allows for a good representation of the entire domain of parameters considered by a relatively low number of samples. It is possible to incorporate correlations in the sampled set and to avoid spurious correlations due to the sampling process, using the restricted pairing technique of Iman & Conover (1982).

In case of evaluating the global sensitivity for the system parameters, the sample was created using the LHS-technique described above. The LHS was carried out with the UNCSAM (UNCertainty analysis by Monte Carlo SAMpling techniques) software package (Janssen et al., 1994). The distribution functions specified for the system parameters are described in detail in Section 5.1. No correlations were incorporated in the sampled set of system parameters.

The sample of process parameter values has been created using real properties of a selection of 180 pesticides, which are currently (June 1996) registered in the Netherlands. The creation of this sample is described in detail in Section 4.1.

3.4 Global sensitivity measures

For the sensitivity analysis the TOXSWA model can be viewed as follows. A scalar model output y depends on a number of scalar inputs x_1 , x_2 , ..., x_k.

$$y = f(x_1, x_2, ..., x_k) \tag{3.1}$$

or in vector notation:

$$Y = f(X) \tag{3.2}$$

The random vector $X = (x_1 , x_2 , ..., x_k)$ has some given multivariate distribution D, which describes the distribution of the individual components and their dependencies.

The given function f is deterministic and is evaluated by simulation; f represents a single selected output, in this case the AEC after 4, 21 or 28 days. The different outputs will be analyzed separately, although they have been calculated simultaneously. In the sensitivity analysis the scalar inputs x_1 , x_2 , ..., x_k are the logarithms of the process or the system parameters. Logarithms were taken because of the skew distributions of most of the (process) parameters over their range.[2]

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[2] These logarithms were taken from the sampled values after the Monte Carlo runs were performed for the benefit of determining the sensitivity measures like *TMV* and *BMV* (in order to obtain a suitable spline regression).

In global sensitivity analysis a model output f(x) is studied when the vector X ranges over some domain Δ. Here the case is discussed that Δ is finite. Let μ denote the mean of f over Δ. Then the total variation *VTOT* of f over Δ may be defined as:

$$VTOT = \text{mean}_{\Delta}(\text{f}(x) - \mu)^2 \tag{3.3}$$

Let U denote a subset of X, for instance one particular x_i, or a group of inputs corresponding to a particular submodel. It would be welcome to have some measure to express the sensitivity of f(x), on Δ, with respect to such a subset U. Intuitively it can be said that f is very sensitive to subset U, if most of the variation of f can be absorbed by a function f_U that depends solely on the inputs U. On the other hand it might be said that f is very sensitive to the inputs U, if any approximation of f that does not depend on U, will perform badly. Thus the sensitivity with respect to U can be characterized positively, i.e. assessing how well f can be approximated by a function that depends only on U; and negatively, i.e. assessing how badly f is approximated by functions that do not depend on U.

The positive characterization is formally defined in the following way. The least squares approximation $\hat{\text{f}}_U(U)$ of f(x) absorbs as much of the variation of f as possible by a function of U only. If that approximation has the property that the mean of $(\text{f} - \hat{\text{f}}_U)^2$ is much smaller than *VTOT*, then f(x) is very sensitive to U. Accordingly the *top marginal variance* of U (TMV_U) is defined as follows:

$$TMV_U = VTOT - \text{mean}_{\Delta}\left(\hat{\text{f}}_U(U) - \text{f}(x)\right)^2 \tag{3.4}$$

The negative characterization of the sensitivity of f with respect to the inputs U can be formalized as follows. Denote by V the inputs not comprised in U. The least squares approximation $\hat{\text{f}}_V(V)$ represents the best approximation that can be achieved by a function of V only. If this approximation is bad, U comprises a sensitive set of inputs. Accordingly, the *bottom marginal variance* of U (BMV_U) is defined as:

$$BMV_U = \text{mean}_{\Delta}\left(\hat{\text{f}}_V(V) - \text{f}(x)\right)^2 \tag{3.5}$$

Often the top marginal variance and the bottom marginal variance are expressed as percentages of the total variance *VTOT*. It can be shown that the top marginal variance equals $TMV_U = \text{Var}_{\Delta}\,\hat{\text{f}}_U(U)$; and that the bottom marginal variance equals $BMV_U = VTOT - \text{Var}_{\Delta}\,\hat{\text{f}}_V(V)$. Note that BMV_U is the complement of TMV_V: they add up to *VTOT*.

Unfortunately, BMV_U and TMV_U need not to be equal. Differences may be caused by dependence of the range and variability of one x_i on the values of the others.

But such a dependence is absent in the case of the present sensitivity analysis of TOXSWA. In case of independence, it can be shown that $BMV_U \geq TMV_U$ with equality if f is a so-called additive function of the x-es:

$$f(x) = f_1(x_1) + \ldots + f_k(x_k) \tag{3.6}$$

So additivity signifies that the effect of a change in x_i is the same for different values of the other x-es. Non-additivity is often called interaction. Thus, in case of independent inputs, differences between the TMV and BMV are caused by non-additivity.

The concepts of top and bottom-marginal variances have been introduced in Sobol' (1990, 1995) and Jansen et al. (1994). Sobol' speaks of *sensitivity indices* instead of variances. For a more formal definition of top and bottom marginal variances, the reader is referred to Jansen & Withagen (1998).

In the performed single-input sensitivity analysis, the function f is approximated by means of a smooth additive function of the type:

$$f(x) = s_1(x_1) + \ldots + s_k(x_k) \tag{3.7}$$

where the functions s_i are so-called smoothing splines. Smoothing splines are complicated functions, constructed from segments of (cubic) polynomials between the distinct values of x_i and constrained to be 'smooth' at the junctions. The smoothness of the splines can be controlled by means of the so-called *effective number of degrees of freedom* (edf). Edf acts much the same as the number of degrees of freedom of a polynomial: a larger edf results in closer adherence to the data, at the price of less smoothness (Genstat 5 Committee, 1993). We used a edf of three in this study.

The validity of such an analysis depends critically on the quality of this approximation, which is expressed by the percentage variance accounted for. If that percentage is far below 100, the analysis 'sees' only a small part of the variation of f, and becomes less relevant.

It is possible to assign more weight to some parts of the input domain Δ by taking weighted means over Δ, instead of the plain means used above. In the sensitivity analysis of TOXSWA, plain means were taken.

In this study, first a single-input sensitivity analysis of TOXSWA was performed, which analyses the sensitivity of individual inputs. Afterwards, the most sensitive inputs were subjected to a group-of-inputs sensitivity analysis. Both analyses were performed on the process parameters as well as on the system parameters.

The top and bottom-marginal variances were used as global sensitivity measures in this study, to indicate sensitive inputs of TOXSWA. They have been calculated using statistical features of the software package Genstat (Genstat 5 Committee,

1993). Two Genstat programs were written: one for a single-input sensitivity analysis and one for a group-of-inputs sensitivity analysis. The Genstat programs are given in Annexes 1 and 2, respectively. Both programs were initially written for the process parameters, but were adjusted for the system parameters in a later stage of this study. These adjusted programs are not given in the Annexes.

Single-input sensitivity analysis
The Genstat program for a single-input sensitivity analysis reads the sample with process or system parameters values, and the output file of the shell containing the AECs after 4, 21 and 28 days, described in Section 3.1. Next, the Genstat program approximates the output (the AECs) by means of the smooth additive function (Eq. 3.7) and calculates the top and bottom marginal variances for each process or system parameter. The sensitive parameters were indicated on basis of the values of their top and bottom marginal variances. The results are described in Section 4.3 and 5.3 for the process and system parameters, respectively.

Group-of-inputs sensitivity analysis
Next, the most sensitive parameters were subjected to a group-of-inputs sensitivity analysis, to check if the most sensitive parameters found in the single-input analysis, really account for most of the variation in the output, or to check if any variance not accounted for is caused by interaction (non-additivity). The group-of-inputs analysis is based on the fact that the sensitive parameters are responsible for almost all variation in the output. So, if we assign new values to the insensitive parameters of each combination, while fixing the sensitive parameters at their original values, i.e. the values used in the single-input analysis, and performing a new Monte Carlo simulation, it was expected that the variation in the output is about the same as the variation in the output resulting from the single-input analysis.

The two sets of simulation results can be compared by calculating the top and bottom variance for two independent complementary groups of inputs U and V. Let U denote the group of sensitive parameters and V the group of insensitive parameters. V_1 and V_2 are two independent realizations of V. They denote respectively the realization with the 'original' values of the insensitive parameters and a new realization with values of the insensitive parameters (obtained by randomization, see below). Then $f(U, V_1)$ and $f(U, V_2)$ are independent realizations of $f(U, V)$, given U, e.g. the AECs after 4 days calculated with both parameter sets. Thus $f(U, V_1)$ - $f(U, V_2)$ has expectation 0, while its variance, i.e. its expected square, given U, is twice the variance of $f(U, V)$, given U.

It follows that the expectation of ½ $[f(U, V_1) - f(U, V_2)]^2$ is equal to the bottom marginal variance BMV_V:

$$BMV_V = \tfrac{1}{2}\left[f(U,V_1) - f(U,V_2)\right]^2 \tag{3.8}$$

The estimation of the top marginal variance is based on the following. As stated above, the top marginal variance from U is equal to $TMV_U = VTOT - BMV_V$. Hence,

$$
\begin{aligned}
TMV_U &= VTOT - \tfrac{1}{2}\left[\mathrm{f}(U,V_1) - \mathrm{f}(U,V_2)\right]^2 \\
&= VTOT - \tfrac{1}{2}\left[\mathrm{f}(U,V_1) - \mathrm{f}_0 - \mathrm{f}(U,V_2) - \mathrm{f}_0\right]^2 \\
&= \mathrm{covar}\left[\mathrm{f}(U,V_1) - \mathrm{f}(U,V_2)\right]
\end{aligned} \tag{3.9}
$$

in which f_0 is the best approximation of f when U and V are unknown. Accordingly, top marginal variances are estimated as covariances between the two realizations of f(U, V), e.g. two columns with the calculated AEC4 from both samples, and bottom marginal variances as half mean squared differences between the two realizations of f(U, V) (Jansen & Withagen, 1998).

To obtain a new sample, in which other values are assigned to the insensitive parameters, a Genstat program was used (Annex 3). This Genstat program was already used in a earlier stage of this study to reduce correlations in the sample of process parameter values (Section 4.1) by randomizing the values of each column over the rows of the sample. The same principle was applied here. The values of the insensitive parameters (columns) were randomized over the pesticides (the rows). In the Genstat program, the columns to be randomized have to be indicated. As a result of this randomization, new parameter combinations per pesticide were obtained.

4 Identification of process parameters contributing most to the variation in the model output

4.1 Sample of process parameters

To perform a global sensitivity analysis on the process parameters, a sample with values for the process parameters, i.e. a sample with pesticide properties, was needed (Table 4.1). The Henry coefficient is introduced here, as a new process parameter. This is done, because the process parameters from which the Henry coefficient is calculated, i.e. the saturated vapour pressure, the temperature, the molecular mass and the solubility, (Eq. 2.9) are always found in this combination in the TOXSWA model. Moreover, the Henry coefficient, K_H, is a generally known parameter used to rank pesticides for their volatilization capacity (e.g. Lyman et al., 1982).

Table 4.1 Summary of the process parameters and their ranges applied in the global sensitivity analysis of TOXSWA. The distribution of the process parameters corresponds in most cases (but not all, see the text!) to the one of the 180 real pesticides used

Symbol	Description	Range	Unit
k	transformation rate coefficient in the water layer	$6.9 \cdot 10^{-5}$ - 77.0	d^{-1}
$K_{om,ss}$	slope of the sorption isotherm for suspended solids	$1.0 \cdot 10^{-4}$ - 180	$m^3.kg^{-1}$
n_{ss}	Freundlich exponent for sorption to susp. solids	0.694 – 1.151	-
K_{mp}	slope of sorption isotherm for macrophytes	$1.0 \cdot 10^{-4}$ - 180	$m^3.kg^{-1}$
k_l	exchange coefficient in the liquid phase	1.42 - 3.47	$m.d^{-1}$
k_g	exchange coefficient in the gas phase	135.9 – 333.1	$m.d^{-1}$
K_H	Henry coefficient	$1.19 \cdot 10^{-16}$ - 2.58	-
D_w	diffusion coefficient in water	29.5 – 82.8	$mm^2.d^{-1}$
k_b	transformation rate coefficient in sediment	$4.9 \cdot 10^{-4}$ - 77.0	d^{-1}
$K_{om,wb}$	slope of sorption isotherm for sediment	$1.0 \cdot 10^{-4}$ - 180	$m^3.kg^{-1}$
n_{wb}	Freundlich exponent for sorption to sediment	0.606 - 1.212	-

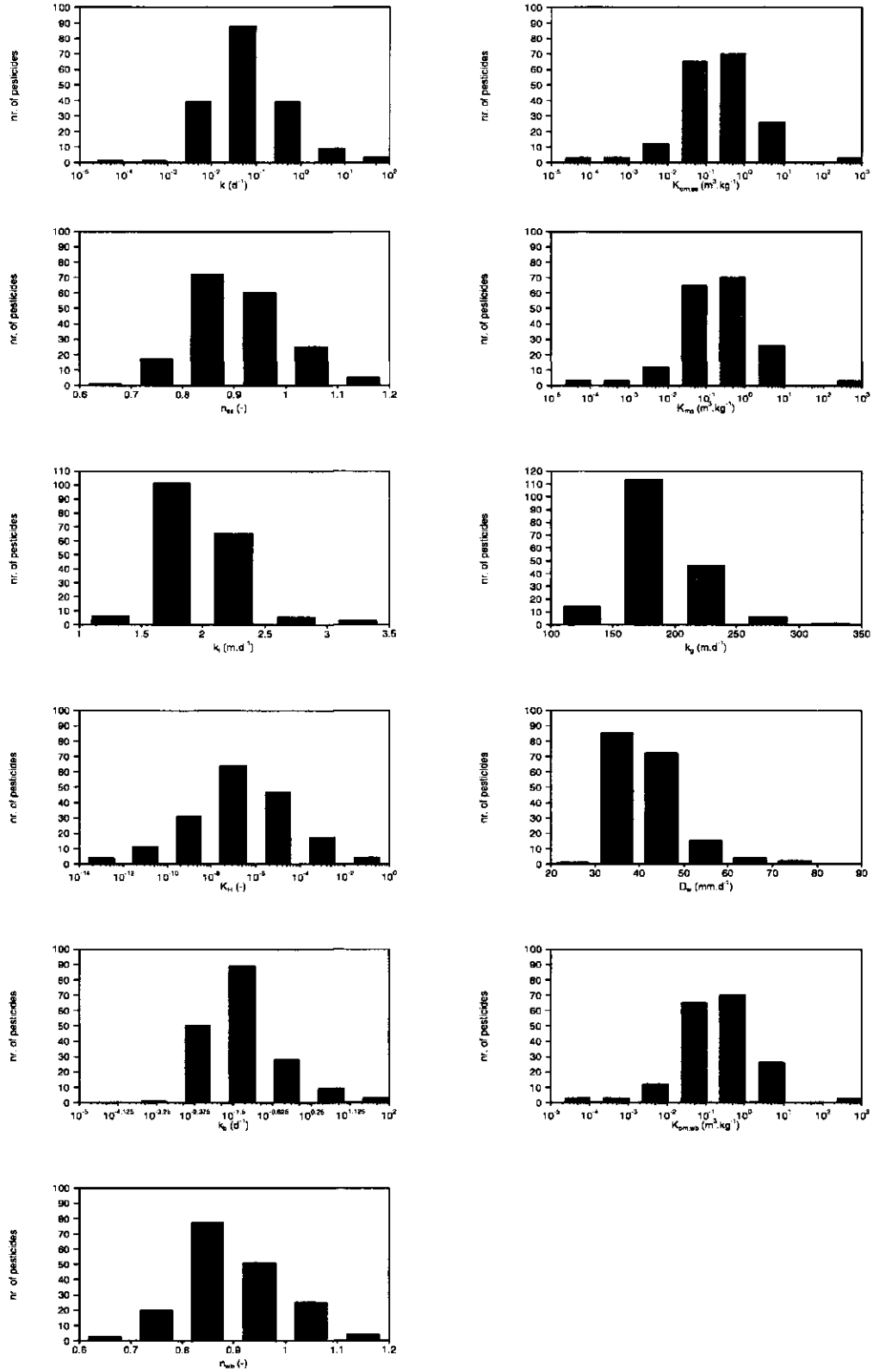

Fig. 4.1 The distribution of the process parameters of the 180 pesticides. In most cases (but not all, see the text!) the distribution corresponds to the one of the 180 real pesticides used (The numbers on the x-axis represent the interval boundaries of distributions shown)

Creation of the sample of process parameters

Because we want to examine the variation in the output for the total domain of pesticide properties of the pesticides registered in the Netherlands, it was decided to use real values for the sample of the process parameters. From Linders et al. (1994) and a list of registered pesticides provided by the Board for the Authorization of Pesticides (June, 1996), 180 pesticides were selected. For these pesticides, a sample with values for the process parameters has been created. Missing process parameter values were supplemented (where possible) from Van Rijn et al. (1995) or Tomlin (1994)[3]. The sample is listed in Annex 5. In Figure 1, the distributions of the process parameters are visualized. Note, that the distributions of the three sorption coefficients are identical. This is also the case for the distributions of the Freundlich exponents (n_{ss} and n_{wb}).

The transformation rate coefficient in the water layer (k) is calculated via:

$$k = \frac{\ln(2)}{DT_{50}} \tag{4.1}$$

with

DT_{50} = the half life time in water (d).

If the half life time of the pesticide in water was missing the following procedure was followed to estimate this half life time:

1 the DT_{50} of the water-sediment system was taken;

If this half life time was missing then:

2 the sum of the hydrolysis DT_{50} and ½ the photolysis DT_{50} was taken;

If these data were also missing then:

3 the DT_{50} in soil was taken.

Figure 4.1 shows that almost 50% of the 180 pesticides have transformation rates between 0.01 and 0.1 d^{-1}, which corresponds to half lifes of 7 to 70 d.

In literature, no data were available for sorption of pesticides to suspended solids. Therefore, the slope of the sorption isotherm for suspended solids, $K_{om,ss}$, was estimated to be equal to the slope of the sorption isotherm for soil, based at the organic matter content (K_{om}) for all pesticides. The K_{om} values for soil of a few pesticides were estimated from qualitative data (Van Rijn et al., 1995):

immobile	K_{om}:	> 100 $dm^3.kg^{-1}$;
slightly mobile	K_{om}:	20-100 $dm^3.kg^{-1}$;
moderately mobile	K_{om}:	5-20 $dm^3.kg^{-1}$.

---

[3] The following calculation rules were applied in case in the original reference the process parameter values were given as (a and b are process parameter values):

< a then	½ a was taken (assuming that the lowest possible value is zero);
> a then	a was taken;
a to b then	½ (a + b) was taken;
< a to < b then	½ (a + b) was taken;
a to < b then	½ (a + b) was taken;
etc.	

The calculation rules mentioned above were applied on these data. Figure 4.1 shows that only a few pesticides (i.e. pyrethroids), have high coefficients (>100 $m^3.kg^{-1}$) for sorption to suspended solids; most pesticides have sorption coefficients between 0.01 and 1 $m^3.kg^{-1}$.

Also, no data were available for the Freundlich exponent for sorption to suspended solids, n_{ss}. Calvet et al. (1980) reported a range of 0.7-1.0 for the Freundlich exponent for pesticide sorption to organic matter in soils for different pesticides. Usually, a standard value of 0.9 based on the average reported by these authors, is taken. We assume that the same value can be assessed for pesticide sorption to suspended solids. But, if we apply this standard value to each of the 180 pesticides, it can be said on beforehand that the Freundlich exponent for sorption to suspended solids, will have no influence on the variation in the output. Therefore, some artificial variation between the Freundlich exponents of the 180 pesticides is introduced. This is done by multiplying the standard value of 0.9 by a randomly drawn value from a log-normal distribution function with mean 1 and standard deviation τ (so also the variation coefficient equals τ). The variation coefficient was set by trial and error, using a minimum and maximum value of the Freundlich exponent on the sample of size 180. The minimum value was set to 0.7 as reported by Calvet et al. (1980). In this study, the maximum value of the Freundlich exponent was set to 1.2. After multiplying the standard value with the random draw from the distribution function the resulting values should be within this range. To introduce the lognormal variation in the Freundlich exponent, a Genstat program was written. This program is given in Annex 4.

Also, no data were available for the sorption of pesticides to macrophytes. Therefore, the distribution coefficient for pesticides between water and macrophytes, K_{mp}, (i.e. the slope of the sorption isotherm based at the mass of dry macrophytes) was also estimated to be equal to the slope of the sorption isotherm for soil. Figure 4.1 shows that the distribution of the coefficient for sorption to macrophytes is identical to the other two sorption coefficients.

The values for the transport coefficients of pesticides in water (k_l) and air (k_g) were not available from literature, but can be calculated using other properties of the pesticides. They can be derived from (Liss & Slater, 1974):

$$k_l = k_{l,\,CO_2} \frac{\sqrt{M_{CO_2}}}{\sqrt{M_m}} \tag{4.2}$$

and

$$k_g = k_{g,\,H_2O} \frac{\sqrt{M_{H_2O}}}{\sqrt{M_m}} \tag{4.3}$$

with

k_{l,CO_2} = transport coefficient CO_2 in liquid phase (= 4.8 $m.d^{-1}$);

M_{CO_2} = molecular mass CO_2 (= 44 $g.mol^{-1}$);

M_m = molecular mass pesticide ($g.mol^{-1}$);

k_{g,H_2O} = transport coefficient H_2O in gas phase (= 720 m.d^{-1});
M_{H_2O} = molecular mass H_2O (= 18 g.mol^{-1}).

Figure 4.1 shows that for most pesticides k_l is between 1.5 and 2.0 m.d^{-1} and k_g is between 150 and 200 m.d^{-1}.

In TOXSWA, the Henry coefficient, K_H, is calculated at the start of each simulation run with the help of Eq. 2.9. Input data are the saturated vapour pressure, P, the molecular mass, M_m, the temperature, T, and the solubility, c_{sol} for each pesticide. For P, M_m and c_{sol} we have used data found in literature mentioned above. Values for the temperature, T, were generated in same way and using the same Genstat program (Annex 4) as described above for the Freundlich exponent for sorption to suspended solids. The minimum and maximum values were assumed to be 273 and 313 K, respectively[4]. Figure 1 shows that for most pesticides the Henry coefficient is in the order of 10^{-8} to 10^{-4}.

The diffusion coefficient of the pesticide in water (D_w) was calculated with the help of the Hayduk & Laudie method. This method is recommended by Lyman et al. (1982) for estimating the diffusion coefficient for organic compounds in water. The Hayduk & Laudie equation is written as:

$$D_w = \frac{13.26 \cdot 10^{-5}}{\eta_w^{1.14} V_B^{0.589}} \cdot 8.64 \cdot 10^6 \qquad (4.4)$$

with
D_w = diffusion coefficient (mm^2.d^{-1});
η_w = (dynamic) viscosity of water (10^{-3} kg.m^{-1}.s^{-1});
V_B = molar volume (LeBas method) (cm^3.mol^{-1}).

The viscosity of water was taken at 20 °C (≈ 1.10^{-3} kg.m^{-1}.s^{-1}). The molar volume of the pesticide was estimated from the chemical structure of the pesticide and the additive volume increments of the individual atoms. The volume increments of some atoms (C, H, O, N, Br, Cl, F, I, and S) for calculating the LeBas molar volume are listed in Reid et al. (1977). Unknown volume increments of atoms (P, Zn) were estimated by interpolation on basis of their molecular mass. Diffusion coefficients are typically in the order of 30 to 50 mm.d^{-1} (Figure 4.1).

For the calculation of the transformation rate coefficient in the sediment (k_b) the DT_{50} of the water-sediment system was taken. If these data were missing the DT_{50}

[4] At the final stage of this study, we realised that it had not been necessary to introduce variation for the temperature T, because we decided to introduce the Henry coefficient as a new process parameter, instead of the separate parameters P, M_m, T and c_{sol}. By calculating the Henry coefficient using real values for P, M_m, and c_{sol} for each pesticide and using a standard value of 293 K for T, the Henry coefficients were very similar to the ones found in Linders et al. (1994). By varying T between 273 and 313 K, the calculated Henry coefficients differ from the ones found in Linders et al. by a factor of 0.93 to 1.07. As the results are not expected to be influenced much by the introduced temperature variation, we did not redo all calculations.

in the soil was taken instead. Equation 4.1 was used to calculate k_b. In sediment, most pesticides have transformation rates between 0.01 and 0.1 d^{-1} (half lifes of 7 to 70 d).

No data were available for the sorption of pesticides to sediment. Therefore, the slope of the sorption isotherm for sediment, $K_{om,wb}$, was also estimated to be equal to the slope of the sorption isotherm for soil.

To introduce some variation between the Freundlich exponents for sorption to the sediment of the 180 pesticides, exactly the same procedure is followed as described for the Freundlich exponent for sorption to suspended solids.

Correlation

From the results of an initial Monte Carlo simulation, it was shown that the assumption of the sorption coefficients for sorption to macrophytes, suspended solids and sediment being equal (K_{mp} = $K_{om,ss}$ = $K_{om,wb}$), give insufficient information to identify if any of these sorption coefficients is a sensitive process parameter, because they all showed the same influence on the variation in the output. In other words: it was not possible to identify if one, two or all three sorption coefficients are sensitive process parameters, because they are fully correlated.

Other high correlations existed as well within the sample of process parameter values. The exchange coefficients in the liquid and gas phase (k_l and k_g) were also fully correlated (correlation coefficient of 1), because they were both calculated as the square root of molecular mass of the pesticide, M_m, multiplied with a factor (Eqs. 4.2 and 4.3). A high correlation was also found (correlation coefficient of 0.99) between the transformation rate coefficients in the water layer and sediment (k and k_b), which can be explained by the fact that in most cases the same half life time was taken to calculate both coefficients. The diffusion coefficient in water, D_w, is calculated with the help of the molar volume (Eq. 4.4). In general, a high molar volume of a molecule will correspond with a high molecular mass. Therefore, also high correlations were found between D_w and the exchange coefficients k_l and k_g (correlation coefficients of 0.91).

We want these correlations to be absent in the sample of process parameter values, because we want to avoid to indicate a parameter as sensitive, whereas in reality this parameter only shows as sensitive parameter because it depends on a real sensitive parameter.

To obtain such a sample with (almost) no correlation between the process parameters, a Genstat program was written (Annex 3). This Genstat program reads the values of each process parameter (the columns) of the original sample of process parameter values (denoting 'real' pesticides) (Annex 5), and randomizes the values of each column over the 180 pesticides (the rows). In this way a new sample was obtained; the ranges and the distributions of the values of the process parameters correspond to those of existing pesticides, but on the other hand the combination of process parameter values for a specific pesticide are fictitious.

Therefore, the pesticides are referred to as hypothetical pesticides in the remainder of this report. The sample of process parameter values obtained after randomization (so, denoting hypothetical pesticides) is shown in Annex 6.

4.2 Standard set of system parameters, entries and initial conditions

To perform a sensitivity analysis on the process parameters, a standard set of system parameters, entries and initial conditions was needed. The standard set was used to run TOXSWA for each of the hypothetical pesticides using the process parameter values from the sample, described in the previous section. In this section this standard set is described.

Ditch and sediment characteristics
The cross section of the ditch has a trapezoidal shape. The width of the ditch bottom is 1 m and the side slope (horizontal/vertical) is 1.5.

The concentration suspended solids in the ditch is 30 $g.m^{-3}$. This is the amount of suspended solids in standard water. Standard suspended solids contain 20% organic matter. These standards were derived from the average situation in the governmental waters in the Netherlands (Venema, 1991). The amount of dry macrophyte biomass present per m^2 ditch bottom is 300 g. This corresponds with a high average for the peak biomass for Dutch ditches (Brock, 1988).

For the sediment, TOXSWA needs a distribution with depth for the organic matter content, the bulk density, the porosity and the tortuosity. Very few data concerning distributions of organic matter contents with depth are available, as well as concerning bulk densities, and porosities. Therefore, the data set from the experimental ditches 3 and 8 of the DLO Winand Staring Centre with sandy sediments has been used. The properties were measured during the linuron experiment from May through August 1995 (Crum et al., 1998). The values are obtained by averaging the values of the measurements taken in 5 segments of each ditch on a total of 23 different days during this period (total observations: 230) (Table 4.2). In TOXSWA smaller layers than the layers in Table 4.2 are considered, but it was assumed that all layers within the layer of 0-1 cm have identical properties as this layer. So, these values have been straightly entered as model input.

Table 4.2 Average sediment properties of the experimental ditches 3 and 8

Depth (cm)	Org. mat. fr. (-)	Bulk density ($kg.m^{-3}$)	Porosity (-)	Tortuosity (-)
0 - 1	0.25	80	0.82	0.82
1 - 2	0.19	220	0.77	0.77
2 - 4	0.06	670	0.62	0.62
4 - 10	0.02	1500	0.36	0.28

The relation between the tortuosity factor and the volume fraction of liquid (the volume fraction of liquid equals the porosity in sediment) was derived from literature compilation by Leistra (1978). The tortuosity factors in the range above a

porosity of 0.50 were obtained by linear interpolation with the maximum value of the tortuosity is 1.0 at a porosity of 1.0 (De Heer, 1979).

Hydrology

The water depth in the ditch is constant at 0.5 m. For the flow velocity, u, a value of 10 $m.d^{-1}$ was chosen. Both values are expected to be close to the realistic worst case that will be applied in the registration procedure. (Mid 1996 this realistic worst case scenario was not yet selected.) The dispersion coefficient E_x is calculated with the equation of Jain (Young & Wallis, 1993):

$$E_x = \beta \frac{u^2 O^3}{\kappa A U^*} \tag{4.5}$$

with

β	=	dimensionless parameter ($\beta \leq 0.0164$, we took here: 0.0164);
κ	=	dimensionless transverse mixing coefficient ($\kappa \approx 0.4$ for channels with small scale longitudinal non-uniformity, such as sidewall irregularities (Fischer et al., 1979));
u	=	average cross-sectional flow velocity;
U^*	=	shear velocity ($m.d^{-1}$) ($U^* \approx 0.1\ u$ (Lijklema & Koelmans, 1991));
O	=	width of the water surface (m) (O = 2.5 m);
A	=	cross sectional area of flow (m^2) (A = 0.875 m^2).

Applying Equation (4.5) the dispersion coefficient equals 73.2 $m^2.d^{-1}$.

It was shown that this equation gives a good approximation of the values measured in the experimental ditches of the DLO Winand Staring Centre during the linuron experiment (P.I. Adriaanse, 1997, pers. comm.).

Initial conditions and entries

The initial concentration in the water layer, i.e. the nominal concentration, can be calculated by dividing the deposition of the pesticide onto the surface of the water layer by the volume of the water in the ditch. In this study, a standard deposition of 1 $mg.m^{-2}$ onto the water surface is assumed. The volume of water in the ditch (per unit length) can be calculated from:

$$V = \frac{h(b + h s_l) \cdot 1}{(b + 2h s_l) \cdot 1} \tag{4.6}$$

in which the numerator is the wetted area of the ditch and the denominator the width of the surface water. In the standard set, the bottom width of the ditch equals 1 m, the water depth equals 0.5 m and side slope equals 1.5, so the volume of the ditch per unit length equals 0.875 m^2. From this, a nominal concentration of 2.86 $mg.m^{-3}$ (= 2.86 $\mu g.l^{-1}$) pesticide in the water layer results.

For the sensitivity analysis it was assumed that the sediment is free of pesticides at the start of the simulation.

It was assumed that there is no upward or downward seepage in the sediment. Therefore, the dispersion length, L_{dis}, was given a dummy value, and the volume flux q and the concentration of pesticide in the incoming water c_{lb} were set to zero for every day to be simulated.

4.3 Results

The total variation in the AECs resulting from the 180 Monte Carlo simulations, is characterized by some basic statistical features (Table 4.3).

Table 4.3 The mean, standard deviation, coefficient of variation (cv), median, 2.5% and 97.5% percentile for the average exposure concentrations ($\mu g.l^{-1}$) after 4, 21 and 28 days (AEC4, AEC21 and AEC28

	AEC4	AEC21	AEC28
Mean	1.578	0.966	0.791
Standard deviation	0.807	0.684	0.566
Coef. of variation (%)	51.1	70.8	71.6
Median	1.739	0.908	0.733
2.5% percentile	0.020	0.009	0.007
97.5% percentile	2.682	2.228	1.808

If we compare the median of AEC4 with the calculated nominal concentration of 2.86 $\mu g.l^{-1}$, it shows that 50% of the hypothetical pesticides have an AEC4 equal to or more than 60% of the nominal concentration. For the medians of AEC21 and AEC28, the percentages are 32% and 26% of the nominal concentration, respectively. The 97.5% percentile of AEC4 shows that 2.5% of the hypothetical pesticides have an AEC4 equal to or more than 94% of the nominal concentration. This group of hypothetical pesticides has (combinations of) process parameter values denoting very slowly disappearing pesticides, e.g. low transformation and/or volatilization rates (DT_{50} > 80 d; $K_H < 10^{-7}$). The 97.5% percentile of AEC28 shows that the average exposure concentration over 28 days of these pesticides is still more than 63% of the nominal concentration.

The 2.5% percentile of AEC4 shows that 2.5% of the hypothetical pesticides have an AEC4 equal to or less than 0.7% of the nominal concentration. This group of pesticides has (combinations of) of process parameter values denoting very rapidly disappearing pesticides, e.g. high transformation and/or volatilization rates (DT_{50} < 1 d; $K_H > 10^{-4}$).

4.3.1 Single-input sensitivity analysis

In Table 4.4 the top and bottom marginal variances of the process parameters for AEC4, AEC21 and AEC28 are given, arranged in order of priority.

Table 4.4 Estimates of the top (TMV) and bottom (BMV) marginal variances (%) of the process parameters for AEC4, AEC21 and AEC28

Process parameter	AEC4		AEC21		AEC28	
	TMV	BMV	TMV	BMV	TMV	BMV
k	32.3	30.4	47.2	45.2	49.5	47.7
K_{mp}	34.0	37.9	17.5	11.6	17.7	11.7
K_H	19.6	13.9	15.2	17.7	12.0	14.5
k_1	2.7	0.5	2.4	2.1	2.3	2.0
$K_{om,wb}$	0.7	1.1	1.3	0.1	1.3	2.4
n_{ss}	0.5	0.1	1.0	2.1	1.3	0.1
$K_{om,ss}$	0.2	1.6	0.4	1.0	0.5	1.0
k_h	0.0	0.2	0.0	0.0	0.0	0.2
k_g	0.0	0.0	0.0	0.3	0.0	0.0
D_w	0.0	0.0	0.0	0.0	0.0	0.0
n_{wb}	0.0	0.4	0.0	0.0	0.0	0.0

The top marginal variance represents the positive characterization of the sensitivity with respect to the considered parameter, i.e. assessing how well the AECs can be approximated by a function that depends only on the considered parameter. The bottom marginal variance represents the negative characterization of the sensitivity with respect to the considered parameters, i.e. assessing how badly the AECs are approximated by functions that do not depend on the considered parameter, but depend on all the other parameters. The top and bottom marginal variances are expressed as percentages of the total variance. As these percentages are higher, the considered parameters are more sensitive.

The AECs were approximated by means of a smooth additive function described in Section 3.3 (Eq. 3.7). The quality of this approximation is expressed by the percentage variance accounted for. If this percentage is far below 100, the approximation is bad, and becomes less relevant. The total of the top marginal variances is not exactly equal to the percentage variance accounted for, because of small random correlations between the sampled process parameters.

The results of Table 4.4 show that the coefficient for sorption to macrophytes (K_{mp}) and the transformation rate coefficient in the water layer (k) are the most sensitive process parameters for AEC4. Both top and bottom marginal contributions are more than 30%. The Henry coefficient (K_H) with top and bottom marginal variances of 19.6 and 13.9%, respectively, can be indicated as a third sensitive process parameter with respect to AEC4. The total percentage variance accounted for this analysis equals 87.6%, indicating a good approximation of AEC4 by means of a smooth additive function (smoothing spline with three effective degrees of freedom).

Furthermore, Table 4.4 shows that k is the most sensitive process parameter for AEC21, the top and bottom marginal variances are both more than 45%. Two other sensitive process parameters can be identified: K_{mp} and K_H, with top and bottom marginal variances of 17.5 and 11.6% and 15.2 and 17.7%, respectively. The total percentage variance accounted for equals 80.9%, indicating a good approximation of AEC21 by means of a smooth additive function.

The results of Table 4.4 show that k is also the most sensitive process parameter for AEC28, with both the top and bottom marginal variance in the order of about 50%. K_{mp} and K_H can also be identified as sensitive process parameters with respect to AEC28. The total percentage variance accounted for equals 80.3%.

The results show that the influence of the transformation rate coefficient increases with an increasing average exposure duration.

Summarizing the results of this analysis, it can be concluded that for all three outputs considered, i.e. AEC4, AEC21, and AEC28, the same three parameters, namely k, K_{mp} and K_H, are the most sensitive process parameters.

4.3.2 Group-of-inputs sensitivity analysis

To check if the most sensitive process parameters k, K_{mp} and K_H, found in the single-input analysis, really account for most of the variation in the output, and to check if any variance not accounted for is caused by interaction of the sensitive process parameters, the calculation was repeated with a new sample of process parameter values. The new sample was created by randomizing the values of the insensitive process parameters (the columns) over the 180 (hypothetical) pesticides (the rows). The sensitive process parameters kept their original values. As a result of this randomization, new process parameter combinations per pesticide were obtained and again 180 simulations with TOXSWA were done. The sample with new process parameter combinations after randomization of the insensitive parameters is given in Annex 7. It was expected that AECs calculated with this new sample of process parameter values approximate the AECs calculated in the single-input analysis very closely. The two sets of simulation results can be compared by calculating the top and bottom variance for two independent complementary groups of inputs U and V, in which U is the group of sensitive process parameters and V the group of insensitive process parameters. V_1 and V_2 denote the realization with the 'original' values of the insensitive process parameters and the new realization obtained after randomization of the insensitive process parameters, respectively (Section 3.3).

In Table 4.5 the top marginal variance of U and the bottom marginal variance of V are given. The two are complementary and add up to the total variance.

Table 4.5 The top marginal variance of U and the bottom marginal variance of V (%) for AEC4, AEC21 and AEC28

	AEC4	AEC21	AEC28
TMV_U	97.2	93.1	92.4
BMV_v	2.8	6.9	7.6

The results of Table 4.5 show that the BMV_V for AEC4, AEC21 and AEC28 are relatively small compared to the TMV_U. This indicates that V, i.e. the group of insensitive process parameters, has indeed little influence on the variation in the

AECs and that U, i.e. the group of sensitive process parameters accounts for almost all variation.

In Figure 4.2 the relation between f(U, V_1) and f(U, V_2) is given for AEC4, AEC21 and AEC28 in so-called scatterplots. In the plots, the line f(U, V_1) = f(U, V_2) is presented as well. This line represents the expectation of f(U, V_1) - f(U, V_2) = 0 (Section 3.3), or in other words it was expected that the AECs calculated from both samples would be equal, hence would be situated on the line f(U, V_1) = f(U, V_2). The results of Figure 4.2 show that the calculated average exposure concentrations for both analyses agree very well in the lower regions: below 1.5 $\mu g.l^{-1}$, 1.25 $\mu g.l^{-1}$ and 1.0 $\mu g.l^{-1}$ for AEC4, AEC21 and AEC28, respectively. The differences between the AECs in the upper regions are mainly caused by large differences between the sorption coefficients for sorption onto suspended solids or onto the sediment. The differences are in the order of a factor of 1000. So, in these circumstances, the sensitive process parameters are small and the values of the other parameters become more important.

The results of this global sensitivity analysis for the process parameters show that for the defined standard set of system parameters almost all the variation in the AECs can be explained by the variation of three sensitive process parameters, namely the transformation rate coefficient in the water layer (k), the sorption coefficient for the sorption to macrophytes (K_{mp}) and the Henry coefficient (K_H). So, for calculating the AECs with TOXSWA, proper values are needed for these three process parameters. The Henry coefficient depends on the values of the saturated vapour pressure, the solubility, the temperature at which both are measured and the molecular mass (Eq. 2.9).

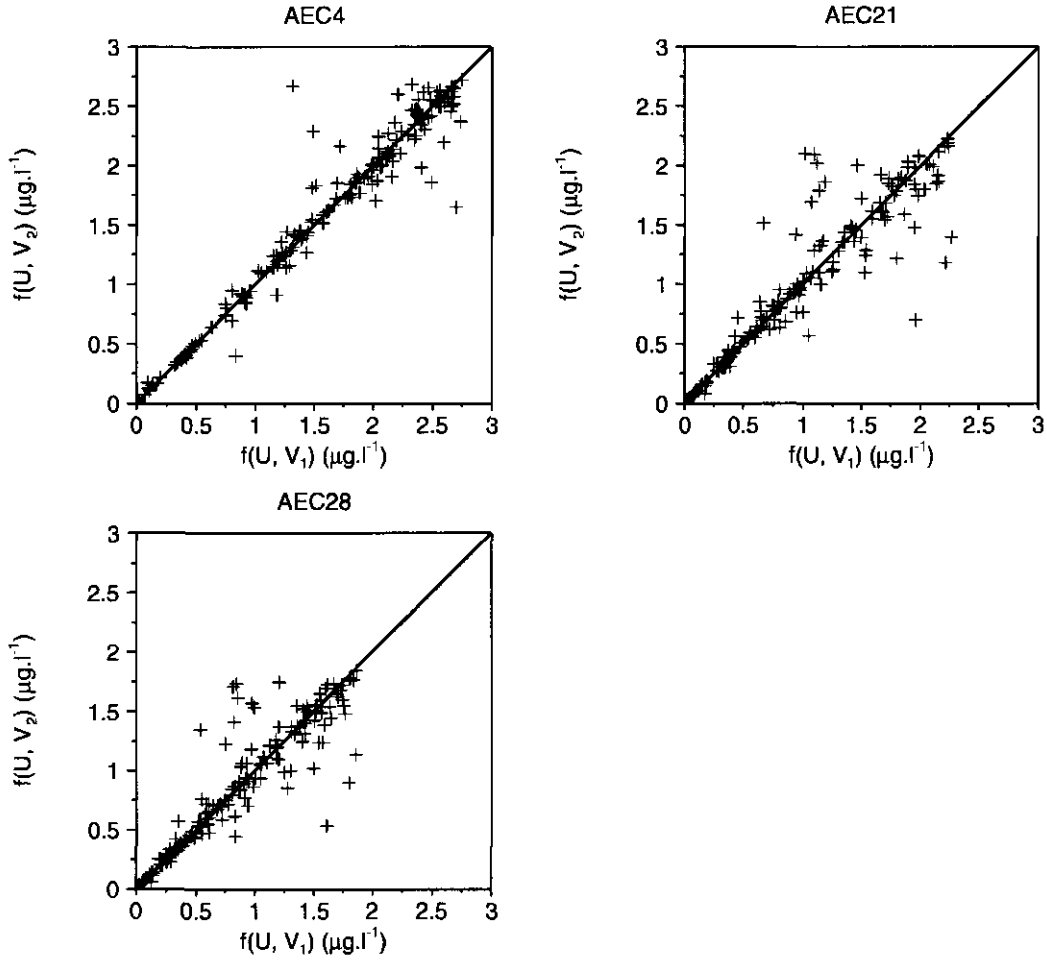

Fig. 4.2 The relation between $f(U,V_1)$ and $f(U,V_2)$ for AEC4, AEC21 and AEC28 (process parameters)

5 Identification of system parameters contributing most to the variation in the model output

Now the sensitive process parameters are known, the system parameters are involved in the sensitivity analysis. It is identified which of the system parameters contribute most to the variation in the model output. In other words: 'How important is the choice of the set of system parameters'? This is examined for all pesticides registered in the Netherlands, characterized by the ranges and distributions of the most sensitive process parameters: the transformation rate coefficient in the water layer (k), the sorption coefficient for the sorption to macrophytes (K_{mp}) and the Henry coefficient (K_H). Fixed values (e.g. medians) were given to the other (insensitive) process parameters (Section 5.2).

5.1 Sample of system parameters

The system parameters were described in detail in Section 4.2. In this section the ranges, distributions and correlations of the system parameters are described (Table 5.1). In the first column the symbols used in the equations (Chapter 2) are given.

Table 5.1 Summary of the system parameters

Symbol	Description	Unit
u	constant flow velocity	$m.d^{-1}$
E_x	dispersion coefficient	$m^2.d^{-1}$
h	constant water depth in the ditch	m
b	bottom width of the ditch	m
s_1	side slope, horizontal/vertical	-
h_w	water depth defining the exchanging perimeter $P_{z=0}$	m
ss	mass concentration of suspended solids	$g.m^{-3}$
$m_{om,ss}$	mass fraction of organic matter of suspended solids	-
DW	dry weight of macrophytes	$g.m^{-2}$
ρ_b	bulk density of dry bottom material	$kg.m^{-3}$
ε	volume fraction of pore water	-
λ	tortuosity factor	-
$m_{om,wb}$	mass fraction of organic matter of sediment	-

In the sensitivity analysis of TOXSWA, no upward (entry) or downward seepage was considered, because in the standard scenarios to be defined for the registration procedure, upward or downward seepage is not considered as well. Hence, system parameters like the length of the drained or infiltrated field (ℓ), the seepage flux (q), the concentration in the seepage water (c_{lb}) and the dispersion length (L_{dis}) were not involved in this analysis. They were set to zero or a dummy value was given.

An overview of the ranges attributed to the system parameters is given in Table 5.2. In most cases the ranges are compiled from literature, but some (h_w, $m_{om,wb}$, ε and λ) are more or less arbitrary.

The range of the flow velocity for Dutch ditches has been derived by Beltman & Adriaanse (in prep.) from relevant residence times of water in a ditch. These range from a flow velocity of 1 $m.d^{-1}$ for a ditch with a water depth of 1 m in spring, to a flow velocity of 120 $m.d^{-1}$ for a ditch with a water depth of 0.25 m in autumn. In this study, a maximum flow velocity of 100 $m.d^{-1}$ was taken. These are realistic minimal values. Higher flow velocities occur, but these are not realistic for our sensitivity analysis, because (i) this is the range of interest for standard scenarios, i.e. registration, and (ii) for higher flow velocities all of the pesticide mass will have flowed out of the ditch after two days, i.e. this is not relevant for average exposure concentrations.

In conformity with the definition of a ditch in Gorree et al. (1995) a maximum water depth of 1.5 m was taken. The minimum water depth was set to 0.1 m. The minimum bottom width of a ditch in the Netherlands is 0.5 m (Werkgroep herziening cultuurtechnisch vademecum, 1988). The maximum bottom width was set to 5 m, in this study. The allowable side slope beneath the water level of a ditch ranges from 1 to 4 (horizontal/vertical) (Werkgroep herziening cultuurtechnisch vademecum, 1988).

The range of the amount of suspended solids for ditches and its organic matter content was estimated from a literature compilation by Beltman & Adriaanse (in prep.) using the few available sources that concern or are related to ditches. The maximum amount of suspended solids measured in ditches[5] was 30 $g.m^{-3}$. The maximum organic matter content of the suspended solids measured was 80%. However, it was assumed that suspended solids can consist of pure organic matter, and therefore the maximum mass fraction was set to 1.

In Brock (1988), the maximum measured total dry biomass is given for 21 macrophytes in shallow water. A maximum of 1193 $g.m^{-2}$ was measured for *Elodea nuttallii*. Assuming that the root part of the total biomass is not contributing to the sorption to macrophytes, a maximum of 1000 $g.m^{-2}$ seems a reasonable estimation.

The range of the sediment bulk density ρ_b was set to 20-3000 $kg.m^{-3}$. The maximum value of the bulk density set here is actually too high, considering the bulk density of pure minerals (2650 $kg.m^{-3}$). This error was detected at the final stage of the study, but it turned out that this error had no influence on the results. The mass fraction of organic matter was assumed to receive any value in the range from 0 to 1; the porosity and the tortuosity any value in the range from 0 to 0.99.

The range of dispersion coefficient E_x was calculated with the equation of Jain (Eq. 4.5), substituting the minimum and maximum values of the ditch dimensions and the flow velocity.

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5 According to the data found from the literature compilation, the concentration suspended solids of 30 $g.m^3$ derived from the average situation in governmental waters and used for the standard set of system parameters (Section 4.2) was too high in case ditches. A standard value of 15 $g.m^{-3}$ would have been more relevant.

Because in literature no detailed information about distributions of the system parameters subjected to the sensitivity analysis was available, a uniform distribution over the ranges specified in Table 5.2 was assumed for all system parameters. A disadvantage of this assumption is the possibility of generating a sample with a lot of extreme values, instead of generating a sample with common values and only a few extreme values. Therefore, the minimum and maximum values specified in Table 5.2 were taken with a certain caution.

During the sampling procedure with the UNCSAM software package (Section 3.2) no correlations between the system parameters were incorporated. However, after sampling was done, two conditions were checked. First, for every combination it was checked if the water depth which defines the exchanging perimeter (h_w) was smaller or equal to the water depth (h) itself. If this was not the case, a new value of h_w was sampled. Secondly, it was checked if for every combination, the dispersion coefficient (E_x) was greater than five times the flow velocity. This is necessary, because otherwise the positivity conditions for the numerical solution in TOXSWA will not be fulfilled, and as a result the calculations will stop. A new value of E_x was sampled in case this condition was not accommodated.

The sample of system parameters is given in Annex 8.

Table 5.2 Ranges of system parameters

Parameter	Unit	Minimum	Maximum
u	$m.d^{-1}$	1	100
h	m	0.1	1.5
b	m	0.5	5
s_1	-	1	4
h_w	m	0.01	0.2
ss	$g.m^{-3}$	1	30
$m_{om,ss}$	-	0	1
DW	$g.m^{-2}$	0	1000
ρ_b	$kg.m^{-3}$	20	3000
ε	-	0	0.99
λ	-	0	0.99
$m_{om,wb}$	-	0	1
E_x	$m^2.d^{-1}$	10	12000

5.2 'Standard' set of process parameters

Most of the output variation caused by variation of process parameters can be characterized by the variation of three sensitive process parameters only (Section 4.3). So, fixed values (e.g. median) can be used for the other (insensitive) process parameters. In Table 5.3, the median values derived from the sample of 180 hypothetical pesticides, are given. Together with the sample of the sensitive process parameter values, these values are used to determine the sensitive system parameters with respect to the AECs.

Table 5.3 Median values of the insensitive process parameters

Process parameter	Median	Unit
$K_{om,ss}$	0.129	$m^3.kg^{-1}$
n_{ss}	0.9	-
k_l	1.966	$m.d^{-1}$
k_g	181.1	$m.d^{-1}$
D_w	41.4	$mm^2.d^{-1}$
k_b	0.0231	d^{-1}
$K_{om,wb}$	0.129	$m^3.kg^{-1}$
n_{wb}	0.9	-

5.3 Results

The total variation in the AECs resulting from the 180 Monte Carlo simulations for the system parameters, is characterized by some basic statistical features. In Table 5.4 the results are given for the average exposure concentrations after 4, 21 and 28 days (AEC4, AEC21 and AEC28).

Table 5.4 The mean, standard deviation, the coefficient of variation (cv), median, 2.5% and 97.5% percentile for the AEC4, AEC21 and AEC28 ($\mu g.l^{-3}$)

	AEC4	AEC21	AEC28
Mean	1.127	0.381	0.301
Standard deviation	0.855	0.369	0.307
Coef. of variation (%)	75.8	96.9	101.8
Median	0.872	0.258	0.196
2.5% percentile	0.028	0.013	0.010
97.5% percentile	3.736	1.299	1.134

In this case, the mean, the median, the 2.5% and 97.5% percentile can not be compared directly with the nominal concentration resulting from the standard deposition of 1 $mg.m^{-2}$ onto the water surface, because the nominal concentration is different for each calculation performed within the Monte Carlo simulations. The ditch dimensions are different for each calculation, so nominal concentrations differ (Section 4.2). It shows from the 2.5% and 97.5% percentiles of AEC4 that nominal concentrations resulting from the standard deposition, range from concentrations lower than 0.028 $\mu g.l^{-1}$ (in case of large water volumes in the ditch), to concentrations higher than 3.736 $\mu g.l^{-1}$ (in case of small water volumes in the ditch).

5.3.1 Single-input sensitivity analysis

In Table 5.5, the top marginal variance (the positive characterization of the sensitivity with respect to the considered parameter, i.e. assessing how well the AECs can be approximated by a function that depends only on the considered parameter) and bottom marginal variance (the negative characterization of the sensitivity with respect to the considered parameters, i.e. assessing how badly the AECs are approximated by functions that do not depend on the considered parameter, but depend on all the other parameters) of the system parameters and the three sensitive process parameters for AEC4, AEC21 and AEC28 are given.

The sensitive process parameters are included in this table, because they account for part of the input variation during this analysis and therefore they might also be partly responsible for the variation in the output. Again, the top and bottom marginal variances are expressed as percentages of the total variance. As these percentages are higher, the considered parameters are more sensitive.

Table 5.5 The top(TMV) and bottom (BMV) marginal variances (%) of the system parameters and the three sensitive process parameters for AEC4, AEC21 and AEC28

Parameter	AEC4		AEC21		AEC28	
	TMV	BMV	TMV	BMV	TMV	BMV
u	1.1	2.2	23.9	27.9	27.1	31.6
h	39.8	42.9	23.0	26.6	21.0	24.5
b	5.2	6.7	1.8	3.3	1.2	2.7
s_1	0.1	0.0	0.0	0.0	0.0	0.0
h_w	0.0	0.0	0.6	0.0	0.6	0.0
ss	0.0	0.9	0.0	1.3	0.0	1.3
$m_{om,ss}$	0.9	2.4	0.0	0.0	0.0	0.0
DW	0.0	0.0	0.0	0.0	0.0	0.0
$m_{om,wb}$	0.0	0.0	0.0	0.0	0.0	0.0
ρ_b	0.0	0.0	0.6	0.0	0.8	0.0
ε	1.0	0.0	1.1	0.0	1.0	0.0
λ	0.0	0.0	0.0	0.0	0.0	0.0
E_x	0.0	0.7	0.0	0.3	0.0	0.3
k	0.9	0.0	0.7	0.0	0.9	0.0
K_{mp}	1.6	0.2	0.2	0.0	0.0	0.0
K_H	0.0	0.0	0.1	0.0	0.2	0.0

The results of Table 5.5 show that the water depth (h) is the most sensitive system parameter with respect to AEC4. Both top and bottom marginal variance are in the order of 40%. The water depth is also a sensitive system parameter with respect to AEC21 and AEC28, with top and bottom variances of 23.0 and 26.6% and 21.0 and 24.5%, respectively.

Table 5.5 also shows that, the flow velocity (u) is a sensitive system parameter with respect to AEC21 and AEC28, with top and bottom variances of 23.9 and 27.9% and 27.1 and 31.6%, respectively. It influences less the AEC4, as for most of the selected flow velocities most pesticide mass has not yet flowed out of the ditch after four days and so the exact value of the flow velocity is not very important with respect to the AEC4.

From the top and bottom marginal variances of the three sensitive process parameters with respect to the top and bottom marginal variances of the sensitive system parameters, it is shown that the contribution to the variation in the output is very much dominated by the system parameters. The contribution of the process parameters is almost none.

However, the above results must be interpreted with care, because no smooth additive function could be found approximating the AECs satisfactorily. The percentages variance accounted for were 48.7, 52.9 and 53.7% for AEC4, AEC21 and AEC28, respectively. These percentages are far below 100%, so the approximations by the smoothing splines are less relevant. However, no other

function (e.g. linear), showing a better approximation of the AECs could be found either.

5.3.2 Group-of-inputs sensitivity analysis

To check if the most sensitive system parameters u and h, found in the single-input analysis, really account for most of the variation in the output, and to check if any variance not accounted for in the single-input analysis is caused by interaction, the calculation was repeated with a new sample of system parameter values. The new sample was created by randomizing of the values of the insensitive system parameters (Section 3.3). The sensitive system parameters and the sensitive process parameters kept their original values. (Also h_w and E_x kept their original values, because else the limitations of $h_w < h$ and $E_x > 5 \times u$ are not fulfilled). As a result of this randomization, new system parameter combinations were obtained and again 180 simulations with TOXSWA were done. The sample with new parameter combinations is given in Annex 9. It was expected that AECs calculated with this new sample are nearly similar to the AECs calculated in the single-input analysis. The two sets of simulation results can be compared by calculating the top and bottom variance for two independent complementary groups of inputs U (the sensitive parameters) and V (the insensitive parameters).

In Table 5.6 the top marginal variance of U and the bottom marginal variance of U are given. The two are complementary and add up to the total variance.

Table 5.6 The top marginal variance of U and the bottom marginal variance of V (%) for AEC4, AEC21 and AEC28

	AEC4	AEC21	AEC28
TMV_U	48.5	56.9	57.5
BMV_V[1]	51.2	42.9	42.3

[1] Note, that TMV_U and BMV_V do not completely add up to the total variance, probably because of small rounding errors.

The results of Table 5.6 show that the BMV_v for AEC4, AEC21 and AEC28 is almost equal to the TMV_U. This indicates that U, i.e. the group of sensitive system and process parameters, does not account for all the variation in the AECs. So, it was not possible from this analysis to indicate u and h as the group of system parameters accounting for most of the variation in the AECs.

In Figure 5.1 the relation between f(U, V_1) and f(U, V_2) is given for AEC4, AEC21 and AEC28 in case of the system parameters. Compared to the analysis of the process parameters (Figure 4.2), it is clearly shown that there is no relation between f(U, V_1) and f(U, V_2) in case of the system parameters. The data points are scattered throughout the represented area, and, in most cases, are a far way of the line f(U, V_1) = f(U, V_2), representing the expectation of f(U, V_1) - f(U, V_2) = 0.

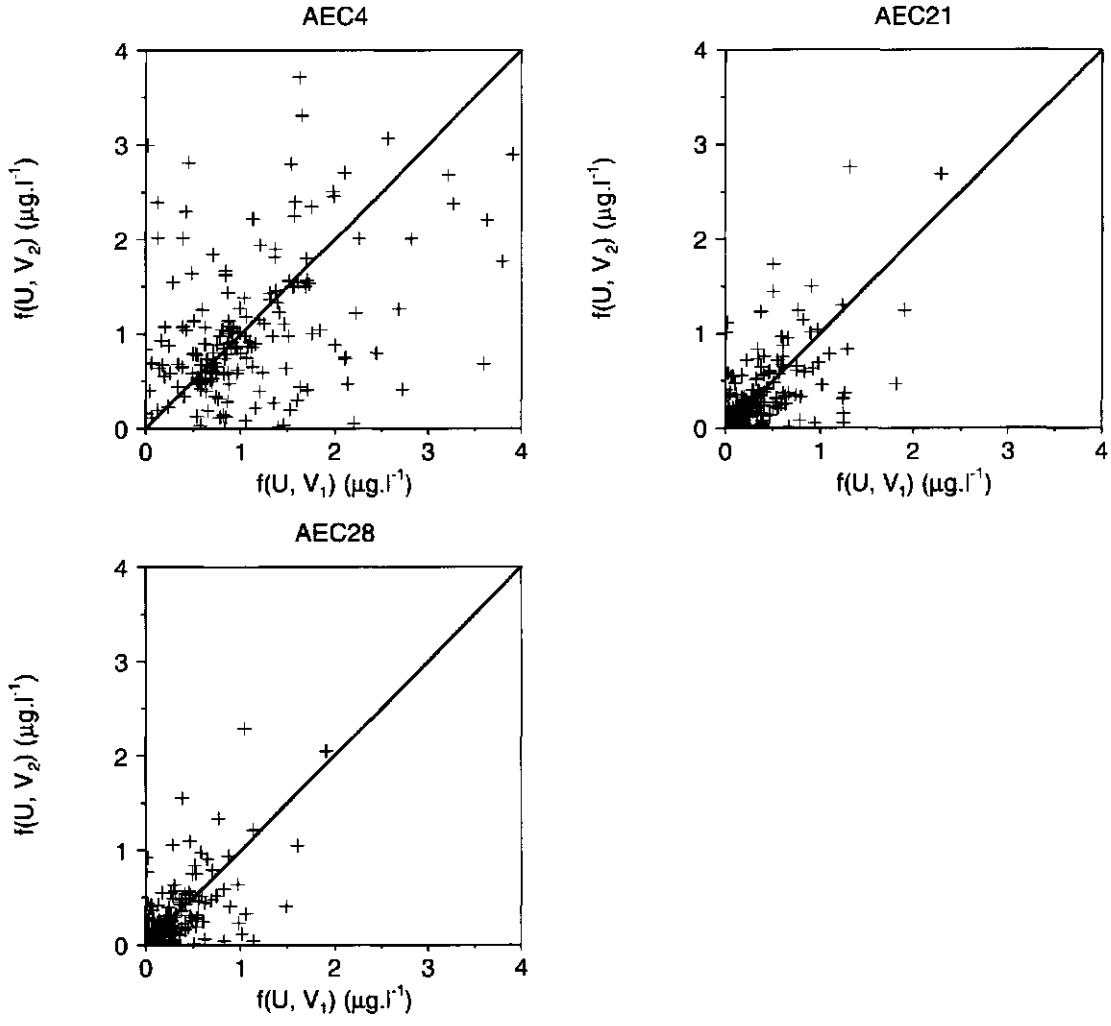

Fig 5.1 The relation between $f(U,V_1)$ and $f(U,V_2)$ for AEC4, AEC21 and AEC28 (system parameters)

However, when the randomized sample of system parameters and the generated output, were subjected to a single-input analysis, u and h showed again as sensitive system parameters, but also the sensitive process parameters now contributed to the variation in the output. This is shown in Table 5.7. The quality of the approximation of the AECs by the additive function was better compared to the original single-input analysis, i.e. the percentages variance accounted for were 77.2, 68.5 and 68.0% for AEC4, AEC21 and AEC28, respectively. These large differences between replicated estimates of the same quantities are a clear indication that the sample size is too small for the current purpose.

Table 5.7 The top (TMV) and bottom (BMV) marginal variances (%) of the system parameters and the three sensitive process parameters for AEC4, AEC21 and AEC28 when subjecting the randomized sample of system parameters to a single-input analysis

Parameter	AEC4		AEC21		AEC28	
	TMV	BMV	TMV	BMV	TMV	BMV
u	0.3	2.0	16.6	18.8	20.0	21.7
h	46.6	43.6	25.9	29.9	22.8	27.3
b	0.0	0.5	0.0	0.0	0.0	0.0
s_1	0.0	0.0	0.0	0.2	0.0	0.1
h_w	0.0	0.0	0.0	0.3	0.0	0.3
ss	1.1	0.0	0.2	0.0	0.0	0.0
$m_{om,ss}$	0.4	0.3	1.6	0.5	1.9	0.5
DW	0.4	0.9	2.2	0.8	3.5	1.0
$m_{om,wb}$	2.4	0.1	0.7	0.0	0.4	0.0
ρ_b	2.3	0.3	0.3	0.1	0.1	0.0
ε	0.0	0.0	0.0	0.0	0.0	0.0
λ	1.4	0.0	2.1	0.0	1.9	0.0
E_x	0.0	0.0	0.2	0.6	0.2	0.9
k	18.7	7.3	17.5	8.5	17.1	8.4
K_{mp}	12.0	12.7	3.3	5.8	2.4	4.9
K_H	5.3	2.7	5.6	3.5	5.4	3.5

Therefore a new analysis was done with a sample of 2000 combinations of the system parameters, instead of the sample with 180 combinations used in the previous analysis. The results of the analysis using the big sample are described in Section 5.4.

Another point to notify is that the dry weight of macrophytes (*DW*) did not come out as a sensitive system parameter, although the coefficient for sorption to macrophytes is shown to be a sensitive process parameter. After all, no sorption to macrophytes is possible if there is not any substrate. A first assumption trying to explain why the dry weight of macrophytes did not show up was that in our sample high sorption coefficients coincidentally correspond to low dry weights of macrophytes. Analysis of the sampled values did not confirm this assumption. The above problem is further analyzed in Section 5.5.

5.4 Results of the analysis using a big sample of system parameters and sensitive process parameters

In this section, the sensitivity analysis to identify the system parameters contributing most to the variation in the model output was repeated using a sample of 2000 combinations of system parameters and sensitive process parameters.

5.4.1 Single-input sensitivity analysis

In Table 5.8 the top and bottom marginal variances of the system parameters and the sensitive process parameters for AEC4, AEC21 and AEC28 as a result of the analysis using the big sample of system parameters and sensitive process parameters is given.

Table 5.8 The top (TMV) and bottom (BMV) marginal variances (%) of the system parameters and the three sensitive process parameters for AEC4, AEC21 and AEC28 as a result of the analysis using the big sample of system parameters and sensitive process parameters

Parameter	AEC4		AEC21		AEC28	
	TMV	BMV	TMV	BMV	TMV	BMV
u	4.7	3.5	22.7	20.5	25.1	22.9
h	41.9	40.5	24.6	23.2	21.8	20.5
b	0.9	1.2	0.4	0.5	0.3	0.5
s_l	0.2	0.3	0.2	0.1	0.2	0.1
h_w	0.0	0.0	0.0	0.0	0.0	0.0
ss	0.0	0.0	0.0	0.0	0.0	0.0
$m_{om,ss}$	0.0	0.0	0.1	0.0	0.0	0.0
DW	0.9	0.6	0.3	0.2	0.3	0.1
$m_{om,wb}$	0.0	0.0	0.0	0.0	0.0	0.0
ρ_b	0.2	0.1	0.5	0.2	0.5	0.2
ε	0.4	0.1	1.0	0.3	1.0	0.3
λ	0.0	0.0	0.0	0.0	0.0	0.0
E_x	0.3	0.7	0.0	0.2	0.0	0.1
k	11.5	9.8	11.6	9.7	11.1	9.3
K_{mp}	8.4	6.7	3.2	1.7	2.7	1.4
K_H	7.3	6.8	5.6	5.0	5.1	4.6

The results of Table 5.8 show that next to the system parameters, u and h, also the sensitive process parameters k, K_{mp} and K_H contribute to the variation in the AECs. The system parameters u and h were already indicated as sensitive system parameters as a result of the previous sensitivity analysis for the system parameters using the sample with 180 parameter combinations. Compared to this analysis the top and bottom marginal variances of the sensitive system parameters are in the same order of magnitude. Again, DW did not come out as a sensitive system parameter. Furthermore, it is shown again that the flow velocity u is less sensitive to the AEC4, as for most of the selected flow velocities most pesticide mass has not yet flowed out of the ditch and so, the exact value of the flow velocity is less relevant with respect to the AEC4.

From the previous analysis we concluded that the variation in the output is very much dominated by the sensitive system parameters, but the results of the sensitivity analysis using the big sample show that the sensitive process parameters also add to the variation in the output. Their contribution is about half the contribution of the system parameters.

The total percentages variances accounted for were 73.1, 65.6 and 63.8% for AEC4, AEC21 and AEC28, respectively, indicating a reasonable approximation of the AECs by means of the smooth additive function. So, compared to the total percentages accounted for as a result of subjecting the original sample of 180 combinations to the analysis (Section 5.3.1), subjecting the big sample of system parameters to the single-input analysis results in a much more relevant approximation of the AECs by means of the smooth additive function. Still, about 25% (AEC4) to 35% (AEC21 and AEC28) of the variation in the output is unaccounted for. The unexplained variation might possibly be found in the interaction between the sensitive parameters. To investigate this, a group-of-inputs analysis is performed.

5.4.2 Group-of-inputs analysis

A new sample for the group-of-inputs analysis was created by randomizing the insensitive system parameters (compare Section 5.3.2) and next 2 000 simulations with TOXSWA were done. In Table 5.9 the top marginal variance of U and the bottom marginal variance of V are given.

Table 5.9 The top and marginal variance of U and the bottom marginal variance of V(%) for AEC4, AEC21 and AEC28

	AEC4	AEC21	AEC28
TMV_U	92.5	95.3	95.6
BMV_V	7.5	4.7	4.4

Table 5.9 shows that the BMV_v for AEC4, AEC21 and AEC28 are relatively small compared to the *TMVU*. This indicates that V, i.e. the group of the insensitive parameters has little influence on the variation in the AECs and that U, i.e. the group of sensitive system parameters, u and h, and the sensitive process parameters, k, K_{mp} and K_H accounts for almost all variation in the AECs. Compared to the results of the single-input analysis, where 73.1, 65.6 and 63.8% of the total variance was accounted for (AEC4, AEC21 and AEC28, respectively), the results of the group-of-inputs analysis make also clear that about 25% of the total variance is caused by interaction between the sensitive system and process parameters.

In Figure 5.2 the relation between $f(U,V_1)$ and $f(U,V_2)$ is given for AEC4, AEC21 and AEC28 in case of the system parameters and using the big sample. V_1 and V_2 denote the group of insensitive system parameters of the original big sample, and of the second sample created for the group-of-inputs analysis, respectively. Compared to the analysis of the system parameters using the sample with 180 parameter combinations (Figure 5.1) it is shown that the data points are situated much closer to the line $f(U, V_1) = f(U, V_2)$, representing the expectation of $f(U, V_1) - f(U, V_2) = 0$.

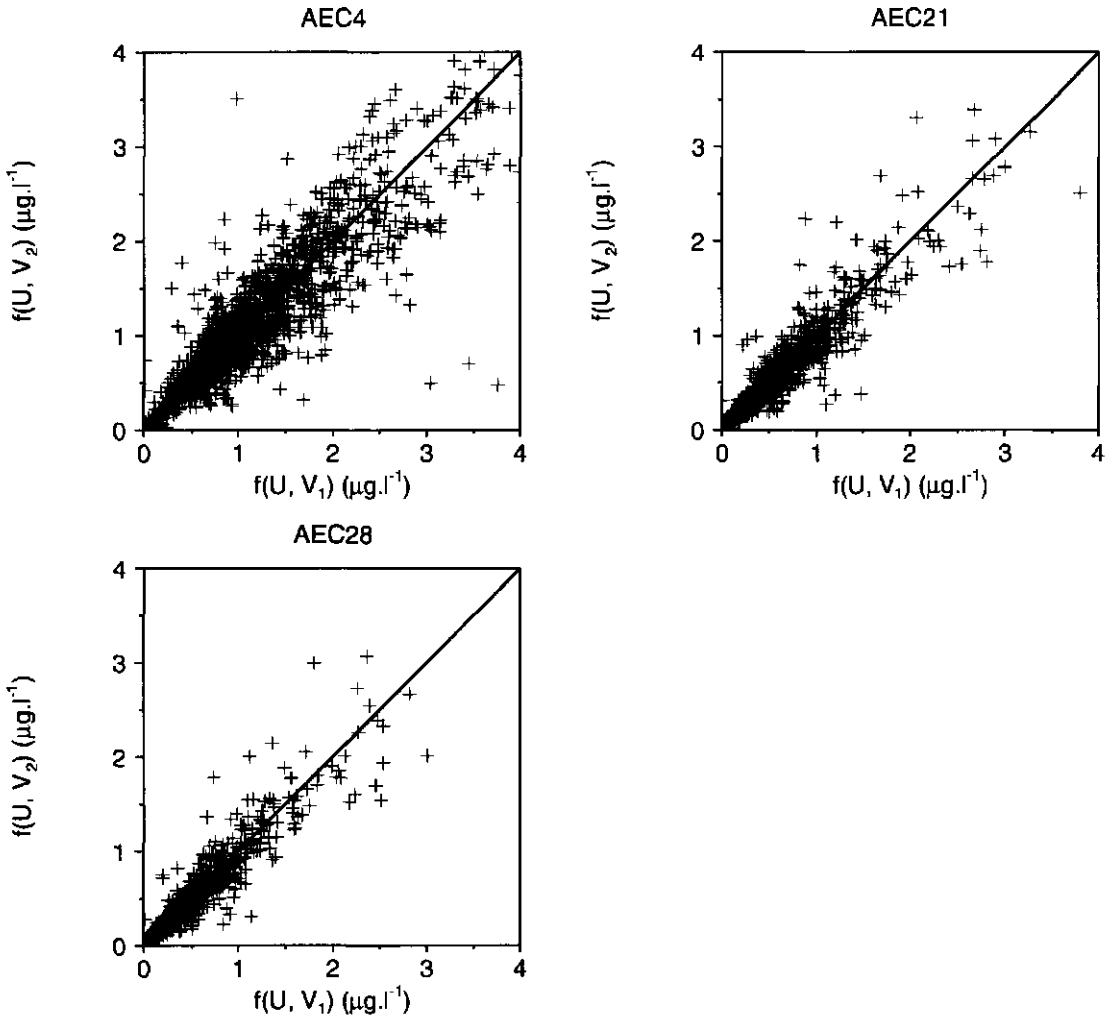

Fig 5.2 The relation between $f(U,V_1)$ and $f(U,V_2)$ for AEC4, AEC21 and AEC28 (system parameters, big sample)

Summarizing the results of the global sensitivity analysis for the system parameters, it is shown that almost all variation in the AECs can be explained by the variation of two sensitive system parameters, namely, the flow velocity (u) and the water depth (h), and the three sensitive process parameters, the transformation rate coefficient in the water layer (k), the sorption coefficient for the sorption to macrophytes (K_{mp}) and the Henry coefficient (K_H).

5.5 Dry weight of macrophytes

In Sections 5.3.2 and 5.4.2, it was notified that the dry weight of macrophytes (DW) did not come out as a sensitive system parameter, although the coefficient for sorption to macrophytes is shown to be a sensitive process parameter. After all, no sorption to macrophytes is possible if there is not any substrate.

The above problem was analyzed with the help of a simple equation describing the relationship between the momentary concentration, (i.e. the acute exposure

concentration after instantaneous sorption to macrophytes), and sorption to macrophytes, while neglecting sorption to suspended solids. The derivation of this equation is described in more detail in Section 6.1. The equation reads:

$$c = \frac{c^*}{1 + \frac{DW \cdot K_{mp} \cdot P_{z=0}}{A}} \tag{5.7}$$

The nominal concentration (c^*) can be calculated by dividing the pesticide mass deposited onto the water surface by the volume of water in the ditch (Eq. 4.6). Taking a standard deposition of 1 mg.m^{-2} onto the water surface and h = 0,5 m, b = 1 m and s_1 = 1.5, the nominal concentration equals 2.86 μg.l^{-1}. The wetted perimeter ($P_{z=0}$) equals 2.80 m and the cross sectional area of flow (A) equals 0.875 m^2.

In Figure 5.3, the relationship between the momentary concentration, c, and the dry weight of macrophytes is given for a very poor (K_{mp} = 1.0·10^{-4} m^3.kg^{-1}), a moderately (K_{mp} = 0.129 m^3.kg^{-1}) and a very well adsorbing pesticide (K_{mp} = 180 m^3.kg^{-1}). (These are the minimum, the median and the maximum values of K_{mp} in the sample of process parameters (Annex 5).) It shows that the dry weight of macrophytes is not sensitive to the momentary concentration in case of very poor adsorbing pesticides; the momentary concentration almost equals the nominal concentration for the total domain of the dry weight of macrophytes. On the other hand, Figure 5.3 shows that the dry weight of macrophytes is very sensitive in case of very well adsorbing pesticides; the momentary concentration diminishes very rapidly to almost zero. In case of a moderately adsorbing pesticide the momentary concentration lowers to about 70% of the nominal concentration for the maximum dry weight of macrophytes of 1 kg.m^{-2}. So, it can be concluded that for a least 50% of the pesticides *DW* is a sensitive parameter with respect to the momentary concentration. This also indicates that *DW* might be sensitive with respect to the chronic exposures AEC4, AEC21 and AEC28.

The reason why the dry weight of macrophytes did not come out as a sensitive system parameter in our sensitivity analysis, can be explained by the ranges and the distributions specified for K_{mp} and *DW*. In TOXSWA, these parameters always occur as a product of both. Therefore, the effect of a change in K_{mp} may always bedominant to the effect of a change in *DW*. This may be demonstrated by calculating the coefficient of variation (CV) for both parameters using the values from the big sample. The CV (the quotient of the standard deviation and the mean) is relative measure for the degree of spreading within a distribution of a parameter. In Table 5.10 the CV, mean and standard deviation of *DW*, K_{mp} and their product is given.

Table 5.10 The CV, mean and standard deviation of DW, K_{mp} and their product

	Mean	Standard deviation	CV (%)
DW	500	288.7	57.7
K_{mp}	2.808	17.7	629.8
$DW \cdot K_{mp}$	1425	10510	734.4

Table 5.10 shows that the CV of K_{mp} is more than a factor of 10 higher, than the CV of *DW*, showing that the degree of spreading within the distribution of K_{mp} is much higher than it is for *DW*. So,indeed K_{mp} clearly dominates *DW* because of the ranges and distributions specified for both parameters.

In addition, we considered the product K_{mp}·*DW* as a small model: $y = K_{mp}$·*DW* = f(K_{mp}, *DW*) and calculated the individual contributions of K_{mp} and *DW* to the product by approximating f by means of a smoothing spline and calculating top and bottom marginal variances (i.e. we assess how well and how badly f can be approximated by a function that depends only on K_{mp} or by a function that depends only on *DW*). The result is given in Table 5.11.

Table 5.11 The top and bottom marginal variances (%) of DW and K_{mp} for the product

	TMV	BMV
DW	0.8	0.9
K_{mp}	70.2	70.4

Table 5.11 shows that the TMV and the BMV of K_{mp} are much higher than the TMV and the BMV of *DW* (70 versus 1%), proving that the contribution of K_{mp} to the product is very high compared to the contribution of *DW*. Therefore *DW* did not show as a sensitive parameter in our analysis. The percentage accounted for is 71,2%, indicating a reasonable approximation of f by means of the smoothing spline.

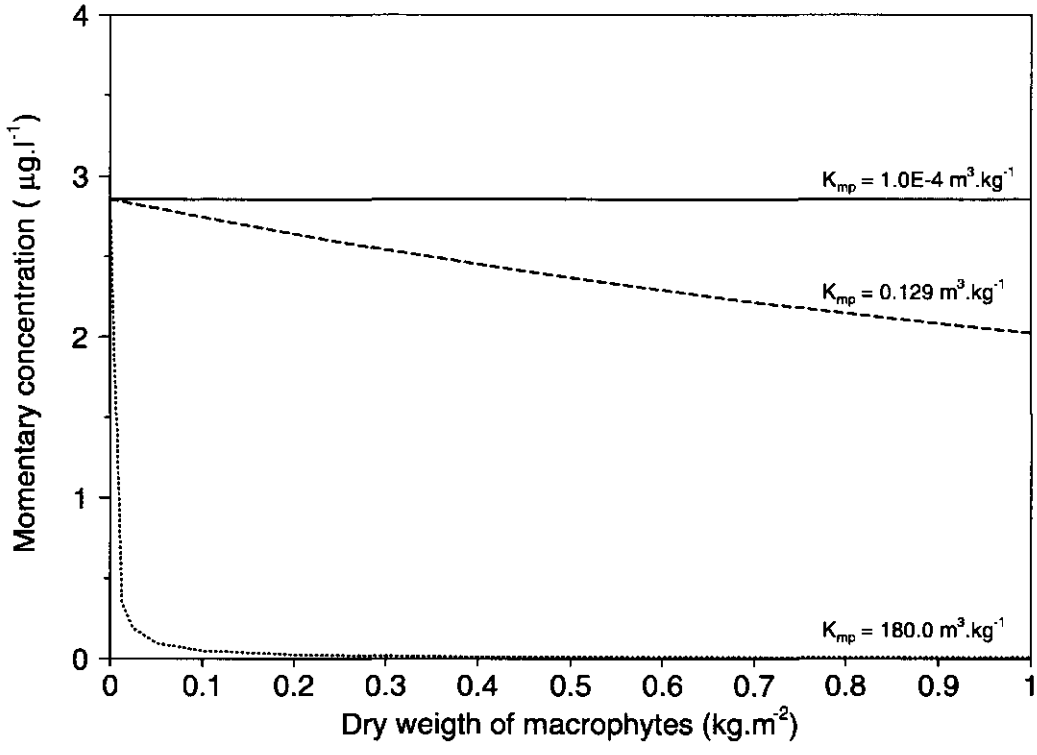

Fig. 5.3 The relationship between the momentary concentration and the dry weight of macrophytes for a pesticides with a very low, average and high adsorption capacity (K_{mp} = 1.0·10^{-4} m^3.kg^{-1}, 0.129 m^3.kg^{-1} and 180 m^3.kg^{-1}, respectively), while neglecting sorption to suspended solids

6 Acute exposure concentration

The acute exposure concentration (AEC0) is defined as the pesticide concentration in the water layer immediately after deposition, i.e. the momentary concentration. This is the concentration after instantaneous equilibrium sorption to macrophytes and suspended solids. The momentary concentration can be calculated without using TOXSWA with the help of some simple equations. Therefore, an analytical method was used to identify the sensitive parameters for the acute exposure concentration.

6.1 Method

The momentary concentration, c, can be calculated from Eq. (2.2). Substituting Eqs. (2.4), (2.5) and (2.6) in Eq. (2.2) leads to:

$$c^* = c + \frac{DW.P_{z=0}}{A}.K_{mp}.c + ss.m_{om,ss}.K_{om,ss}.c_{e,ss}.\left(\frac{c}{c_{e,ss}}\right)^{n_{ss}} \tag{6.1}$$

Eq. 6.1 shows that it is impossible to derive values of c from values of c^* in an explicit way. Rearranging Eq. 6.1, and assuming linear sorption for sorption to suspended solids ($n_{ss} = 1$), leads to an explicit equation for c:

$$c = \frac{c^*}{1 + \frac{DW \cdot P_{z=0}}{A} \cdot K_{mp} + ss \cdot m_{om,ss} \cdot K_{om,ss}} \tag{6.2}$$

Assuming linear sorption for sorption to suspended solids is justified, because for many pesticides, the value of n_{ss} is close to 1. Besides, generally sorption to suspended solids plays a minor role as the results of the previously described sensitivity analysis for chronic exposure durations has shown. (Other calculations with TOXSWA, executed in other projects, showed that in case of pyrethroids with K_{om} values above 100 000 $dm^3.kg^{-1}$ sorption to suspended solids can absorb up to about 60% of the initial pesticide mass instantaneously.)

The wetted perimeter, $P_{z=0}$, can be calculated via:

$$P_{z=0} = b + 2h\sqrt{s_l^2 + 1} \tag{6.3}$$

and the cross sectional area of flow, A, can be calculated via:

$$A = h(b + h\ s_l) \tag{6.4}$$

The nominal concentration (c^*) can be calculated by dividing the pesticide mass deposited onto to water surface by the volume of water in the ditch (Eq. 4.6). Taking a standard deposition of 1 $M.L^{-2}$ onto the water surface, the nominal concentration ($M.L^{-3}$) can be calculated from:

$$c^* = \frac{(b + 2h s_1)}{h(b + h s_1)} \tag{6.5}$$

Substituting Eqs. 6.3, 6.4 and 6.5 in Eq. 6.2 leads to an expression for calculating the acute exposure concentration as a function of the process parameters K_{mp} and $K_{om,ss}$ and the system parameters h, b, s_1, DW, ss and $m_{om,ss}$:

$$c = \frac{\dfrac{(b + 2hs_1)}{h(b + hs_1)}}{1 + \dfrac{DW \cdot (b + 2h\sqrt{s_1^2 + 1})}{h(b + hs_1)} \cdot K_{mp} + ss \cdot m_{om,ss} \cdot K_{om,ss}} \tag{6.6}$$

We are interested in the sensitivity of the acute exposure concentration to these process and system parameters. For this purpose, the concept of relative sensitivity as defined by McCuen (1973) and used by Boekhold & Van der Zee (1991) and Beltman et al. (1995) was used. The relative sensitivity (s_x) is defined as:

$$s_x = \frac{\dfrac{\partial y}{y}}{\dfrac{\partial x}{x}} \tag{6.7}$$

in which $\partial y/y$ is the relative change in y, i.e. the acute exposure concentration, c, and $\partial x/x$ is the relative change in x, i.e. one of the process or system parameters mentioned above. Eq. 6.7 can be rearranged as:

$$s_x = \frac{x}{y} \cdot \frac{\partial y}{\partial x} \tag{6.8}$$

The relative sensitivity measure can be used to compare the sensitivity of y to changes in the parameters involved, since s_x is invariant to the magnitude of x. As the absolute value of s_x is high, y is sensitive to changes in the considered parameter. Values of s_x ranging from -1 to 1 indicate attenuation of x in y, values smaller than -1 or larger than 1 imply that the variations in x are amplified in y. Negative values of s_x indicate a decrease in y when x increases.

The relative sensitivity function of the acute exposure concentration to each of these process and system parameters can now be derived analytically. The functions are presented here below. The derivations of the relative sensitivity functions are given in Annex 10.

$$H = 2DW \cdot K_{mp}\sqrt{s_1^2 + 1} \tag{6.16a}$$

$$J = DW \cdot K_{mp} \cdot b \tag{6.16b}$$

The relative sensitivity function s_x for $x = DW$, K_{mp}, $K_{om,ss}$, ss or $m_{om,ss}$ reads:

with

x	B	C	
DW	$\frac{b + 2h\sqrt{s_1^2 + 1}}{h(b + hs_1)} \cdot K_{mp}$	$1 + ss \cdot m_{om,ss} \cdot K_{om,ss}$	(6.10)
K_{mp}	$\frac{b + 2h\sqrt{s_1^2 + 1}}{h(b + hs_1)} \cdot DW$	$1 + ss \cdot m_{om,ss} \cdot K_{om,ss}$	(6.11)
$K_{om,ss}$	$ss \cdot m_{om,ss}$	$1 + \frac{b + 2h\sqrt{s_1^2 + 1}}{h(b + hs_1)} \cdot DW \cdot K_{mp}$	(6.12)
ss	$m_{om,ss} \cdot K_{om,ss}$	$1 + \frac{b + 2h\sqrt{s_1^2 + 1}}{h(b + hs_1)} \cdot DW \cdot K_{mp}$	(6.13)
$m_{om,ss}$	$ss \cdot K_{om,ss}$	$1 + \frac{b + 2h\sqrt{s_1^2 + 1}}{h(b + hs_1)} \cdot DW \cdot K_{mp}$	(6.14)

B and C are constants.

The relative sensitivity function s_x for $x = b$ reads:

$$s_b = \frac{b \cdot (C \cdot E + F \cdot G - D \cdot G - C \cdot D \cdot h)}{(b + D) \cdot (G \cdot b + C \cdot h \cdot b + C \cdot E + F \cdot G)} \tag{6.15}$$

with

$$C = 1 + ss \cdot m_{om,ss} \cdot K_{om,ss} \tag{6.15a}$$

$$D = 2hs_1 \tag{6.15b}$$

$$E = h^2 s_1 \tag{6.15c}$$

$$F = 2h\sqrt{s_1^2 + 1} \tag{6.15d}$$

$$G = DW \cdot K_{mp} \tag{6.15e}$$

The relative sensitivity function s_x for $x = h$ reads:

$$s_h = \frac{h \cdot (2s_1(Cs_1h^2 + (Cb + H)h + J) - (b + 2hs_1) \cdot (2Cs_1h + Cb + H))}{(b + 2hs_1) \cdot (Cs_1h^2 + (Cb + H)h + J)} \tag{6.16}$$

with

And finally, the relative sensitivity function s_x for $x = s_1$ reads:
C, D, E, F G, H, J and *K* are constants. The values of these constants were calculated by substituting the values defined for the standard set of system parameters (Section 4.2) and the median values of the process parameters (Section 5.2). These equations enable us to do this kind of sensitivity analysis for every set of parameters in a quick and simple way.

$$s_{s_1} = \frac{s_1 \cdot (2h(J + K\sqrt{s_1^2 + 1} + C(hb + h^2 s_1)) - (b + 2hs_1)(Ks_1(s_1^2 + 1)^{-1/2} + Ch^2))}{(b + 2hs_1) \cdot (J + K\sqrt{s_1^2 + 1} + C(hb + h^2 s_1))} \tag{6.17}$$

with

$$K = 2h \cdot DW \cdot K_{mp} \tag{6.17a}$$

6.2 Results

For each parameter, the relative sensitivity to the acute exposure concentration was calculated with the help of Equations 6.10 to 6.17 for about ten different values of the considered parameter. The values were chosen from the domains specified in an earlier stage of this study. (The domain of each process parameter is derived from the sample of process parameter values listed in Annex 5 and is specified in Table 4.1, and the domain of the system parameters is specified in Table 5.2.) The calculated values of the relative sensitivity were plotted as function of relative values of the considered parameter. The results are presented in Figures 6.1 and 6.2. In Fig. 6.1, the relative sensitivity s_x of each parameter to AEC0 is given as a function of the relative value of the parameter (x), where x is taken relative to its maximum value (x_{max}). So, the x axis ranges from 0 to 1 and describes the total domain of each parameter shown in this figure.

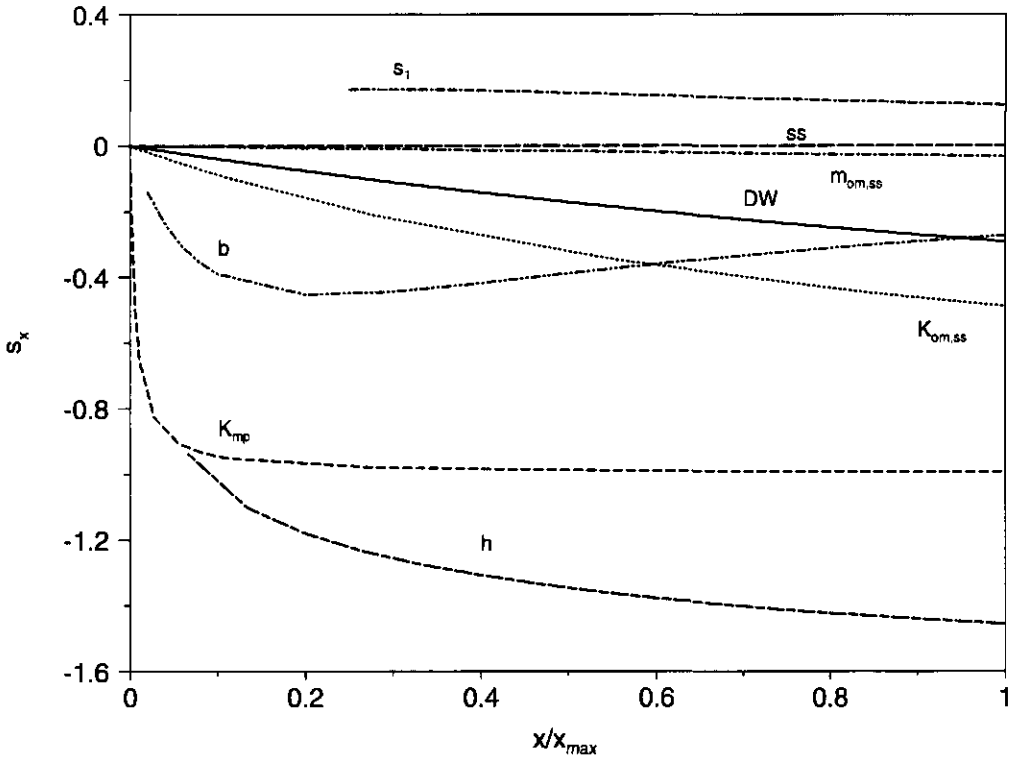

Fig. 6.1 The relative sensitivity (s) of each parameter (x) to the AEC0 as a function of the relative value of the parameter (x/x_{max}), where x_{max} equals the maximum value of x

Figure 6.1 shows that for all parameters except h, the absolute value of the relative sensitivity is below 1, so, this indicates attenuation of each of these parameter in AEC0. The absolute value of h reaches above 1, indicating amplification of h in AEC0. For all parameters except s_1, the relative sensitivity has a negative value, so, the AEC0 decreases if any of these parameters increases.

The water depth (h) and the coefficient for sorption to macrophytes (K_{mp}) are the most sensitive parameters with respect to AEC0 in case the total domain of each parameter is taken into consideration. The relative sensitivity functions of these two parameters show the highest absolute values. For low values of K_{mp} the relative sensitivity is small, but it increases rapidly to a value of about –0.9. This value is reached for K_{mp} in the order of 2000 $dm^3.kg^{-1}$. The relative sensitivity of h is about –0.75 for small values of h, but decreases to about –1.5 for its maximum value of 1.5 m. Figure 6.1 also shows that the AEC0 is not sensitive to changes in the concentration of suspended solids (ss) or the mass fraction of organic matter of the suspended solids ($m_{om,ss}$). This indicates that sorption to suspended solids plays a minor role with respect to the AEC0. Only in case of pesticides with high sorption coefficients, sorption to suspended solids may be relevant in determining the AEC0. This is shown by the increasing relative sensitivity for an increasing value of the coefficient for sorption to suspended solids ($K_{om,ss}$).

An increase of the side slope (s_1) leads to a relative increase of the width of the water surface with respect to the water volume. Therefore, the amount of pesticides deposited onto the water surface as a result of the standard deposition of

1 mg.m^{-2} leads to higher acute exposure concentrations. This explains the positive value of s for s_1.

The relative sensitivity function of b shows a minimum value of about –0.43 for the relative value of 0.2. So, for b increasing from 0.5 to 1 m, the relative sensitivity of the momentary concentration for the bottom width b increases (a constant $\partial b/b$ increment entails a growing $\partial c/c$ increment, in absolute figures). For b increasing from 1.0 to 5.0 m, the relative sensitivity of the momentary concentration for the bottom width decreases. Indeed, the effect of the side slope becomes less important and for large values of b the relative sensitivity approach 0.

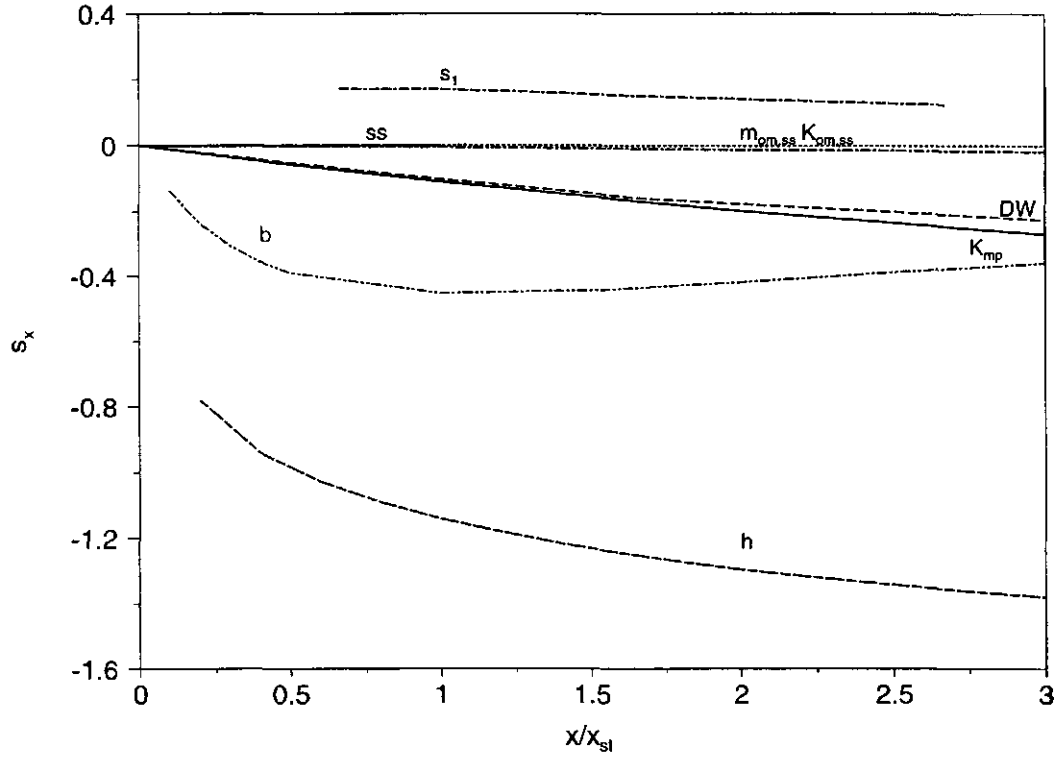

Fig. 6.2 The relative sensitivity (s) of each parameter (x) to the AEC0 as a function of the relative value of the parameter (x/x_{st}), where x_{st} equals the standard or median value of x

Figure 6.2 shows the relative sensitivity in case the values of the parameters are taken relative to their standard values (x_{st}), i.e. the value specified for the standard set in case of the system parameters (Section 4.2) or the median value in case of the process parameters (Section 5.2). In Fig. 6.2, the x axis ranges from 0 to 3, and, as a consequence, it shows only a part of the domain of the parameters with high maximum values with respect to their standard value. In particularly; a small part of the domain of K_{mp} and $K_{om,ss}$, is shown in Figure 6.2, because the maximum values shown are in the order of 17 dm^3.kg^{-1}, while the maximum values of there domain raise to 180 000 dm^3.kg^{-1}. Therefore, the sensitivity of K_{mp} to AEC0 is less pronounced in this figure than it is in Fig. 6.1. The same holds true for $K_{om,ss}$. So, Figure 6.2 makes clear that for K_{mp} and $K_{om,ss}$ values, differing less than a value of

3 from their median values, the relative change in AEC0 is small, i.e. below a factor of 0.3.

The value 1 at the x axis represents the standard set in case of the system parameters. For most of the system parameters, it shows that in case of small relative changes from the standard value 1, the relative sensitivity does not change considerably. Changes in the bottom width and the water depth affect the relative sensitivity more than changes in the other parameters.

So, the sensitivity analysis of the acute exposure concentration, AEC0, indicates that the water depth, h, influences the acute exposure concentration more than the other system and process parameters. The relative diminution in the AEC0 ranges from 0.85 to 1.5, which is high compared to the value of 0.45 for the lowering of the mean AEC4 with respect to the nominal concentration resulting from the process parameters' variation (Table 4.3, (2.86 - 1.578) / 2.86 = 0.45).

For sorption coefficients for sorption to suspended solids or to macrophytes that are higher than about 500 $dm^3.kg^{-1}$ the acute exposure concentration varies considerably, up to a relative sensitivity of -0.4 and -1.0, respectively. For the bottom width of the ditch, the acute exposure concentration varies up to a relative sensitivity of –0.43.

For all other system and process parameters (so, excluding the water depth, the bottom width and both sorption coefficients at values above 500 $dm^3.kg^{-1}$) the acute exposure concentration, AEC0, does not vary much. The value of the relative sensitivity is about 0.2 or less.

Only for the side slope, s_1, there is a positive correlation with the AEC0, i.e. the acute exposure concentration increases when s_1 increases. In all other cases the acute exposure concentration lowers when the parameter value increases.

7 Discussion and conclusions

In this study a global sensitivity analysis of TOXSWA model (version 1.0) was performed using Monte Carlo methods. Two major steps were distinguished in this sensitivity analysis. In the first step it has been identified which process parameters contribute most to the variation in the output for a standard set of system parameters. In the second step, it was identified which system parameters contribute most to the variation in the output. The output considered in both steps, was the average exposure concentrations after 4, 21, and 28 days (AEC4, AEC21 and AEC28), i.e. the exposure periods for testing chronic toxicity of three standard organisms.

Identification of the parameters contributing most to the variation of the acute exposure concentration was done analytically, because the acute exposure concentration can be calculated without using TOXSWA with the help of some simple equations. From these equations, the relative sensitivity function for each of the parameters determining the acute exposure concentration was derived.

Sensitive process parameters for chronic exposure concentrations
For the defined standard set of system parameters almost all the variation in the chronic exposure concentrations (AEC4, AEC21 and AEC28) can be explained by the variation of three sensitive process parameters: the transformation rate coefficient in the water layer (k) the coefficient for the sorption to macrophytes (K_{mp}) and the Henry coefficient (K_H). The group of the three sensitive parameters accounts for 92 to 97% of all the variation in the output, i.e. AEC4, AEC21 and AEC28. So, for calculating the AECs with TOXSWA proper values are needed for these process parameters. Fixed values (e.g. median) can be used for the other (insensitive) process parameters.

Sensitive system parameters for chronic exposure concentrations
The sample of 180 combinations of the system parameters and the three sensitive process parameters, was to small to identify the group of system (and process parameters) accounting for almost all the variation in the output. Therefore, a new sample of 2000 combinations of the system parameters and the three sensitive process parameters was created. With the help of this sample it was identified that almost all variation in the AECs can be explained by the variation of two sensitive system parameters: the water depth (h) and the flow velocity (u) and the three sensitive process parameters. (The flow velocity is not very sensitive with respect to AEC4, as for most of the selected flow velocities most pesticide mass has not yet flowed out of the ditch after four days.) The group of the three sensitive process parameters and two sensitive system parameters accounts for about 92 to 96% of all variation in AEC4, AEC21 and AEC28.

Dry weight of macrophytes
Although the coefficient for sorption to macrophytes is shown to be a sensitive parameter, the dry weight of macrophytes did not come out as a sensitive

parameter. This seems strange, because no sorption to macrophytes is possible if there is not any substrate. Analyzing this problem for the acute exposure concentration analytically with the help of a simple equation showed that, for pesticides with sorption capacities above the median value of our sample of 180 pestcides, the dry weight of macrophytes is sensitive with respect to the acute exposure concentration. Therefore it is also expected that the dry weight of macrophytes is sensitive with respect to the chronic exposure concentrations, because of the sensitivity of the sorption coefficient for chronic exposure concentrations. The explanation for not showing the dry weight of macrophytes as a sensitive parameter in our analysis, is found in the range and distribution specified for the dry weight of macrophytes. In TOXSWA, the dry weight of macrophytes always occurs as a product of the dry weight and the sorption coefficient, we showed that the effect of a change in the sorption coefficient is likely to dominate often the effect of a change in the dry weight.

Sensitive parameters for the acute exposure concentration

The water depth was identified as the most sensitive parameter with respect to the acute exposure concentration. In our case of a trapezium-shaped cross-section, the bottom width of the ditch was also identified as a sensitive parameter, however, to lesser degree than the water depth. Sorption coefficients for sorption to suspended solids or to macrophytes are sensitive parameters if their values are above about 500 $dm^3.kg^{-1}$.

Standard scenarios

For the standard scenarios that are currently developed for the registration procedure, the input parameters defining the environment, i.e. the system parameters, have to be determined. This sensitivity study shows that only two system parameters have a significant effect on the AECs, i.e. the flow velocity (u) and the water depth (h). Therefore, the attention in defining the standard scenarios should be focussed on these two parameters. Input parameters which represent pesticide properties (the process parameters) are not included in the set defining the standard scenarios. However, it might be possible to develop standard tables and/or figures based on the three sensitive process parameters for simple prediction of AECs with respect to the defined standard scenario.

Uncertainty analysis

For future study, we recommend to identify for specific situations (given pesticide and 'system') the influence of the input uncertainty on the output uncertainty. For a given pesticide and system, it is useful to be able to quantify the importance of an imperfect knowledge and/or the natural variation in their parameter values for the simulation results. In this way, it is known which model inputs need to be measured with high accuracy to diminish the uncertainty in the calculated concentrations as much as possible. This is useful for performing e.g. validation experiments.

List of symbols

A	=	cross-sectional area of flow	(L^2)
b	=	width of ditch bottom	(L)
BMV_U	=	bottom marginal variance of group U	(1)
BMV_V	=	bottom marginal variance of group V	(1)
c	=	mass concentration of substance in the water phase	($M.L^{-3}$)
c^*	=	mass concentration substance in water layer (this includes substance sorbed to suspended solids and to macrophytes)	($M.L^{-3}$)
c_a	=	mass concentration of substance in the air	($M.L^{-3}$)
c_b^*	=	mass concentration of substance in sediment	($M.L^{-3}$)
$c_{e,ss}$	=	concentration c, at which $K_{F,ss}$ has been estimated	($M.L^{-3}$)
$c_{e,wb}$	=	concentration c, at which $K_{F,wb}$ has been estimated	($M.L^{-3}$)
c_{lb}	=	mass concentration of substance in the liquid phase of sediment	($M.L^{-3}$)
c_{sol}	=	solubility of substance in water	($M.L^{-3}$)
D_{lb}	=	diffusion coefficient of substance in the liquid phase of sediment	($L^2.T^{-1}$)
DT_{50}	=	the half life time in water	(T)
D_w	=	diffusion coefficient of substance in water	($L^2.T^{-1}$)
DW	=	dry weight of macrophytes per area of sediment	($M.L^{-2}$)
E_{lb}	=	dispersion coefficient in pore water	($L^2.T^{-1}$)
E_x	=	dispersion coefficient in direction of flow	($L^2.T^{-1}$)
$\hat{f}_U$	=	least squares approximation of group U	(1)
$\hat{f}_V$	=	least squares approximation of group V	(1)
h	=	water level above ditch bottom	(L)
h_w	=	water level above ditch bottom, defining the exchanging perimeter $P_{z=0}$	(L)
J	=	areic mass flux of substance in water layer by and dispersion	($M.L^{-2}.T^{-1}$)
J_{lb}	=	areic mass flux of substance in the liquid phase of the sediment by advection, dispersion and diffusion	($M.L^{-2}.T^{-1}$)
J_{wa}	=	areic mass flux of substance across the water-interface, the flux is negative in upward direction	($M.L^{-2}.T^{-1}$)
J_{wb}	=	areic mass flux of substance across the water-sediment interface, the flux is positive in downward direction	($M.L^{-2}.T^{-1}$)
$J_{wb,adv}$	=	areic mass flux by advection at the water-sediment interface	($M.L^{-2}.T^{-1}$)
$J_{wb,dif}$	=	areic mass flux by diffusion at the water-sediment interface	($M.L^{-2}.T^{-1}$)
k	=	transformation rate coefficient for substance in water column	(T^{-1})
k_b	=	transformation rate coefficient for substance in the sediment	(T^{-1})

k_g	=	exchange coefficient of substance in the gas phase	($L.T^{-1}$)
k_l	=	exchange coefficient of substance in the liquid phase	($L.T^{-1}$)
$k_{t,l}$	=	overall transfer coefficient for the air-water interface, based at the liquid phase	($L.T^{-1}$)
K_{mp}	=	distribution coefficient for substance between macrophytes and water, i.e. slope of sorption isotherm based at the mass of dry macrophytes	($L^3.M^{-1}$)
$K_{om,ss}$	=	slope of sorption isotherm for suspended solids, based at the organic matter content	($L^3.M^{-1}$)
$K_{om,wb}$	=	slope of sorption isotherm for sediment, based the organic matter content	($L^3.M^{-1}$)
$K_{F,ss}$	=	Freundlich coefficient for sorption to suspended solids	($L^3.M^{-1}$)
$K_{F,wb}$	=	Freundlich coefficient for sorption to bottom material	($L^3.M^{-1}$)
K_H	=	dimensionless Henry coefficient	(1)
L_{dis}	=	dispersion length	(L)
ℓ	=	length of drained or infiltrated lot, oriented perpendicular to the ditch and extended on one or two sides of the ditch	(L)
$m_{om,ss}$	=	mass fraction of organic matter of the suspended solids	($M.M^{-1}$)
$m_{om,wb}$	=	mass fraction of organic matter of the sediment material	($M.M^{-1}$)
M_m	=	molecular mass	($M.N^{-1}$)
n_{ss}	=	Freundlich exponent for sorption to suspended solids	(1)
n_{wb}	=	Freundlich exponent for sorption to bottom material	(1)
O	=	width of the water surface	(L)
P	=	saturated vapour pressure of substance	($L^{-1}.M.T^{-2}$)
P_0	=	wetted perimeter	(L)
$P_{z=0}$	=	length wetted perimeter at depth $z = 0$	(L)
q	=	areic volume flux, i.e. volume drained or supplied water divided by lot area and time. The flux is positive with infiltration and negative with upward flow (drainage from the field lot)	($L^3.L^{-2}.T^{-1}$)
R	=	universal gas constant	($L^2.M.T^{-2}.N^{-1}.\theta^{-1}$)
s_l	=	side slope, horizontal/vertical	(1)
ss	=	mass concentration of suspended solids in the water layer, i.e. the ratio of the mass of dry suspended solids divided by the volume of water	($M.L^{-3}$)
t	=	time	(T)
T	=	temperature at which the saturated vapour pressure, the solubility and the exchange coefficients in the liquid and gas phases are defined	(θ)
TMV_U	=	top marginal variance of group U	(1)
TMV_V	=	top marginal variance of group V	(1)
u	=	flow velocity water	($L.T^{-1}$)
U	=	group of sensitive parameters	(1)
U^*	=	shear velocity	($L.T^{-1}$)
V	=	group of insensitive parameters	(1)
V_B	=	molar volume (LeBas method)	($M^3.N^{-1}$)
$VTOT$	=	total variance	(1)
w	=	average flow velocity of pore water (i.e. $\ell q/P\varepsilon$)	($L.T^{-1}$)

x	=	downstream distance along ditch axis	(L)
X_b	=	content of substance sorbed, i.e. the ratio of the mass of substance sorbed divided by the mass of dry bottom material	($M.M^{-1}$)
X_{mp}	=	content of substance sorbed to macrophytes, i.e. the ratio of the mass of substance sorbed divided by the mass of dry macrophytes	($M.M^{-1}$)
X_{ss}	=	content of substance sorbed to suspended solids i.e. the ratio of the mass of substance sorbed divided by the mass of dry suspended solids	($M.M^{-1}$)
z	=	depth under the water-sediment interface	(L)
β	=	dimensionless parameter in the equation of Jain	(1)
η_w	=	(dynamic) viscosity of water	($M.L^{-1}.T^{-1}$);
ε	=	volume fraction of pore water, i.e. volume of liquid divided by volume of bottom material	(1)
κ	=	dimensionless transverse mixing coefficient	(1)
λ	=	tortuosity factor, i.e. ratio of surface area of bottom material to liquid phase	(1)
ρ_b	=	bulk density of dry bottom material, i.e. volumic mass of dry bottom material	($M.L^{-3}$)

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Annex 1 Genstat program for a single-input sensitivity analysis

```
job  'xunaspl: xtended simple single-input uncertainty analysis using
splines'
\version 2, based on standard form of % variance accounted for
scal edfs; 3  :\effective degrees of freedom of spline
set  [inpr=*; outpr=*]
poin x; !p(krtfwl, kdomssdit, exfrss, kdmpdit, klq, kga, \
          kdfw, krtfwb, kdomwb1, exfrwb, khe)
poin y; !p(aec4, aec21, aec28)
vari x[], y[]
open name='proparrd.fam'; chan=2; file=in; width=266
read [chan=2; setn=y; pr=err] x[]
open name='aecrd.sgn'; chan=3; file=in; width=250
read [chan=3; setn=y; pr=err; skip=1] y[]
calc x[] = log(x[])

calc k,m,N = nval(x,y,x[1])
calc kp1 = k+1
vari set; !(2...kp1)
vari [k] mean, var, cv%, min, max, nmv
for  i=1...k
calc mean$[i] = mean(x[i]) & var$[i] = var(x[i])
     & min$[i]  = min(x[i]) & max$[i]  = max(x[i])
     & nmv$[i]  = nmv(x[i])
endf
calc cv% = 100 * sqrt(var) / mean
prin x, mean, var, cv%, min, max, nmv;\
     deci=*,3,3,1,3,3,0; field=10,-12,-12,7,-12,-12,5
dele [redef=y] mean, var, cv%, min, max, nmv
vari [m] mean, var, cv%, min, max, nmv
for  i=1...m
calc mean$[i] = mean(y[i]) & var$[i]  = var(y[i])
     &    min$[i]  = min(y[i]) &  max$[i]  = max(y[i])
     &    nmv$[i]  = nmv(y[i])
endf
calc cv% = 100 * sqrt(var) / mean
prin y, mean, var, cv%, min, max, nmv; \
     deci=*,3,3,1,3,3,0; field=10,-12,-12,7,-12,-12,5

vari [k] rho, student, estlin, selin, botlin%, toplin%, \
         estspl, botspl%, topspl%
scal rhos[1...k]
pen  1,2; meth=poi,lin; sym=1,0; linest=1

for yvar = y[]
   calc vary  = var(yvar)
   page
   prin [sq=y] '*** Linear uncertainty analysis of', !p(yvar), '***';\
            field=*,2,*; just=left
   mode yvar
   term x[]
   fit  [nomes=res,lev; pr=s] x[]
   rkee est= est; se= se; dev= rss; df= rdf
   calc rms = rss / rdf
   calc cod = 100 * (1 - rss/(N-1)/vary)
   prin [sq=y; ipr=*] 'Coefficient of determination', cod;\
        field = *, 5; deci= *, 1; just=left
   calc estlin = est$[set] & selin = se$[set]
   calc student = estlin/selin
   calc botlin% = 100 * (student**2-1)/(rdf+1) * rms/vary
   calc rhos[] = corr(yvar;x[])
   equa new=rho; old=rhos
```

```
   calc toplin% = 100 * ((N-1)*rho**2-1) / (N-2)
   prin x, estlin, botlin%, toplin%;\
          deci=(*,3,1,1); field=10,-12,10,10

   prin [sq=y] '*** Spline uncertainty analysis of',
!p(yvar), '***';\
           field=*,2,*; just=left
\  top uncertainty contributions
   for  i=1...k
        mode yvar; fit=fit
        fit  [prin=*; nomes=lev] s(x[i]; edfs)
        rkee dev=rss; df=rdf
        rkee resi=residu
        calc rms = rss/rdf
        calc topspl%$[i] = 100 * (vary-rms) / vary
endf

\  bottom uncertainty contributions
   model yvar; fit=fit
   term s(x[]; edfs)
   fit  [nomes=res,lev; pr=s] s(x[]; edfs)
   rkee est= est; dev= rss; df= rdf
   calc rms = rss/rdf
   calc msadd = rms
   calc estspl = est$[set]
   calc cod = 100 * (1 - rss/(N-1)/vary)
   prin [sq=y; ipr=*] 'Coefficient of determination', cod;\
        field = *, 5; deci= *, 1; just=left

   for  i=1...k
        if (i.eq.1)
           drop [prin=*; nomes=lev] s(x[i]; edfs)
        else
           calc j = i-1
           swit [prin=*; nomes=lev] s(x[i,j]; edfs)
        endi
        rkee dev=rss; df=rdf
        calc rms = rss/rdf
        calc botspl%$[i] = 100 * (rms-msadd) / vary
   endf
   prin x, estspl, botspl%, topspl% ;\
          deci=(*,3,1,1); field=10,-12,10,10
endf
stop
```

Annex 2 Genstat program for a group-of-inputs sensitivity analysis

```
job  'global sensitivity analysis toxswa'
set  [inpr=*]
\u: group of 3 sensitive inputs
\v: other (insensitive) inputs
\same row: same v
\other column: other u
vari [180] kol[1,2]
open name='caec4.dat'; chan=2; file=in
read [chan=2] kol[]
calc kol[] = 1000*kol[]
scal mean[1,2], var[1,2], bmvu, tmvv
calc var[] = var(kol[])
calc mean[] = mean(kol[])
calc bmvu = mean((kol[1]-kol[2])**2) / 2
calc tmvv = covar(kol[1]; kol[2])
calc mvar = (var[1]+var[2])/2
calc bmvu%, tmvv% = 100 * bmvu,tmvv / mvar
prin mean[]
prin var[]
&    tmvv%, bmvu%
pen  1; meth=poi; sym=3; size=.6; thickness=2
dgra kol[2]; kol[1]; pen=1
stop
```

Annex 3 Genstat program for randomization of the columns of a sample

```
job 'randomization of process parameters'
set [inpr=*]
unit [180]
scal seed; 310197
vari x[1...14]
open name='propar.dat'; chan=2; file=in; width=362
read [chan=2; skip=*] x[]

corr [corr=c] x[]
calc c = 100 * c
prin c; deci=0; field=4

calc N = nval(x[1])
vari[N] u[1...14]
calc seed = urand(seed)
calc u[] = urand(0;14(N))
for i = 1...14
  sort [index=u[i]] x[i]
endfor

corr [corr=c] x[]
calc c = 100 * c
prin c; deci=0; field=4

open name='propar.new';chan=2; file=out; width=200
prin [chan=2; squash=yes] 'krtfwl        kdomssdit     exfrss         \
kdmpdit       klq           kga           psat          mamol          \
tekhe         cosol         kdfw          krtfwb        kdomwbl        \
exfrwb'; just=left
prin [chan=2;squash=yes] x[];\
 fieldwidth=14,14,14,14,14,14,-14,14,14,14,14,14,14,14;\
 deci=6,4,4,4,4,4,4,4,4,4,4,6,4,4; just=left
```

stop

Annex 4 Genstat program to create lognormal variation with C.V. = τ and mean 1

```
job 'jitter'
set [inpr=*]
unit [180]
scal seed; 160896
vari x[1...14], U[1...14], X[1...14]
open name='propar.fam'; chan=2; file=in; width=362
read [chan=2; setn=y; pr=err; skip=1] x[]

corr [corr=c] x[]
calc c = 100 * c
prin c; deci=0; field=4

scal tau[1...14], sigsq[1...14], sig[1...14], zeta[1...14]
calc tau[] = 0., 0., .1, 0., 0., 0., 0., 0., .025, 0., 0., 0., 0., .1
calc sigsq[] = log(tau[]**2 + 1)
calc zeta[] = - sigsq[] / 2
calc sig[] = sqrt(sigsq[])

calc seed = urand(seed)
calc U[] = ednormal(urand(14(0);180))
calc X[] = exp(zeta[] + sig[] * U[])

calc X[] = x[] * X[]
corr [corr=C] X[]
calc C = 100 * C
prin C; deci=0; field=4

open name='proparjt.dat';chan=2; file=out; width=200
prin [chan=2; squash=yes] 'krtfwl        kdomssdit     exfrss          \
kdmpdit       klq           kga           psat          mamol           \
tekhe         cosol         kdfw          krtfwb        kdomwb1         \
exfrwb'; just=left
prin [chan=2;squash=yes] X[];\
 fieldwidth=14,14,14,14,14,14,-14,14,14,14,14,14,14,14;\
 deci=6,4,4,4,4,4,4,4,4,4,6,4,4; just=left

stop
```

Annex 5 Sample of process parameters ('real' pesticides)

	k	$K_{om,ss}$	n_{ss}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
1	0.1308E-01	0.7000E-02	0.8154E+00	0.7000E-02	0.2350E+01	0.2257E+03	0.2300E-03	0.1832E+03	0.2844E+03	0.7900E+06	0.5370E+02	0.1308E-01	0.7000E-02	0.7416E+00	0.2256E-10
2	0.1050E-01	0.3484E+01	0.7817E+00	0.3484E+01	0.1960E+01	0.1878E+03	0.9000E-05	0.2647E+03	0.3005E+03	0.1400E+01	0.4470E+02	0.9763E-02	0.3484E+01	0.7762E+00	0.6812E-06
3	0.1155E+00	0.4700E-02	0.9444E+00	0.4700E-02	0.2310E+01	0.2214E+03	0.1700E-01	0.1903E+03	0.2898E+03	0.6000E+04	0.4730E+02	0.1155E+00	0.4700E-02	0.9844E+00	0.2237E-06
4	0.2133E-01	0.7500E-01	0.8926E+00	0.7500E-01	0.3470E+01	0.3331E+03	0.5500E-07	0.8410E+02	0.2942E+03	0.2800E+06	0.8280E+02	0.9902E+00	0.7500E-01	0.7853E+00	0.6754E-14
5	0.1386E+01	0.9500E-01	0.9549E+00	0.9500E-01	0.1920E+01	0.1840E+03	0.9000E-05	0.2755E+03	0.3009E+03	0.8000E+01	0.4390E+02	0.1386E+01	0.9500E-01	0.1040E+01	0.1239E-06
6	0.1899E-02	0.6400E-01	0.9699E+00	0.6400E-01	0.2100E+01	0.2013E+03	0.1000E-02	0.2302E+03	0.2955E+03	0.4000E+04	0.4780E+02	0.1899E-02	0.6400E-01	0.7209E+00	0.2343E-07
7	0.6863E-02	0.7000E-01	0.9104E+00	0.7000E-01	0.2170E+01	0.2080E+03	0.4000E-04	0.2157E+03	0.2781E+03	0.3000E+02	0.4430E+02	0.6863E-02	0.7000E-01	0.9089E+00	0.1244E-06
8	0.5251E-01	0.8620E+00	0.8661E+00	0.8620E+00	0.1790E+01	0.1715E+03	0.1800E-03	0.3173E+03	0.2870E+03	0.3000E+02	0.3990E+02	0.1333E-01	0.8620E+00	0.9328E+00	0.7979E-06
9	0.6931E+00	0.2800E-01	0.8108E+00	0.2800E-01	0.2130E+01	0.2045E+03	0.4600E-02	0.2232E+03	0.2846E+03	0.4000E+02	0.4700E+02	0.6931E+00	0.2800E-01	0.7665E+00	0.1085E-04
10	0.6931E+00	0.4000E-03	0.9909E+00	0.4000E-03	0.2050E+01	0.1971E+03	0.4600E-03	0.2403E+03	0.3006E+03	0.5000E+03	0.4650E+02	0.1444E-01	0.4000E-03	0.8360E+00	0.8847E-07
11	0.2476E-01	0.1420E+01	0.9026E+00	0.1420E+01	0.1720E+01	0.1652E+03	0.3200E-03	0.3421E+03	0.3022E+03	0.3500E+00	0.3940E+02	0.8664E-01	0.1420E+01	0.8817E+00	0.1245E-03
12	0.8664E-01	0.1110E+03	0.8790E+00	0.1110E+03	0.1550E+01	0.1485E+03	0.2400E-04	0.4229E+03	0.2849E+03	0.1000E+00	0.3110E+02	0.2762E-02	0.1110E+03	0.8921E+00	0.4284E-04
13	0.2009E-02	0.5780E+00	0.8659E+00	0.5780E+00	0.1730E+01	0.1663E+03	0.1000E-02	0.3374E+03	0.2787E+03	0.5000E+01	0.3400E+02	0.2009E-02	0.5780E+00	0.8709E+00	0.2912E-04
14	0.1386E+01	0.5650E+00	0.9341E+00	0.5650E+00	0.1480E+01	0.1423E+03	0.1300E-05	0.4610E+03	0.2915E+03	0.1000E+00	0.3830E+02	0.1980E+00	0.5650E+00	0.1017E+01	0.2473E-05
15	0.1733E+00	0.9500E-01	0.8645E+00	0.9500E-01	0.1540E+01	0.1476E+03	0.1100E-04	0.4281E+03	0.2985E+03	0.2500E+00	0.3590E+02	0.1100E-01	0.9500E-01	0.1035E+01	0.7591E-05
16	0.8155E-01	0.8500E-01	0.9330E+00	0.8500E-01	0.1730E+01	0.1659E+03	0.1000E+00	0.3390E+03	0.2832E+03	0.1700E+03	0.3250E+02	0.8155E-01	0.8500E-01	0.9599E+00	0.8469E-04
17	0.6601E-01	0.3000E+00	0.8212E+00	0.3000E+00	0.1790E+01	0.1717E+03	0.6700E-04	0.3164E+03	0.2914E+03	0.2200E+02	0.3540E+02	0.1100E-01	0.3000E+00	0.9199E+00	0.3977E-06
18	0.1925E-01	0.2350E+00	0.6942E+00	0.2350E+00	0.1820E+01	0.1748E+03	0.1250E-02	0.3054E+03	0.2902E+03	0.9000E+00	0.3610E+02	0.1260E-01	0.2350E+00	0.8114E+00	0.1758E-03
19	0.5059E-02	0.3400E-01	0.8762E+00	0.3400E-01	0.2240E+01	0.2154E+03	0.6650E+00	0.2012E+03	0.2770E+03	0.1200E+03	0.4840E+02	0.9902E-01	0.3400E-01	0.9502E+00	0.4842E-03
20	0.7001E-02	0.5200E-01	0.9168E+00	0.5200E-01	0.2070E+01	0.1987E+03	0.5000E-04	0.2363E+03	0.2916E+03	0.3500E+04	0.4250E+02	0.7001E-02	0.5200E-01	0.8514E+00	0.1392E-08
21	0.1824E+00	0.1100E-01	0.8777E+00	0.1100E-01	0.2140E+01	0.2053E+03	0.2700E-02	0.2213E+03	0.2928E+03	0.3200E+03	0.4530E+02	0.1824E+00	0.1100E-01	0.8990E+00	0.7669E-06
22	0.8557E-02	0.1270E-01	0.8499E+00	0.1270E-01	0.2080E+01	0.1991E+03	0.2500E-04	0.2353E+03	0.2863E+03	0.1990E+03	0.4450E+02	0.9902E-01	0.1270E-01	0.8981E+00	0.1242E-07
23	0.1333E-01	0.4400E+00	0.1022E+01	0.4400E+00	0.1860E+01	0.1783E+03	0.5300E-04	0.2935E+03	0.2873E+03	0.3500E+02	0.4530E+02	0.1333E-01	0.4400E+00	0.8869E+00	0.1860E-06
24	0.9902E-01	0.5390E+00	0.1002E+01	0.5390E+00	0.1680E+01	0.1611E+03	0.5300E-03	0.3596E+03	0.3050E+03	0.9500E+02	0.3660E+02	0.1925E-01	0.5390E+00	0.7350E+00	0.7910E-06
25	0.1238E-01	0.6400E-01	0.8209E+00	0.6400E-01	0.2140E+01	0.2052E+03	0.5000E-05	0.2216E+03	0.2808E+03	0.4000E+03	0.4690E+02	0.1238E-01	0.6400E-01	0.8312E+00	0.1186E-08
26	0.1980E-01	0.4800E-01	0.1056E+01	0.4800E-01	0.2880E+01	0.2759E+03	0.5000E-05	0.1226E+03	0.2890E+03	0.1000E+07	0.5420E+02	0.1980E-01	0.4800E-01	0.1070E+01	0.2551E-12
27	0.1593E-01	0.5031E+01	0.1033E+01	0.5031E+01	0.1950E+01	0.1873E+03	0.7600E-04	0.2659E+03	0.2943E+03	0.6000E+00	0.4620E+02	0.6932E-01	0.5031E+01	0.9913E+00	0.1377E-04
28	0.8830E-02	0.1330E+00	0.1017E+01	0.1330E+00	0.2180E+01	0.2095E+03	0.1700E-04	0.2127E+03	0.2893E+03	0.7000E+02	0.4640E+02	0.1100E-01	0.1330E+00	0.1037E+01	0.2147E-07
29	0.6900E-04	0.2510E+00	0.1046E+01	0.2510E+00	0.2180E+01	0.2090E+03	0.1300E-02	0.2137E+03	0.2861E+03	0.8900E+02	0.4670E+02	0.1733E-01	0.2510E+00	0.8548E+00	0.1312E-05
30	0.4163E-02	0.2930E+00	0.1056E+01	0.2930E+00	0.1700E+01	0.1631E+03	0.2700E-02	0.3506E+03	0.2939E+03	0.1400E+01	0.3810E+02	0.7374E-02	0.2930E+00	0.9540E+00	0.2767E-03
31	0.7146E-02	0.8160E+00	0.1060E+01	0.8160E+00	0.1700E+01	0.1633E+03	0.5300E-05	0.3498E+03	0.2931E+03	0.2500E+01	0.3650E+02	0.1155E+01	0.8160E+00	0.7923E+00	0.3043E-06
32	0.8155E-02	0.5500E-01	0.9562E+00	0.5500E-01	0.2050E+01	0.1969E+03	0.2100E-06	0.2407E+03	0.3039E+03	0.1710E+03	0.4170E+02	0.8155E-02	0.5500E-01	0.9730E+00	0.1170E-09
33	0.1540E+00	0.6100E-01	0.9062E+00	0.6100E-01	0.1760E+01	0.1693E+03	0.1000E-01	0.3255E+03	0.2962E+03	0.8500E+02	0.3430E+02	0.6931E+00	0.6100E-01	0.8134E+00	0.1555E-04
34	0.8664E-02	0.1000E-01	0.9106E+00	0.1000E-01	0.2260E+01	0.2170E+03	0.8000E-04	0.1982E+03	0.2815E+03	0.1000E+04	0.4780E+02	0.8664E-02	0.1000E-01	0.9185E+00	0.6774E-08
35	0.9902E-01	0.2137E+01	0.8753E+00	0.2137E+01	0.1560E+01	0.1497E+03	0.2000E-06	0.4163E+03	0.3029E+03	0.4000E-02	0.3120E+02	0.9902E-01	0.2137E+01	0.9256E+00	0.8266E-05
36	0.3301E-02	0.2190E+00	0.7475E+00	0.2190E+00	0.1860E+01	0.1788E+03	0.3000E-04	0.2918E+03	0.2966E+03	0.1400E+03	0.3750E+02	0.3301E-02	0.2190E+00	0.9549E+00	0.2536E-07
37	0.3984E-02	0.5800E-01	0.7738E+00	0.5800E-01	0.2470E+01	0.2369E+03	0.4480E-06	0.1662E+03	0.3029E+03	0.1300E+05	0.5200E+02	0.3984E-02	0.5800E-01	0.8631E+00	0.2274E-11
38	0.1980E+00	0.1800E-02	0.8023E+00	0.1800E-02	0.2520E+01	0.2413E+03	0.2270E-01	0.1602E+03	0.2947E+03	0.1000E+06	0.5800E+02	0.1980E+00	0.1800E-02	0.8050E+00	0.1484E-07
39	0.2310E+00	0.4760E+00	0.8904E+00	0.4760E+00	0.1420E+01	0.1359E+03	0.4000E-07	0.5052E+03	0.2863E+03	0.1000E-02	0.3100E+02	0.2773E-01	0.4760E+00	0.9120E+00	0.8490E-05
40	0.2039E+00	0.2080E+00	0.8749E+00	0.2080E+00	0.1840E+01	0.1763E+03	0.4000E-06	0.3003E+03	0.2866E+03	0.7000E+01	0.3840E+02	0.2039E+00	0.2080E+00	0.8382E+00	0.7202E-08
41	0.2069E-01	0.1190E+00	0.1023E+01	0.1190E+00	0.2180E+01	0.2092E+03	0.1300E-03	0.2133E+03	0.2843E+03	0.5800E+03	0.4380E+02	0.2069E-01	0.1190E+00	0.8414E+00	0.2022E-07
42	0.6301E-01	0.1590E+00	0.9005E+00	0.1590E+00	0.1830E+01	0.1751E+03	0.1200E-01	0.3043E+03	0.2963E+03	0.4000E+02	0.3660E+02	0.3301E-01	0.1590E+00	0.9524E+00	0.3705E-04
43	0.9181E-02	0.1000E-03	0.9409E+00	0.1000E-03	0.2140E+01	0.2055E+03	0.4500E-02	0.2210E+03	0.2856E+03	0.6500E+04	0.5100E+02	0.1444E-01	0.1000E-03	0.9501E+00	0.6444E-07
44	0.1155E+00	0.1250E+00	0.1004E+01	0.1250E+00	0.2430E+01	0.2329E+03	0.8800E-01	0.1720E+03	0.2950E+03	0.1800E+02	0.5670E+02	0.1155E+00	0.1250E+00	0.8922E+00	0.3428E-03
45	0.1980E+00	0.1400E-01	0.8922E+00	0.1400E-01	0.1740E+01	0.1673E+03	0.1300E-03	0.3332E+03	0.3075E+03	0.2000E+01	0.4680E+02	0.1980E+00	0.1400E-01	0.8913E+00	0.8472E-05
46	0.6027E-01	0.1000E-03	0.9228E+00	0.1000E-03	0.2080E+01	0.1992E+03	0.1000E-02	0.2351E+03	0.2891E+03	0.3500E+03	0.4790E+02	0.6027E-01	0.1000E-03	0.8699E+00	0.2795E-06
47	0.3466E+01	0.8700E-01	0.8472E+00	0.8700E-01	0.2140E+01	0.2055E+03	0.1600E+01	0.2210E+03	0.2910E+03	0.1000E+05	0.5440E+02	0.3466E+01	0.8700E-01	0.8211E+00	0.1461E-04
48	0.9627E-02	0.4280E+00	0.9910E+00	0.4280E+00	0.2210E+01	0.2123E+03	0.1600E-03	0.2070E+03	0.2976E+03	0.6000E+01	0.5540E+02	0.2458E-02	0.4280E+00	0.8532E+00	0.2231E-05
49	0.2390E-01	0.2010E+00	0.8197E+00	0.2010E+00	0.1650E+01	0.1587E+03	0.2500E-04	0.3705E+03	0.2902E+03	0.1300E+01	0.3690E+02	0.2390E-01	0.2010E+00	0.9114E+00	0.2953E-05
50	0.3014E-01	0.1580E+00	0.7585E+00	0.1580E+00	0.1950E+01	0.1868E+03	0.2200E-06	0.2673E+03	0.2869E+03	0.3100E+02	0.3890E+02	0.2950E-01	0.1580E+00	0.9638E+00	0.7952E-09
51	0.4621E+00	0.1840E+01	0.9351E+00	0.1840E+01	0.1580E+01	0.1515E+03	0.1200E-07	0.4063E+03	0.2937E+03	0.3300E+01	0.3360E+02	0.2311E-01	0.1840E+01	0.1026E+01	0.6049E-09
52	0.2888E-01	0.1040E+00	0.8244E+00	0.1040E+00	0.1810E+01	0.1733E+03	0.1200E-06	0.3107E+03	0.2947E+03	0.8000E-01	0.4050E+02	0.2888E-01	0.1040E+00	0.1008E+01	0.1902E-06
53	0.8252E-02	0.1150E+01	0.8778E+00	0.1150E+01	0.1600E+01	0.1538E+03	0.3000E-03	0.3943E+03	0.2973E+03	0.5000E-01	0.3560E+02	0.8252E-02	0.1150E+01	0.9895E+00	0.9571E-03
54	0.3301E-01	0.1700E-01	0.9334E+00	0.1700E-01	0.2100E+01	0.2018E+03	0.1100E-02	0.2292E+03	0.2897E+03	0.2500E+04	0.5000E+02	0.3301E-01	0.1700E-01	0.6690E+00	0.4187E-07
55	0.1691E-01	0.2520E+00	0.8890E+00	0.2520E+00	0.1620E+01	0.1551E+03	0.9900E-06	0.3879E+03	0.2975E+03	0.7500E+01	0.3320E+02	0.1691E-01	0.2520E+00	0.8555E+00	0.2070E-07
56	0.7374E-02	0.7200E-01	0.7886E+00	0.7200E-01	0.2050E+01	0.1971E+03	0.1500E-03	0.2402E+03	0.2923E+03	0.4500E+00	0.4640E+02	0.7374E-02	0.7200E-01	0.9168E+00	0.3294E-04
57	0.2236E-01	0.5840E+01	0.1143E+01	0.5840E+01	0.1720E+01	0.1647E+03	0.5000E-05	0.3441E+03	0.2880E+03	0.7180E+06	0.4310E+02	0.2236E-01	0.5840E+01	0.9472E+00	0.1001E-11
58	0.1386E+01	0.1030E+00	0.8749E+00	0.1030E+00	0.1850E+01	0.1775E+03	0.4000E-08	0.2963E+03	0.2825E+03	0.5000E+00	0.4200E+02	0.1386E+00	0.1030E+00	0.6940E+00	0.1009E-08

	k	$K_{om,ss}$	n_{ss}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
59	0.2390E-01	0.2320E+00	0.7152E+00	0.2320E+00	0.2090E+01	0.2001E+03	0.1100E-05	0.2331E+03	0.2845E+03	0.4200E+02	0.4650E+02	0.2069E-02	0.2320E+00	0.8170E+00	0.2581E-08
60	0.1980E-01	0.2060E-01	0.8621E+00	0.2060E-01	0.2260E+01	0.2170E+03	0.8700E-02	0.1981E+03	0.2965E+03	0.1300E+03	0.5670E+02	0.1980E-01	0.2060E-01	0.9896E+00	0.5378E-05
61	0.1980E-01	0.5400E+01	0.8837E+00	0.5400E+01	0.1900E+01	0.1821E+03	0.5000E-05	0.2815E+03	0.2979E+03	0.1000E+02	0.3460E+02	0.1980E-01	0.5400E+01	0.8917E+00	0.5682E-07
62	0.2310E-02	0.6100E-01	0.8521E+00	0.6100E-01	0.2310E+01	0.2220E+03	0.1000E-04	0.1893E+03	0.2856E+03	0.3700E+03	0.4510E+02	0.1475E-01	0.6100E-01	0.8461E+00	0.2154E-08
63	0.5776E+00	0.6100E-01	0.8549E+00	0.6100E-01	0.2650E+01	0.2541E+03	0.5000E-05	0.1445E+03	0.2825E+03	0.1000E+07	0.6660E+02	0.5776E+00	0.6100E-01	0.9440E+00	0.3076E-12
64	0.4201E-01	0.1100E-01	0.1036E+01	0.1100E-01	0.2120E+01	0.2035E+03	0.5000E-03	0.2253E+03	0.2876E+03	0.1900E+04	0.4370E+02	0.1873E-01	0.1100E-01	0.8758E+00	0.2479E-07
65	0.5332E-01	0.8400E-01	0.9342E+00	0.8400E-01	0.1880E+01	0.1805E+03	0.8600E-04	0.2863E+03	0.3046E+03	0.1100E+03	0.4000E+02	0.5545E-02	0.8400E-01	0.8571E+00	0.8840E-07
66	0.3224E-02	0.6000E-01	0.9016E+00	0.6000E-01	0.2050E+01	0.1962E+03	0.4700E-01	0.2423E+03	0.2851E+03	0.7500E+03	0.4140E+02	0.3224E-02	0.6000E-01	0.9495E+00	0.6405E-05
67	0.2773E+00	0.1400E+00	0.1050E+01	0.1400E+00	0.2020E+01	0.1942E+03	0.1900E-01	0.2475E+03	0.2913E+03	0.1170E+03	0.4790E+02	0.2773E+00	0.1400E+00	0.8869E+00	0.1660E-04
68	0.2666E-01	0.1700E-01	0.1065E+01	0.1700E-01	0.1860E+01	0.1787E+03	0.8600E-02	0.2921E+03	0.2974E+03	0.4000E+02	0.3910E+02	0.5545E-01	0.1700E-01	0.9790E+00	0.2540E-04
69	0.4780E-01	0.1710E+00	0.8588E+00	0.1710E+00	0.1830E+01	0.1754E+03	0.1000E-03	0.3034E+03	0.2958E+03	0.4000E+03	0.3660E+02	0.9242E-02	0.1710E+00	0.8267E+00	0.3084E-07
70	0.3466E+02	0.2150E+00	0.9235E+00	0.2150E+00	0.1590E+01	0.1521E+03	0.8900E-06	0.4035E+03	0.2852E+03	0.9000E+00	0.3600E+02	0.3466E+02	0.2150E+00	0.8493E+00	0.1683E-06
71	0.3466E+02	0.8700E-02	0.1024E+01	0.8700E-02	0.1670E+01	0.1606E+03	0.5300E-07	0.3618E+03	0.3014E+03	0.7000E+00	0.3570E+02	0.3466E+02	0.8700E-02	0.9733E+00	0.1093E-07
72	0.6027E-01	0.1150E+01	0.8637E+00	0.1150E+01	0.2070E+01	0.1984E+03	0.4200E-06	0.2371E+03	0.2928E+03	0.2000E+01	0.4660E+02	0.2250E-02	0.1150E+01	0.8863E+00	0.2045E-07
73	0.1386E+01	0.6160E+00	0.7876E+00	0.6160E+00	0.1700E+01	0.1634E+03	0.7300E-03	0.3494E+03	0.3035E+03	0.3300E+00	0.3270E+02	0.4951E-01	0.6160E+00	0.1018E+01	0.3063E-03
74	0.3151E-01	0.2075E+01	0.7541E+00	0.2075E+01	0.1830E+01	0.1753E+03	0.3000E-02	0.3035E+03	0.2867E+03	0.6800E+01	0.3350E+02	0.3151E-01	0.2075E+01	0.7804E+00	0.5618E-04
75	0.1980E+00	0.1300E+01	0.9449E+00	0.1300E+01	0.1570E+01	0.1510E+03	0.1800E-03	0.4090E+03	0.2942E+03	0.9000E+01	0.3560E+02	0.2311E-01	0.1300E+01	0.1008E+01	0.3344E-05
76	0.1980E+00	0.1300E+01	0.8097E+00	0.1300E+01	0.1660E+01	0.1595E+03	0.4700E-04	0.3670E+03	0.2863E+03	0.1000E+01	0.3850E+02	0.2311E-01	0.1300E+01	0.1157E+01	0.7245E-05
77	0.1386E+01	0.3500E+01	0.9537E+00	0.3500E+01	0.1630E+01	0.1560E+03	0.5500E-04	0.3834E+03	0.2939E+03	0.2000E+01	0.3380E+02	0.1386E+01	0.3500E+01	0.9379E+00	0.4314E-05
78	0.1733E+00	0.5330E+01	0.9453E+00	0.5330E+01	0.1480E+01	0.1416E+03	0.5100E-05	0.4651E+03	0.2876E+03	0.6000E+03	0.3620E+02	0.1733E+00	0.5330E+01	0.1165E+01	0.1653E-08
79	0.1980E+00	0.1972E+01	0.9615E+00	0.1972E+01	0.1450E+01	0.1389E+03	0.2200E-03	0.4839E+03	0.2983E+03	0.5000E-03	0.2950E+02	0.5078E-02	0.1972E+01	0.8741E+00	0.8585E-01
80	0.2773E-01	0.3500E-01	0.1042E+01	0.3500E-01	0.1990E+01	0.1913E+03	0.1500E-05	0.2550E+03	0.2910E+03	0.9000E+00	0.4870E+02	0.2773E-01	0.3500E-01	0.8846E+00	0.1757E-06
81	0.1925E-01	0.4020E+00	0.1029E+01	0.4020E+00	0.1770E+01	0.1699E+03	0.1800E-02	0.3233E+03	0.3004E+03	0.9600E+01	0.3740E+02	0.1958E-02	0.4020E+00	0.9486E+00	0.2427E-04
82	0.1824E-01	0.3250E+00	0.9223E+00	0.3250E+00	0.2030E+01	0.1946E+03	0.2700E-01	0.2463E+03	0.2841E+03	0.1300E+02	0.4220E+02	0.7001E-02	0.3250E+00	0.8604E+00	0.2166E-03
83	0.2100E-01	0.1270E-01	0.8992E+00	0.1270E-01	0.1690E+01	0.1623E+03	0.6500E-05	0.3541E+03	0.2868E+03	0.1200E+06	0.3080E+02	0.9902E+01	0.1270E-01	0.8562E+00	0.8043E-11
84	0.1800E-01	0.4000E-01	0.1134E+01	0.4000E-01	0.1830E+01	0.1760E+03	0.7100E-04	0.3013E+03	0.2971E+03	0.2300E+03	0.3750E+02	0.1800E-01	0.4000E-01	0.7748E+00	0.3765E-07
85	0.8664E+00	0.3750E+00	0.9153E+00	0.3750E+00	0.1630E+01	0.1562E+03	0.8400E-04	0.3825E+03	0.2867E+03	0.1000E+02	0.3300E+02	0.6931E+00	0.3750E+00	0.1030E+01	0.1348E-05
86	0.1712E-01	0.1160E+00	0.8515E+00	0.1160E+00	0.2260E+01	0.2170E+03	0.5000E-04	0.1982E+03	0.3063E+03	0.1370E+07	0.5030E+02	0.1712E-01	0.1160E+00	0.8230E+00	0.2841E-11
87	0.9902E-01	0.6540E+01	0.9059E+00	0.6540E+01	0.2450E+01	0.2349E+03	0.1900E-06	0.1691E+03	0.2962E+03	0.1200E+05	0.6130E+02	0.9902E-01	0.6540E+01	0.1017E+01	0.1087E-11
88	0.9242E-02	0.6533E+01	0.1029E+01	0.6533E+01	0.2030E+01	0.1951E+03	0.4000E-04	0.2452E+03	0.2975E+03	0.1000E+07	0.4500E+02	0.9242E-02	0.6533E+01	0.9147E+00	0.3966E-11
89	0.1386E+01	0.1130E+00	0.1130E+01	0.1130E+00	0.1530E+01	0.1467E+03	0.1640E-07	0.4335E+03	0.2961E+03	0.2700E+01	0.3240E+02	0.1386E+01	0.1130E+00	0.8580E+00	0.1070E-08
90	0.3151E+00	0.6000E-01	0.8842E+00	0.6000E-01	0.2010E+01	0.1930E+03	0.1300E+00	0.2506E+03	0.3097E+03	0.2800E+04	0.4590E+02	0.9902E-01	0.6000E-01	0.8768E+00	0.4518E-05
91	0.5023E-02	0.2000E+01	0.8277E+00	0.2000E+01	0.1850E+01	0.1772E+03	0.9300E-02	0.2972E+03	0.2847E+03	0.1400E+04	0.3900E+02	0.5023E-02	0.2000E+01	0.9452E+00	0.8339E-06
92	0.1980E+00	0.6400E-01	0.8197E+00	0.6400E-01	0.1880E+01	0.1799E+03	0.1300E-02	0.2883E+03	0.2837E+03	0.1114E+04	0.4310E+02	0.1359E-01	0.6400E-01	0.1045E+01	0.1426E-06
93	0.8774E-02	0.1440E+00	0.8814E+00	0.1440E+00	0.1990E+01	0.1910E+03	0.2000E-06	0.2557E+03	0.2971E+03	0.5100E+03	0.4530E+02	0.7220E-02	0.1440E+00	0.9201E+00	0.4060E-10
94	0.1238E-01	0.1000E+00	0.7833E+00	0.1000E+00	0.1650E+01	0.1586E+03	0.5000E-03	0.3709E+03	0.2849E+03	0.1800E+01	0.5110E+02	0.1238E-01	0.1000E+00	0.7762E+00	0.4349E-04
95	0.1540E+00	0.2810E+00	0.8575E+00	0.2810E+00	0.1750E+01	0.1681E+03	0.5000E-06	0.3302E+03	0.2874E+03	0.1300E+02	0.4020E+02	0.5501E-02	0.2810E+00	0.8625E+00	0.5315E-08
96	0.8774E-02	0.4300E-01	0.9075E+00	0.4300E-01	0.2220E+01	0.2127E+03	0.3300E-05	0.2063E+03	0.2883E+03	0.6000E+02	0.4380E+02	0.8774E-02	0.4300E-01	0.9239E+00	0.4733E-08
97	0.2773E+00	0.1800E+03	0.8379E+00	0.1800E+03	0.1500E+01	0.1440E+03	0.2000E-06	0.4499E+03	0.2860E+03	0.5000E-02	0.3060E+02	0.3466E-01	0.1800E+03	0.9133E+00	0.7567E-05
98	0.1523E-01	0.2000E-01	0.1067E+01	0.2000E-01	0.2080E+01	0.1996E+03	0.2700E-03	0.2343E+03	0.2845E+03	0.6000E+01	0.4480E+02	0.3872E-02	0.2000E-01	0.9015E+00	0.4457E-05
99	0.1925E-01	0.6330E+00	0.9306E+00	0.6330E+00	0.1870E+01	0.1791E+03	0.2200E-01	0.2908E+03	0.2984E+03	0.7300E+01	0.4500E+02	0.4930E-03	0.6330E+00	0.8630E+00	0.3533E-03
100	0.5251E-02	0.2330E+00	0.9368E+00	0.2330E+00	0.2020E+01	0.1935E+03	0.2000E-02	0.2491E+03	0.2874E+03	0.8100E+02	0.4560E+02	0.5291E-02	0.2330E+00	0.1106E+01	0.2574E-05
101	0.2350E-01	0.2900E-01	0.8754E+00	0.2900E-01	0.3010E+01	0.2885E+03	0.5000E-05	0.1121E+03	0.2862E+03	0.6000E+04	0.7540E+02	0.2773E-01	0.2900E-01	0.7695E+00	0.3925E-10
102	0.1066E+00	0.8000E-01	0.7877E+00	0.8000E-01	0.1950E+01	0.1875E+03	0.5000E-04	0.2653E+03	0.2919E+03	0.5000E-01	0.4600E+02	0.1238E-01	0.8000E-01	0.1018E+01	0.1093E-03
103	0.3224E-01	0.2900E-01	0.9453E+00	0.2900E-01	0.2250E+01	0.2157E+03	0.2000E-03	0.2006E+03	0.2849E+03	0.1500E+04	0.5080E+02	0.3224E-01	0.2900E-01	0.9607E+00	0.1129E-07
104	0.2476E-01	0.1000E-03	0.8980E+00	0.1000E-03	0.2170E+01	0.2085E+03	0.3100E-03	0.2146E+03	0.2963E+03	0.6200E+03	0.4770E+02	0.2476E-01	0.1000E-03	0.7780E+00	0.4355E-07
105	0.1238E-01	0.2700E-01	0.9516E+00	0.2700E-01	0.1910E+01	0.1828E+03	0.2900E-03	0.2793E+03	0.2823E+03	0.7100E+04	0.3880E+02	0.1238E-01	0.2700E-01	0.8638E+00	0.4860E-08
106	0.6245E-02	0.1000E-01	0.7675E+00	0.1000E-01	0.2400E+01	0.2301E+03	0.1000E-09	0.1762E+03	0.2961E+03	0.1900E+03	0.5180E+02	0.6932E-01	0.1000E-01	0.9482E+00	0.3767E-13
107	0.7702E+02	0.2280E+00	0.1086E+01	0.2280E+00	0.2800E+01	0.2687E+03	0.1000E-09	0.1292E+03	0.2906E+03	0.7220E+06	0.6710E+02	0.7702E+02	0.2280E+00	0.9159E+00	0.7406E-17
108	0.3648E-01	0.1000E+00	0.8383E+00	0.1000E+00	0.2240E+01	0.2148E+03	0.8600E-06	0.2022E+03	0.2757E+03	0.1820E+04	0.4900E+02	0.3301E-01	0.1000E+00	0.8617E+00	0.4168E-10
109	0.2100E-01	0.8100E-01	0.9479E+00	0.8100E-01	0.1910E+01	0.1833E+03	0.4700E-04	0.2778E+03	0.2919E+03	0.3000E+02	0.3980E+02	0.2100E-01	0.8100E-01	0.1034E+01	0.1793E-06
110	0.7702E-02	0.4050E+00	0.7485E+00	0.4050E+00	0.2140E+01	0.2053E+03	0.5900E-05	0.2213E+03	0.2918E+03	0.6000E+02	0.4860E+02	0.3809E-02	0.4050E+00	0.8326E+00	0.8971E-08
111	0.4332E-01	0.5000E-02	0.8299E+00	0.5000E-02	0.2680E+01	0.2572E+03	0.4000E-01	0.1411E+03	0.2900E+03	0.4000E+06	0.6350E+02	0.2950E-01	0.5000E-02	0.8526E+00	0.5852E-08
112	0.1066E+00	0.9600E-01	0.1110E+01	0.9600E-01	0.1830E+01	0.1757E+03	0.1300E-03	0.3023E+03	0.2964E+03	0.2400E+03	0.4220E+02	0.1980E-01	0.9600E-01	0.1029E+01	0.6645E-07
113	0.4621E+00	0.5060E+00	0.9070E+00	0.5060E+00	0.2120E+01	0.2035E+03	0.3800E-04	0.2253E+03	0.2974E+03	0.3000E+02	0.4370E+02	0.4621E+00	0.5060E+00	0.8088E+00	0.1154E-06
114	0.8351E-02	0.1200E-01	0.8932E+00	0.1200E-01	0.2500E+01	0.2399E+03	0.6700E-02	0.1622E+03	0.2842E+03	0.5800E+05	0.5380E+02	0.8664E-01	0.1200E-01	0.8379E+00	0.7928E-08
115	0.6863E-02	0.1030E+00	0.9803E+00	0.1030E+00	0.1890E+01	0.1813E+03	0.1700E-02	0.2838E+03	0.2744E+03	0.5300E+03	0.3740E+02	0.6863E-02	0.1030E+00	0.9253E+00	0.3990E-06
116	0.4780E-02	0.1660E+00	0.1060E+01	0.1660E+00	0.2110E+01	0.2020E+03	0.4300E-05	0.2287E+03	0.2899E+03	0.6780E+03	0.4550E+02	0.4780E-02	0.1660E+00	0.6057E+00	0.6018E-09

k	$K_{om,se}$	n_{se}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_{it}	
117	0.2773E+00	0.3200E-01	0.8850E+00	0.3200E-01	0.2170E+01	0.2087E+03	0.5800E-04	0.2143E+03	0.3015E+03	0.1200E+04	0.4580E+02	0.2773E+00	0.3200E-01	0.1006E+01	0.4132E-08
118	0.3224E-02	0.2800E-01	0.8835E+00	0.2800E-01	0.1630E+01	0.1564E+03	0.7700E-02	0.3814E+03	0.2951E+03	0.2790E+04	0.3490E+02	0.3224E-02	0.2800E-01	0.1045E+01	0.4291E-06
119	0.1386E+00	0.1700E-01	0.9406E+00	0.1700E-01	0.2130E+01	0.2041E+03	0.1700E-01	0.2241E+03	0.3065E+03	0.2000E+06	0.4830E+02	0.3381E-01	0.1700E-01	0.9355E+00	0.7474E-08
120	0.3151E-01	0.1930E+00	0.8792E+00	0.1930E+00	0.2170E+01	0.2085E+03	0.6000E-02	0.2146E+03	0.2891E+03	0.5700E+03	0.4810E+02	0.3151E-01	0.1930E+00	0.8069E+00	0.9397E-06
121	0.8252E-02	0.3550E+00	0.8961E+00	0.3550E+00	0.1870E+01	0.1798E+03	0.2100E-03	0.2888E+03	0.3078E+03	0.1420E+03	0.3720E+02	0.8252E-02	0.3550E+00	0.9755E+00	0.1669E-06
122	0.1386E+00	0.9190E+00	0.9250E+00	0.9190E+00	0.1850E+01	0.1778E+03	0.5000E-05	0.2953E+03	0.3023E+03	0.3900E+00	0.3920E+02	0.1733E+00	0.9190E+00	0.8161E+00	0.1506E-05
123	0.1083E-01	0.3440E+00	0.1008E+01	0.3440E+00	0.1790E+01	0.1722E+03	0.2700E-05	0.3147E+03	0.3023E+03	0.2600E+02	0.3810E+02	0.2265E-02	0.3440E+00	0.9469E+00	0.1300E-07
124	0.1540E+00	0.1330E-01	0.8424E+00	0.1330E-01	0.2180E+01	0.2092E+03	0.3300E-02	0.2132E+03	0.2913E+03	0.2000E+05	0.4880E+02	0.1540E+00	0.1330E-01	0.8275E+00	0.1453E-07
125	0.1650E-01	0.2000E-02	0.8400E+00	0.2000E-02	0.2150E+01	0.2063E+03	0.3100E-01	0.2193E+03	0.2875E+03	0.2800E+06	0.4600E+02	0.3851E-01	0.2000E-02	0.8759E+00	0.1016E-07
126	0.1195E-01	0.4400E-01	0.8610E+00	0.4400E-01	0.2030E+01	0.1946E+03	0.3800E-02	0.2463E+03	0.2865E+03	0.2000E+04	0.4400E+02	0.1386E+01	0.4400E-01	0.8734E+00	0.1964E-06
127	0.3301E-01	0.1410E+00	0.8695E+00	0.1410E+00	0.1960E+01	0.1883E+03	0.1300E-02	0.2632E+03	0.2859E+03	0.5500E+02	0.4560E+02	0.3648E-01	0.1410E+00	0.8506E+00	0.2617E-05
128	0.9120E-02	0.1166E+01	0.8876E+00	0.1166E+01	0.1890E+01	0.1812E+03	0.2100E-03	0.2842E+03	0.2865E+03	0.7700E+02	0.3920E+02	0.9120E-02	0.1166E+01	0.8271E+00	0.3254E-06
129	0.7296E-01	0.1000E+01	0.9282E+00	0.1000E+01	0.1760E+01	0.1685E+03	0.3300E-09	0.3288E+03	0.2920E+03	0.4000E+00	0.3530E+02	0.5728E-02	0.1000E+01	0.8586E+00	0.1117E-09
130	0.8719E-02	0.1110E+00	0.9301E+00	0.1110E+00	0.1900E+01	0.1821E+03	0.4000E-02	0.2813E+03	0.2860E+03	0.3000E+00	0.3940E+02	0.8719E-02	0.1110E+00	0.1045E+01	0.1577E-02
131	0.6027E-01	0.3400E+00	0.9273E+00	0.3400E+00	0.1610E+01	0.1544E+03	0.4500E-04	0.3913E+03	0.2891E+03	0.2000E+00	0.3240E+02	0.1733E-01	0.3400E+00	0.8721E+00	0.3662E-04
132	0.1980E+00	0.1345E+01	0.8266E+00	0.1345E+01	0.1660E+01	0.1593E+03	0.3300E-04	0.3678E+03	0.3009E+03	0.1700E+01	0.3670E+02	0.1980E+00	0.1345E+01	0.1083E+01	0.2854E-05
133	0.5332E-01	0.5000E-02	0.8886E+00	0.5000E-02	0.1840E+01	0.1766E+03	0.3300E-02	0.2991E+03	0.2992E+03	0.1000E+07	0.3880E+02	0.5332E-01	0.5000E-02	0.8148E+00	0.3968E-09
134	0.5332E-01	0.1100E-01	0.8900E+00	0.1100E-01	0.1730E+01	0.1661E+03	0.1200E-03	0.3384E+03	0.2812E+03	0.5000E-01	0.3350E+02	0.5332E-01	0.1100E-01	0.8577E+00	0.3474E-03
135	0.3014E-01	0.4610E+00	0.9485E+00	0.4610E+00	0.2060E+01	0.1979E+03	0.4000E-02	0.2383E+03	0.3030E+03	0.2700E+04	0.4210E+02	0.6418E-02	0.4610E+00	0.8446E+00	0.1401E-06
136	0.1540E+00	0.2020E+00	0.9164E+00	0.2020E+00	0.1820E+01	0.1748E+03	0.1500E-01	0.3053E+03	0.3098E+03	0.5000E+01	0.3740E+02	0.5545E-01	0.2020E+00	0.1011E+01	0.3555E-03
137	0.5100E-03	0.4300E+01	0.8983E+00	0.4300E+01	0.1640E+01	0.1574E+03	0.8000E-07	0.3767E+03	0.2955E+03	0.4800E+02	0.3510E+02	0.4590E-02	0.4300E+01	0.8957E+00	0.2555E-09
138	0.1238E-01	0.2210E+00	0.8728E+00	0.2210E+00	0.2050E+01	0.1966E+03	0.1690E-03	0.2414E+03	0.2804E+03	0.3300E+02	0.3980E+02	0.1691E-01	0.2210E+00	0.1058E+01	0.5303E-06
139	0.1540E+00	0.4000E-01	0.9575E+00	0.4000E-01	0.2190E+01	0.2099E+03	0.3100E-01	0.2117E+03	0.2851E+03	0.6130E+03	0.4560E+02	0.8252E-02	0.4000E-01	0.9147E+00	0.4516E-05
140	0.1899E-02	0.1790E+00	0.8884E+00	0.1790E+00	0.2320E+01	0.2226E+03	0.8000E-03	0.1883E+03	0.3106E+03	0.8670E+06	0.4540E+02	0.2773E-01	0.1790E+00	0.7792E+00	0.6727E-10
141	0.1386E+01	0.2420E+00	0.9678E+00	0.2420E+00	0.1510E+01	0.1450E+03	0.1300E-07	0.4439E+03	0.2765E+03	0.2000E+01	0.3050E+02	0.1386E+01	0.2420E+00	0.8584E+00	0.1255E-08
142	0.1650E-01	0.1100E-01	0.7032E+00	0.1100E-01	0.2380E+01	0.2282E+03	0.1000E-09	0.1792E+03	0.2966E+03	0.2500E+03	0.4940E+02	0.1650E-01	0.1100E-01	0.1212E+01	0.2907E-13
143	0.1260E-01	0.7170E+00	0.1052E+01	0.7170E+00	0.1720E+01	0.1651E+03	0.1300E-03	0.3422E+03	0.2904E+03	0.1100E+03	0.3640E+02	0.7220E-02	0.7170E+00	0.8213E+00	0.1675E-06
144	0.3466E+00	0.1600E-01	0.7578E+00	0.1600E-01	0.2200E+01	0.2112E+03	0.3900E-03	0.2092E+03	0.2977E+03	0.1900E+04	0.4570E+02	0.8774E-02	0.1600E-01	0.1008E+01	0.1735E-07
145	0.2773E-01	0.1170E+00	0.8539E+00	0.1170E+00	0.1990E+01	0.1909E+03	0.1100E-01	0.2561E+03	0.2833E+03	0.1500E+02	0.4220E+02	0.2773E-01	0.1170E+00	0.8650E+00	0.7973E-04
146	0.1575E-01	0.9960E+00	0.9386E+00	0.9960E+00	0.2010E+01	0.1927E+03	0.6900E-02	0.2514E+03	0.2976E+03	0.1320E+02	0.3910E+02	0.2888E-01	0.9960E+00	0.7846E+00	0.5310E-04
147	0.6932E-01	0.3760E+00	0.1082E+01	0.3760E+00	0.1650E+01	0.1581E+03	0.1000E-03	0.3734E+03	0.2926E+03	0.4200E+01	0.3450E+02	0.6932E-01	0.3760E+00	0.8479E+00	0.3654E-05
148	0.8664E-01	0.8300E-02	0.8690E+00	0.8300E-02	0.1640E+01	0.1573E+03	0.1000E-09	0.3770E+03	0.2903E+03	0.5000E-03	0.3160E+02	0.8664E-01	0.8300E-02	0.7835E+00	0.3124E-07
149	0.1386E+01	0.7000E-02	0.1031E+01	0.7000E-02	0.1640E+01	0.1569E+03	0.1300E-06	0.3789E+03	0.2997E+03	0.1490E+01	0.3210E+02	0.1386E+01	0.7000E-02	0.8179E+00	0.1327E-07
150	0.6932E-01	0.6200E+01	0.8512E+00	0.6200E+01	0.1670E+01	0.1599E+03	0.2500E-03	0.3649E+03	0.2938E+03	0.1200E-01	0.3250E+02	0.6932E-01	0.6200E+01	0.8514E+00	0.3112E-02
151	0.1899E-02	0.2630E+00	0.8520E+00	0.2630E+00	0.1850E+01	0.1778E+03	0.1900E-02	0.2952E+03	0.2965E+03	0.1150E+03	0.3900E+02	0.1050E-01	0.2630E+00	0.9296E+00	0.1978E-05
152	0.7702E-02	0.5100E-02	0.9204E+00	0.5100E-02	0.2140E+01	0.2052E+03	0.5000E-05	0.2216E+03	0.2891E+03	0.2100E+03	0.4810E+02	0.7702E-02	0.5100E-02	0.9100E+00	0.2195E-08
153	0.1800E-01	0.1069E+01	0.7737E+00	0.1069E+01	0.1650E+01	0.1582E+03	0.1100E-06	0.3728E+03	0.2806E+03	0.4000E+00	0.3440E+02	0.3466E+00	0.1069E+01	0.9538E+00	0.4394E-07
154	0.3466E+00	0.3500E-01	0.9044E+00	0.3500E-01	0.1530E+01	0.1471E+03	0.1500E-05	0.4314E+03	0.2881E+03	0.5000E+01	0.3210E+02	0.3466E+00	0.3500E-01	0.8288E+00	0.5404E-07
155	0.3894E-01	0.2900E-01	0.9341E+00	0.2900E-01	0.1760E+01	0.1688E+03	0.2100E-04	0.3275E+03	0.2965E+03	0.2360E+04	0.3320E+02	0.5776E+00	0.2900E-01	0.8258E+00	0.1182E-08
156	0.1491E-01	0.5900E-01	0.9342E+00	0.5900E-01	0.2240E+01	0.2151E+03	0.8000E-06	0.2017E+03	0.3045E+03	0.6200E+01	0.4680E+02	0.1195E-01	0.5900E-01	0.8102E+00	0.1028E-07
157	0.1899E-02	0.6130E+00	0.8776E+00	0.6130E+00	0.1810E+01	0.1741E+03	0.9600E-06	0.3078E+03	0.2933E+03	0.3200E+02	0.3570E+02	0.1899E-02	0.6130E+00	0.1061E+01	0.3787E-08
158	0.1980E+00	0.1150E+03	0.9210E+00	0.1150E+03	0.1560E+01	0.1493E+03	0.8000E-02	0.4187E+03	0.3018E+03	0.2000E-01	0.3450E+02	0.9627E-02	0.1150E+03	0.9452E+00	0.6675E-01
159	0.6601E-01	0.2470E+00	0.9360E+00	0.2470E+00	0.1470E+01	0.1414E+03	0.9500E-05	0.4665E+03	0.2885E+03	0.3000E-01	0.3110E+02	0.6931E+00	0.2470E+00	0.7909E+00	0.6159E-04
160	0.6301E-01	0.6300E+00	0.8737E+00	0.6300E+00	0.1870E+01	0.1799E+03	0.3500E-01	0.2884E+03	0.3098E+03	0.4500E+01	0.3780E+02	0.8664E-01	0.6300E+00	0.8372E+00	0.8709E-03
161	0.2567E-01	0.3900E+00	0.9023E+00	0.3900E+00	0.2050E+01	0.1966E+03	0.2250E-03	0.2414E+03	0.3122E+03	0.2200E+02	0.3980E+02	0.9367E-02	0.3900E+00	0.8520E+00	0.9512E-06
162	0.3555E-01	0.1900E-01	0.9315E+00	0.1900E-01	0.1650E+01	0.1581E+03	0.3600E-03	0.3734E+03	0.2856E+03	0.1330E+04	0.3670E+02	0.1155E+00	0.1900E-01	0.8219E+00	0.4257E-07
163	0.2829E-01	0.1200E-01	0.8588E+00	0.1200E-01	0.1930E+01	0.1854E+03	0.5000E-03	0.2714E+03	0.2945E+03	0.8400E+05	0.4440E+02	0.3151E+00	0.1200E-01	0.9092E+00	0.6597E-09
164	0.2311E-01	0.8800E-01	0.9004E+00	0.8800E-01	0.1690E+01	0.1622E+03	0.5700E-02	0.3545E+03	0.2866E+03	0.3500E+02	0.3550E+02	0.3466E+00	0.8800E-01	0.1024E+01	0.2423E-04
165	0.2567E-01	0.4420E+00	0.9543E+00	0.4420E+00	0.2030E+01	0.1946E+03	0.2300E-01	0.2463E+03	0.2997E+03	0.2000E+03	0.4310E+02	0.2567E-01	0.4420E+00	0.9602E+00	0.1137E-04
166	0.2236E-01	0.1558E+01	0.8235E+00	0.1558E+01	0.1830E+01	0.1760E+03	0.5700E-01	0.3011E+03	0.2943E+03	0.3500E+00	0.4120E+02	0.1050E-01	0.1558E+01	0.8363E+00	0.2004E-01
167	0.9902E-01	0.1100E-01	0.8196E+00	0.1100E-01	0.1710E+01	0.1639E+03	0.1600E-03	0.3472E+03	0.2951E+03	0.9000E+00	0.3830E+02	0.9902E-01	0.1100E-01	0.1014E+01	0.2515E-04
168	0.6301E-01	0.1164E+01	0.9172E+00	0.1164E+01	0.1820E+01	0.1750E+03	0.1600E-01	0.3047E+03	0.2961E+03	0.4000E+01	0.3830E+02	0.6730E-02	0.1164E+01	0.8328E+00	0.4951E-03
169	0.1320E-01	0.1340E+00	0.8547E+00	0.1340E+00	0.1850E+01	0.1776E+03	0.5000E-03	0.2958E+03	0.2887E+03	0.7200E+02	0.3800E+02	0.7617E-02	0.1340E+00	0.8969E+00	0.8557E-06
170	0.8155E-02	0.8600E-01	0.9950E+00	0.8600E-01	0.1990E+01	0.1905E+03	0.4400E-05	0.2570E+03	0.2898E+03	0.6800E+02	0.3900E+02	0.7702E-02	0.8600E-01	0.8350E+00	0.6901E-08
171	0.3961E-01	0.2080E+00	0.9215E+00	0.2080E+00	0.1800E+01	0.1726E+03	0.4000E-03	0.3133E+03	0.2896E+03	0.3900E+02	0.3820E+02	0.3961E-01	0.2080E+00	0.7563E+00	0.1335E-05
172	0.6418E-02	0.1100E-01	0.1028E+01	0.1100E-01	0.1980E+01	0.1904E+03	0.1000E-02	0.2574E+03	0.2908E+03	0.1540E+06	0.4890E+02	0.3851E-01	0.1100E-01	0.9176E+00	0.6912E-09
173	0.4951E-01	0.3200E-01	0.8951E+00	0.3200E-01	0.1990E+01	0.1907E+03	0.1700E-03	0.2565E+03	0.2958E+03	0.4350E+03	0.4840E+02	0.4951E-01	0.3200E-01	0.7997E+00	0.4076E-07
174	0.2166E-01	0.9850E+00	0.8811E+00	0.9850E+00	0.1850E+01	0.1771E+03	0.4000E-01	0.2975E+03	0.2964E+03	0.1000E+02	0.3250E+02	0.2039E-01	0.9850E+00	0.7554E+00	0.4829E-03

k	$K_{om,ss}$	n_{ss}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_h	$K_{om,wb}$	n_{wb}	K_{ll}	
175	0.3466E-01	0.1085E+01	0.1151E+01	0.1085E+01	0.1710E+01	0.1643E+03	0.1400E-02	0.3457E+03	0.2901E+03	0.1290E+05	0.3660E+02	0.5332E-01	0.1085E+01	0.8528E+00	0.1556E-07
176	0.3466E+00	0.8300E-01	0.8387E+00	0.8300E-01	0.1530E+01	0.1465E+03	0.2600E-04	0.4350E+03	0.2936E+03	0.9000E+01	0.3440E+02	0.3648E-01	0.8300E-01	0.9632E+00	0.5148E-06
177	0.6931E+00	0.1570E+00	0.8681E+00	0.1570E+00	0.1880E+01	0.1806E+03	0.1600E-04	0.2861E+03	0.2885E+03	0.2000E+01	0.4310E+02	0.3014E-01	0.1570E+00	0.7207E+00	0.9540E-06
178	0.1899E-01	0.8000E-01	0.7444E+00	0.8000E-01	0.1920E+01	0.1839E+03	0.5000E-05	0.2758E+03	0.2972E+03	0.1000E+02	0.4660E+02	0.1899E-01	0.8000E-01	0.9775E+00	0.5581E-07
179	0.6931E+00	0.1500E-01	0.7365E+00	0.1500E-01	0.3020E+01	0.2899E+03	0.3200E+04	0.1110E+03	0.2859E+03	0.1000E+04	0.7250E+02	0.6931E+00	0.1500E-01	0.8633E+00	0.1494E+00
180	0.1066E-01	0.2300E+00	0.9501E+00	0.2300E+00	0.2140E+01	0.2055E+03	0.1100E-01	0.2210E+03	0.2922E+03	0.7600E+03	0.5100E+02	0.1066E-01	0.2300E+00	0.9468E+00	0.1317E-05
min	0.6904E-04	0.1000E-05	0.6940E+00	0.1000E-05	0.1420E+01	0.1359E+03	0.0000E+00	0.8410E+02	0.2744E+03	0.0000E+00	0.2950E+02	0.4930E-03	0.1000E-05	0.6060E+00	0.1190E-16
max	0.7702E+02	0.1800E+03	0.1151E+01	0.7702E+02	0.3470E+01	0.3331E+03	0.3200E+05	0.5052E+03	0.3122E+03	0.1370E+07	0.8280E+02	0.7702E+02	0.1800E+03	0.1212E+01	0.2576E+01
median	0.2860E-01	0.1290E+00	0.9000E+00	0.1290E+00	0.1900E+01	0.1821E+03	0.1300E-03	0.2814E+03	0.2917E+03	0.5150E+02	0.4155E+02	0.2310E-01	0.1290E+00	0.8870E+00	0.1280E-06

Annex 6 Sample of process parameters (hypothetical pesticides)

	k	$K_{om,ss}$	n_{ss}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
1	0.2773E+00	0.8400E-01	0.9282E+00	0.1500E-01	0.3010E+01	0.1471E+03	0.5800E-04	0.2146E+03	0.3050E+03	0.2600E+02	0.4390E+02	0.1333E-01	0.2900E-01	0.6690E+00	0.1887E-06
2	0.5251E-01	0.1700E-01	0.1082E+01	0.1000E+00	0.2380E+01	0.1783E+03	0.3200E+04	0.1622E+03	0.2851E+03	0.8500E+02	0.4880E+02	0.5023E-02	0.5780E+00	0.9486E+00	0.2576E+01
3	0.3301E-01	0.3760E+00	0.7444E+00	0.1069E+01	0.1740E+01	0.2127E+03	0.4000E-04	0.2146E+03	0.2868E+03	0.9000E+00	0.3940E+02	0.1899E-01	0.1270E-01	0.8170E+00	0.4000E-05
4	0.1925E-01	0.1200E-01	0.1060E+01	0.8100E-01	0.1670E+01	0.2885E+03	0.6700E-04	0.2414E+03	0.2846E+03	0.1150E+03	0.4680E+02	0.5545E-02	0.6160E+00	0.1035E+01	0.5944E-07
5	0.3224E-02	0.4420E+00	0.8108E+00	0.1700E-01	0.1510E+01	0.1748E+03	0.8600E-06	0.2463E+03	0.2842E+03	0.7180E+06	0.4690E+02	0.5776E+00	0.3484E+01	0.1008E+01	0.1248E-12
6	0.2310E+00	0.1700E-01	0.9678E+00	0.5500E-01	0.1620E+01	0.1661E+03	0.3800E-02	0.2403E+03	0.3015E+03	*0.3300E+00*	*0.4860E+02*	*0.7702E-02*	*0.8800E-01*	*0.8981E+00*	*0.1104E-02*
7	0.1386E+01	0.3000E+00	0.1065E+01	0.1330E-01	0.2140E+01	0.1799E+03	0.8700E-02	0.1903E+03	0.3035E+03	0.1000E+04	0.4310E+02	0.1980E+00	0.4400E+00	0.9638E+00	0.6560E-06
8	0.8252E-02	0.2210E+00	0.8932E+00	0.2060E-01	0.2240E+01	0.1476E+03	0.5500E-07	0.3649E+03	0.3005E+03	0.4000E+02	0.4530E+02	0.9902E-01	0.4700E-02	0.8584E+00	0.2008E-09
9	0.2133E-01	0.9190E+00	0.1029E+01	0.2210E+00	0.1920E+01	0.1775E+03	0.2000E-03	0.2353E+03	0.3029E+03	0.4800E+02	0.5540E+02	0.1980E-01	0.6130E+00	0.8148E+00	0.3893E-06
10	0.1386E+01	0.8500E-01	0.9386E+00	0.4400E-01	0.1900E+01	0.1587E+03	0.5300E-05	0.3173E+03	0.2865E+03	0.6200E+03	0.2950E+02	0.4780E-02	0.6540E+01	0.7835E+00	0.1139E-08
11	0.7702E-02	0.1580E+00	0.8196E+00	0.6400E-01	0.2100E+01	0.1450E+03	0.3100E-03	0.3107E+03	0.3045E+03	0.3900E+00	0.3610E+02	0.1238E-01	0.2150E+00	0.1045E+01	0.9754E-04
12	0.5776E+00	0.2630E+00	0.8197E+00	0.1100E-01	0.1700E+01	0.1715E+03	0.1000E-02	0.2714E+03	0.2832E+03	0.2000E+00	0.4650E+02	0.1386E+01	0.4280E+00	0.9632E+00	0.5763E-03
13	0.8252E-02	0.2900E-01	0.8922E+00	0.1700E-01	0.2130E+01	0.2001E+03	0.4700E-01	0.2813E+03	0.2866E+03	0.3500E+04	0.3990E+02	0.3466E+02	0.1000E-01	0.8414E+00	0.1585E-05
14	0.4621E+00	0.1400E-01	0.8549E+00	0.6300E+00	0.1500E+01	0.1833E+03	0.9000E-05	0.3047E+03	0.3023E+03	0.4200E+02	0.3050E+02	0.1733E-01	0.4300E-01	0.1030E+01	0.2598E-07
15	0.3466E+00	0.1300E+01	0.8890E+00	0.4800E-01	0.1640E+01	0.1562E+03	0.2100E-06	0.4335E+03	0.2887E+03	0.2500E+01	0.5380E+02	0.3151E-01	0.1100E-01	0.8699E+00	0.1517E-07
16	0.8664E+00	0.3400E+00	0.8515E+00	0.3400E+00	0.2180E+01	0.1485E+03	0.1600E-01	0.3034E+03	0.2891E+03	0.2000E+04	0.7250E+02	0.7001E-02	0.5400E+01	0.7804E+00	0.1010E-05
17	0.2310E-02	0.7000E-02	0.8814E+00	0.2630E+00	0.1980E+01	0.1726E+03	0.5700E-01	0.2908E+03	0.2933E+03	0.2000E+03	0.7540E+02	0.8252E-02	0.6533E+01	0.9607E+00	0.3399E-04
18	0.6301E-01	0.4760E+00	0.9228E+00	0.6400E-01	0.2140E+01	0.1875E+03	0.8000E-07	0.2491E+03	0.2942E+03	0.3500E+00	0.3810E+02	0.1386E+01	0.8000E-01	0.9239E+00	0.2328E-07
19	0.6601E-01	0.2930E+00	0.8926E+00	0.2000E-01	0.1850E+01	0.1659E+03	0.9900E-06	0.2991E+03	0.2744E+03	0.1400E+01	0.4890E+02	0.1980E-01	0.2060E-01	0.8372E+00	0.9270E-07
20	0.2069E-01	0.1800E-02	0.9351E+00	0.1000E-01	0.2880E+01	0.1751E+03	0.5900E-05	0.2755E+03	0.3006E+03	0.6130E+03	0.3900E+02	0.9627E-02	0.5100E-02	0.8230E+00	0.1061E-08
21	0.6900E-04	0.5780E+00	0.8212E+00	0.6000E-01	0.1870E+01	0.1979E+03	0.5000E-03	0.2351E+03	0.2976E+03	0.7900E+06	0.6710E+02	0.5501E-02	0.1069E+01	0.8869E+00	0.6013E-10
22	0.3466E+00	0.2510E+00	0.9026E+00	0.2900E-01	0.2080E+01	0.2099E+03	0.2500E-03	0.4281E+03	0.3122E+03	0.2200E+02	0.4900E+02	0.2265E-02	0.2020E+00	0.8102E+00	0.1874E-05
23	0.8155E-01	0.2900E-01	0.9059E+00	0.3760E+00	0.1580E+01	0.2123E+03	0.1500E-05	0.1292E+03	0.2958E+03	0.1000E+02	0.4250E+02	0.1691E-01	0.1200E-01	0.9199E+00	0.7881E-08
24	0.1386E+00	0.2470E+00	0.6942E+00	0.1590E+00	0.2260E+01	0.2055E+03	0.5000E-03	0.2888E+03	0.2825E+03	0.2200E+02	0.3640E+02	0.6931E+00	0.9600E-01	0.6057E+00	0.2794E-05
25	0.5100E-03	0.1150E+01	0.7475E+00	0.7200E-01	0.1650E+01	0.1905E+03	0.7600E-04	0.2383E+03	0.2900E+03	0.4000E+06	0.3440E+02	0.1359E-01	0.8700E-01	0.8913E+00	0.1878E-10
26	0.1386E+01	0.4020E+00	0.9501E+00	0.2930E+00	0.2260E+01	0.1763E+03	0.1000E-02	0.3013E+03	0.2983E+03	0.6000E+03	0.3570E+02	0.2773E+00	0.2630E+00	0.7923E+00	0.2025E-06
27	0.9242E-02	0.5800E-01	0.7152E+00	0.1100E-01	0.1990E+01	0.2112E+03	0.5000E-05	0.4651E+03	0.2844E+03	0.6000E+01	0.4530E+02	0.7220E-02	0.1300E+01	0.7853E+00	0.1639E-06
28	0.5332E-01	0.1660E+00	0.7541E+00	0.1000E-01	0.2130E+01	0.1663E+03	0.1300E-03	0.2216E+03	0.2919E+03	0.1900E+03	0.3240E+02	0.1980E-01	0.1150E+01	0.8514E+00	0.6248E-07
29	0.1540E+00	0.1000E+00	0.7877E+00	0.2300E+00	0.1880E+01	0.1523E+03	0.1250E-02	0.2514E+03	0.2963E+03	0.4000E-02	0.4210E+02	0.1238E-01	0.8160E+00	0.9913E+00	0.3189E-01
30	0.6932E-01	0.1069E+01	0.8197E+00	0.8700E-01	0.1530E+01	0.1788E+03	0.6650E+00	0.1720E+03	0.2966E+03	0.6000E+04	0.3660E+02	0.3648E-01	0.2075E+01	0.9355E+00	0.7731E-05
31	0.2100E-01	0.2000E-01	0.1086E+01	0.4420E+00	0.1680E+01	0.2170E+03	0.4600E-02	0.3003E+03	0.2876E+03	0.3000E+02	0.4660E+02	0.1386E+01	0.6300E+00	0.7792E+00	0.1925E-04
32	0.1386E+00	0.1930E+00	0.8235E+00	0.1410E+00	0.1640E+01	0.1633E+03	0.6000E-02	0.3302E+03	0.2757E+03	0.6500E+04	0.4590E+02	0.5728E-02	0.2080E+00	0.9133E+00	0.1330E-06
33	0.8719E-02	0.2300E+00	0.9803E+00	0.1030E+00	0.1650E+01	0.2035E+03	0.1100E-06	0.3705E+03	0.2947E+03	0.6800E+01	0.5100E+02	0.1444E-01	0.1100E-01	0.9253E+00	0.2446E-08
34	0.2773E-01	0.7500E-01	0.9543E+00	0.6100E-01	0.1840E+01	0.1717E+03	0.8600E-04	0.1226E+03	0.2951E+03	0.7500E+01	0.3320E+02	0.6931E+00	0.3200E-01	0.8631E+00	0.5729E-06
35	0.7146E-02	0.1270E-01	0.9342E+00	0.5330E+01	0.2200E+01	0.1927E+03	0.2000E-06	0.3053E+03	0.2913E+03	0.4000E+00	0.3250E+02	0.1980E+00	0.1340E+00	0.8922E+00	0.6303E-07
36	0.3466E+02	0.1400E+00	0.9342E+00	0.8300E-02	0.1860E+01	0.2053E+03	0.1700E-02	0.3494E+03	0.2847E+03	0.2000E+01	0.3450E+02	0.2773E-01	0.6400E-01	0.1058E+01	0.1254E-03
37	0.6601E-01	0.1030E+00	0.9004E+00	0.1000E-03	0.2060E+01	0.2045E+03	0.5000E-04	0.4229E+03	0.3023E+03	0.5300E+03	0.3660E+02	0.9242E-02	0.2300E+00	0.8179E+00	0.1588E-07
38	0.1824E+00	0.4300E+01	0.8424E+00	0.4280E+00	0.1660E+01	0.2572E+03	0.4700E-04	0.2127E+03	0.2939E+03	0.5700E+03	0.3490E+02	0.2069E-01	0.5390E+00	0.9440E+00	0.7178E-08
39	0.1925E-01	0.2137E+01	0.8539E+00	0.2000E+01	0.1690E+01	0.1497E+03	0.5000E-05	0.3541E+03	0.2849E+03	0.7700E+02	0.3740E+02	0.6931E+00	0.1420E+01	0.1212E+01	0.9707E-08
40	0.2476E-01	0.9500E-01	0.9235E+00	0.1400E+00	0.1760E+01	0.2170E+03	0.4000E-06	0.4035E+03	0.2914E+03	0.8670E+06	0.4620E+02	0.7702E-02	0.1710E+00	0.7909E+00	0.7684E-13
41	*0.8830E-02*	*0.8700E-01*	*0.9023E+00*	*0.1660E+00*	*0.2180E+01*	0.2095E+03	*0.3000E-02*	0.1981E+03	0.2893E+03	0.2000E+01	0.4500E+02	0.2773E-01	0.1170E+00	0.7665E+00	0.1235E-03
42	0.3151E+00	0.9600E-01	0.8023E+00	0.2520E+00	0.1700E+01	0.1996E+03	0.1300E-03	0.2070E+03	0.2971E+03	0.1420E+03	0.4200E+02	0.6730E-02	0.4000E-03	0.9201E+00	0.7671E-07
43	0.3466E+02	0.1164E+01	0.9360E+00	0.1440E+00	0.1710E+01	0.1969E+03	0.4000E-01	0.2863E+03	0.2901E+03	0.5000E-01	0.4170E+02	0.8664E-01	0.2000E-01	0.8869E+00	0.9497E-01
44	0.1824E-01	0.1040E+00	0.8776E+00	0.1900E-01	0.2070E+01	0.1771E+03	0.1000E-09	0.8410E+02	0.2928E+03	0.1170E+03	0.4780E+02	0.4930E-03	0.9500E-01	0.9495E+00	0.2952E-13
45	0.1540E+00	0.1410E+00	0.9334E+00	0.1558E+01	0.1530E+01	0.1560E+03	0.3600E-03	0.1110E+03	0.2856E+03	0.4000E+03	0.4560E+02	0.1100E-01	0.1150E+03	0.9159E+00	0.4207E-07
46	0.6418E-02	0.6000E-01	0.8400E+00	0.4000E-01	0.1600E+01	0.1574E+03	0.5100E-05	0.3374E+03	0.2874E+03	0.3000E+02	0.3080E+02	0.3301E-01	0.1000E-01	0.8326E+00	0.2401E-07
47	0.8155E-02	0.8160E+00	0.8980E+00	0.1400E-01	0.1630E+01	0.1467E+03	0.8000E-03	0.3472E+03	0.2975E+03	0.1330E+04	0.4770E+02	0.3151E-01	0.2800E-01	0.8360E+00	0.8444E-07
48	0.8774E-02	0.1100E-01	0.8790E+00	0.4300E-01	0.1850E+01	0.2282E+03	0.5700E-02	0.3734E+03	0.2787E+03	0.5000E+01	0.3210E+02	0.1386E+01	0.1250E+00	0.9168E+00	0.1837E-03
49	0.1980E+00	0.8300E-01	0.8244E+00	0.1270E-01	0.1840E+01	0.1681E+03	0.1300E-02	0.3133E+03	0.2910E+03	0.3000E+00	0.3110E+02	0.5078E-02	0.4050E+00	0.8532E+00	0.5612E-03
50	0.4201E-01	0.1000E-03	0.1017E+01	0.2280E+00	0.1830E+01	0.1992E+03	0.5000E-05	0.2935E+03	0.2902E+03	0.6000E+01	0.3250E+02	0.2773E-01	0.3200E-01	0.1017E+01	0.1014E-06
51	0.2773E+00	0.1100E-01	0.1022E+01	0.2150E+00	0.2250E+01	0.2413E+03	0.8000E-06	0.2253E+03	0.2943E+03	0.6000E+04	0.5110E+02	0.6863E-02	0.1030E+00	0.8917E+00	0.1228E-10
52	0.1899E-01	0.5400E+01	0.1036E+01	0.1000E-03	0.2050E+01	0.1753E+03	0.5300E-07	0.3767E+03	0.2880E+03	0.1370E+07	0.4570E+02	0.1733E+00	0.1160E+00	0.8604E+00	0.6085E-14
53	0.3224E-01	0.1166E+01	0.8737E+00	0.1270E-01	0.2080E+01	0.2349E+03	0.1700E-01	0.3734E+03	0.2891E+03	*0.7000E+01*	*0.3430E+02*	*0.1925E-01*	*0.5840E+01*	*0.8506E+00*	*0.3772E-03*
54	0.1980E+00	0.1700E-01	0.1042E+01	0.2020E+00	0.1610E+01	0.2087E+03	0.5000E-03	0.4665E+03	0.2979E+03	0.4000E+02	0.4050E+02	0.8155E-02	0.1700E-01	0.8288E+00	0.2354E-05
55	0.1333E-01	0.4400E+00	0.9406E+00	0.1100E-01	0.1860E+01	0.2369E+03	0.2000E-06	0.2758E+03	0.2965E+03	0.6780E+03	0.4790E+02	0.3466E+02	0.1000E-03	0.9256E+00	0.3300E-10
56	0.5332E-01	0.6130E+00	0.9449E+00	0.3750E+00	0.1730E+01	0.1772E+03	0.1100E-04	0.3275E+03	0.2860E+03	0.6000E+02	0.4600E+02	0.9763E-02	0.3440E+00	0.9452E+00	0.2525E-07
57	0.8664E-01	0.4000E-01	0.8645E+00	0.2190E+00	0.1650E+01	0.1907E+03	0.3300E-02	0.2673E+03	0.2806E+03	0.9000E+01	0.5100E+02	0.3466E-01	0.2210E+00	0.8817E+00	0.4201E-04
58	0.1386E+01	0.1190E+00	0.8661E+00	0.1340E+00	0.1910E+01	0.2090E+03	0.4000E-01	0.2815E+03	0.2896E+03	0.9000E+00	0.3300E+02	0.8664E-02	0.2350E+00	0.8069E+00	0.5197E-02

	k	$K_{om,as}$	n_{as}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
59	0.8557E-02	0.2520E+00	0.9070E+00	0.2080E+00	0.1990E+01	0.1805E+03	0.3100E-01	0.1982E+03	0.2908E+03	0.3500E+02	0.4650E+02	0.1050E-01	0.1110E+00	0.6940E+00	0.7260E-04
60	0.9120E-02	0.1100E-01	0.7585E+00	0.3400E-01	0.1690E+01	0.1828E+03	0.1800E-02	0.1832E+03	0.2898E+03	0.3300E+01	0.3840E+02	0.1386E+00	0.1000E-03	0.8734E+00	0.4147E-04
61	0.9902E-01	0.1558E+01	0.8383E+00	0.5780E+00	0.1790E+01	0.1685E+03	0.3900E-03	0.2253E+03	0.2964E+03	0.3100E+02	0.3590E+02	0.3381E-01	0.1110E+03	0.8258E+00	0.1150E-05
62	0.1386E+01	0.1840E+01	0.8961E+00	0.3200E-01	0.2100E+01	0.1389E+03	0.1100E-01	0.2952E+03	0.2851E+03	0.2000E+01	0.3740E+02	0.2458E-02	0.1600E-01	0.8957E+00	0.6848E-03
63	0.7001E-02	0.2330E+00	0.8588E+00	0.4000E-03	0.1420E+01	0.1639E+03	0.2500E-04	0.2414E+03	0.2904E+03	0.9500E+02	0.4470E+02	0.9242E-02	0.5000E-02	0.1157E+01	0.2631E-07
64	0.3014E-01	0.8700E-02	0.8884E+00	0.1710E+00	0.1470E+01	0.2148E+03	0.1700E-04	0.3709E+03	0.2906E+03	0.9000E+00	0.4440E+02	0.3224E-02	0.4020E+00	0.1106E+01	0.2900E-05
65	0.2039E+00	0.1000E-01	0.7738E+00	0.6100E-01	0.1830E+01	0.1699E+03	0.1000E-09	0.1691E+03	0.2961E+03	0.2800E+06	0.4660E+02	0.9120E-02	0.4000E-01	0.9730E+00	0.2453E-16
66	0.6931E+00	0.9850E+00	0.1002E+01	0.2700E-01	0.2680E+01	0.2018E+03	0.1600E-04	0.2778E+03	0.2823E+03	0.7100E+04	0.3750E+02	0.6931E+00	0.5650E+00	0.8617E+00	0.2667E-09
67	0.1980E+00	0.3500E-01	0.9537E+00	0.5390E+00	0.2350E+01	0.2092E+03	0.2700E-01	0.3011E+03	0.2891E+03	0.1710E+03	0.4560E+02	0.6932E-01	0.7200E-01	0.8479E+00	0.1978E-04
68	0.6931E+00	0.8000E-01	0.9315E+00	0.7170E+00	0.2400E+01	0.1913E+03	0.1900E-01	0.2918E+03	0.3097E+03	0.1000E+01	0.4020E+02	0.6932E-01	0.3000E+00	0.8759E+00	0.2153E-02
69	0.2166E-01	0.1085E+01	0.7833E+00	0.9500E-01	0.2310E+01	0.1538E+03	0.3300E-02	0.2452E+03	0.2873E+03	0.2500E+03	0.5180E+02	0.1066E-01	0.1790E+00	0.9089E+00	0.1355E-05
70	0.1691E-01	0.3484E+01	0.8472E+00	0.2420E+00	0.1850E+01	0.1493E+03	0.8400E-04	0.2963E+03	0.2898E+03	0.1000E+07	0.3450E+02	0.3466E+00	0.1100E-01	0.1045E+01	0.1033E-10
71	0.1260E-01	0.1900E-01	0.7886E+00	0.5400E+01	0.2110E+01	0.1946E+03	0.2200E-01	0.2506E+03	0.2815E+03	0.1300E+05	0.5030E+02	0.9902E-01	0.7000E-02	0.1070E+01	0.1812E-06
72	0.1083E-01	0.1160E+00	0.8749E+00	0.1580E+00	0.2220E+01	0.2063E+03	0.1300E-02	0.2557E+03	0.2974E+03	0.1300E+01	0.3750E+02	0.3224E-01	0.4800E-01	0.9114E+00	0.1034E-03
73	0.9902E-01	0.2800E-01	0.7032E+00	0.9960E+00	0.2170E+01	0.2151E+03	0.1200E-06	0.3596E+03	0.2891E+03	0.1000E+07	0.4120E+02	0.8774E-02	0.2900E-01	0.9147E+00	0.1795E-13
74	0.1238E-01	0.1100E-01	0.9306E+00	0.4610E+00	0.2010E+01	0.2214E+03	0.2700E-03	0.2884E+03	0.2984E+03	0.2100E+03	0.4380E+02	0.1958E-02	0.1800E+03	0.7846E+00	0.1495E-06
75	0.1386E+01	0.4800E-01	0.9368E+00	0.2470E+00	0.2450E+01	0.1673E+03	0.5000E-03	0.2210E+03	0.2985E+03	0.7000E+00	0.4220E+02	0.3151E+00	0.8700E-02	0.8275E+00	0.6361E-04
76	0.1050E-01	0.1800E+03	0.9164E+00	0.8700E-02	0.2030E+01	0.1757E+03	0.1600E-03	0.3457E+03	0.2885E+03	0.2000E+06	0.3360E+02	0.8664E-01	0.3250E+00	0.9540E+00	0.1153E-09
77	0.7702E+02	0.1170E+00	0.7876E+00	0.2320E+00	0.2030E+01	0.1631E+03	0.2500E-04	0.2343E+03	0.2843E+03	0.4000E+03	0.3270E+02	0.3851E-01	0.4300E+01	0.8630E+00	0.6195E-08
78	0.2390E-01	0.5330E+01	0.1134E+01	0.4300E+01	0.1880E+01	0.1586E+03	0.5000E-04	0.3164E+03	0.3075E+03	0.7500E+03	0.4870E+02	0.2567E-01	0.9500E-01	0.8580E+00	0.8251E-08
79	0.1650E-01	0.1030E+00	0.8749E+00	0.6000E-01	0.2050E+01	0.2052E+03	0.2400E-04	0.1762E+03	0.2942E+03	0.1700E+03	0.4450E+02	0.1800E-01	0.1000E+01	0.9501E+00	0.1017E-07
80	0.2350E-01	0.1150E+01	0.8837E+00	0.3000E+00	0.1630E+01	0.1778E+03	0.3800E-04	0.2958E+03	0.2997E+03	0.1100E+03	0.5080E+02	0.9367E-02	0.6000E-01	0.8382E+00	0.4100E-07
81	0.9902E-01	0.1972E+01	0.8154E+00	0.6130E+00	0.1570E+01	0.1798E+03	0.8000E-02	0.3834E+03	0.3078E+03	0.1300E+03	0.3660E+02	0.5332E-01	0.1166E+01	0.8312E+00	0.9218E-05
82	0.2773E-01	0.1500E-01	0.9453E+00	0.4050E+00	0.1990E+01	0.1564E+03	0.3500E-01	0.2012E+03	0.2845E+03	0.4500E+01	0.3670E+02	0.8252E-02	0.6400E-01	0.9092E+00	0.6615E-03
83	0.6863E-02	0.8600E-01	0.8097E+00	0.1100E-01	0.1770E+01	0.1821E+03	0.4500E-02	0.3023E+03	0.2950E+03	0.8400E+05	0.5000E+02	0.2039E-01	0.1085E+01	0.8211E+00	0.6602E-08
84	0.2390E-01	0.9500E-01	0.1060E+01	0.1150E+01	0.2140E+01	0.2154E+03	0.1200E-07	0.2241E+03	0.2923E+03	0.4000E+01	0.3780E+02	0.1712E-01	0.2420E+00	0.8514E+00	0.2766E-09
85	0.6931E+00	0.1300E+01	0.1056E+01	0.1250E+00	0.1710E+01	0.1991E+03	0.1300E-06	0.2137E+03	0.2962E+03	0.2360E+04	0.4940E+02	0.4951E-01	0.2280E+00	0.1008E+01	0.4780E-11
86	0.8774E-02	0.8800E-01	0.8792E+00	0.3500E-01	0.2210E+01	0.2020E+03	0.3200E-03	0.1883E+03	0.2833E+03	0.2800E+06	0.3160E+02	0.1873E-01	0.2900E-01	0.7350E+00	0.9136E-10
87	0.1155E+00	0.2320E+00	0.8690E+00	0.1170E+00	0.2240E+01	0.1595E+03	0.2270E-01	0.3728E+03	0.2837E+03	0.1000E+07	0.4700E+02	0.5332E-01	0.8000E-01	0.9549E+00	0.3588E-08
88	0.1523E-01	0.2190E+00	0.1056E+01	0.8600E-01	0.1750E+01	0.1821E+03	0.2200E-06	0.2287E+03	0.2852E+03	0.3000E+02	0.5370E+02	0.3014E-01	0.1400E-01	0.9844E+00	0.7073E-09
89	0.7702E-02	0.4700E-02	0.9215E+00	0.7000E-02	0.1540E+01	0.1966E+03	0.1900E-06	0.3498E+03	0.3018E+03	0.5000E+03	0.3440E+02	0.1691E-01	0.7000E-02	0.8134E+00	0.5298E-10
90	0.4332E-01	0.7170E+00	0.7737E+00	0.1300E+01	0.2010E+01	0.1581E+03	0.8000E-04	0.3670E+03	0.2918E+03	0.1820E+04	0.3980E+02	0.1100E-01	0.1100E-01	0.8586E+00	0.6650E-08
91	0.1491E-01	0.3200E-01	0.1023E+01	0.3200E-01	0.1630E+01	0.1760E+03	0.8800E-01	0.3390E+03	0.2951E+03	0.5500E+02	0.3350E+02	0.5332E-01	0.1270E-01	0.9176E+00	0.2211E-03
92	0.1155E+00	0.3500E+01	0.1050E+01	0.1600E-01	0.1590E+01	0.1930E+03	0.3000E-03	0.3422E+03	0.2997E+03	0.1540E+06	0.3660E+02	0.9902E-01	0.1930E+00	0.1061E+01	0.2675E-09
93	0.8664E-01	0.5200E-01	0.9562E+00	0.1040E+00	0.1870E+01	0.2055E+03	0.6700E-02	0.2063E+03	0.2915E+03	0.5000E+00	0.4730E+02	0.1386E+01	0.1500E-01	0.9147E+00	0.1141E-02
94	0.1733E+00	0.6100E-01	0.9250E+00	0.1150E+01	0.2050E+01	0.1416E+03	0.1500E-01	0.1662E+03	0.2955E+03	0.1000E+05	0.4840E+02	0.7220E-02	0.1660E+00	0.7563E+00	0.1015E-06
95	0.1650E-01	0.4400E-01	0.9444E+00	0.9500E-01	0.1730E+01	0.1799E+03	0.3000E-04	0.2363E+03	0.2874E+03	0.1200E+03	0.4000E+02	0.3809E-02	0.3550E+00	0.1017E+01	0.2473E-07
96	0.3466E+00	0.4300E-01	0.9301E+00	0.8000E-01	0.1730E+01	0.1582E+03	0.2000E-06	0.3255E+03	0.2859E+03	0.1490E+01	0.3250E+02	0.1155E+01	0.5330E+01	0.8548E+00	0.1838E-07
97	0.1980E+00	0.5900E-01	0.9699E+00	0.2010E+00	0.2140E+01	0.1966E+03	0.5000E-04	0.4090E+03	0.2910E+03	0.1100E+03	0.4370E+02	0.2311E-01	0.3750E+00	0.1014E+01	0.7684E-07
98	0.2567E-01	0.3500E-01	0.8778E+00	0.3250E+00	0.2070E+01	0.1581E+03	0.3300E-04	0.3233E+03	0.2902E+03	0.1800E+01	0.3980E+02	0.6931E+00	0.5800E-01	0.1024E+01	0.2457E-05
99	0.6863E-02	0.1200E-01	0.9479E+00	0.6533E+01	0.2470E+01	0.1733E+03	0.2700E-05	0.4187E+03	0.3039E+03	0.4000E+04	0.4310E+02	0.3872E-02	0.7500E-01	0.9538E+00	0.1119E-09
100	0.1540E+00	0.3750E+00	0.9016E+00	0.1130E+00	0.3470E+01	0.1942E+03	0.1900E-02	0.3441E+03	0.2937E+03	0.1300E+02	0.3690E+02	0.3648E-01	0.2520E+00	0.8161E+00	0.2059E-04
101	0.2236E-01	0.3440E+00	0.8900E+00	0.1200E-01	0.2320E+01	0.1515E+03	0.7300E-03	0.3506E+03	0.2973E+03	0.3200E+03	0.4830E+02	0.3301E-01	0.8620E+00	0.1006E+01	0.3236E-06
102	0.9627E-02	0.3900E+00	0.1024E+01	0.4400E+00	0.1960E+01	0.2052E+03	0.1400E-02	0.2292E+03	0.2971E+03	0.3000E+02	0.3920E+02	0.2773E-01	0.1100E-01	0.8758E+00	0.4330E-05
103	0.2888E-01	0.3550E+00	0.8876E+00	0.5031E+01	0.1960E+01	0.1465E+03	0.4000E-08	0.2463E+03	0.2890E+03	0.2700E+04	0.6350E+02	0.3851E-01	0.5500E-01	0.7695E+00	0.1519E-12
104	0.3648E-01	0.1340E+00	0.1004E+01	0.1570E+00	0.1820E+01	0.2399E+03	0.2200E-03	0.2463E+03	0.2947E+03	0.2000E+01	0.3560E+02	0.1980E+00	0.1190E+00	0.8363E+00	0.1106E-04
105	0.3014E-01	0.1110E+00	0.8728E+00	0.1110E+03	0.2050E+01	0.1787E+03	0.1000E-03	0.3545E+03	0.2765E+03	0.1000E-02	0.3570E+02	0.3961E-01	0.3760E+00	0.8555E+00	0.1542E-01
106	0.1899E-02	0.1100E-01	0.9172E+00	0.2000E-02	0.1850E+01	0.1839E+03	0.9500E-05	0.2022E+03	0.2866E+03	0.1400E+01	0.3120E+02	0.9902E-01	0.5031E+01	0.8768E+00	0.5758E-06
107	0.2311E-01	0.6330E+00	0.1028E+01	0.5800E-01	0.1530E+01	0.1791E+03	0.5000E-06	0.3035E+03	0.2841E+03	0.5000E+01	0.3110E+02	0.7702E+02	0.1300E+01	0.8271E+00	0.1285E-07
108	0.2567E-01	0.5000E-02	0.8762E+00	0.5100E-02	0.1800E+01	0.1606E+03	0.1500E-05	0.2213E+03	0.2992E+03	0.1000E+06	0.6660E+02	0.3301E-02	0.1130E+00	0.1018E+01	0.1335E-11
109	0.1980E+00	0.5000E-02	0.9223E+00	0.5000E-02	0.1850E+01	0.1651E+03	0.1300E-02	0.2157E+03	0.2913E+03	0.1000E+07	0.3510E+02	0.1100E-01	0.1700E-01	0.9896E+00	0.1158E-09
110	0.6301E-01	0.5500E-01	0.8610E+00	0.8400E-01	0.2140E+01	0.1544E+03	0.2250E-03	0.2659E+03	0.3009E+03	0.1200E+06	0.3940E+02	0.2888E-01	0.3500E+01	0.9755E+00	0.1993E-09
111	0.1308E-01	0.1330E+00	0.8835E+00	0.2800E-01	0.2150E+01	0.3331E+03	0.1000E+00	0.5052E+03	0.2955E+03	0.1400E+03	0.4810E+02	0.3984E-02	0.2510E+00	0.7554E+00	0.1469E-03
112	0.9181E-02	0.6160E+00	0.9204E+00	0.6160E+00	0.1900E+01	0.1987E+03	0.2300E-03	0.2972E+03	0.2881E+03	0.5000E-01	0.3910E+02	0.3466E+00	0.9190E+00	0.9469E+00	0.5708E-03
113	0.4163E-02	0.6540E+01	0.1067E+01	0.2350E+00	0.1890E+01	0.1521E+03	0.9600E-06	0.1121E+03	0.2865E+03	0.8000E+01	0.3830E+02	0.5776E+00	0.6330E+00	0.9100E+00	0.5647E-08
114	0.8664E-02	0.5390E+00	0.9516E+00	0.6400E-01	0.1830E+01	0.1593E+03	0.9000E-05	0.2331E+03	0.2964E+03	0.2400E+03	0.3920E+02	0.6418E-02	0.1570E+00	0.8721E+00	0.3547E-08
115	0.2009E-02	0.2810E+00	0.1110E+01	0.1100E-01	0.1790E+01	0.1647E+03	0.2100E-03	0.4499E+03	0.2972E+03	0.1000E+00	0.3720E+02	0.3224E-02	0.1700E-01	0.8350E+00	0.3824E-03
116	0.1899E-02	0.6100E-01	0.8850E+00	0.8800E-01	0.1920E+01	0.1634E+03	0.1000E-03	0.3147E+03	0.2861E+03	0.2000E+01	0.3650E+02	0.5545E-01	0.4760E+00	0.1029E+01	0.6614E-05

	k	$K_{om,as}$	n_{as}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_h	$K_{om,wb}$	n_{wb}	K_H
117	0.3894E-01	0.4050E+00	0.8547E+00	0.3440E+00	0.1480E+01	0.2035E+03	0.1100E-05	0.2561E+03	0.2852E+03	0.9000E+01	0.4640E+02	0.1155E+00	0.2930E+00	0.9015E+00	0.1315E-07
118	0.1320E-01	0.6100E-01	0.1033E+01	0.5200E-01	0.2800E+01	0.1551E+03	0.3300E-05	0.3678E+03	0.2808E+03	0.4200E+01	0.3540E+02	0.7374E-02	0.1150E+01	0.8921E+00	0.1238E-06
119	0.2773E+00	0.5840E+01	0.8499E+00	0.9600E-01	0.2430E+01	0.1754E+03	0.8900E-06	0.2213E+03	0.2963E+03	0.2800E+04	0.6130E+02	0.1899E-02	0.1580E+00	0.9468E+00	0.2855E-10
120	0.2666E-01	0.3250E+00	0.1130E+01	0.1166E+01	0.1890E+01	0.2687E+03	0.1200E-03	0.2017E+03	0.2962E+03	0.6200E+01	0.4380E+02	0.1980E-01	0.3900E+00	0.9790E+00	0.1585E-05
121	0.1980E+00	0.1440E+00	0.8811E+00	0.2080E+00	0.1640E+01	0.2055E+03	0.2100E-03	0.3825E+03	0.3106E+03	0.1900E+04	0.4480E+02	0.5291E-02	0.8400E-01	0.8114E+00	0.1637E-07
122	0.1066E+00	0.9960E+00	0.8842E+00	0.2330E+00	0.1820E+01	0.1778E+03	0.1100E-02	0.3879E+03	0.2856E+03	0.2790E+04	0.3210E+02	0.9902E+00	0.2470E+00	0.8562E+00	0.6441E-07
123	0.1899E-02	0.6300E+00	0.8387E+00	0.2810E+00	0.2120E+01	0.1812E+03	0.4480E-06	0.2632E+03	0.2812E+03	0.9000E+00	0.5200E+02	0.2311E-01	0.9960E+00	0.9775E+00	0.5604E-07
124	0.1980E-01	0.1570E+00	0.9106E+00	0.8300E-01	0.2500E+01	0.1643E+03	0.4200E-06	0.2132E+03	0.3030E+03	0.1000E+04	0.3550E+02	0.6932E-01	0.4420E+00	0.8520E+00	0.3554E-10
125	0.1575E-01	0.1110E+03	0.8992E+00	0.1930E+00	0.1700E+01	0.2226E+03	0.5300E-04	0.2371E+03	0.2867E+03	0.1000E+02	0.3880E+02	0.1195E-01	0.5200E-01	0.8088E+00	0.5272E-06
126	0.4780E-02	0.2700E-01	0.9453E+00	0.3500E-01	0.2080E+01	0.1741E+03	0.5000E-05	0.2193E+03	0.3098E+03	0.3500E+02	0.3060E+02	0.8719E-02	0.2810E+00	0.9895E+00	0.1216E-07
127	0.1593E-01	0.4280E+00	0.8299E+00	0.1100E-01	0.1870E+01	0.1359E+03	0.1000E-01	0.2423E+03	0.2770E+03	0.8900E+02	0.4640E+02	0.1650E-01	0.2700E-01	0.8650E+00	0.1182E-04
128	0.1066E+00	0.1130E+00	0.9950E+00	0.4760E+00	0.2140E+01	0.1599E+03	0.1000E-02	0.2838E+03	0.2859E+03	0.5800E+03	0.3400E+02	0.7617E-02	0.1330E-01	0.9120E+00	0.2059E-06
129	0.3151E-01	0.6000E-01	0.8520E+00	0.7000E-01	0.2190E+01	0.1868E+03	0.2000E-02	0.2861E+03	0.2943E+03	0.5000E-01	0.4500E+02	0.6863E-02	0.2137E+01	0.8571E+00	0.4677E-02
130	0.8351E-02	0.1790E+00	0.9273E+00	0.1160E+00	0.2030E+01	0.1722E+03	0.5000E-05	0.3043E+03	0.3009E+03	0.3500E+03	0.3460E+02	0.2773E+00	0.1410E+00	0.7780E+00	0.1738E-08
131	0.7296E-01	0.1330E-01	0.9341E+00	0.3484E+01	0.2170E+01	0.1909E+03	0.2700E-02	0.4610E+03	0.2825E+03	0.1200E-01	0.3240E+02	0.9902E+01	0.2000E-02	0.7762E+00	0.4416E-01
132	0.6027E-01	0.1000E-03	0.1052E+01	0.2510E+00	0.1810E+01	0.1873E+03	0.1500E-03	0.2647E+03	0.2869E+03	0.6000E+00	0.4370E+02	0.1733E-01	0.7170E+00	0.8328E+00	0.2774E-04
133	0.6301E-01	0.4610E+00	0.7485E+00	0.7500E-01	0.2310E+01	0.2085E+03	0.8600E-02	0.2793E+03	0.2961E+03	0.5000E-02	0.5800E+02	0.1475E-01	0.4000E-01	0.1018E+01	0.1951E+00
134	0.3961E-01	0.4000E-03	0.8886E+00	0.4020E+00	0.2170E+01	0.1910E+03	0.4700E-04	0.3384E+03	0.3004E+03	0.5000E+01	0.4810E+02	0.2311E-01	0.3500E-01	0.8846E+00	0.1274E-05
135	0.1540E+00	0.1000E+00	0.8588E+00	0.9190E+00	0.1760E+01	0.2041E+03	0.7100E-04	0.2570E+03	0.3065E+03	0.1800E+02	0.8280E+02	0.6027E-01	0.9850E+00	0.9524E+00	0.3978E-06
136	0.2829E-01	0.6400E-01	0.9409E+00	0.1030E+00	0.2020E+01	0.2085E+03	0.1300E-03	0.3054E+03	0.2863E+03	0.3000E-01	0.3900E+02	0.7001E-02	0.1590E+00	0.1045E+01	0.5559E-03
137	0.1925E-01	0.5100E-02	0.8951E+00	0.1800E-02	0.2090E+01	0.1414E+03	0.4600E-03	0.2210E+03	0.2899E+03	0.6000E+02	0.3820E+02	0.8155E-01	0.3400E-01	0.9502E+00	0.7030E-06
138	0.5251E-02	0.1420E+01	0.8659E+00	0.5900E-01	0.2140E+01	0.1573E+03	0.2900E-03	0.1893E+03	0.2849E+03	0.1320E+02	0.4560E+02	0.4621E+00	0.1200E-01	0.9733E+00	0.1755E-05
139	0.6027E-01	0.8300E-02	0.9153E+00	0.1150E+03	0.2240E+01	0.1423E+03	0.1100E-01	0.2143E+03	0.2936E+03	0.7600E+03	0.4310E+02	0.1050E-01	0.8500E-01	0.8638E+00	0.1271E-05
140	0.1980E-01	0.6533E+01	0.9330E+00	0.6540E+01	0.1860E+01	0.2092E+03	0.5000E-05	0.4163E+03	0.3014E+03	0.1300E+02	0.4510E+02	0.8664E-01	0.8300E-01	0.1026E+01	0.6390E-07
141	0.9902E-01	0.6400E-01	0.7675E+00	0.1164E+01	0.1950E+01	0.2013E+03	0.1800E-03	0.2653E+03	0.2916E+03	0.5800E+05	0.4400E+02	0.2390E-01	0.8100E-01	0.9482E+00	0.3396E-09
142	0.8155E-02	0.2080E+00	0.7578E+00	0.6330E+00	0.1990E+01	0.1904E+03	0.2100E-04	0.2302E+03	0.2867E+03	0.2000E-01	0.4530E+02	0.2236E-01	0.2320E+00	0.7207E+00	0.1014E-03
143	0.1980E-01	0.7000E-01	0.9210E+00	0.2900E-01	0.2180E+01	0.1760E+03	0.4300E-05	0.2921E+03	0.2860E+03	0.2500E+00	0.5440E+02	0.1308E-01	0.1040E+00	0.7416E+00	0.2113E-05
144	0.3301E-02	0.8100E-01	0.9005E+00	0.2900E-01	0.1650E+01	0.2329E+03	0.1000E-04	0.3770E+03	0.2919E+03	0.2700E+01	0.3320E+02	0.1333E-01	0.6400E-01	0.7762E+00	0.5753E-06
145	0.3555E-01	0.2420E+00	0.9909E+00	0.9850E+00	0.1720E+01	0.1951E+03	0.1690E-03	0.3332E+03	0.2885E+03	0.3700E+03	0.3100E+02	0.1824E+00	0.5060E+00	0.8863E+00	0.6344E-07
146	0.6027E-01	0.5060E+00	0.9168E+00	0.1200E-01	0.1450E+01	0.2220E+03	0.4000E-03	0.4350E+03	0.3046E+03	0.9600E+01	0.3830E+02	0.2950E-01	0.2000E+01	0.9296E+00	0.7158E-05
147	0.1386E+01	0.2020E+00	0.1151E+01	0.1790E+00	0.2030E+01	0.2080E+03	0.4500E-04	0.2574E+03	0.2863E+03	0.8100E+02	0.3980E+02	0.2762E-02	0.3400E+00	0.8625E+00	0.6007E-07
148	0.1066E-01	0.8620E+00	0.9075E+00	0.3900E+00	0.1790E+01	0.2157E+03	0.5500E-04	0.3078E+03	0.2965E+03	0.4500E+00	0.5420E+02	0.2039E+00	0.1800E-02	0.8526E+00	0.1526E-04
149	0.5332E-01	0.2350E+00	0.9615E+00	0.1085E+01	0.1930E+01	0.1971E+03	0.3300E-09	0.3618E+03	0.2922E+03	0.3300E+02	0.4430E+02	0.2069E-02	0.1558E+01	0.9185E+00	0.1489E-11
150	0.1980E+00	0.1600E-01	0.9910E+00	0.1000E+00	0.2180E+01	0.2301E+03	0.1600E+01	0.2232E+03	0.2976E+03	0.1000E+00	0.4540E+02	0.2009E-02	0.6100E-01	0.8990E+00	0.1443E+01
151	0.5023E-02	0.6200E+01	0.9044E+00	0.1190E+00	0.2260E+01	0.1806E+03	0.1300E-07	0.2883E+03	0.2781E+03	0.7300E+01	0.4600E+02	0.2476E-01	0.1440E+00	0.9472E+00	0.2221E-09
152	0.1899E-02	0.1000E+01	0.8904E+00	0.1330E+00	0.2120E+01	0.1813E+03	0.1300E+00	0.2210E+03	0.2938E+03	0.1500E+02	0.3600E+02	0.3466E+00	0.2330E+00	0.1037E+01	0.7841E-03
153	0.3466E-01	0.1000E-01	0.9485E+00	0.7000E-02	0.1760E+01	0.1962E+03	0.6500E-05	0.1602E+03	0.2804E+03	0.1000E+02	0.3740E+02	0.4951E-01	0.1164E+01	0.1034E+01	0.4467E-07
154	0.1195E-01	0.2800E-01	0.8754E+00	0.4000E-01	0.2650E+01	0.2899E+03	0.1000E-02	0.3913E+03	0.2961E+03	0.5000E-03	0.3830E+02	0.2250E-02	0.1100E-01	0.1083E+01	0.3179E+00
155	0.1540E+00	0.2010E+00	0.8379E+00	0.5000E-02	0.1560E+01	0.1776E+03	0.5000E-05	0.3814E+03	0.2974E+03	0.4000E+02	0.3880E+02	0.1899E-02	0.1900E-01	0.8461E+00	0.1928E-07
156	0.1712E-01	0.2080E+00	0.8983E+00	0.1345E+01	0.1810E+01	0.1840E+03	0.5000E-05	0.1982E+03	0.2849E+03	0.1700E+01	0.3810E+02	0.2950E-01	0.1000E+00	0.8050E+00	0.2461E-06
157	0.3466E+01	0.2280E+00	0.8266E+00	0.1972E+01	0.2050E+01	0.1688E+03	0.6900E-02	0.2550E+03	0.3029E+03	0.6800E+02	0.3910E+02	0.2773E-01	0.1840E+01	0.8379E+00	0.1028E-04
158	0.1386E+01	0.5650E+00	0.8695E+00	0.5060E+00	0.2520E+01	0.1935E+03	0.5300E-03	0.2975E+03	0.2977E+03	0.1900E+04	0.4550E+02	0.1155E+00	0.2190E+00	0.8741E+00	0.3352E-07
159	0.6245E-02	0.1000E-03	0.9341E+00	0.5650E+00	0.1650E+01	0.1440E+03	0.7700E-02	0.3943E+03	0.2928E+03	0.1114E+04	0.4220E+02	0.1444E-01	0.1345E+01	0.1008E+01	0.1119E-05
160	0.3301E-01	0.3400E-01	0.8753E+00	0.8500E-01	0.1550E+01	0.1748E+03	0.3100E-01	0.2092E+03	0.2920E+03	0.1400E+04	0.4140E+02	0.3301E-01	0.4400E-01	0.9602E+00	0.1908E-05
161	0.1238E-01	0.3200E-01	0.7365E+00	0.1700E-01	0.1830E+01	0.1569E+03	0.4000E-07	0.2133E+03	0.2939E+03	0.2500E+04	0.4780E+02	0.2100E-01	0.5000E-02	0.8709E+00	0.1396E-11
162	0.4780E-01	0.7000E-02	0.8575E+00	0.8620E+00	0.1480E+01	0.2170E+03	0.2300E-01	0.2953E+03	0.2897E+03	0.5100E+03	0.3560E+02	0.5545E-01	0.3500E-01	0.9379E+00	0.5530E-05
163	0.2236E-01	0.2000E+01	0.9549E+00	0.1300E+01	0.1820E+01	0.2759E+03	0.5000E-05	0.1445E+03	0.2945E+03	0.4350E+03	0.3800E+02	0.1238E-01	0.5900E-01	0.1165E+01	0.6782E-09
164	0.5059E-02	0.7200E-01	0.8521E+00	0.3550E+00	0.1880E+01	0.1883E+03	0.1000E-09	0.2117E+03	0.2975E+03	0.7220E+06	0.4220E+02	0.1155E+00	0.6100E-01	0.9452E+00	0.1185E-16
165	0.6932E-01	0.1710E+00	0.9104E+00	0.8000E-01	0.1950E+01	0.1652E+03	0.4000E-02	0.1411E+03	0.3098E+03	0.1990E+03	0.3900E+02	0.4590E-02	0.1330E+00	0.9328E+00	0.1101E-05
166	0.1800E-01	0.4000E-01	0.8637E+00	0.5840E+01	0.2170E+01	0.1750E+03	0.4000E-02	0.2216E+03	0.2966E+03	0.7200E+02	0.5670E+02	0.2888E-01	0.2800E-01	0.9599E+00	0.4993E-05
167	0.1800E-01	0.2060E-01	0.9575E+00	0.8160E+00	0.2050E+01	0.2257E+03	0.1700E-03	0.1792E+03	0.2845E+03	0.1500E+04	0.4670E+02	0.1386E+01	0.1030E+00	0.1040E+01	0.8586E-08
168	0.1238E-01	0.1100E-01	0.1143E+01	0.2137E+01	0.3020E+01	0.1766E+03	0.9300E-02	0.3421E+03	0.2965E+03	0.2300E+03	0.3380E+02	0.9902E-01	0.1000E+00	0.8267E+00	0.5612E-05
169	0.1980E+00	0.1250E+00	0.8512E+00	0.4700E-02	0.1950E+01	0.1854E+03	0.1300E-03	0.4314E+03	0.2856E+03	0.1200E+04	0.4580E+02	0.1980E+00	0.1400E+00	0.8969E+00	0.1968E-07
170	0.3984E-02	0.2000E-02	0.8277E+00	0.2800E-01	0.1720E+01	0.1971E+03	0.1000E-09	0.4439E+03	0.3022E+03	0.5000E-03	0.3890E+02	0.1238E-01	0.8300E-02	0.8577E+00	0.3533E-07
171	0.2476E-01	0.1150E+03	0.8777E+00	0.1000E+01	0.1660E+01	0.1693E+03	0.2700E-02	0.2565E+03	0.2876E+03	0.4000E+00	0.3530E+02	0.8774E-02	0.1000E-03	0.7748E+00	0.7241E-03
172	0.3224E-02	0.8000E-01	0.8681E+00	0.3500E+01	0.1560E+01	0.1946E+03	0.1800E-03	0.2475E+03	0.2863E+03	0.3500E+00	0.4680E+02	0.1733E+00	0.2080E+00	0.8446E+00	0.5348E-04
173	0.1733E+00	0.2075E+01	0.1008E+01	0.1800E+03	0.1670E+01	0.2541E+03	0.1640E-07	0.2006E+03	0.2870E+03	0.1000E+02	0.5670E+02	0.9902E-01	0.8600E-01	0.8493E+00	0.1379E-09
174	0.1238E-01	0.1345E+01	0.1029E+01	0.1110E+00	0.2020E+01	0.1611E+03	0.4000E-04	0.2402E+03	0.3063E+03	0.3900E+02	0.4310E+02	0.3466E+01	0.4610E+00	0.8213E+00	0.9674E-07

	k	$K_{om,as}$	n_{as}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
175	0.7374E-02	0.6400E-01	0.8209E+00	0.2075E+01	0.1720E+01	0.1878E+03	0.4400E-05	0.3789E+03	0.2926E+03	0.1290E+05	0.4840E+02	0.1260E-01	0.7000E-01	0.8633E+00	0.5312E-10
176	0.6931E+00	0.1590E+00	0.7817E+00	0.1000E-03	0.1910E+01	0.1622E+03	0.1600E-03	0.4839E+03	0.2903E+03	0.8000E-01	0.3350E+02	0.8252E-02	0.1972E+01	0.7997E+00	0.4009E-03
177	0.2100E-01	0.1270E-01	0.9062E+00	0.6200E+01	0.1830E+01	0.1984E+03	0.1200E-01	0.2842E+03	0.2883E+03	0.2000E+05	0.3620E+02	0.8664E-01	0.2010E+00	0.8528E+00	0.7114E-07
178	0.4621E+00	0.2900E-01	0.8621E+00	0.6100E-01	0.1990E+01	0.1946E+03	0.1300E-05	0.4063E+03	0.2875E+03	0.3200E+02	0.4790E+02	0.6932E-01	0.6100E-01	0.8219E+00	0.6905E-08
179	0.3151E-01	0.2150E+00	0.1046E+01	0.1420E+01	0.1830E+01	0.1510E+03	0.1700E-01	0.2407E+03	0.2931E+03	0.1200E+05	0.3850E+02	0.1540E+00	0.6200E+01	0.7209E+00	0.1399E-06
180	0.4951E-01	0.5031E+01	0.1031E+01	0.1840E+01	0.1850E+01	0.2053E+03	0.2600E-04	0.3288E+03	0.2958E+03	0.7000E+02	0.3670E+02	0.7374E-02	0.6000E-01	0.1011E+01	0.4966E-07
min	0.6904E-04	0.1000E-05	0.6940E+00	0.1000E-05	0.1420E+01	0.1359E+03	0.0000E+00	0.8410E+02	0.2744E+03	0.0000E+00	0.2950E+02	0.4930E-03	0.1000E-05	0.6060E+00	0.1190E-16
max	0.7702E+02	0.1800E+03	0.1151E+01	0.7702E+02	0.3470E+01	0.3331E+03	0.3200E+05	0.5052E+03	0.3122E+03	0.1370E+07	0.8280E+02	0.7702E+02	0.1800E+03	0.1212E+01	0.2576E+01
median	0.2860E-01	0.1290E+00	0.9000E+00	0.1290E+00	0.1900E+01	0.1821E+03	0.1300E-03	0.2814E+03	0.2917E+03	0.5150E+02	0.4155E+02	0.2310E-01	0.1290E+00	0.8870E+00	0.1280E-06

Annex 7 Sample of process parameters after randomization of the insensitive parameters

	k	$K_{om,as}$	n_{as}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_{ll}
1	0.2773E+00	0.1000E-01	0.8520E+00	0.1500E-01	0.2320E+01	0.2899E+03	0.5800E-04	0.2146E+03	0.3050E+03	0.2600E+02	0.4690E+02	0.1691E-01	0.1900E-01	0.8288E+00	0.1887E-06
2	0.5251E-01	0.5840E+01	0.1151E+01	0.1000E+00	0.1990E+01	0.2123E+03	0.3200E+04	0.1622E+03	0.2851E+03	0.8500E+02	0.3550E+02	0.5332E-01	0.1000E-01	0.8312E+00	0.2576E+01
3	0.3301E-01	0.2020E+00	0.8621E+00	0.1069E+01	0.1530E+01	0.1582E+03	0.4000E-04	0.2146E+03	0.2868E+03	0.9000E+00	0.3460E+02	0.6932E-01	0.2020E+00	0.6940E+00	0.4000E-05
4	0.1925E-01	0.2000E+01	0.8850E+00	0.8100E-01	0.2110E+01	0.1515E+03	0.6700E-04	0.2414E+03	0.2846E+03	0.1150E+03	0.3810E+02	0.9120E-02	0.2900E-01	0.8699E+00	0.5944E-07
5	0.3224E-02	0.1710E+00	0.1029E+01	0.1700E-01	0.1950E+01	0.2085E+03	0.8600E-06	0.2463E+03	0.2842E+03	0.7180E+06	0.3440E+02	0.9242E-02	0.5780E+00	0.7762E+00	0.1248E-12
6	0.2310E+00	0.1700E-01	0.7675E+00	0.5500E-01	0.1860E+01	0.1910E+03	0.3800E-02	0.2403E+03	0.3015E+03	0.3300E+00	0.3940E+02	0.1238E-01	0.6100E-01	0.8102E+00	0.1104E-02
7	0.1386E+01	0.7000E-02	0.9315E+00	0.1330E-01	0.1870E+01	0.1930E+03	0.8700E-02	0.1903E+03	0.3035E+03	0.1000E+04	0.3900E+02	0.1100E-01	0.1200E-01	0.1017E+01	0.6560E-06
8	0.8252E-02	0.1420E+01	0.9516E+00	0.2060E-01	0.1800E+01	0.1562E+03	0.5500E-07	0.3649E+03	0.3005E+03	0.4000E+02	0.6710E+02	0.5332E-01	0.1270E-01	0.9482E+00	0.2008E-09
9	0.2133E-01	0.9960E+00	0.1056E+01	0.2210E+00	0.1990E+01	0.2090E+03	0.2000E-03	0.2353E+03	0.3029E+03	0.4800E+02	0.3210E+02	0.3466E+00	0.1840E+01	0.1018E+01	0.3893E-06
10	0.1386E+01	0.3400E+00	0.9168E+00	0.4400E-01	0.1790E+01	0.1681E+03	0.5300E-05	0.3173E+03	0.2865E+03	0.6200E+03	0.4450E+02	0.5545E-01	0.8000E-01	0.8526E+00	0.1139E-08
11	0.7702E-02	0.1000E-03	0.9575E+00	0.6400E-01	0.1610E+01	0.2013E+03	0.3100E-03	0.3107E+03	0.3045E+03	0.3900E+00	0.3810E+02	0.1359E-01	0.1100E-01	0.7780E+00	0.9754E-04
12	0.5776E+00	0.6200E+01	0.8244E+00	0.1100E-01	0.2170E+01	0.1476E+03	0.1000E-02	0.2714E+03	0.2832E+03	0.2000E+00	0.2950E+02	0.2069E-02	0.1250E+00	0.7997E+00	0.5763E-03
13	0.8252E-02	0.2010E+00	0.9334E+00	0.1700E-01	0.1920E+01	0.1805E+03	0.4700E-01	0.2813E+03	0.2866E+03	0.3500E+04	0.4530E+02	0.9902E-01	0.5031E+01	0.7665E+00	0.1585E-05
14	0.4621E+00	0.1410E+00	0.8588E+00	0.6300E+00	0.2140E+01	0.1651E+03	0.9000E-05	0.3047E+03	0.3023E+03	0.4200E+02	0.4400E+02	0.9902E+01	0.5330E+01	0.1008E+01	0.2598E-07
15	0.3466E+00	0.4800E-01	0.9406E+00	0.4800E-01	0.1930E+01	0.1991E+03	0.2100E-06	0.4335E+03	0.2887E+03	0.2500E+01	0.3920E+02	0.1980E-01	0.4020E+00	0.8326E+00	0.1517E-07
16	0.8664E+00	0.1330E-01	0.8792E+00	0.3400E+00	0.1880E+01	0.1715E+03	0.1600E-01	0.3034E+03	0.2891E+03	0.2000E+04	0.3850E+02	0.8252E-02	0.1110E+03	0.7846E+00	0.1010E-05
17	0.2310E-02	0.8400E-01	0.9562E+00	0.2630E+00	0.1560E+01	0.1693E+03	0.5700E-01	0.2908E+03	0.2933E+03	0.2000E+03	0.4830E+02	0.1050E-01	0.1400E-01	0.7695E+00	0.3399E-04
18	0.6301E-01	0.2137E+01	0.8400E+00	0.6400E-01	0.2140E+01	0.2052E+03	0.8000E-07	0.2491E+03	0.2942E+03	0.3500E+00	0.3660E+02	0.3851E-01	0.6100E-01	0.8548E+00	0.2328E-07
19	0.6601E-01	0.1069E+01	0.1060E+01	0.2000E-01	0.1820E+01	0.1485E+03	0.9900E-06	0.2991E+03	0.2744E+03	0.1400E+01	0.4680E+02	0.3381E-01	0.1000E-03	0.9602E+00	0.9270E-07
20	0.2069E-01	0.4300E+01	0.1022E+01	0.1000E-01	0.2260E+01	0.1996E+03	0.5900E-05	0.2755E+03	0.3006E+03	0.6130E+03	0.4600E+02	0.1155E+00	0.2330E+00	0.7350E+00	0.1061E-08
21	0.6900E-04	0.2900E-01	0.8814E+00	0.6000E-01	0.1640E+01	0.2041E+03	0.5000E-03	0.2351E+03	0.2976E+03	0.7900E+06	0.3110E+02	0.3809E-02	0.1164E+01	0.9199E+00	0.6013E-10
22	0.3466E+00	0.1000E+00	0.8196E+00	0.2900E-01	0.1600E+01	0.1423E+03	0.2500E-03	0.4281E+03	0.3122E+03	0.2200E+02	0.6660E+02	0.2311E-01	0.1590E+00	0.8050E+00	0.1874E-05
23	0.8155E-01	0.3550E+00	0.8690E+00	0.3760E+00	0.2250E+01	0.2282E+03	0.1500E-05	0.1292E+03	0.2958E+03	0.1000E+02	0.3900E+02	0.4621E+00	0.5900E-01	0.9607E+00	0.7881E-08
24	0.1386E+00	0.1000E-03	0.9228E+00	0.1590E+00	0.1840E+01	0.1467E+03	0.5000E-03	0.2888E+03	0.2825E+03	0.2200E+02	0.5440E+02	0.4951E-01	0.9190E+00	0.1029E+01	0.2794E-05
25	0.5100E-03	0.1166E+01	0.9342E+00	0.7200E-01	0.2050E+01	0.1971E+03	0.7600E-04	0.2383E+03	0.2900E+03	0.4000E+06	0.3740E+02	0.9902E-01	0.2800E-01	0.9159E+00	0.1878E-10
26	0.1386E+01	0.1972E+01	0.1031E+01	0.2930E+00	0.1690E+01	0.2170E+03	0.1000E-02	0.3013E+03	0.2983E+03	0.6000E+03	0.3910E+02	0.1155E+00	0.1440E+00	0.7792E+00	0.2025E-06
27	0.9242E-02	0.1030E+00	0.9070E+00	0.1100E-01	0.1630E+01	0.2329E+03	0.5000E-05	0.4651E+03	0.2844E+03	0.6000E+01	0.4250E+02	0.1386E+01	0.8700E-02	0.1035E+01	0.1639E-06
28	0.5332E-01	0.6100E-01	0.9306E+00	0.1000E-01	0.2430E+01	0.2001E+03	0.1300E-03	0.2216E+03	0.2919E+03	0.1900E+03	0.3440E+02	0.2773E+00	0.4800E-01	0.8990E+00	0.6248E-07
29	0.1540E+00	0.5000E-02	0.1024E+01	0.2300E+00	0.1830E+01	0.1821E+03	0.1250E-02	0.2514E+03	0.2963E+03	0.4000E-02	0.8280E+02	0.2773E-01	0.6300E+00	0.7853E+00	0.3189E-01
30	0.6932E-01	0.1000E-01	0.1050E+01	0.8700E-01	0.1910E+01	0.2053E+03	0.6650E+00	0.1720E+03	0.2966E+03	0.6000E+04	0.4200E+02	0.8252E-02	0.1800E+03	0.9468E+00	0.7731E-05
31	0.2100E-01	0.3500E-01	0.1028E+01	0.4420E+00	0.2260E+01	0.2020E+03	0.4600E-02	0.3003E+03	0.2876E+03	0.3000E+02	0.3750E+02	0.1691E-01	0.4400E-01	0.1026E+01	0.1925E-04
32	0.1386E+00	0.3250E+00	0.8637E+00	0.1410E+00	0.2090E+01	0.2170E+03	0.6000E-02	0.3302E+03	0.2757E+03	0.6500E+04	0.3980E+02	0.6863E-02	0.1710E+00	0.1014E+01	0.1330E-06
33	0.8719E-02	0.5031E+01	0.1110E+01	0.1030E+00	0.1480E+01	0.1521E+03	0.1100E-06	0.3705E+03	0.2947E+03	0.6800E+01	0.4170E+02	0.4780E-02	0.3500E-01	0.8350E+00	0.2446E-08
34	0.2773E-01	0.1200E-01	0.9104E+00	0.6100E-01	0.1760E+01	0.1726E+03	0.8600E-04	0.1226E+03	0.2951E+03	0.7500E+01	0.4790E+02	0.1444E-01	0.2930E+00	0.8179E+00	0.5729E-06
35	0.7146E-02	0.2510E+00	0.7738E+00	0.5330E+01	0.1650E+01	0.2220E+03	0.2000E-06	0.3053E+03	0.2913E+03	0.4000E+00	0.4310E+02	0.1733E-01	0.1400E+00	0.9495E+00	0.6303E-07
36	0.3466E+02	0.3500E-01	0.8983E+00	0.8300E-02	0.1850E+01	0.1979E+03	0.1700E-02	0.3494E+03	0.2847E+03	0.2000E+01	0.3980E+02	0.9367E-02	0.8800E-01	0.9733E+00	0.1254E-03
37	0.6601E-01	0.1190E+00	0.8521E+00	0.1000E-03	0.1760E+01	0.1775E+03	0.5000E-04	0.4229E+03	0.3023E+03	0.5300E+03	0.4840E+02	0.3014E-01	0.6000E-01	0.9185E+00	0.1588E-07
38	0.1824E+00	0.5100E-02	0.9106E+00	0.4280E+00	0.1810E+01	0.3331E+03	0.4700E-04	0.2127E+03	0.2939E+03	0.5700E+03	0.3540E+02	0.2773E-01	0.9600E-01	0.1157E+01	0.7178E-08
39	0.1925E-01	0.1270E-01	0.9909E+00	0.2000E+01	0.1880E+01	0.1927E+03	0.5000E-05	0.3541E+03	0.2849E+03	0.7700E+02	0.3720E+02	0.1980E-01	0.2150E+00	0.7207E+00	0.9707E-08
40	0.2476E-01	0.4420E+00	0.8472E+00	0.1400E+00	0.1650E+01	0.1717E+03	0.4000E-06	0.4035E+03	0.2914E+03	0.8670E+06	0.4530E+02	0.3466E+00	0.1790E+00	0.1008E+01	0.7684E-13
41	0.8830E-02	0.8160E+00	0.7365E+00	0.1660E+00	0.2500E+01	0.1663E+03	0.3000E-02	0.1981E+03	0.2893E+03	0.2000E+01	0.4310E+02	0.6931E+00	0.5060E+00	0.8148E+00	0.1235E-03
42	0.3151E+00	0.6160E+00	0.8424E+00	0.2520E+00	0.1530E+01	0.1581E+03	0.1300E-03	0.2070E+03	0.2971E+03	0.1420E+03	0.3300E+02	0.9902E-01	0.6540E+01	0.9147E+00	0.7671E-07
43	0.3466E+02	0.1100E-01	0.9341E+00	0.1440E+00	0.1720E+01	0.1633E+03	0.4000E-01	0.2863E+03	0.2901E+03	0.5000E-01	0.4590E+02	0.3301E-01	0.5800E-01	0.8479E+00	0.9497E-01
44	0.1824E-01	0.5400E+01	0.8266E+00	0.1900E-01	0.2880E+01	0.1611E+03	0.1000E-09	0.8410E+02	0.2928E+03	0.1170E+03	0.4860E+02	0.3872E-02	0.3484E+01	0.8617E+00	0.2952E-13
45	0.1540E+00	0.4280E+00	0.1042E+01	0.1558E+01	0.1540E+01	0.1631E+03	0.3600E-03	0.1110E+03	0.2856E+03	0.4000E+03	0.3690E+02	0.3151E-01	0.2190E+00	0.8271E+00	0.4207E-07
46	0.6418E-02	0.9850E+00	0.8992E+00	0.4000E-01	0.2080E+01	0.1414E+03	0.5100E-05	0.3374E+03	0.2874E+03	0.3000E+02	0.5000E+02	0.6730E-02	0.3200E-01	0.9755E+00	0.2401E-07
47	0.8155E-02	0.2000E-01	0.1004E+01	0.1400E-01	0.1710E+01	0.1966E+03	0.8000E-03	0.3472E+03	0.2975E+03	0.1330E+04	0.3560E+02	0.1958E-02	0.1150E+01	0.7835E+00	0.8444E-07
48	0.8774E-02	0.8700E-02	0.8197E+00	0.4300E-01	0.2260E+01	0.1904E+03	0.5700E-02	0.3734E+03	0.2787E+03	0.5000E+01	0.3830E+02	0.5776E+00	0.9500E-01	0.9452E+00	0.1837E-03
49	0.1980E+00	0.1590E+00	0.1036E+01	0.1270E-01	0.2310E+01	0.1799E+03	0.1300E-02	0.3133E+03	0.2910E+03	0.3000E+00	0.4220E+02	0.1800E-01	0.3500E+01	0.9168E+00	0.5612E-03
50	0.4201E-01	0.6000E-01	0.7541E+00	0.2280E+00	0.1900E+01	0.1574E+03	0.5000E-05	0.2935E+03	0.2902E+03	0.6000E+01	0.7250E+02	0.8664E-01	0.8600E-01	0.9549E+00	0.1014E-06
51	0.2773E+00	0.5780E+00	0.9059E+00	0.2150E+00	0.1960E+01	0.2572E+03	0.8000E-06	0.2253E+03	0.2943E+03	0.6000E+04	0.4840E+02	0.3224E-02	0.2350E+00	0.8258E+00	0.1228E-10
52	0.1899E-01	0.1558E+01	0.8884E+00	0.1000E-03	0.2140E+01	0.2214E+03	0.5300E-07	0.3767E+03	0.2880E+03	0.1370E+07	0.3320E+02	0.9902E+00	0.2900E-01	0.9092E+00	0.6085E-14
53	0.3224E-01	0.1130E+00	0.8753E+00	0.1270E-01	0.2070E+01	0.1595E+03	0.1700E-01	0.3734E+03	0.2891E+03	0.7000E+01	0.5100E+02	0.6931E+00	0.2210E+00	0.8650E+00	0.3772E-03
54	0.1980E+00	0.8000E-01	0.8837E+00	0.2020E+00	0.2170E+01	0.2035E+03	0.5000E-03	0.4665E+03	0.2979E+03	0.4000E+02	0.4570E+02	0.5728E-02	0.1700E-01	0.1083E+01	0.2354E-05
55	0.1333E-01	0.2900E-01	0.8499E+00	0.1100E-01	0.2400E+01	0.2045E+03	0.2000E-06	0.2758E+03	0.2965E+03	0.6780E+03	0.3080E+02	0.3466E+00	0.1000E-01	0.8922E+00	0.3300E-10
56	0.5332E-01	0.2280E+00	0.9368E+00	0.3750E+00	0.2170E+01	0.1760E+03	0.1100E-04	0.3275E+03	0.2860E+03	0.6000E+02	0.3920E+02	0.5023E-02	0.9960E+00	0.9176E+00	0.2525E-07
57	0.8664E-01	0.8300E-02	0.8890E+00	0.2190E+00	0.1840E+01	0.2541E+03	0.3300E-02	0.2673E+03	0.2806E+03	0.9000E+01	0.3670E+02	0.2311E-01	0.1200E-01	0.1045E+01	0.4201E-04
58	0.1386E+01	0.8700E-01	0.8932E+00	0.1340E+00	0.1850E+01	0.1623E+03	0.4000E-01	0.2815E+03	0.2896E+03	0.9000E+00	0.4940E+02	0.6931E+00	0.8000E-01	0.9790E+00	0.5197E-02

	k	$K_{om,ss}$	n_{ss}	K_{mp}	k_1	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_{lt}
59	0.8557E-02	0.4400E+00	0.1067E+01	0.2080E+00	0.1720E+01	0.1699E+03	0.3100E-01	0.1982E+03	0.2908E+03	0.3500E+02	0.4650E+02	0.2888E-01	0.1410E+00	0.8069E+00	0.7260E-04
60	0.9120E-02	0.4000E-03	0.1017E+01	0.3400E-01	0.1770E+01	0.1787E+03	0.1800E-02	0.1832E+03	0.2898E+03	0.3300E+01	0.4620E+02	0.8664E-02	0.1190E+00	0.9895E+00	0.4147E-04
61	0.9902E-01	0.4000E-01	0.8762E+00	0.5780E+00	0.2240E+01	0.1868E+03	0.3900E-03	0.2253E+03	0.2964E+03	0.3100E+02	0.5380E+02	0.1899E-02	0.4280E+00	0.8461E+00	0.1150E-05
62	0.1386E+01	0.1100E-01	0.8811E+00	0.3200E-01	0.1620E+01	0.2052E+03	0.1100E-01	0.2952E+03	0.2851E+03	0.2000E+01	0.3900E+02	0.1386E+01	0.6400E-01	0.9502E+00	0.6848E-03
63	0.7001E-02	0.3750E+00	0.9549E+00	0.4000E-03	0.1690E+01	0.2257E+03	0.2500E-04	0.2414E+03	0.2904E+03	0.9500E+02	0.4880E+02	0.1066E-01	0.4000E-01	0.9540E+00	0.2631E-07
64	0.3014E-01	0.1900E-01	0.9330E+00	0.1710E+00	0.1650E+01	0.1606E+03	0.1700E-04	0.3709E+03	0.2906E+03	0.9000E+00	0.3800E+02	0.6931E+00	0.1166E+01	0.8161E+00	0.2900E-05
65	0.2039E+00	0.7500E-01	0.9004E+00	0.6100E-01	0.2310E+01	0.1798E+03	0.1000E-09	0.1691E+03	0.2961E+03	0.2800E+06	0.4790E+02	0.7617E-02	0.2420E+00	0.9133E+00	0.2453E-16
66	0.6931E+00	0.1345E+01	0.6942E+00	0.2700E-01	0.2150E+01	0.2087E+03	0.1600E-04	0.2778E+03	0.2823E+03	0.7100E+04	0.3780E+02	0.1540E+00	0.4300E-01	0.1018E+01	0.2667E-09
67	0.1980E+00	0.2800E-01	0.7876E+00	0.5390E+00	0.3010E+01	0.1643E+03	0.2700E-01	0.3011E+03	0.2891E+03	0.1710E+03	0.4310E+02	0.2762E-02	0.3440E+00	0.8625E+00	0.1978E-04
68	0.6931E+00	0.3900E+00	0.8575E+00	0.7170E+00	0.1850E+01	0.1778E+03	0.1900E-01	0.2918E+03	0.3097E+03	0.1000E+01	0.4000E+02	0.9902E-01	0.6533E+01	0.8088E+00	0.2153E-02
69	0.2166E-01	0.6400E-01	0.9250E+00	0.9500E-01	0.1740E+01	0.2349E+03	0.3300E-02	0.2452E+03	0.2873E+03	0.2500E+03	0.3120E+02	0.7374E-02	0.8300E-01	0.9638E+00	0.1355E-05
70	0.1691E-01	0.1700E-01	0.8980E+00	0.2420E+00	0.1630E+01	0.1935E+03	0.8400E-04	0.2963E+03	0.2898E+03	0.1000E+07	0.4550E+02	0.4951E-01	0.2080E+00	0.1061E+01	0.1033E-10
71	0.1260E-01	0.7000E-02	0.9449E+00	0.5400E+01	0.1920E+01	0.1652E+03	0.2200E-01	0.2506E+03	0.2815E+03	0.1300E+05	0.3160E+02	0.2265E-02	0.1558E+01	0.7923E+00	0.1812E-06
72	0.1083E-01	0.8800E-01	0.8661E+00	0.1580E+00	0.1730E+01	0.2226E+03	0.1300E-02	0.2557E+03	0.2974E+03	0.1300E+01	0.3450E+02	0.3851E-01	0.2630E+00	0.8532E+00	0.1034E-03
73	0.9902E-01	0.6100E-01	0.7578E+00	0.9960E+00	0.1890E+01	0.1840E+03	0.1200E-06	0.3596E+03	0.2891E+03	0.1000E+07	0.5670E+02	0.1155E+01	0.5500E-01	0.8638E+00	0.1795E-13
74	0.1238E-01	0.2060E-01	0.9479E+00	0.4610E+00	0.2010E+01	0.2127E+03	0.2700E-03	0.2884E+03	0.2984E+03	0.2100E+03	0.4500E+02	0.5332E-01	0.3750E+00	0.9296E+00	0.1495E-06
75	0.1386E+01	0.4020E+00	0.9016E+00	0.2470E+00	0.2240E+01	0.1560E+03	0.5000E-03	0.2210E+03	0.2985E+03	0.7000E+00	0.3910E+02	0.1238E-01	0.7000E-02	0.8520E+00	0.6361E-04
76	0.1050E-01	0.5900E-01	0.9409E+00	0.8700E-02	0.1990E+01	0.1987E+03	0.1600E-03	0.3457E+03	0.2885E+03	0.2000E+06	0.5110E+02	0.6418E-02	0.6400E-01	0.9355E+00	0.1153E-09
77	0.7702E+02	0.2420E+00	0.7032E+00	0.2320E+00	0.2080E+01	0.1788E+03	0.2500E-04	0.2343E+03	0.2843E+03	0.4000E+03	0.4120E+02	0.1195E-01	0.3400E-01	0.9538E+00	0.6195E-08
78	0.2390E-01	0.5330E+01	0.1060E+01	0.4300E+01	0.1830E+01	0.1416E+03	0.5000E-04	0.3164E+03	0.3075E+03	0.7500E+03	0.5080E+02	0.4590E-02	0.1100E-01	0.8134E+00	0.8251E-08
79	0.1650E-01	0.2810E+00	0.9235E+00	0.6000E-01	0.1640E+01	0.1905E+03	0.2400E-04	0.1762E+03	0.2942E+03	0.1700E+03	0.4900E+02	0.1712E-01	0.2137E+01	0.8869E+00	0.1017E-07
80	0.2350E-01	0.1160E+00	0.8383E+00	0.3000E+00	0.2800E+01	0.1778E+03	0.3800E-04	0.2958E+03	0.2997E+03	0.1100E+03	0.6350E+02	0.2100E-01	0.1100E-01	0.7909E+00	0.4100E-07
81	0.9902E-01	0.1030E+00	0.9282E+00	0.6130E+00	0.2450E+01	0.2055E+03	0.8000E-02	0.3834E+03	0.3078E+03	0.1300E+03	0.3640E+02	0.2311E-01	0.1330E-01	0.8913E+00	0.9218E-05
82	0.2773E-01	0.2150E+00	0.8876E+00	0.4050E+00	0.1870E+01	0.1551E+03	0.3500E-01	0.2012E+03	0.2845E+03	0.4500E+01	0.3560E+02	0.1925E-01	0.1930E+00	0.1165E+01	0.6615E-03
83	0.6863E-02	0.2000E-02	0.9164E+00	0.1100E-01	0.1570E+01	0.1685E+03	0.4500E-02	0.3023E+03	0.2950E+03	0.8400E+05	0.4050E+02	0.3466E+01	0.7000E-01	0.8360E+00	0.6602E-08
84	0.2390E-01	0.1300E+01	0.1086E+01	0.1150E+01	0.1650E+01	0.1659E+03	0.1200E-07	0.2241E+03	0.2923E+03	0.4000E+01	0.4140E+02	0.1873E-01	0.8100E-01	0.8230E+00	0.2766E-09
85	0.6931E+00	0.1800E+03	0.8197E+00	0.1250E+00	0.2050E+01	0.2099E+03	0.1300E-06	0.2137E+03	0.2962E+03	0.2360E+04	0.4530E+02	0.9902E-01	0.1300E+01	0.8275E+00	0.4780E-11
86	0.8774E-02	0.7200E-01	0.1130E+01	0.3500E-01	0.1850E+01	0.1634E+03	0.3200E-03	0.1883E+03	0.2833E+03	0.2800E+06	0.5420E+02	0.3224E-02	0.8620E+00	0.6057E+00	0.9136E-10
87	0.1155E+00	0.2520E+00	0.9075E+00	0.1170E+00	0.1850E+01	0.1757E+03	0.2270E-01	0.3728E+03	0.2837E+03	0.1000E+07	0.5540E+02	0.1260E-01	0.1100E-01	0.1058E+01	0.3588E-08
88	0.1523E-01	0.1400E+00	0.9501E+00	0.8600E-01	0.1730E+01	0.1722E+03	0.2200E-06	0.2287E+03	0.2852E+03	0.3000E+02	0.4390E+02	0.8664E-01	0.1150E+03	0.8170E+00	0.7073E-09
89	0.7702E-02	0.3760E+00	0.8777E+00	0.7000E-02	0.1640E+01	0.1569E+03	0.1900E-06	0.3498E+03	0.3018E+03	0.5000E+03	0.3350E+02	0.3466E+02	0.2900E-01	0.9253E+00	0.5298E-10
90	0.4332E-01	0.7000E-01	0.9485E+00	0.1300E+01	0.1450E+01	0.2170E+03	0.8000E-04	0.3670E+03	0.2918E+03	0.1820E+04	0.3510E+02	0.8252E-02	0.2320E+00	0.8571E+00	0.6650E-08
91	0.1491E-01	0.4050E+00	0.9023E+00	0.3200E-01	0.2030E+01	0.2154E+03	0.8800E-01	0.3390E+03	0.2951E+03	0.5500E+02	0.4810E+02	0.1475E-01	0.1085E+01	0.8446E+00	0.2211E-03
92	0.1155E+00	0.1170E+00	0.9537E+00	0.1600E-01	0.1850E+01	0.1581E+03	0.3000E-03	0.3422E+03	0.2997E+03	0.1540E+06	0.5180E+02	0.1980E-01	0.3900E+00	0.8379E+00	0.2675E-09
93	0.8664E-01	0.1800E-02	0.8235E+00	0.1040E+00	0.2470E+01	0.2053E+03	0.6700E-02	0.2063E+03	0.2915E+03	0.5000E+00	0.3940E+02	0.8719E-02	0.6200E+01	0.9844E+00	0.1141E-02
94	0.1733E+00	0.1840E+01	0.8842E+00	0.1150E+01	0.1830E+01	0.1586E+03	0.1500E-01	0.1662E+03	0.2955E+03	0.1000E+05	0.4890E+02	0.1308E-01	0.4760E+00	0.7748E+00	0.1015E-06
95	0.1650E-01	0.2700E-01	0.7444E+00	0.9500E-01	0.2130E+01	0.1748E+03	0.3000E-04	0.2363E+03	0.2874E+03	0.1200E+03	0.4660E+02	0.2888E-01	0.8400E-01	0.1030E+01	0.2473E-07
96	0.3466E+00	0.4300E-01	0.9273E+00	0.8000E-01	0.2180E+01	0.1962E+03	0.2000E-06	0.3255E+03	0.2859E+03	0.1490E+01	0.4540E+02	0.1386E+01	0.9500E-01	0.9913E+00	0.1838E-07
97	0.1980E+00	0.2080E+00	0.9678E+00	0.2010E+00	0.1850E+01	0.1573E+03	0.5000E-04	0.4090E+03	0.2910E+03	0.1100E+03	0.4440E+02	0.8664E-01	0.2280E+00	0.1040E+01	0.7684E-07
98	0.2567E-01	0.1150E+01	0.8737E+00	0.3250E+00	0.2220E+01	0.2080E+03	0.3300E-04	0.3233E+03	0.2902E+03	0.1800E+01	0.4560E+02	0.1444E-01	0.2300E+00	0.9452E+00	0.2457E-05
99	0.6863E-02	0.5390E+00	0.9223E+00	0.6533E+01	0.2060E+01	0.1753E+03	0.2700E-05	0.4187E+03	0.3039E+03	0.4000E+04	0.3660E+02	0.6931E+00	0.6160E+00	0.1034E+01	0.1119E-09
100	0.1540E+00	0.1300E+01	0.1002E+01	0.1130E+00	0.1670E+01	0.2092E+03	0.1900E-02	0.3441E+03	0.2937E+03	0.1300E+02	0.3110E+02	0.1650E-01	0.1000E-03	0.8562E+00	0.2059E-04
101	0.2236E-01	0.6300E+00	0.8886E+00	0.1200E-01	0.1860E+01	0.2413E+03	0.7300E-03	0.3506E+03	0.2973E+03	0.3200E+03	0.6130E+02	0.8155E-02	0.4700E-02	0.9015E+00	0.3236E-06
102	0.9627E-02	0.3200E-01	0.7886E+00	0.4400E+00	0.1870E+01	0.1813E+03	0.1400E-02	0.2292E+03	0.2971E+03	0.3000E+02	0.3210E+02	0.1824E+00	0.1030E+00	0.1106E+01	0.4330E-05
103	0.2888E-01	0.1440E+00	0.9950E+00	0.5031E+01	0.2380E+01	0.1622E+03	0.4000E-08	0.2463E+03	0.2890E+03	0.2700E+04	0.4810E+02	0.1733E+00	0.2080E+00	0.1006E+01	0.1519E-12
104	0.3648E-01	0.1250E+00	0.8776E+00	0.1570E+00	0.3020E+01	0.1593E+03	0.2200E-03	0.2463E+03	0.2947E+03	0.2000E+01	0.3430E+02	0.2069E-01	0.1170E+00	0.9599E+00	0.1106E-04
105	0.3014E-01	0.1790E+00	0.8659E+00	0.1110E+03	0.2680E+01	0.1913E+03	0.1000E-03	0.3545E+03	0.2765E+03	0.1000E-02	0.5030E+02	0.8774E-02	0.3400E+00	0.9256E+00	0.1542E-01
106	0.1899E-02	0.8000E-01	0.1143E+01	0.2000E-02	0.1950E+01	0.1946E+03	0.9500E-05	0.2022E+03	0.2866E+03	0.1400E+01	0.3250E+02	0.1386E+01	0.1300E+01	0.8586E+00	0.5758E-06
107	0.2311E-01	0.1200E-01	0.8681E+00	0.5800E-01	0.2650E+01	0.1733E+03	0.5000E-06	0.3035E+03	0.2841E+03	0.5000E+01	0.4650E+02	0.7702E+02	0.3250E+00	0.9120E+00	0.1285E-07
108	0.2567E-01	0.4610E+00	0.8925E+00	0.5100E-02	0.1660E+01	0.1946E+03	0.1500E-05	0.2213E+03	0.2992E+03	0.1000E+06	0.4470E+02	0.2773E-01	0.7000E-02	0.9147E+00	0.1335E-11
109	0.1980E+00	0.1330E+00	0.9453E+00	0.5000E-02	0.1910E+01	0.1760E+03	0.1300E-02	0.2157E+03	0.2913E+03	0.1000E+07	0.3820E+02	0.1980E-01	0.1580E+00	0.8734E+00	0.1158E-09
110	0.6301E-01	0.1930E+00	0.9453E+00	0.8400E-01	0.2120E+01	0.1909E+03	0.2250E-03	0.2659E+03	0.3009E+03	0.1200E+06	0.3610E+02	0.2950E-01	0.4300E+01	0.8114E+00	0.1993E-09
111	0.1308E-01	0.1660E+00	0.1033E+01	0.2800E-01	0.1700E+01	0.2885E+03	0.1000E+00	0.5052E+03	0.2955E+03	0.1400E+03	0.3600E+02	0.9242E-02	0.8160E+00	0.8213E+00	0.1469E-03
112	0.9181E-02	0.2800E-01	0.8904E+00	0.6160E+00	0.2030E+01	0.1751E+03	0.2300E-03	0.2972E+03	0.2881E+03	0.5000E-01	0.4020E+02	0.1155E+00	0.2470E+00	0.9775E+00	0.5708E-03
113	0.4163E-02	0.2320E+00	0.8778E+00	0.2350E+00	0.2140E+01	0.1493E+03	0.9600E-06	0.1121E+03	0.2865E+03	0.8000E+01	0.3380E+02	0.1899E-02	0.7500E-01	0.1037E+01	0.5647E-08
114	0.8664E-02	0.2470E+00	0.8728E+00	0.6400E-01	0.2010E+01	0.1873E+03	0.9000E-05	0.2331E+03	0.2964E+03	0.2400E+03	0.3400E+02	0.6027E-01	0.2010E+00	0.7762E+00	0.3547E-08
115	0.2009E-02	0.4400E-01	0.9204E+00	0.1100E-01	0.2120E+01	0.1907E+03	0.2100E-03	0.4499E+03	0.2972E+03	0.1000E+00	0.4480E+02	0.7374E-02	0.3000E+00	0.8577E+00	0.3824E-03
116	0.1899E-02	0.2300E+00	0.8547E+00	0.8800E-01	0.1510E+01	0.2151E+03	0.1000E-03	0.3147E+03	0.2861E+03	0.2000E+01	0.4660E+02	0.7001E-02	0.1420E+01	0.9469E+00	0.6614E-05

	k	$K_{om,ss}$	n_{ss}	K_{wp}	k_l	k_g	P	M_m	T	c_{sol}	D_w	k_b	$K_{om,wb}$	n_{wb}	K_H
117	0.3894E-01	0.5500E-01	0.8512E+00	0.3440E+00	0.1880E+01	0.2148E+03	0.1100E-05	0.2561E+03	0.2862E+03	0.9000E+01	0.4600E+02	0.5545E-01	0.2075E+01	0.1024E+01	0.1315E-07
118	0.1320E-01	0.2330E+00	0.7152E+00	0.5200E-01	0.1530E+01	0.2369E+03	0.3300E-05	0.3678E+03	0.2808E+03	0.4200E+01	0.7540E+02	0.3648E-01	0.5840E+01	0.9632E+00	0.1238E-06
119	0.2773E+00	0.4000E-01	0.9026E+00	0.9600E-01	0.2070E+01	0.1538E+03	0.8900E-06	0.2213E+03	0.2963E+03	0.2800E+04	0.4700E+02	0.7702E-02	0.3200E-01	0.1011E+01	0.2855E-10
120	0.2666E-01	0.1500E-01	0.9215E+00	0.1166E+01	0.1790E+01	0.1791E+03	0.1200E-03	0.2017E+03	0.2962E+03	0.6200E+01	0.3250E+02	0.1386E+00	0.5000E-02	0.8759E+00	0.1585E-05
121	0.1980E+00	0.5200E-01	0.1029E+01	0.2080E+00	0.1790E+01	0.1969E+03	0.2100E-03	0.3825E+03	0.3106E+03	0.1900E+04	0.3980E+02	0.3648E-01	0.4000E-01	0.9239E+00	0.1637E-07
122	*0.1066E+00*	*0.5060E+00*	*0.7737E+00*	*0.2330E+00*	*0.2020E+01*	*0.1806E+03*	*0.1100E-02*	*0.3879E+03*	*0.2856E+03*	*0.2790E+04*	*0.4430E+02*	0.5545E-02	0.1345E+01	0.8211E+00	0.6441E-07
123	0.1899E-02	0.3400E-01	0.7817E+00	0.2810E+00	0.1890E+01	0.1599E+03	0.4480E-06	0.2632E+03	0.2812E+03	0.9000E+00	0.3660E+02	0.6863E-02	0.2000E+01	0.8219E+00	0.5604E-07
124	0.1980E-01	0.1270E-01	0.9543E+00	0.8300E-01	0.1830E+01	0.1878E+03	0.4200E-06	0.2132E+03	0.3030E+03	0.1000E+04	0.4220E+02	0.2009E-02	0.1330E+00	0.8709E+00	0.3554E-10
125	0.1575E-01	0.2630E+00	0.8097E+00	0.1930E+00	0.1680E+01	0.2092E+03	0.5300E-04	0.2371E+03	0.2867E+03	0.1000E+02	0.3570E+02	0.2950E-01	0.5100E-02	0.9100E+00	0.5272E-06
126	0.4780E-02	0.1110E+00	0.1134E+01	0.3500E-01	0.2080E+01	0.1688E+03	0.5000E-05	0.2193E+03	0.3098E+03	0.3500E+02	0.4370E+02	0.2773E+00	0.3550E+00	0.8506E+00	0.1216E-07
127	0.1593E-01	0.1100E-01	0.8835E+00	0.1100E-01	0.1550E+01	0.1497E+03	0.1000E-01	0.2423E+03	0.2770E+03	0.8900E+02	0.3240E+02	0.2236E-01	0.3760E+00	0.8863E+00	0.1182E-04
128	0.1066E+00	0.4700E-02	0.8277E+00	0.4760E+00	0.1710E+01	0.2301E+03	0.1000E-02	0.2838E+03	0.2859E+03	0.5800E+03	0.3990E+02	0.1980E+00	0.4420E+00	0.1212E+01	0.2059E-06
129	0.3151E-01	0.7170E+00	0.9044E+00	0.7000E-01	0.2240E+01	0.1992E+03	0.2000E-02	0.2861E+03	0.2943E+03	0.5000E-01	0.5370E+02	0.1980E+00	0.1340E+00	0.9730E+00	0.4677E-02
130	0.8351E-02	0.6533E+01	0.9341E+00	0.1160E+00	0.1950E+01	0.1812E+03	0.5000E-05	0.3043E+03	0.3009E+03	0.3500E+03	0.3590E+02	0.6932E-01	0.2700E-01	0.8363E+00	0.1738E-08
131	0.7296E-01	0.1570E+00	0.8549E+00	0.3484E+01	0.1820E+01	0.1951E+03	0.2700E-02	0.4610E+03	0.2825E+03	0.1200E-01	0.3240E+02	0.2039E-01	0.5200E-01	0.7563E+00	0.4416E-01
132	0.6027E-01	0.1340E+00	0.9210E+00	0.2510E+00	0.2050E+01	0.2112E+03	0.1500E-03	0.2647E+03	0.2869E+03	0.6000E+00	0.3830E+02	0.1238E-01	0.1040E+00	0.8267E+00	0.2774E-04
133	0.6301E-01	0.1000E+00	0.8610E+00	0.7500E-01	0.2100E+01	0.2399E+03	0.8600E-02	0.2793E+03	0.2961E+03	0.5000E-02	0.3490E+02	0.2458E-02	0.8500E-01	0.8758E+00	0.1951E+00
134	0.3961E-01	0.8500E-01	0.7485E+00	0.4020E+00	0.2140E+01	0.2055E+03	0.4700E-04	0.3384E+03	0.3004E+03	0.5000E+01	0.4380E+02	0.3151E+00	0.1100E-01	0.8382E+00	0.1274E-05
135	0.1540E+00	0.6100E-01	0.7833E+00	0.9190E+00	0.1560E+01	0.1754E+03	0.7100E-04	0.2570E+03	0.3065E+03	0.1800E+02	0.4680E+02	0.3301E-01	0.4610E+00	0.9201E+00	0.3978E-06
136	0.2829E-01	0.3500E+01	0.9360E+00	0.1030E+00	0.3470E+01	0.2687E+03	0.1300E-03	0.3054E+03	0.2863E+03	0.3000E-01	0.3890E+02	0.9627E-02	0.4000E-03	0.8921E+00	0.5559E-03
137	0.1925E-01	0.1000E+01	0.1008E+01	0.1800E-02	0.1990E+01	0.1440E+03	0.4600E-03	0.2210E+03	0.2899E+03	0.6000E+02	0.3530E+02	0.7001E-02	0.2060E-01	0.8372E+00	0.7030E-06
138	0.5251E-02	0.1580E+00	0.8922E+00	0.5900E-01	0.1630E+01	0.2157E+03	0.2900E-03	0.1893E+03	0.2849E+03	0.1320E+02	0.4640E+02	0.5776E+00	0.1570E+00	0.1070E+01	0.1755E-05
139	0.6027E-01	0.8620E+00	0.1056E+01	0.1150E+03	0.1810E+01	0.1833E+03	0.1100E-01	0.2143E+03	0.2936E+03	0.7600E+03	0.3620E+02	0.2476E-01	0.5400E+01	0.8555E+00	0.1271E-05
140	0.1980E-01	0.2190E+00	0.8515E+00	0.6540E+01	0.1580E+01	0.2095E+03	0.5000E-05	0.4163E+03	0.3014E+03	0.1300E+02	0.3740E+02	0.1238E-01	0.1972E+01	0.8917E+00	0.6390E-07
141	0.9902E-01	0.1700E-01	0.9172E+00	0.1164E+01	0.1830E+01	0.1661E+03	0.1800E-03	0.2653E+03	0.2916E+03	0.5800E+05	0.3060E+02	0.5078E-02	0.1700E-01	0.8768E+00	0.3396E-09
142	0.8155E-02	0.9500E-01	0.9005E+00	0.6330E+00	0.1670E+01	0.1946E+03	0.2100E-04	0.2302E+03	0.2867E+03	0.2000E-01	0.4730E+02	0.3466E-01	0.1110E+00	0.8528E+00	0.1014E-03
143	0.1980E-01	0.3000E+00	0.8695E+00	0.2900E-01	0.2130E+01	0.1750E+03	0.4300E-05	0.2921E+03	0.2860E+03	0.2500E+00	0.4770E+02	0.1333E-01	0.1160E+00	0.6690E+00	0.2113E-05
144	0.3301E-02	0.5000E-02	0.8023E+00	0.2900E-01	0.1760E+01	0.1771E+03	0.1000E-04	0.3770E+03	0.2919E+03	0.2700E+01	0.3880E+02	0.9902E-01	0.8700E-01	0.9486E+00	0.5753E-06
145	0.3555E-01	0.6400E-01	0.9386E+00	0.9850E+00	0.2100E+01	0.1821E+03	0.1690E-03	0.3332E+03	0.2885E+03	0.3700E+03	0.3740E+02	0.5501E-02	0.6330E+00	0.9114E+00	0.6344E-07
146	0.6027E-01	0.6540E+01	0.9351E+00	0.1200E-01	0.2050E+01	0.1389E+03	0.4000E-03	0.4350E+03	0.3046E+03	0.9600E+01	0.3050E+02	0.3984E-02	0.1270E-01	0.9472E+00	0.7158E-05
147	0.1386E+01	0.6400E-01	0.8209E+00	0.1790E+00	0.1750E+01	0.1799E+03	0.4500E-04	0.2574E+03	0.2863E+03	0.8100E+02	0.4780E+02	0.1386E+01	0.2000E-02	0.1017E+01	0.6007E-07
148	0.1066E-01	0.2210E+00	0.9301E+00	0.3900E+00	0.1980E+01	0.1465E+03	0.5500E-04	0.3078E+03	0.2965E+03	0.4500E+00	0.3570E+02	0.7702E-02	0.5390E+00	0.7554E+00	0.1526E-04
149	0.5332E-01	0.4760E+00	0.8749E+00	0.1085E+01	0.1820E+01	0.1772E+03	0.3300E-09	0.3618E+03	0.2922E+03	0.3300E+02	0.4310E+02	0.1050E-01	0.2800E-01	0.8631E+00	0.1489E-11
150	0.1980E+00	0.8100E-01	0.8790E+00	0.1000E+00	0.2180E+01	0.1839E+03	0.1600E+01	0.2232E+03	0.2976E+03	0.1000E+00	0.4510E+02	0.3466E+02	0.1600E-01	0.8869E+00	0.1443E+01
151	0.5023E-02	0.1600E-01	0.8754E+00	0.1190E+00	0.2210E+01	0.1984E+03	0.1300E-07	0.2883E+03	0.2781E+03	0.7300E+01	0.3880E+02	0.1980E+00	0.1500E-01	0.8817E+00	0.2221E-09
152	0.1899E-02	0.6000E-01	0.8539E+00	0.1330E+00	0.1470E+01	0.1647E+03	0.1300E+00	0.2210E+03	0.2938E+03	0.1500E+02	0.3450E+02	0.2250E-02	0.2520E+00	0.8514E+00	0.7841E-03
153	0.3466E-01	0.1100E-01	0.8588E+00	0.7000E-02	0.2190E+01	0.2018E+03	0.6500E-05	0.1602E+03	0.2804E+03	0.1000E+02	0.3660E+02	0.8774E-02	0.1000E+00	0.9896E+00	0.4467E-07
154	0.1195E-01	0.9190E+00	0.8900E+00	0.4000E-01	0.1420E+01	0.1510E+03	0.1000E-02	0.3913E+03	0.2961E+03	0.5000E-03	0.4670E+02	0.3224E-01	0.1069E+01	0.8328E+00	0.3179E+00
155	0.1540E+00	0.8300E-01	0.9699E+00	0.5000E-02	0.2200E+01	0.1854E+03	0.5000E-05	0.3814E+03	0.2974E+03	0.4000E+02	0.5800E+02	0.2773E-01	0.3500E-01	0.8957E+00	0.1928E-07
156	0.1712E-01	0.1150E+03	0.8951E+00	0.1345E+01	0.2050E+01	0.1748E+03	0.5000E-05	0.1982E+03	0.2849E+03	0.1700E+01	0.5200E+02	0.2773E-01	0.1130E+00	0.9440E+00	0.2461E-06
157	0.3466E+01	0.6330E+00	0.1052E+01	0.1972E+01	0.1730E+01	0.1776E+03	0.6900E-02	0.2550E+03	0.3029E+03	0.6800E+02	0.3830E+02	0.3301E-01	0.1030E+00	0.8721E+00	0.1028E-04
158	0.1386E+01	0.1400E-01	0.8299E+00	0.5060E+00	0.1660E+01	0.1942E+03	0.5300E-03	0.2975E+03	0.2977E+03	0.1900E+04	0.3650E+02	0.1899E-01	0.6400E-01	0.9501E+00	0.3352E-07
159	0.6245E-02	0.1164E+01	0.8379E+00	0.5650E+00	0.2030E+01	0.1966E+03	0.7700E-02	0.3943E+03	0.2928E+03	0.1114E+04	0.3100E+02	0.8664E-01	0.7170E+00	0.8604E+00	0.1119E-05
160	0.3301E-01	0.2930E+00	0.9342E+00	0.8500E-01	0.1700E+01	0.1875E+03	0.3100E-01	0.2092E+03	0.2920E+03	0.1400E+04	0.3750E+02	0.3301E-02	0.2810E+00	0.9328E+00	0.1908E-05
161	0.1238E-01	0.2075E+01	0.1046E+01	0.1700E-01	0.2140E+01	0.1971E+03	0.4000E-07	0.2133E+03	0.2939E+03	0.2500E+04	0.3320E+02	0.1100E-01	0.2510E+00	0.8414E+00	0.1396E-11
162	0.4780E-01	0.2350E+00	0.9444E+00	0.8620E+00	0.1500E+01	0.1828E+03	0.2300E-01	0.2953E+03	0.2897E+03	0.5100E+03	0.4220E+02	0.6932E-01	0.6000E-01	0.8630E+00	0.5530E-05
163	0.2236E-01	0.3200E-01	0.8108E+00	0.1300E+01	0.2140E+01	0.1763E+03	0.5000E-05	0.1445E+03	0.2945E+03	0.4350E+03	0.4580E+02	0.3961E-01	0.1000E+00	0.8580E+00	0.6782E-09
164	0.5059E-02	0.6130E+00	0.8961E+00	0.3550E+00	0.1590E+01	0.1359E+03	0.1000E-09	0.2117E+03	0.2975E+03	0.7220E+06	0.3670E+02	0.4930E-03	0.5000E-02	0.8741E+00	0.1185E-16
165	0.6932E-01	0.1085E+01	0.1065E+01	0.8000E-01	0.1960E+01	0.1450E+03	0.4000E-02	0.1411E+03	0.3098E+03	0.1990E+03	0.3350E+02	0.8155E-01	0.1150E+01	0.8584E+00	0.1101E-05
166	0.1800E-01	0.9500E-01	0.8749E+00	0.5840E+01	0.1480E+01	0.1766E+03	0.4000E-02	0.2216E+03	0.2966E+03	0.7200E+02	0.4780E+02	0.1733E+00	0.6130E+00	0.7804E+00	0.4993E-05
167	0.1800E-01	0.1100E-01	0.9153E+00	0.8160E+00	0.1900E+01	0.1471E+03	0.1700E-03	0.1792E+03	0.2845E+03	0.1500E+04	0.4210E+02	0.2390E-01	0.1700E-01	0.1008E+01	0.8586E-08
168	0.1238E-01	0.2080E+00	0.8645E+00	0.2137E+01	0.1830E+01	0.2085E+03	0.9300E-02	0.3421E+03	0.2965E+03	0.2300E+03	0.3270E+02	0.1100E-01	0.1660E+00	0.9089E+00	0.5612E-05
169	0.1980E+00	0.1040E+00	0.9910E+00	0.4700E-02	0.1990E+01	0.2759E+03	0.1300E-03	0.4314E+03	0.2856E+03	0.1200E+04	0.4640E+02	0.1733E-01	0.7200E-01	0.8969E+00	0.1968E-07
170	0.3984E-02	0.1110E+03	0.1023E+01	0.2800E-01	0.2180E+01	0.1587E+03	0.1000E-09	0.4439E+03	0.3022E+03	0.5000E-03	0.3250E+02	0.7220E-02	0.1800E-02	0.8846E+00	0.3533E-07
171	0.2476E-01	0.5650E+00	0.8212E+00	0.1000E+01	0.2030E+01	0.2035E+03	0.2700E-02	0.2565E+03	0.2876E+03	0.4000E+00	0.4500E+02	0.1333E-01	0.2000E-01	0.8514E+00	0.7241E-03
172	0.3224E-02	0.2900E-01	0.9062E+00	0.3500E+01	0.2520E+01	0.1564E+03	0.1800E-03	0.2475E+03	0.2863E+03	0.3500E+00	0.4560E+02	0.2567E-01	0.1000E-03	0.9524E+00	0.5348E-04
173	0.1733E+00	0.1100E-01	0.8387E+00	0.1800E+03	0.2180E+01	0.1639E+03	0.1640E-07	0.2006E+03	0.2870E+03	0.1000E+02	0.3840E+02	0.1980E+00	0.8300E-02	0.1045E+01	0.1379E-09
174	0.1238E-01	0.1000E-03	0.8154E+00	0.1110E+00	0.2350E+01	0.2055E+03	0.4000E-04	0.2402E+03	0.3063E+03	0.3900E+02	0.5100E+02	0.3151E-01	0.9850E+00	0.7416E+00	0.9674E-07

	k	$K_{om,ss}$	n_{ss}	K_{mp}	k_l	k_g	P	M_m	T	c_{sol}	D_w	k_h	$K_{om,wb}$	n_{wb}	K_H
175	0.7374E-02	0.1150E+01	0.7475E+00	0.2075E+01	0.1650E+01	0.1783E+03	0.4400E-05	0.3789E+03	0.2926E+03	0.1290E+05	0.5670E+02	0.1386E+01	0.4400E+00	0.7209E+00	0.5312E-10
176	0.6931E+00	0.9600E-01	0.1082E+01	0.1000E-03	0.2050E+01	0.1883E+03	0.1600E-03	0.4839E+03	0.2903E+03	0.8000E-01	0.4380E+02	0.5291E-02	0.1000E+01	0.8493E+00	0.4009E-03
177	0.2100E-01	0.8600E-01	0.9803E+00	0.6200E+01	0.1700E+01	0.2063E+03	0.1200E-01	0.2842E+03	0.2883E+03	0.2000E+05	0.4870E+02	0.2039E+00	0.4050E+00	0.8633E+00	0.7114E-07
178	0.4621E+00	0.3440E+00	0.7585E+00	0.6100E-01	0.1720E+01	0.1741E+03	0.1300E-05	0.4063E+03	0.2875E+03	0.3200E+02	0.4560E+02	0.7220E-02	0.1100E-01	0.9379E+00	0.6905E-08
179	0.3151E-01	0.3484E+01	0.7877E+00	0.1420E+01	0.2170E+01	0.1673E+03	0.1700E-01	0.2407E+03	0.2931E+03	0.1200E+05	0.3360E+02	0.6932E-01	0.6100E-01	0.8981E+00	0.1399E-06
180	0.4951E-01	0.5800E-01	0.9615E+00	0.1840E+01	0.2020E+01	0.1544E+03	0.2600E-04	0.3288E+03	0.2958E+03	0.7000E+02	0.4370E+02	0.9763E-02	0.5650E+00	0.1045E+01	0.4966E-07
min	0.6904E-04	0.1000E-05	0.6940E+00	0.1000E-05	0.1420E+01	0.1359E+03	0.0000E+00	0.8410E+02	0.2744E+03	0.0000E+00	0.2950E+02	0.4930E-03	0.1000E-05	0.6060E+00	0.1190E-16
max	0.7702E+02	0.1800E+03	0.1151E+01	0.7702E+02	0.3470E+01	0.3331E+03	0.3200E+05	0.5052E+03	0.3122E+03	0.1370E+07	0.8280E+02	0.7702E+02	0.1800E+03	0.1212E+01	0.2576E+01
median	0.2860E-01	0.1290E+00	0.9000E+00	0.1290E+00	0.1900E+01	0.1821E+03	0.1300E-03	0.2814E+03	0.2917E+03	0.5150E+02	0.4155E+02	0.2310E-01	0.1290E+00	0.8870E+00	0.1280E-06

Annex 8 Sample of system parameters (including the three sensitive process parameters)

	u	h	b	s_1	h_w	ss	$m_{on,ss}$	DW	$m_{on,wb}$	•	•	•	E_x	k	K_{mp}	K_{it}
1	0.6468E+02	0.9740E+00	0.2017E+01	0.1761E+01	0.9279E-01	0.1054E+02	0.4958E+00	0.7913E+03	0.4270E+00	0.5705E+03	0.4632E+00	0.4446E+00	0.9772E+04	0.2773E+00	0.1500E-01	0.1887E-06
2	0.5155E+02	0.1147E+01	0.1884E+01	0.1770E+01	0.5674E-01	0.2509E+02	0.6293E+00	0.5774E+03	0.3555E+00	0.1461E+04	0.9871E+00	0.4127E+00	0.1180E+05	0.5251E-01	0.1000E+00	0.2576E+01
3	0.6970E+02	0.1417E+01	0.1519E+01	0.3883E+01	0.1988E+00	0.8227E+01	0.4118E-01	0.1840E+03	0.7185E+00	0.1560E+04	0.1217E+00	0.1243E+00	0.8189E+04	0.3301E-01	0.1069E+01	0.4000E-05
4	0.1045E+02	0.2136E+00	0.1084E+01	0.1086E+01	0.1854E+00	0.4864E+01	0.7501E+00	0.6354E+03	0.4876E+00	0.2634E+04	0.3612E+00	0.6898E+00	0.1064E+04	0.1925E-01	0.8100E-01	0.5944E-07
5	0.7159E+02	0.1473E+01	0.4616E+01	0.2699E+01	0.4009E-01	0.1832E+02	0.2383E+00	0.6484E+03	0.6123E-01	0.2391E+04	0.8379E+00	0.1491E+00	0.8505E+04	0.3224E-02	0.1700E-01	0.1248E-12
6	0.2666E+02	0.8072E+00	0.4400E+01	0.1381E+01	0.1740E+00	0.9871E+01	0.3995E+00	0.4105E+03	0.6561E+00	0.5624E+03	0.2254E+00	0.1061E+00	0.1119E+05	0.2310E+00	0.5500E-01	0.1104E-02
7	0.1747E+02	0.3573E+00	0.2791E+01	0.2183E+01	0.1945E+00	0.2953E+02	0.9626E+00	0.7223E+03	0.9680E+00	0.2202E+04	0.9963E-01	0.6693E+00	0.8976E+04	0.1386E+01	0.1330E-01	0.6560E-06
8	0.8856E+02	0.1294E+01	0.4658E+01	0.3441E+01	0.1655E+00	0.2232E+02	0.2774E+00	0.8718E+03	0.2258E+00	0.1843E+03	0.4134E+00	0.8359E+00	0.6617E+04	0.8252E-02	0.2060E-01	0.2008E-09
9	0.9469E+02	0.5674E+00	0.3455E+01	0.1391E+01	0.1195E+00	0.1595E+01	0.9244E+00	0.1408E+03	0.8398E+00	0.2082E+04	0.6158E+00	0.8069E+00	0.3973E+04	0.2133E-01	0.2210E+00	0.3893E-06
10	0.2414E+02	0.4631E+00	0.3221E+01	0.2149E+01	0.6086E-01	0.7977E+01	0.5252E+00	0.8962E+03	0.7602E+00	0.2343E+04	0.1830E+00	0.4284E+00	0.4209E+04	0.1386E+01	0.4400E-01	0.1139E-08
11	0.2017E+02	0.1257E+01	0.2463E+01	0.3103E+01	0.1576E+00	0.1035E+02	0.9001E+00	0.7651E+03	0.2165E+00	0.2406E+04	0.7736E+00	0.9058E+00	0.9358E+04	0.7702E-02	0.6400E-01	0.9754E-04
12	0.5311E+01	0.3918E+00	0.1416E+01	0.1210E+01	0.1403E+00	0.9702E+01	0.3873E+00	0.7353E+03	0.4897E-01	0.1191E+04	0.8117E+00	0.4588E+00	0.4411E+04	0.5776E+00	0.1100E-01	0.5763E-03
13	0.5680E+02	0.9608E+00	0.3442E+01	0.1493E+01	0.1605E+00	0.2874E+02	0.5290E+00	0.7778E+03	0.5337E+00	0.1231E+04	0.5489E+00	0.2071E-01	0.1362E+04	0.8252E-02	0.1700E-01	0.1585E-05
14	0.9446E+02	0.5559E+00	0.1335E+01	0.2016E+01	0.1712E+00	0.2658E+02	0.8940E+00	0.8050E+03	0.5233E+00	0.2747E+04	0.5229E+00	0.9238E+00	0.3846E+04	0.4621E+00	0.6300E+00	0.2598E-07
15	0.8826E+02	0.1392E+01	0.4946E+01	0.2674E+01	0.1269E+00	0.2796E+02	0.7651E+00	0.2134E+03	0.2432E+00	0.2446E+04	0.8873E+00	0.5941E+00	0.7828E+04	0.3466E+00	0.4800E-01	0.1517E-07
16	0.7098E+02	0.8557E+00	0.4678E+01	0.1232E+01	0.8704E-01	0.1214E+02	0.2444E+00	0.4443E+03	0.1547E+00	0.1362E+04	0.1462E+00	0.9276E+00	0.1124E+05	0.8664E+00	0.3400E+00	0.1010E-05
17	0.6391E+02	0.2507E+00	0.3751E+01	0.3830E+01	0.5606E-01	0.3472E+01	0.9692E+00	0.4860E+03	0.5846E+00	0.1794E+04	0.3395E+00	0.8518E+00	0.5904E+04	0.2310E-02	0.2630E+00	0.3399E-04
18	0.4288E+02	0.1007E+01	0.4466E+01	0.1153E+01	0.1334E-01	0.2157E+02	0.1316E+00	0.8755E+03	0.7010E+00	0.4783E+03	0.1282E+00	0.7413E+00	0.7748E+04	0.6301E-01	0.6400E-01	0.2328E-07
19	0.4773E+02	0.3485E+00	0.4769E+01	0.3348E+01	0.1272E+00	0.6853E+01	0.1520E+00	0.5616E+03	0.7793E+00	0.3102E+03	0.1607E+00	0.2878E+00	0.1307E+04	0.6601E-01	0.2000E-01	0.9270E-07
20	0.6492E+02	0.1176E+01	0.6119E+00	0.3576E+01	0.1970E+00	0.2392E+02	0.1853E+00	0.2788E+03	0.6521E+00	0.2980E+04	0.4536E+00	0.2814E+00	0.2235E+04	0.2069E-01	0.1000E-01	0.1061E-08
21	0.6549E+02	0.2287E+00	0.4050E+01	0.2436E+01	0.7530E-01	0.1890E+02	0.6532E+00	0.5258E+03	0.9177E+00	0.3208E+03	0.8614E+00	0.6193E+00	0.4481E+04	0.6900E-04	0.6000E-01	0.6013E-10
22	0.9092E+01	0.8657E+00	0.2547E+01	0.3865E+01	0.4524E-01	0.1751E+02	0.2714E+00	0.2690E+03	0.1915E+00	0.1248E+03	0.5180E+00	0.3036E+00	0.1170E+04	0.3466E+00	0.2900E-01	0.1874E-05
23	0.5443E+02	0.3095E+00	0.2571E+01	0.2925E+01	0.1429E+00	0.2774E+02	0.3414E+00	0.8937E+02	0.2052E+00	0.1025E+04	0.6415E+00	0.4773E+00	0.6107E+04	0.8155E-01	0.3760E+00	0.7881E-08
24	0.3691E+02	0.9332E+00	0.3843E+01	0.3695E+01	0.1463E+00	0.2027E+01	0.6270E+00	0.3899E+03	0.3918E+00	0.1900E+04	0.1419E+00	0.1624E+00	0.1104E+05	0.1386E+00	0.1590E+00	0.2794E-05
25	0.7545E+02	0.2004E+00	0.3949E+01	0.2122E+01	0.1288E+00	0.2352E+02	0.3062E+00	0.9735E+03	0.5548E+00	0.2655E+04	0.6854E+00	0.6266E+00	0.9750E+04	0.5100E-03	0.7200E-01	0.1878E-10
26	0.3946E+01	0.7495E+00	0.3626E+01	0.3292E+01	0.9363E-01	0.1356E+02	0.6828E+00	0.2840E+03	0.5499E+00	0.1818E+04	0.1712E+00	0.3612E+00	0.1058E+05	0.1386E+01	0.2930E+00	0.2025E-06
27	0.1821E+02	0.5607E+00	0.4722E+01	0.3500E+01	0.1952E+00	0.1099E+02	0.7392E+00	0.6733E+03	0.7718E-01	0.8042E+03	0.3427E+00	0.3329E+00	0.5671E+04	0.9242E-02	0.1100E-01	0.1639E-06
28	0.2806E+02	0.1316E+01	0.1460E+01	0.1198E+01	0.6712E-01	0.1547E+02	0.2421E-01	0.9561E+03	0.1081E-01	0.4840E+03	0.8777E+00	0.9829E+00	0.9188E+04	0.5332E-01	0.1000E-01	0.6248E-07
29	0.4154E+02	0.1204E+01	0.4163E+01	0.3727E+01	0.1237E+00	0.2859E+02	0.5858E+00	0.2552E+03	0.6445E+00	0.4519E+03	0.2305E+00	0.7818E+00	0.9536E+03	0.1540E+00	0.2300E+00	0.3189E-01
30	0.1887E+01	0.1307E+01	0.4953E+01	0.1968E+01	0.8949E-01	0.2893E+02	0.6017E+00	0.8340E+03	0.1786E+00	0.1956E+04	0.8573E+00	0.8867E+00	0.8619E+04	0.6932E-01	0.8700E-01	0.7731E-05
31	0.7901E+02	0.8125E+00	0.3254E+01	0.2197E+01	0.1806E+00	0.1007E+01	0.7955E+00	0.4273E+03	0.3005E+00	0.2593E+04	0.9193E+00	0.5321E+00	0.1004E+05	0.2100E-01	0.4420E+00	0.1925E-04
32	0.2534E+02	0.1352E+01	0.2288E+01	0.2800E+01	0.9692E-01	0.5956E+01	0.9281E+00	0.5406E+03	0.9368E+00	0.2481E+04	0.2676E+00	0.2239E+00	0.5243E+04	0.1386E+00	0.1410E+00	0.1330E-06
33	0.5369E+02	0.1014E+01	0.3972E+01	0.2771E+01	0.1486E+00	0.1720E+02	0.3718E+00	0.9545E+03	0.9293E+00	0.1142E+04	0.7839E+00	0.7033E+00	0.1595E+04	0.8719E-02	0.1030E+00	0.2446E-08
34	0.5871E+02	0.1075E+01	0.2914E+01	0.2291E+01	0.1643E+00	0.2539E+02	0.7112E+00	0.9496E+03	0.7734E+00	0.1508E+04	0.1375E+00	0.1926E+00	0.1018E+05	0.2773E-01	0.6100E-01	0.5729E-06
35	0.8262E+02	0.4664E+00	0.1941E+01	0.3090E+01	0.1062E+00	0.1192E+02	0.6676E+00	0.8396E+03	0.1499E+00	0.1830E+04	0.1494E+00	0.9740E+00	0.4732E+04	0.7146E-02	0.5330E+01	0.6303E-07
36	0.6097E+02	0.9177E+00	0.4778E+01	0.1919E+01	0.1165E+00	0.7161E+01	0.1134E+00	0.5854E+03	0.6641E+00	0.7688E+03	0.7909E+00	0.8381E-01	0.4646E+03	0.3466E+02	0.8300E-02	0.1254E-03
37	0.8318E+02	0.1022E+01	0.1314E+01	0.1575E+01	0.9519E-01	0.2306E+02	0.9307E-01	0.4707E+03	0.3780E+00	0.1786E+04	0.2570E+00	0.2143E+00	0.3127E+04	0.6601E-01	0.1000E-03	0.1588E-07
38	0.4880E+02	0.1492E+01	0.1245E+01	0.2620E+01	0.3028E-01	0.2145E+02	0.6746E+00	0.3247E+03	0.7541E+00	0.1620E+03	0.5403E+00	0.5017E+00	0.9859E+04	0.1824E+00	0.4280E+00	0.7178E-08
39	0.8477E+01	0.9527E+00	0.2444E+01	0.3812E+01	0.1749E+00	0.1702E+02	0.4752E+00	0.4757E+03	0.1739E-01	0.8902E+03	0.8218E+00	0.1368E+00	0.4971E+04	0.1925E-01	0.2000E+01	0.9707E-08
40	0.8594E+02	0.7278E+00	0.3146E+01	0.1620E+01	0.1865E+00	0.2336E+02	0.8247E+00	0.3858E+03	0.9932E+00	0.2704E+03	0.6601E+00	0.6649E+00	0.3579E+04	0.2476E-01	0.1400E+00	0.7684E-13
41	0.3264E+02	0.3764E+00	0.3411E+01	0.2266E+01	0.1392E+00	0.5137E+01	0.4108E+00	0.6896E+02	0.8349E+00	0.2232E+04	0.7970E+00	0.6458E-01	0.6601E+04	0.8830E-02	0.1660E+00	0.1235E-03
42	0.3069E+02	0.1126E+01	0.1854E+01	0.2244E+01	0.1698E+00	0.2821E+01	0.3512E+00	0.1693E+03	0.5620E+00	0.1407E+04	0.9718E+00	0.4668E+00	0.2984E+04	0.3151E+00	0.2520E+00	0.7671E-07
43	0.4908E+02	0.4804E+00	0.1621E+01	0.1454E+01	0.1841E+00	0.2382E+02	0.5903E+00	0.9119E+03	0.8969E+00	0.1268E+04	0.6359E-01	0.3991E+00	0.5723E+04	0.3466E+02	0.1440E+00	0.9497E-01
44	0.9202E+02	0.4153E+00	0.2267E+01	0.3743E+01	0.9226E-01	0.2590E+01	0.8524E+00	0.6262E+03	0.1951E+00	0.3787E+03	0.7354E+00	0.3445E+00	0.1097E+05	0.1824E-01	0.1900E-01	0.2952E-13
45	0.9348E+02	0.1339E+01	0.3094E+01	0.2941E+01	0.1075E+00	0.5635E+01	0.2224E+00	0.8113E+03	0.7641E+00	0.2128E+04	0.9737E+00	0.7464E-01	0.7204E+04	0.1540E+00	0.1558E+01	0.4207E-07
46	0.6219E+02	0.3385E+00	0.4481E+01	0.1867E+01	0.1033E+00	0.9078E+01	0.5711E+00	0.2428E+02	0.9466E+00	0.1432E+03	0.9699E-01	0.6763E+00	0.2369E+04	0.6418E-02	0.4000E-01	0.2401E-07
47	0.9425E+01	0.4866E+00	0.4811E+01	0.1697E+01	0.9564E-01	0.1257E+02	0.4372E+00	0.2647E+03	0.7452E+00	0.7104E+03	0.8941E+00	0.7990E+00	0.1165E+05	0.8155E-02	0.1400E-01	0.8444E-07
48	0.7838E+02	0.1618E+00	0.2582E+01	0.3029E+01	0.1239E+00	0.1958E+02	0.4331E+00	0.8808E+03	0.2477E+00	0.4278E+03	0.9096E+00	0.2558E+00	0.2433E+04	0.8774E-02	0.4300E-01	0.1837E-03
49	0.4529E+02	0.4092E+00	0.1372E+01	0.2883E+01	0.6398E-01	0.1365E+02	0.1753E-01	0.4602E+03	0.8943E+00	0.1687E+04	0.5323E+00	0.4472E+00	0.8307E+04	0.1980E+00	0.1270E-01	0.5612E-03
50	0.1861E+02	0.2923E+00	0.2171E+01	0.2164E+01	0.1894E+00	0.2611E+02	0.9531E+00	0.5452E+03	0.3146E+00	0.1205E+04	0.9614E+00	0.6739E-01	0.5411E+04	0.4201E-01	0.2280E+00	0.1014E-06
51	0.7451E+02	0.6664E+00	0.4982E+01	0.3396E+01	0.8354E-01	0.1740E+02	0.7303E+00	0.3393E+03	0.4002E+00	0.2761E+04	0.3900E+00	0.7251E+00	0.7433E+04	0.2773E+00	0.2150E+00	0.1228E-10
52	0.6890E+02	0.6266E+00	0.2606E+01	0.1429E+01	0.2827E-01	0.2812E+02	0.6639E+00	0.8056E+03	0.8316E+00	0.1578E+04	0.8322E+00	0.2258E+00	0.4838E+04	0.1899E-01	0.1000E-03	0.6085E-14
53	0.1339E+02	0.9797E+00	0.2861E+01	0.3707E+01	0.1788E+00	0.1459E+02	0.6491E+00	0.7834E+03	0.9514E+00	0.1643E+04	0.4392E+00	0.6800E+00	0.1023E+05	0.3224E-01	0.1270E-01	0.3772E-03
54	0.9863E+02	0.1492E+01	0.4120E+01	0.2755E+01	0.1320E+00	0.1759E+02	0.3208E+00	0.4349E+03	0.7165E-01	0.1883E+04	0.3889E-02	0.2936E+00	0.7905E+04	0.1980E+00	0.2020E+00	0.2354E-05
55	0.3507E+02	0.1065E+01	0.2959E+01	0.1680E+01	0.1689E+00	0.2572E+02	0.8188E+00	0.8195E+03	0.3659E+00	0.2803E+04	0.7779E+00	0.2122E-03	0.1873E+04	0.1333E-01	0.1100E-01	0.3300E-10
56	0.3001E+02	0.2754E+00	0.3311E+01	0.2370E+01	0.8452E-01	0.1242E+02	0.5521E+00	0.5337E+03	0.1739E+00	0.2470E+04	0.9034E-01	0.3837E-01	0.1428E+04	0.5332E-01	0.3750E+00	0.2525E-07
57	0.1135E+02	0.1250E+01	0.2099E+01	0.2023E+01	0.1758E-01	0.2434E+02	0.5046E+00	0.6316E+03	0.1662E+00	0.6981E+03	0.4069E+00	0.2523E+00	0.1246E+04	0.8664E-01	0.2190E+00	0.4201E-04
58	0.3185E+02	0.3718E+00	0.3690E+01	0.2460E+01	0.1877E+00	0.6258E+01	0.9740E+00	0.4920E+03	0.8465E+00	0.8708E+03	0.9356E+00	0.7495E+00	0.5016E+04	0.1386E+01	0.1340E+00	0.5197E-02

	u	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_H
59	0.2252E+02	0.9431E+00	0.3242E+01	0.3269E+01	0.1350E+00	0.1365E+01	0.2950E+00	0.7992E+03	0.5962E-01	0.1305E+04	0.4866E+00	0.2390E+00	0.2137E+04	0.8557E-02	0.2080E+00	0.7260E-04
60	0.1387E+01	0.4919E+00	0.3345E+01	0.3375E+01	0.3738E-01	0.2287E+02	0.9969E+00	0.1146E+03	0.2797E+00	0.1219E+04	0.7525E+00	0.3678E+00	0.3260E+04	0.9120E-02	0.3400E-01	0.4147E-04
61	0.8054E+01	0.1388E+01	0.4298E+01	0.3482E+01	0.4150E-01	0.2103E+02	0.1466E+00	0.3287E+02	0.9975E+00	0.2148E+04	0.4706E+00	0.5619E+00	0.1199E+05	0.9902E-01	0.5780E+00	0.1150E-05
62	0.4551E+01	0.1062E+01	0.1375E+01	0.2071E+01	0.1847E+00	0.1068E+02	0.2469E+00	0.6895E+03	0.1316E+00	0.9987E+03	0.8457E-01	0.8769E+00	0.2042E+04	0.1386E+01	0.3200E-01	0.6848E-03
63	0.8715E+02	0.4228E+00	0.2892E+01	0.3332E+01	0.1150E+00	0.4107E+01	0.4138E+00	0.5946E+03	0.6256E+00	0.1105E+04	0.3560E+00	0.6300E+00	0.2896E+04	0.7001E-02	0.4000E-03	0.2631E-07
64	0.3833E+02	0.1409E+01	0.4361E+01	0.2222E+01	0.1559E+00	0.8987E+01	0.5563E+00	0.3130E+03	0.7259E+00	0.1848E+04	0.8043E+00	0.6976E+00	0.1137E+04	0.3014E-01	0.1710E+00	0.2900E-05
65	0.4581E+02	0.1402E+01	0.4128E+01	0.2715E+01	0.1761E+00	0.1647E+02	0.6140E+00	0.1537E+03	0.5298E-02	0.2904E+04	0.5751E+00	0.3285E+00	0.7723E+04	0.2039E+00	0.6100E-01	0.2453E-16
66	0.8767E+02	0.7930E+00	0.1705E+01	0.3991E+01	0.4185E-01	0.7533E+01	0.3930E+00	0.2050E+03	0.5908E+00	0.2536E+04	0.8850E+00	0.3471E+00	0.8426E+04	0.6931E+00	0.2700E-01	0.2667E-09
67	0.2229E+02	0.1330E+01	0.1989E+01	0.1066E+01	0.1358E+00	0.1681E+02	0.2152E+00	0.1311E+03	0.1597E+00	0.6390E+03	0.6071E+00	0.4833E+00	0.7351E+04	0.1980E+00	0.5390E+00	0.1978E-04
68	0.3385E+02	0.1189E+01	0.6973E+00	0.1445E+01	0.8283E-01	0.4873E+01	0.2621E+00	0.4830E+03	0.9595E+00	0.5049E+03	0.6943E+00	0.5397E+00	0.1619E+04	0.6931E+00	0.7170E+00	0.2153E-02
69	0.9036E+02	0.8348E+00	0.1496E+01	0.1565E+01	0.7738E-01	0.2969E+02	0.9958E-01	0.6558E+03	0.7948E+00	0.1735E+04	0.6302E+00	0.5150E+00	0.6324E+04	0.2166E-01	0.9500E-01	0.1355E-05
70	0.1927E+02	0.1428E+01	0.4238E+01	0.1074E+01	0.6249E-01	0.6054E+01	0.8779E+00	0.2972E+03	0.3244E+00	0.8574E+03	0.2755E+00	0.9444E+00	0.1064E+05	0.1691E-01	0.2420E+00	0.1033E-10
71	0.8407E+02	0.5101E+00	0.1830E+01	0.3530E+01	0.3950E-01	0.1451E+02	0.4664E+00	0.3539E+03	0.1182E+00	0.5336E+03	0.9057E+00	0.2450E+00	0.8042E+04	0.1260E-01	0.5400E+01	0.1812E-06
72	0.9934E+02	0.1305E+00	0.4344E+01	0.3516E+01	0.7102E-01	0.2524E+02	0.7062E-01	0.7517E+03	0.2685E+00	0.1036E+04	0.2590E+00	0.8644E+00	0.8893E+04	0.1083E-01	0.1580E+00	0.1034E-03
73	0.2910E+02	0.4989E+00	0.1582E+01	0.3586E+01	0.1056E+00	0.2028E+02	0.5618E+00	0.3281E+03	0.8042E+00	0.1125E+04	0.4498E+00	0.1757E+00	0.1091E+05	0.9902E-01	0.9960E+00	0.1795E-13
74	0.4951E+02	0.3232E+00	0.2138E+01	0.1797E+01	0.1201E+00	0.1191E+01	0.6141E-01	0.7462E+03	0.2294E+00	0.4576E+02	0.3832E+00	0.1123E+00	0.1139E+05	0.1238E-01	0.4610E+00	0.1495E-06
75	0.6769E+02	0.7657E+00	0.3480E+01	0.1041E+01	0.1538E+00	0.2203E+02	0.3324E+00	0.8460E+02	0.8583E+00	0.2682E+04	0.3336E+00	0.5088E+00	0.9610E+04	0.1386E+01	0.2470E+00	0.6361E-04
76	0.5753E+02	0.8937E+00	0.4867E+01	0.2526E+01	0.8558E-01	0.6606E+01	0.3787E+00	0.5333E+03	0.8090E+00	0.6179E+03	0.5893E+00	0.2157E+00	0.1028E+05	0.1050E-01	0.8700E-02	0.1153E-09
77	0.5029E+02	0.1284E+01	0.7489E+00	0.3424E+01	0.9767E-01	0.2222E+02	0.8729E+00	0.9971E+03	0.6175E+00	0.2572E+04	0.1183E+00	0.6547E+00	0.6020E+04	0.7702E+02	0.2320E+00	0.6195E-08
78	0.7785E+02	0.7307E+00	0.5107E+00	0.2201E+01	0.1108E+00	0.2443E+01	0.3750E+00	0.4693E+02	0.8261E+00	0.2556E+04	0.2856E+00	0.7132E+00	0.8835E+04	0.2390E-01	0.4300E+01	0.8251E-08
79	0.2303E+02	0.6079E+00	0.3575E+01	0.3672E+01	0.1017E+00	0.2184E+02	0.3143E+00	0.1946E+03	0.4433E+00	0.1982E+04	0.3117E+00	0.9348E+00	0.1053E+05	0.1650E-01	0.6000E-01	0.1017E-07
80	0.5802E+02	0.1172E+01	0.2039E+01	0.2802E+01	0.1496E+00	0.1024E+02	0.3349E+00	0.7183E+03	0.7082E+00	0.2845E+04	0.2509E+00	0.8834E+00	0.9262E+04	0.2350E-01	0.3000E+00	0.4100E-07
81	0.3402E+02	0.1104E+01	0.1664E+01	0.2501E+01	0.1790E+00	0.9637E+01	0.8024E+00	0.2194E+03	0.4901E+00	0.2054E+04	0.6463E+00	0.3851E+00	0.3050E+04	0.9902E-01	0.6130E+00	0.9218E-05
82	0.3850E+02	0.5915E+00	0.4509E+01	0.3118E+01	0.8872E-01	0.2464E+02	0.1589E+00	0.5889E+03	0.7424E+00	0.1928E+04	0.4963E+00	0.5415E-01	0.1173E+05	0.2773E-01	0.4050E+00	0.6615E-03
83	0.1528E+02	0.6697E+00	0.1766E+01	0.3903E+01	0.1041E-01	0.1265E+02	0.1781E+00	0.3344E+03	0.6785E+00	0.2036E+04	0.7213E+00	0.9928E-01	0.6879E+03	0.6863E-02	0.1100E-01	0.6602E-08
84	0.7218E+02	0.9112E+00	0.3066E+01	0.3541E+01	0.4868E-01	0.1431E+02	0.9942E+00	0.4329E+03	0.4819E+00	0.2013E+04	0.6501E+00	0.5810E+00	0.6200E+03	0.2390E-01	0.1150E+01	0.2766E-09
85	0.6602E+02	0.1216E+01	0.7605E+00	0.3609E+01	0.1553E+00	0.2777E+02	0.7752E+00	0.3761E+03	0.3960E+00	0.1516E+04	0.2082E+00	0.7939E+00	0.6997E+04	0.6931E+00	0.1250E+00	0.4780E-11
86	0.3296E+02	0.6986E+00	0.2123E+01	0.2897E+01	0.9951E-01	0.2624E+02	0.4923E+00	0.3636E+02	0.3285E+00	0.7545E+03	0.1572E+00	0.9864E+00	0.2833E+04	0.8774E-02	0.3500E-01	0.9136E-10
87	0.7019E+02	0.8183E+00	0.6435E+00	0.1593E+01	0.1774E+00	0.2915E+02	0.3007E+00	0.8917E+03	0.5560E+00	0.6803E+03	0.8141E+00	0.9663E+00	0.1003E+05	0.1155E+00	0.1170E+00	0.3588E-08
88	0.3574E+02	0.7084E+00	0.1010E+01	0.1255E+01	0.3340E-01	0.1871E+02	0.7017E+00	0.6810E+03	0.8683E+00	0.1167E+04	0.4182E+00	0.3905E-01	0.3478E+04	0.1523E-01	0.8600E-01	0.7073E-09
89	0.7348E+02	0.1926E+00	0.4834E+01	0.2336E+01	0.5076E-01	0.2247E+02	0.8335E+00	0.9045E+03	0.5079E+00	0.2824E+04	0.3645E+00	0.5542E+00	0.4897E+04	0.7702E-02	0.7000E-02	0.5298E-10
90	0.9662E+02	0.1038E+01	0.2849E+01	0.2471E+01	0.6366E-01	0.3919E+01	0.9821E+00	0.9821E+02	0.5420E+00	0.1531E+04	0.8473E+00	0.6391E+00	0.5130E+04	0.4332E-01	0.1300E+01	0.6650E-08
91	0.7967E+02	0.9884E+00	0.1199E+01	0.2974E+01	0.1100E+00	0.6372E+01	0.2912E+00	0.8234E+03	0.4614E+00	0.9912E+03	0.1917E+00	0.1763E+00	0.9101E+04	0.1491E-01	0.3200E-01	0.2211E-03
92	0.1636E+02	0.5291E+00	0.2391E+01	0.1505E+01	0.1160E-01	0.1122E+02	0.8420E+00	0.3963E+03	0.7994E-01	0.2733E+04	0.3160E+00	0.4036E+00	0.4629E+04	0.1155E+00	0.1600E-01	0.2675E-09
93	0.8222E+02	0.9054E+00	0.1637E+01	0.2635E+01	0.5118E-01	0.1578E+02	0.9196E+00	0.6035E+03	0.9132E+00	0.3414E+03	0.3078E+00	0.7795E+00	0.7775E+04	0.8664E-01	0.1040E+00	0.1141E-02
94	0.8647E+02	0.1359E+01	0.2747E+01	0.2041E+01	0.2700E-01	0.3805E+01	0.8501E-02	0.4498E+03	0.5970E+00	0.2686E+04	0.6257E+00	0.7184E+00	0.2287E+04	0.1733E+00	0.1150E+01	0.1015E-06
95	0.7624E+02	0.3506E+00	0.2803E+01	0.1742E+01	0.9999E-01	0.1200E+02	0.4512E+00	0.1909E+02	0.3236E-01	0.1354E+04	0.6992E+00	0.3370E+00	0.1126E+05	0.1650E-01	0.9500E-01	0.2473E-07
96	0.2775E+02	0.1432E+01	0.8158E+00	0.1028E+01	0.1047E+00	0.2722E+02	0.4028E+00	0.8447E+00	0.6703E+00	0.2593E+03	0.5997E+00	0.3100E+00	0.1943E+04	0.3466E+00	0.8000E-01	0.1838E-07
97	0.9968E+02	0.1220E+01	0.4401E+01	0.2999E+01	0.7768E-01	0.9431E+01	0.6169E+00	0.2259E+03	0.7353E+00	0.7346E+03	0.9454E+00	0.4325E+00	0.2778E+04	0.1980E+00	0.2010E+00	0.7684E-07
98	0.4399E+02	0.2647E+00	0.2663E+01	0.1901E+01	0.1815E+00	0.1590E+02	0.1579E-01	0.4128E+03	0.6032E+00	0.2115E+04	0.7387E+00	0.3909E+00	0.9233E+03	0.2567E-01	0.3250E+00	0.2457E-05
99	0.4720E+02	0.4313E+00	0.9252E+00	0.3161E+01	0.1302E+00	0.1705E+01	0.6567E+00	0.4621E+03	0.1321E-01	0.1914E+04	0.1959E+00	0.4392E+00	0.3612E+04	0.6863E-02	0.6533E+01	0.1119E-09
100	0.5962E+02	0.1379E+01	0.3389E+01	0.2559E+01	0.1716E+00	0.1142E+02	0.1902E+00	0.6393E+03	0.3782E-01	0.2334E+04	0.3997E+00	0.4192E+00	0.5349E+04	0.1540E+00	0.1130E+00	0.2059E-04
101	0.6071E+02	0.6509E+00	0.2716E+01	0.1806E+01	0.8078E-01	0.2838E+02	0.1190E+00	0.6182E+03	0.3773E+00	0.1433E+04	0.1075E+00	0.1183E+00	0.1767E+04	0.2236E-01	0.1200E-01	0.3236E-06
102	0.4237E+02	0.2063E+00	0.3852E+01	0.1716E+01	0.2950E-01	0.1656E+02	0.5339E-01	0.1463E+03	0.5199E-01	0.3615E+03	0.6804E+00	0.6860E+00	0.3878E+04	0.9627E-02	0.4400E+00	0.4330E-05
103	0.1273E+02	0.1194E+01	0.5465E+00	0.2278E+01	0.5416E-01	0.1110E+02	0.8718E+00	0.8580E+03	0.3496E+00	0.5946E+03	0.9299E+00	0.9727E+00	0.4285E+04	0.2888E-01	0.5031E+01	0.1519E-12
104	0.9824E+02	0.1444E+01	0.2480E+01	0.3650E+01	0.5884E-01	0.2412E+02	0.7451E+00	0.9215E+03	0.5291E+00	0.1150E+04	0.5719E+00	0.4865E+00	0.2588E+04	0.3648E-01	0.1570E+00	0.1106E-04
105	0.2885E+02	0.4427E+00	0.3353E+01	0.3975E+01	0.2028E-01	0.1479E+02	0.1714E+00	0.3003E+03	0.8872E+00	0.2197E+03	0.5817E+00	0.9466E+00	0.3446E+03	0.3014E-01	0.1110E+03	0.1542E-01
106	0.3153E+02	0.1099E+00	0.6710E+00	0.2857E+01	0.1059E+00	0.1609E+02	0.1364E+00	0.7306E+03	0.5172E+00	0.1560E+04	0.7679E-01	0.8385E+00	0.2669E+04	0.1899E-02	0.2000E-02	0.5758E-06
107	0.7254E+01	0.1210E+01	0.4741E+01	0.1355E+01	0.1388E+00	0.3651E+01	0.2067E+00	0.6649E+03	0.9267E+00	0.2302E+04	0.4238E+00	0.2673E+00	0.1011E+05	0.2311E-01	0.5800E-01	0.1285E-07
108	0.4388E+02	0.5996E+00	0.8310E+00	0.1825E+01	0.6824E-01	0.1527E+02	0.6948E+00	0.9663E+03	0.1016E+00	0.5605E+02	0.1629E-01	0.5682E+00	0.8545E+04	0.2567E-01	0.5100E-02	0.1335E-11
109	0.8942E+02	0.1067E+00	0.9026E+00	0.2420E+01	0.4372E-01	0.1782E+02	0.3323E-01	0.8088E+02	0.6883E+00	0.2709E+04	0.5112E+00	0.7459E+00	0.1141E+05	0.1980E+00	0.5000E-02	0.1158E-09
110	0.5095E+02	0.9293E+00	0.3506E+01	0.2490E+01	0.7341E-01	0.2493E+02	0.3598E+00	0.1036E+03	0.8755E+00	0.2937E+04	0.4605E+00	0.9131E+00	0.3710E+04	0.6301E-01	0.8400E-01	0.1993E-09
111	0.9264E+02	0.1238E+01	0.1074E+01	0.3880E+01	0.1933E+00	0.7001E+01	0.7655E-01	0.1169E+02	0.6413E+00	0.1337E+04	0.9791E+00	0.9553E+00	0.6896E+04	0.1308E-01	0.2800E-01	0.1469E-03
112	0.1179E+02	0.1056E+01	0.3913E+01	0.3416E+01	0.1212E+00	0.2472E+02	0.5118E+00	0.7581E+03	0.4207E-01	0.2538E+04	0.8665E+00	0.4111E+00	0.1045E+05	0.9181E-02	0.6160E+00	0.5708E-03
113	0.6825E+02	0.1278E+01	0.1747E+01	0.2741E+01	0.7640E-01	0.9266E+01	0.2823E+00	0.5779E+03	0.6930E+00	0.9714E+03	0.9648E+00	0.8998E+00	0.1009E+05	0.4163E-02	0.2350E+00	0.5647E-08
114	0.9107E+02	0.5244E+00	0.2423E+01	0.1338E+01	0.1416E+00	0.1333E+02	0.1042E+00	0.9072E+03	0.1085E+00	0.2878E+04	0.6565E+00	0.7078E+00	0.3285E+04	0.8664E-02	0.6400E-01	0.3547E-08
115	0.4453E+02	0.1228E+01	0.3007E+01	0.2088E+01	0.1474E+00	0.4416E+01	0.4562E+00	0.2300E+03	0.2889E+00	0.2876E+03	0.1095E-01	0.2702E+00	0.5470E+03	0.2009E-02	0.1100E-01	0.3824E-03
116	0.9958E+01	0.1112E+01	0.4911E+01	0.1946E+01	0.4612E-01	0.6776E+01	0.1749E+00	0.9304E+03	0.9862E+00	0.1624E+04	0.7047E+00	0.3166E+00	0.1071E+05	0.1899E-02	0.8800E-01	0.6614E-05

	u	h	b	s_1	h_w	ss	$m_{on,ss}$	DW	$m_{on,wb}$	•	•	•	E_x	k	K_{mp}	K_H
117	0.6710E+01	0.1791E+00	0.2684E+01	0.1532E+01	0.1537E-01	0.2637E+02	0.2290E+00	0.2069E+03	0.8515E+00	0.9189E+03	0.9274E+00	0.8118E+00	0.9278E+04	0.3894E-01	0.3440E+00	0.1315E-07
118	0.9009E+02	0.6148E+00	0.8940E+00	0.3045E+01	0.1138E+00	0.2271E+02	0.7351E+00	0.1928E+03	0.1411E+00	0.2861E+04	0.6199E+00	0.8161E+00	0.1897E+04	0.1320E-01	0.5200E-01	0.1238E-06
119	0.2058E+02	0.5175E+00	0.7140E+00	0.2611E+01	0.1962E+00	0.2442E+02	0.3617E-01	0.1768E+03	0.3222E+00	0.2493E+04	0.2429E+00	0.2337E+00	0.4175E+04	0.2773E+00	0.9600E-01	0.2855E-10
120	0.3973E+02	0.9706E+00	0.2241E+01	0.2113E+01	0.4750E-01	0.2000E+02	0.9572E+00	0.2899E+03	0.5048E+00	0.1053E+03	0.3690E+00	0.8078E-01	0.7095E+04	0.2666E-01	0.1166E+01	0.1585E-05
121	0.5894E+02	0.1454E+01	0.1035E+01	0.3798E+01	0.1589E+00	0.1628E+02	0.1954E+00	0.3779E+03	0.5761E+00	0.8358E+03	0.7587E+00	0.3833E+00	0.5141E+04	0.1980E+00	0.2080E+00	0.1637E-07
122	0.5613E+02	0.2956E+00	0.4084E+01	0.3460E+01	0.1021E+00	0.1379E+02	0.2548E+00	0.2756E+03	0.5787E+00	0.7822E+03	0.4380E-01	0.7601E+00	0.6725E+04	0.1066E+00	0.2330E+00	0.6441E-07
123	0.3445E+01	0.7562E+00	0.3280E+01	0.3007E+01	0.6700E-01	0.5406E+01	0.5091E+00	0.2406E+03	0.4387E+00	0.2090E+04	0.3297E+00	0.6156E+00	0.6377E+04	0.1899E-02	0.2810E+00	0.5604E-07
124	0.6347E+02	0.1477E+01	0.2372E+01	0.2824E+01	0.1506E-01	0.1516E+02	0.2195E+00	0.6984E+03	0.2841E+00	0.1061E+04	0.5379E+00	0.4718E+00	0.3804E+04	0.1980E-01	0.8300E-01	0.3554E-10
125	0.6725E+02	0.8541E+00	0.1686E+01	0.2365E+01	0.1678E+00	0.1551E+02	0.8139E+00	0.5070E+03	0.9417E+00	0.2264E+04	0.2148E+00	0.5211E+00	0.1081E+05	0.1575E-01	0.1930E+00	0.5272E-06
126	0.1441E+02	0.6347E+00	0.2345E+01	0.2656E+01	0.1821E+00	0.1016E+02	0.5350E+00	0.5426E+02	0.6970E+00	0.1862E+04	0.1663E+00	0.1269E+00	0.6836E+04	0.4780E-02	0.3500E-01	0.1216E-07
127	0.1804E+02	0.7914E+00	0.3112E+01	0.3073E+01	0.1616E+00	0.5684E+01	0.7719E+00	0.1605E+03	0.8851E-01	0.2208E+04	0.5361E-01	0.2764E+00	0.1149E+05	0.1593E-01	0.1100E-01	0.1182E-04
128	0.2272E+01	0.1270E+01	0.1171E+01	0.3180E+01	0.2453E-01	0.4648E+01	0.4470E+00	0.3172E+03	0.9029E+00	0.2960E+04	0.7470E+00	0.1835E+00	0.3411E+04	0.1066E+00	0.4760E+00	0.2059E-06
129	0.3121E+02	0.4502E+00	0.5943E+00	0.1987E+01	0.1367E+00	0.7704E+01	0.5199E+00	0.3460E+03	0.4578E+00	0.3974E+03	0.4412E+00	0.6517E+00	0.8454E+03	0.3151E-01	0.7000E-01	0.4677E-02
130	0.4019E+02	0.1092E+01	0.9695E+00	0.3255E+01	0.7975E-01	0.2743E+02	0.9114E+00	0.8305E+03	0.6351E+00	0.2636E+04	0.7188E+00	0.3707E+00	0.4075E+04	0.8351E-02	0.1160E+00	0.1738E-08
131	0.7511E+02	0.8797E+00	0.2641E+01	0.1289E+01	0.2202E-01	0.1393E+02	0.4413E+00	0.5019E+03	0.4700E+00	0.1285E+04	0.5991E+00	0.1477E-01	0.7037E+04	0.7296E-01	0.3484E+01	0.4416E-01
132	0.7699E+02	0.1084E+01	0.2204E+01	0.1004E+01	0.1639E-01	0.1801E+02	0.9091E+00	0.2466E+03	0.3393E+00	0.2987E+04	0.3110E-01	0.8842E-01	0.1034E+05	0.6027E-01	0.2510E+00	0.2774E-04
133	0.8557E+02	0.5494E+00	0.7801E+00	0.3780E+01	0.1435E+00	0.2037E+02	0.1233E+00	0.5516E+03	0.6077E+00	0.1486E+04	0.6924E+00	0.1999E+00	0.7503E+04	0.6301E-01	0.7500E-01	0.1951E+00
134	0.2716E+02	0.7809E+00	0.1550E+01	0.2590E+01	0.1089E+00	0.1319E+02	0.2588E+00	0.9384E+03	0.8647E+00	0.1606E+04	0.7264E+00	0.5488E+00	0.9442E+04	0.3961E-01	0.4020E+00	0.1274E-05
135	0.8090E+02	0.1328E+01	0.2988E+01	0.1182E+01	0.1333E+00	0.7426E+01	0.6408E+00	0.7100E+03	0.7689E+00	0.2426E+04	0.2359E+00	0.6474E+00	0.5769E+04	0.1540E+00	0.9190E+00	0.3978E-06
136	0.4808E+02	0.7156E+00	0.4442E+01	0.1636E+01	0.1622E+00	0.8596E+01	0.7093E+00	0.9781E+03	0.2521E+00	0.1921E+03	0.3495E+00	0.6363E+00	0.1193E+05	0.2829E-01	0.1030E+00	0.5559E-03
137	0.5556E+02	0.6369E+00	0.3811E+01	0.3935E+01	0.3256E-01	0.7856E+01	0.2055E+00	0.3628E+03	0.1374E+00	0.2309E+04	0.2607E-01	0.2060E+00	0.8363E+04	0.1925E-01	0.1800E-02	0.7030E-06
138	0.5654E+01	0.8431E+00	0.4197E+01	0.3196E+01	0.1130E+00	0.2930E+02	0.5731E+00	0.1057E+03	0.3684E+00	0.2003E+04	0.4736E+00	0.5854E+00	0.4825E+03	0.5251E-02	0.5900E-01	0.1755E-05
139	0.2083E+02	0.1133E+01	0.1222E+01	0.2733E+01	0.1582E+00	0.5326E+01	0.7840E+00	0.9933E+03	0.9747E+00	0.9482E+03	0.7655E+00	0.8416E+00	0.1132E+05	0.6027E-01	0.1150E+03	0.1271E-05
140	0.9719E+02	0.6891E+00	0.4321E+01	0.1121E+01	0.1312E+00	0.8296E+01	0.9856E+00	0.1223E+03	0.3835E+00	0.1246E+04	0.7629E+00	0.5765E-01	0.7626E+04	0.1980E-01	0.6540E+01	0.6390E-07
141	0.2141E+02	0.8871E+00	0.9999E+00	0.1718E+01	0.1999E+00	0.2093E+02	0.5945E+00	0.1800E+03	0.4951E+00	0.1093E+04	0.3930E+00	0.9475E-01	0.1174E+05	0.9902E-01	0.1164E+01	0.3396E-09
142	0.2517E+02	0.1368E+01	0.2949E+01	0.3209E+01	0.1727E+00	0.1489E+02	0.8805E-01	0.9836E+03	0.9057E+00	0.2605E+04	0.2861E+00	0.2615E+00	0.5815E+04	0.8155E-02	0.6330E+00	0.1014E-03
143	0.7070E+02	0.2393E+00	0.3743E+01	0.3149E+01	0.2655E-01	0.2839E+02	0.3151E-02	0.7393E+03	0.1684E+00	0.2792E+04	0.5535E+00	0.4919E+00	0.9913E+04	0.1980E-01	0.2900E-01	0.2113E-05
144	0.9511E+02	0.9974E+00	0.4009E+01	0.1858E+01	0.1247E+00	0.2174E+02	0.7932E+00	0.2358E+03	0.1236E+00	0.8986E+03	0.7100E+00	0.9098E+00	0.6216E+04	0.3301E-02	0.2900E-01	0.5753E-06
145	0.6198E+02	0.1463E+01	0.4256E+01	0.1469E+01	0.2103E-01	0.2165E+01	0.7815E+00	0.7136E+03	0.2739E+00	0.1754E+04	0.5835E+00	0.7905E+00	0.3172E+04	0.3555E-01	0.9850E+00	0.6344E-07
146	0.4663E+02	0.2588E+00	0.1120E+01	0.2322E+01	0.2527E-01	0.8882E+01	0.8969E+00	0.9400E+03	0.2960E+00	0.7176E+03	0.6787E-01	0.8963E+00	0.8719E+04	0.6027E-01	0.1200E-01	0.7158E-05
147	0.2362E+02	0.1263E+01	0.3026E+01	0.2549E+01	0.3123E-01	0.2949E+02	0.6101E+00	0.7726E+03	0.1869E+00	0.2480E+03	0.8274E+00	0.2793E-01	0.4371E+04	0.1386E+01	0.1790E+00	0.6007E-07
148	0.9775E+02	0.1029E+01	0.4212E+01	0.2956E+01	0.1633E+00	0.1930E+02	0.6872E+00	0.1648E+03	0.3347E+00	0.3527E+02	0.4791E+00	0.4754E-01	0.8208E+04	0.1066E-01	0.3900E+00	0.1526E-04
149	0.5537E+02	0.1371E+01	0.1439E+01	0.1332E+01	0.4985E-01	0.2751E+01	0.7591E+00	0.5946E+02	0.1129E+00	0.2246E+04	0.5614E+00	0.8697E+00	0.1080E+05	0.5332E-01	0.1085E+01	0.1489E-11
150	0.9579E+02	0.1047E+01	0.1537E+01	0.3232E+01	0.8709E-01	0.1809E+02	0.8628E+00	0.8872E+03	0.4102E+00	0.6004E+03	0.6368E+00	0.2664E-01	0.4771E+04	0.1980E+00	0.1000E+00	0.1443E+01
151	0.3659E+02	0.5790E+00	0.2191E+01	0.1665E+01	0.1857E-01	0.2736E+02	0.5791E+00	0.4976E+03	0.2621E+00	0.1674E+04	0.8431E+00	0.3237E+00	0.7572E+04	0.5023E-02	0.1190E+00	0.2221E-09
152	0.1420E+02	0.1153E+01	0.1797E+01	0.1838E+01	0.4452E-01	0.1940E+02	0.7819E-01	0.7271E+02	0.8806E+00	0.2185E+04	0.1111E+00	0.8215E+00	0.6767E+04	0.1899E-02	0.1330E+00	0.7841E-03
153	0.6307E+02	0.1663E+00	0.5740E+00	0.2314E+01	0.1270E-01	0.1914E+02	0.4876E+00	0.6844E+03	0.7909E+00	0.4368E+03	0.9497E+00	0.1556E+00	0.8781E+04	0.3466E-01	0.7000E-02	0.4467E-07
154	0.8138E+02	0.7735E+00	0.4036E+01	0.1608E+01	0.1259E+00	0.2052E+02	0.2857E+00	0.3909E+02	0.2062E+00	0.7703E+02	0.3238E+00	0.3008E+00	0.6411E+04	0.1195E-01	0.4000E-01	0.3179E+00
155	0.5313E+02	0.2225E+00	0.4566E+01	0.3310E+01	0.5962E-01	0.4362E+01	0.4196E+00	0.4521E+03	0.7147E+00	0.2885E+04	0.3829E-01	0.3546E+00	0.9990E+04	0.1540E+00	0.5000E-02	0.1928E-07
156	0.2808E+01	0.7010E+00	0.2056E+01	0.3839E+01	0.5441E-01	0.2362E+02	0.5835E-01	0.5129E+03	0.3595E+00	0.1386E+04	0.7997E+00	0.5902E+00	0.6505E+04	0.1712E-01	0.1345E+01	0.2461E-06
157	0.5208E+02	0.2801E+00	0.1816E+01	0.1310E+01	0.7165E-01	0.1175E+02	0.6937E+00	0.1337E+03	0.3061E+00	0.1971E+04	0.9148E+00	0.7265E+00	0.8133E+04	0.3466E+01	0.1972E+01	0.1028E-04
158	0.2618E+02	0.1101E+01	0.8591E+00	0.2409E+01	0.1462E+00	0.2586E+02	0.3615E+00	0.3094E+03	0.6776E+00	0.1013E+03	0.5527E-01	0.6059E+00	0.4549E+04	0.1386E+01	0.5060E+00	0.3352E-07
159	0.7261E+02	0.1507E+00	0.1969E+01	0.3617E+01	0.1181E+00	0.2707E+02	0.8280E+00	0.3596E+03	0.2363E+00	0.1444E+04	0.8702E+00	0.8633E+00	0.9571E+04	0.6245E-02	0.5650E+00	0.1119E-05
160	0.8392E+02	0.6775E+00	0.2753E+01	0.3648E+01	0.5770E-01	0.1881E+02	0.7216E+00	0.7051E+03	0.7872E+00	0.2363E+04	0.5583E+00	0.1694E+00	0.9478E+04	0.3301E-01	0.8500E-01	0.1908E-05
161	0.7388E+02	0.1163E+01	0.1270E+01	0.1953E+01	0.7254E-01	0.2009E+02	0.4250E+00	0.2564E+03	0.2556E-01	0.2387E+04	0.2733E+00	0.9390E+00	0.7976E+04	0.1238E-01	0.1700E-01	0.1396E-11
162	0.9148E+02	0.8240E+00	0.3888E+01	0.1549E+01	0.1534E+00	0.1408E+02	0.4768E-01	0.8650E+03	0.5693E+00	0.2784E+04	0.6677E+00	0.7670E+00	0.5296E+04	0.4780E-01	0.8620E+00	0.5530E-05
163	0.8029E+02	0.1302E+01	0.3580E+01	0.3237E+01	0.1443E+00	0.2552E+02	0.1410E+00	0.4048E+03	0.7295E+00	0.1319E+04	0.2117E+00	0.4998E+00	0.2175E+04	0.2236E-01	0.1300E+01	0.6782E-09
164	0.3755E+02	0.3847E+00	0.3788E+01	0.1268E+01	0.1511E+00	0.8482E+01	0.3265E+00	0.6518E+03	0.5152E+00	0.9400E+03	0.4117E+00	0.5736E+00	0.1159E+05	0.5059E-02	0.3550E+00	0.1185E-16
165	0.3942E+02	0.1225E+00	0.4630E+01	0.2057E+01	0.1126E+00	0.3229E+01	0.1639E+00	0.4173E+03	0.4178E+00	0.4046E+03	0.9523E+00	0.5596E+00	0.7292E+04	0.6932E-01	0.8000E-01	0.1101E-05
166	0.3557E+02	0.1429E+00	0.4884E+01	0.2906E+01	0.1031E+00	0.2129E+02	0.8475E+00	0.1198E+03	0.6331E+00	0.1631E+04	0.6714E+00	0.8282E+00	0.7837E+03	0.1800E-01	0.5840E+01	0.4993E-05
167	0.6679E+02	0.5890E+00	0.1288E+01	0.3358E+01	0.6565E-01	0.2664E+02	0.8608E+00	0.8399E+01	0.8113E+00	0.5329E+03	0.4660E-01	0.1444E+00	0.2507E+04	0.1800E-01	0.8160E+00	0.8586E-08
168	0.5420E+02	0.8717E+00	0.3710E+01	0.1401E+01	0.1667E+00	0.2687E+02	0.4804E+00	0.5704E+03	0.4551E+00	0.6556E+03	0.2382E+00	0.5269E+00	0.9040E+04	0.1238E-01	0.2137E+01	0.5612E-05
169	0.1570E+02	0.7434E+00	0.1915E+01	0.3922E+01	0.6937E-01	0.1849E+01	0.6355E+00	0.9277E+03	0.4291E+00	0.1078E+04	0.2018E+00	0.6040E+00	0.2731E+04	0.1980E+00	0.4700E-02	0.1968E-07
170	0.4184E+02	0.1135E+01	0.4587E+01	0.3558E+01	0.1223E+00	0.1304E+02	0.5438E+00	0.6138E+03	0.6133E+00	0.2169E+04	0.4900E+00	0.8550E+00	0.1512E+04	0.3984E-02	0.2800E-01	0.3533E-07
171	0.9287E+02	0.1718E+00	0.1127E+01	0.2846E+01	0.2271E-01	0.1981E+02	0.9435E+00	0.5179E+03	0.9289E-01	0.1702E+04	0.7817E-01	0.8385E-02	0.5982E+04	0.2476E-01	0.1000E+01	0.7241E-03
172	0.6087E+01	0.4412E+00	0.2311E+01	0.1137E+01	0.3503E-01	0.3277E+01	0.3447E+00	0.8544E+03	0.4129E+00	0.1422E+04	0.3765E+00	0.5365E+00	0.1701E+04	0.3224E-02	0.3500E+01	0.5348E-04
173	0.8483E+02	0.1387E+00	0.3539E+01	0.1899E+01	0.3774E-01	0.2970E+01	0.1077E+00	0.8491E+03	0.9825E+00	0.2279E+04	0.4320E+00	0.1919E+00	0.5599E+04	0.1733E+00	0.1800E+03	0.1379E-09
174	0.5993E+02	0.3978E+00	0.3153E+01	0.1109E+01	0.5241E-01	0.2310E+02	0.5476E+00	0.6500E+02	0.4754E+00	0.2928E+04	0.1814E+00	0.7711E+00	0.7231E+04	0.1238E-01	0.1110E+00	0.9674E-07

	u	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_H
175	0.4086E+02	0.6598E+00	0.4530E+01	0.2389E+01	0.7926E-01	0.2996E+02	0.4678E+00	0.3674E+03	0.2591E+00	0.8256E+03	0.2955E+00	0.4523E+00	0.3403E+04	0.7374E-02	0.2075E+01	0.5312E-10
176	0.7678E+02	0.3263E+00	0.2504E+01	0.2575E+01	0.1175E+00	0.1842E+02	0.9487E+00	0.7721E+03	0.9914E-01	0.1767E+04	0.5055E+00	0.3756E+00	0.5480E+04	0.6931E+00	0.1000E-03	0.4009E-03
177	0.1235E+02	0.5428E+00	0.3612E+01	0.3062E+01	0.9066E-01	0.1148E+02	0.7272E+00	0.5606E+03	0.4482E+00	0.2515E+04	0.8973E+00	0.1417E+00	0.4011E+04	0.2100E-01	0.6200E+01	0.7114E-07
178	0.5265E+02	0.3101E+00	0.3176E+01	0.1248E+01	0.1116E+00	0.1675E+02	0.8858E+00	0.6101E+03	0.8187E+00	0.1711E+04	0.2981E+00	0.7340E+00	0.6142E+04	0.4621E+00	0.6100E-01	0.5905E-08
179	0.1654E+02	0.2409E+00	0.3666E+01	0.3960E+01	0.1341E+00	0.2074E+02	0.8073E+00	0.9719E+03	0.2196E+00	0.2071E+04	0.5130E+00	0.7561E+00	0.1113E+05	0.3151E-01	0.1420E+01	0.1399E-06
180	0.7953E+02	0.1448E+01	0.3988E+01	0.3755E+01	0.3588E-01	0.1286E+02	0.9389E+00	0.6720E+03	0.9640E+00	0.2097E+03	0.1755E-01	0.9599E+00	0.9706E+04	0.4951E-01	0.1840E+01	0.4966E-07
min	0.1390E+01	0.1067E+00	0.5110E+00	0.1004E+01	0.1040E-01	0.1010E+01	0.3200E-02	0.8000E+00	0.5300E-02	0.3500E+02	0.3900E-02	0.2000E-03	0.3450E+03	0.6904E-04	0.1000E-05	0.1190E-16
max	0.9968E+02	0.1492E+01	0.4982E+01	0.3991E+01	0.1999E+00	0.2996E+02	0.9969E+00	0.9970E+03	0.9970E+00	0.2987E+04	0.9871E+00	0.9864E+00	0.1199E+05	0.7702E+02	0.1800E+03	0.2576E+01
mean	0.5051E+02	0.8000E+00	0.2751E+01	0.2500E+01	0.1034E+00	0.1550E+02	0.4999E+00	0.4998E+03	0.4999E+00	0.1510E+04	0.4950E+00	0.4951E+00	0.6271E+04			

Annex 9 Sample of system parameters (including the three sensitive process parameters) after randomization of the insensitive parameters

	u	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_H
1	0.6468E+02	0.9740E+00	0.4400E+01	0.3310E+01	0.9279E-01	0.2572E+02	0.2224E+00	0.8399E+01	0.4178E+00	0.1461E+04	0.5527E-01	0.5269E+00	0.9772E+04	0.2773E+00	0.1500E-01	0.1887E-06
2	0.5155E+02	0.1147E+01	0.1120E+01	0.2113E+01	0.5674E-01	0.1459E+02	0.4876E+00	0.3344E+03	0.2797E+00	0.4368E+03	0.7525E+00	0.8385E+00	0.1180E+05	0.5251E-01	0.1000E+00	0.2576E+01
3	0.6970E+02	0.1417E+01	0.2959E+01	0.2575E+01	0.1988E+00	0.1751E+02	0.6141E-01	0.5019E+03	0.3236E-01	0.5624E+03	0.9299E+00	0.6976E+00	0.8189E+04	0.3301E-01	0.1069E+01	0.4000E-05
4	0.1045E+02	0.2136E+00	0.1288E+01	0.2460E+01	0.1854E+00	0.1192E+02	0.1520E+00	0.4349E+03	0.6175E+00	0.8902E+03	0.6158E+00	0.8842E-01	0.1064E+04	0.1925E-01	0.8100E-01	0.5944E-07
5	0.7159E+02	0.1473E+01	0.2753E+01	0.2071E+01	0.4009E-01	0.1451E+02	0.4752E+00	0.2194E+03	0.7010E+00	0.4278E+03	0.7100E+00	0.3445E+00	0.8505E+04	0.3224E-02	0.1700E-01	0.1248E-12
6	0.2666E+02	0.8072E+00	0.8158E+00	0.1968E+01	0.1740E+00	0.2751E+01	0.4768E-01	0.6810E+03	0.2165E+00	0.3974E+03	0.1814E+00	0.4325E+00	0.1119E+05	0.2310E+00	0.5500E-01	0.1104E-02
7	0.1747E+02	0.3573E+00	0.3345E+01	0.1121E+01	0.1945E+00	0.1024E+02	0.7651E+00	0.6354E+03	0.9862E+00	0.1053E+03	0.3560E+00	0.5941E+00	0.8976E+04	0.1386E+01	0.1330E-01	0.6560E-06
8	0.8856E+02	0.1294E+01	0.1969E+01	0.3007E+01	0.1655E+00	0.1431E+02	0.2152E+00	0.5854E+03	0.6883E+00	0.4046E+03	0.3997E+00	0.2936E+00	0.6617E+04	0.8252E-02	0.2060E-01	0.2008E-09
9	0.9469E+02	0.5674E+00	0.2039E+01	0.1575E+01	0.1195E+00	0.2037E+02	0.2774E+00	0.4498E+03	0.4433E+00	0.2309E+04	0.7970E+00	0.7561E+00	0.3973E+04	0.2133E-01	0.2210E+00	0.3893E-06
10	0.2414E+02	0.4631E+00	0.1816E+01	0.1469E+01	0.6086E-01	0.1628E+02	0.6491E+00	0.9304E+03	0.7994E-01	0.2960E+04	0.8322E+00	0.6266E+00	0.4209E+04	0.1386E+01	0.4400E-01	0.1139E-08
11	0.2017E+02	0.1257E+01	0.2267E+01	0.1210E+01	0.1576E+00	0.1265E+02	0.7093E+00	0.3674E+03	0.8398E+00	0.2232E+04	0.2607E-01	0.1757E+00	0.9358E+04	0.7702E-02	0.6400E-01	0.9754E-04
12	0.5311E+01	0.3918E+00	0.2849E+01	0.1636E+01	0.1403E+00	0.1940E+02	0.8501E-02	0.3130E+03	0.4129E+00	0.2169E+04	0.6359E-01	0.6898E+00	0.4411E+04	0.5776E+00	0.1100E-01	0.5763E-03
13	0.5680E+02	0.9608E+00	0.1222E+01	0.2201E+01	0.1605E+00	0.2174E+02	0.2548E+00	0.6558E+03	0.5079E+00	0.4519E+03	0.1663E+00	0.2157E+00	0.1362E+04	0.8252E-02	0.1700E-01	0.1585E-05
14	0.9446E+02	0.5559E+00	0.3575E+01	0.1454E+01	0.1712E+00	0.1379E+02	0.7932E+00	0.1648E+03	0.6351E+00	0.2634E+04	0.4498E+00	0.3991E+00	0.3846E+04	0.4621E+00	0.6300E+00	0.2598E-07
15	0.8826E+02	0.1392E+01	0.1074E+01	0.3755E+01	0.1269E+00	0.7161E+01	0.4250E+00	0.3636E+02	0.7165E-01	0.1305E+04	0.1419E+00	0.8998E+00	0.7828E+04	0.3466E+00	0.4800E-01	0.1517E-07
16	0.7098E+02	0.8557E+00	0.2171E+01	0.1770E+01	0.8704E-01	0.2624E+02	0.3787E+00	0.2972E+03	0.8261E+00	0.1624E+04	0.3832E+00	0.5321E+00	0.1124E+05	0.8664E+00	0.3400E+00	0.1010E-05
17	0.6391E+02	0.2507E+00	0.4658E+01	0.2222E+01	0.5606E-01	0.1489E+02	0.2621E+00	0.8460E+02	0.5620E+00	0.6179E+03	0.1075E+00	0.3100E+00	0.5904E+04	0.2310E-02	0.2630E+00	0.3399E-04
18	0.4288E+02	0.1007E+01	0.2914E+01	0.1901E+01	0.1334E-01	0.9431E+01	0.3617E-01	0.6984E+03	0.7185E+00	0.2885E+04	0.4736E+00	0.8215E+00	0.7748E+04	0.6301E-01	0.6400E-01	0.2328E-07
19	0.4773E+02	0.3485E+00	0.4050E+01	0.2526E+01	0.1272E+00	0.6054E+01	0.4108E+00	0.7992E+03	0.3684E+00	0.4783E+03	0.6257E+00	0.7132E+00	0.1307E+04	0.6601E-01	0.2000E-01	0.9270E-07
20	0.6492E+02	0.1176E+01	0.3666E+01	0.1742E+01	0.1970E+00	0.2145E+02	0.1077E+00	0.8808E+03	0.9825E+00	0.1319E+04	0.2755E+00	0.7711E+00	0.2235E+04	0.2069E-01	0.1000E-01	0.1061E-08
21	0.6549E+02	0.2287E+00	0.1035E+01	0.1255E+01	0.7530E-01	0.2103E+02	0.4512E+00	0.6138E+03	0.5693E+00	0.7104E+03	0.9737E+00	0.7464E-01	0.4481E+04	0.6900E-04	0.6000E-01	0.6013E-10
22	0.9092E+01	0.8657E+00	0.2288E+01	0.3196E+01	0.4524E-01	0.1242E+02	0.5350E+00	0.5129E+03	0.8465E+00	0.1205E+04	0.9096E+00	0.4919E+00	0.1170E+04	0.3466E+00	0.2900E-01	0.1874E-05
23	0.5443E+02	0.3095E+00	0.1199E+01	0.3500E+01	0.1429E+00	0.2893E+02	0.9389E+00	0.4830E+03	0.1316E+00	0.1191E+04	0.5997E+00	0.8769E+00	0.6107E+04	0.8155E-01	0.3760E+00	0.7881E-08
24	0.3691E+02	0.9332E+00	0.4911E+01	0.3830E+01	0.1463E+00	0.2915E+02	0.1639E+00	0.7100E+03	0.7641E+00	0.1643E+04	0.4320E+00	0.9444E+00	0.1104E+05	0.1386E+00	0.1590E+00	0.2794E-05
25	0.7545E+02	0.2004E+00	0.1664E+01	0.2755E+01	0.1288E+00	0.1200E+02	0.8024E+00	0.3281E+03	0.7734E+00	0.8986E+03	0.4182E+00	0.3756E+00	0.9750E+04	0.5100E-03	0.7200E-01	0.1878E-10
26	0.3946E+01	0.7495E+00	0.3843E+01	0.3975E+01	0.9363E-01	0.2028E+02	0.5618E+00	0.3393E+03	0.2052E+00	0.1125E+04	0.5489E+00	0.3833E+00	0.1058E+05	0.1386E+01	0.2930E+00	0.2025E-06
27	0.1821E+02	0.5607E+00	0.1245E+01	0.3332E+01	0.1952E+00	0.2310E+02	0.7591E+00	0.6518E+03	0.7689E+00	0.2987E+04	0.6787E-01	0.7670E+00	0.5671E+04	0.9242E-02	0.1100E-01	0.1639E-06
28	0.2806E+02	0.1316E+01	0.3751E+01	0.1182E+01	0.6712E-01	0.5684E+01	0.4118E-01	0.9663E+03	0.2196E+00	0.2686E+04	0.4412E+00	0.9663E+00	0.9188E+04	0.5332E-01	0.1000E-01	0.6248E-07
29	0.4154E+02	0.1204E+01	0.1127E+01	0.1532E+01	0.1237E+00	0.2129E+02	0.6746E+00	0.6182E+03	0.8806E+00	0.2538E+04	0.8457E-01	0.4773E+00	0.9536E+03	0.1540E+00	0.2300E+00	0.3189E-01
30	0.1887E+01	0.1307E+01	0.1460E+01	0.3237E+01	0.8949E-01	0.5956E+01	0.2067E+00	0.8962E+03	0.8515E+00	0.1687E+04	0.2955E+00	0.1368E+00	0.8619E+04	0.6932E-01	0.8700E-01	0.7731E-05
31	0.7901E+02	0.8125E+00	0.1941E+01	0.2291E+01	0.1806E+00	0.6853E+01	0.3995E+00	0.3460E+03	0.4901E+00	0.1268E+04	0.8274E+00	0.3329E+00	0.1004E+05	0.2100E-01	0.4420E+00	0.1925E-04
32	0.2534E+02	0.1352E+01	0.3094E+01	0.1505E+01	0.9692E-01	0.2464E+02	0.8628E+00	0.2466E+03	0.1081E-01	0.1433E+04	0.2429E+00	0.3166E+00	0.5243E+04	0.1386E+00	0.1410E+00	0.1330E-06
33	0.5369E+02	0.1014E+01	0.4946E+01	0.1066E+01	0.1486E+00	0.2166E+01	0.6639E+00	0.7051E+03	0.2363E+00	0.4840E+03	0.6992E+00	0.2814E+00	0.1595E+04	0.8719E-02	0.1030E+00	0.2446E-08
34	0.5871E+02	0.1075E+01	0.2123E+01	0.3743E+01	0.1643E+00	0.2796E+02	0.1902E+00	0.2690E+03	0.6413E+00	0.1818E+04	0.8379E+00	0.5017E+00	0.1018E+05	0.2773E-01	0.6100E-01	0.5729E-06
35	0.8262E+02	0.4664E+00	0.5465E+00	0.2023E+01	0.1062E+00	0.9637E+01	0.8729E+00	0.6035E+03	0.8969E+00	0.1971E+04	0.7909E+00	0.5810E+00	0.4732E+04	0.7146E-02	0.5330E+01	0.6303E-07
36	0.6097E+02	0.9177E+00	0.3480E+01	0.2999E+01	0.1165E+00	0.7704E+01	0.6532E+00	0.9119E+03	0.9640E+00	0.1560E+04	0.6199E+00	0.2523E+00	0.4646E+03	0.3466E+02	0.8300E-02	0.1254E-03
37	0.8318E+02	0.1022E+01	0.4298E+01	0.3707E+01	0.9519E-01	0.1016E+02	0.9572E+00	0.2788E+03	0.5962E-01	0.1150E+04	0.5751E+00	0.2258E+00	0.3127E+04	0.6601E-01	0.1000E-03	0.1588E-07
38	0.4880E+02	0.1492E+01	0.9695E+00	0.2559E+01	0.3028E-01	0.2287E+02	0.3750E+00	0.4521E+03	0.5233E+00	0.2197E+03	0.7047E+00	0.3546E+00	0.9859E+04	0.1824E+00	0.4280E+00	0.7178E-08
39	0.8477E+01	0.9527E+00	0.2663E+01	0.2057E+01	0.1749E+00	0.2222E+02	0.8969E+00	0.7581E+03	0.3222E+00	0.7822E+03	0.2590E+00	0.2664E-01	0.4971E+04	0.1925E-01	0.2000E+01	0.9707E-08
40	0.8594E+02	0.7278E+00	0.2311E+01	0.3812E+01	0.1865E+00	0.2874E+02	0.2714E+00	0.9735E+03	0.2432E+00	0.1862E+04	0.6368E+00	0.4036E+00	0.3579E+04	0.2476E-01	0.1400E+00	0.7684E-13
41	0.3264E+02	0.3764E+00	0.1496E+01	0.3358E+01	0.1392E+00	0.5406E+01	0.5046E+00	0.8937E+02	0.9057E+00	0.6556E+03	0.1917E+00	0.2450E+00	0.6601E+04	0.8830E-02	0.1660E+00	0.1235E-03
42	0.3069E+02	0.1126E+01	0.3007E+01	0.3118E+01	0.1698E+00	0.1890E+02	0.9740E+00	0.1463E+03	0.8316E+00	0.1516E+04	0.9497E+00	0.8644E+00	0.2984E+04	0.3151E+00	0.2520E+00	0.7671E-07
43	0.4908E+02	0.4804E+00	0.1705E+01	0.3617E+01	0.1841E+00	0.1647E+02	0.3007E+00	0.5606E+03	0.3146E+00	0.2593E+04	0.7213E+00	0.8161E+00	0.5723E+04	0.3466E+02	0.1440E+00	0.9497E-01
44	0.9202E+02	0.4153E+00	0.4834E+01	0.3903E+01	0.9226E-01	0.1578E+02	0.8718E+00	0.3539E+03	0.3061E+00	0.1407E+04	0.1183E+00	0.8697E+00	0.1097E+05	0.1824E-01	0.1900E-01	0.2952E-13
45	0.9348E+02	0.1339E+01	0.1797E+01	0.3103E+01	0.1075E+00	0.8296E+01	0.5731E+00	0.2756E+03	0.2477E+00	0.2090E+04	0.8431E+00	0.9098E+00	0.7204E+04	0.1540E+00	0.1558E+01	0.4207E-07
46	0.6219E+02	0.3385E+00	0.2641E+01	0.1919E+01	0.1033E+00	0.1871E+02	0.8524E+00	0.8580E+03	0.6256E+00	0.2446E+04	0.4117E+00	0.2673E+00	0.2369E+04	0.6418E-02	0.4000E-01	0.2401E-07
47	0.9425E+01	0.4866E+00	0.3242E+01	0.1493E+01	0.9564E-01	0.1035E+02	0.4804E+00	0.4621E+03	0.2960E+00	0.7346E+03	0.6854E+00	0.6860E+00	0.1165E+05	0.8155E-02	0.1400E-01	0.8444E-07
48	0.7838E+02	0.1618E+00	0.2684E+01	0.2771E+01	0.1239E+00	0.2774E+02	0.7112E+00	0.5704E+03	0.4482E+00	0.5336E+03	0.4963E+00	0.2060E+00	0.2433E+04	0.8774E-02	0.4300E-01	0.1837E-03
49	0.4529E+02	0.4092E+00	0.3690E+01	0.2897E+01	0.6398E-01	0.8482E+01	0.3324E+00	0.8234E+03	0.1016E+00	0.1013E+03	0.7188E+00	0.1999E+00	0.8307E+04	0.1980E+00	0.1270E-01	0.5612E-03
50	0.1861E+02	0.2923E+00	0.1854E+01	0.1953E+01	0.1894E+00	0.2552E+02	0.4138E+00	0.3247E+03	0.4700E+00	0.1093E+04	0.2018E+00	0.6458E-01	0.5411E+04	0.4201E-01	0.2280E+00	0.1014E-06
51	0.7451E+02	0.6664E+00	0.4722E+01	0.2016E+01	0.8354E-01	0.3805E+01	0.1042E+00	0.2552E+03	0.2685E+00	0.2334E+04	0.4632E+00	0.9829E+00	0.7433E+04	0.2773E+00	0.2150E+00	0.1228E-10
52	0.6890E+02	0.6266E+00	0.4009E+01	0.2244E+01	0.2827E-01	0.1527E+02	0.4331E+00	0.2050E+03	0.8042E+00	0.7688E+03	0.4380E-01	0.9131E+00	0.4838E+04	0.1899E-01	0.1000E-03	0.6085E-14
53	0.1339E+02	0.9797E+00	0.1270E+01	0.2620E+01	0.1788E+00	0.4107E+01	0.6676E+00	0.7517E+03	0.6445E+00	0.3208E+03	0.1494E+00	0.2239E+00	0.1023E+05	0.3224E-01	0.1270E-01	0.3772E-03
54	0.9863E+02	0.1492E+01	0.4530E+01	0.2122E+01	0.1320E+00	0.2611E+02	0.2469E+00	0.9836E+03	0.9914E-01	0.2185E+04	0.7264E+00	0.7459E+00	0.7905E+04	0.1980E+00	0.2020E+00	0.2354E-05
55	0.3507E+02	0.1065E+01	0.4867E+01	0.2846E+01	0.1689E+00	0.1809E+02	0.7216E+00	0.3761E+03	0.2621E+00	0.8042E+03	0.7354E+00	0.7413E+00	0.1873E+04	0.1333E-01	0.1100E-01	0.3300E-10
56	0.3001E+02	0.2754E+00	0.4197E+01	0.3935E+01	0.8452E-01	0.1356E+02	0.3598E+00	0.9277E+03	0.5420E+00	0.1843E+03	0.5112E+00	0.4472E+00	0.1428E+04	0.5332E-01	0.3750E+00	0.2525E-07
57	0.1135E+02	0.1250E+01	0.4344E+01	0.3029E+01	0.1758E-01	0.9078E+01	0.6140E+00	0.1223E+03	0.5048E+00	0.1422E+04	0.8218E+00	0.8834E+00	0.1246E+04	0.8664E-01	0.2190E+00	0.4201E-04
58	0.3185E+02	0.3718E+00	0.3539E+01	0.2088E+01	0.1877E+00	0.1110E+02	0.7840E+00	0.9933E+03	0.3555E+00	0.1830E+04	0.3117E+00	0.1417E+00	0.5016E+04	0.1386E+01	0.1340E+00	0.5197E-02

	u	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_{fl}
59	0.2252E+02	0.9431E+00	0.3311E+01	0.1680E+01	0.1350E+00	0.3472E+01	0.1579E-01	0.5333E+03	0.4002E+00	0.1078E+04	0.2733E+00	0.2071E-01	0.2137E+04	0.8557E-02	0.2080E+00	0.7260E-04
60	0.1387E+01	0.4919E+00	0.3455E+01	0.3516E+01	0.3738E-01	0.2442E+02	0.3143E+00	0.4329E+03	0.3393E+00	0.1982E+04	0.1095E-01	0.7905E+00	0.3260E+04	0.9120E-02	0.3400E-01	0.4147E-04
61	0.8054E+01	0.1388E+01	0.1830E+01	0.3865E+01	0.4150E-01	0.2362E+02	0.7752E+00	0.3596E+03	0.3244E+00	0.8256E+03	0.9718E+00	0.5397E+00	0.1199E+05	0.9902E-01	0.5780E+00	0.1150E-05
62	0.4551E+01	0.1062E+01	0.5740E+00	0.3482E+01	0.1847E+00	0.2838E+02	0.6948E+00	0.2358E+03	0.9514E+00	0.2003E+04	0.5583E+00	0.6193E+00	0.2042E+04	0.1386E+01	0.3200E-01	0.6848E-03
63	0.8715E+02	0.4228E+00	0.3411E+01	0.2501E+01	0.1150E+00	0.2949E+02	0.2290E+00	0.1928E+03	0.1547E+00	0.5329E+03	0.1830E+00	0.9390E+00	0.2896E+04	0.7001E-02	0.4000E-03	0.2631E-07
64	0.3833E+02	0.1409E+01	0.3221E+01	0.1086E+01	0.1559E+00	0.1705E+01	0.3930E+00	0.1036E+03	0.4207E-01	0.5049E+03	0.1629E-01	0.5088E+00	0.1137E+04	0.3014E-01	0.1710E+00	0.2900E-05
65	0.4581E+02	0.1402E+01	0.2204E+01	0.2824E+01	0.1761E+00	0.2777E+02	0.8247E+00	0.2406E+03	0.6970E+00	0.2845E+04	0.8141E+00	0.3237E+00	0.7723E+04	0.2039E+00	0.6100E-01	0.2453E-16
66	0.8767E+02	0.7930E+00	0.6973E+00	0.1232E+01	0.4185E-01	0.1881E+02	0.8139E+00	0.8050E+03	0.7259E+00	0.4576E+02	0.2305E+00	0.9466E+00	0.8426E+04	0.6931E+00	0.2700E-01	0.2667E-09
67	0.2229E+02	0.1330E+01	0.4120E+01	0.3880E+01	0.1358E+00	0.1547E+02	0.4413E+00	0.8195E+03	0.7353E+00	0.9482E+03	0.7839E+00	0.7495E+00	0.7351E+04	0.1980E+00	0.5390E+00	0.1978E-04
68	0.3385E+02	0.1189E+01	0.3353E+01	0.1268E+01	0.8283E-01	0.1681E+02	0.1749E+00	0.2899E+03	0.6776E+00	0.2363E+04	0.3160E+00	0.7184E+00	0.1619E+04	0.6931E+00	0.7170E+00	0.2153E-02
69	0.9036E+02	0.8348E+00	0.8310E+00	0.1198E+01	0.7738E-01	0.1981E+02	0.1316E+00	0.4273E+03	0.5152E+00	0.8708E+03	0.8702E+00	0.1624E+00	0.6324E+04	0.2166E-01	0.9500E-01	0.1355E-05
70	0.1927E+02	0.1428E+01	0.2504E+01	0.2436E+01	0.6249E-01	0.2743E+02	0.7719E+00	0.7223E+03	0.2889E+00	0.2013E+04	0.8665E+00	0.1556E+00	0.1064E+05	0.1691E-01	0.2420E+00	0.1033E-10
71	0.8407E+02	0.5101E+00	0.3146E+01	0.1289E+01	0.3950E-01	0.7533E+01	0.5091E+00	0.7462E+03	0.6123E-01	0.7545E+03	0.4536E+00	0.6474E+00	0.8042E+04	0.1260E-01	0.5400E+01	0.1812E-06
72	0.9934E+02	0.1305E+00	0.1621E+01	0.3416E+01	0.7102E-01	0.9871E+01	0.3873E+00	0.1311E+03	0.3835E+00	0.1914E+04	0.9356E+00	0.9740E+00	0.8893E+04	0.1083E-01	0.1580E+00	0.1034E-03
73	0.2910E+02	0.4989E+00	0.3743E+01	0.2611E+01	0.1056E+00	0.2434E+02	0.8335E+00	0.6393E+03	0.2556E-01	0.1362E+04	0.3690E+00	0.3909E+00	0.1091E+05	0.9902E-01	0.9960E+00	0.1795E-13
74	0.4951E+02	0.3232E+00	0.3176E+01	0.2674E+01	0.1201E+00	0.1801E+02	0.7815E+00	0.4693E+02	0.7147E+00	0.1061E+04	0.4134E+00	0.3285E+00	0.1139E+05	0.1238E-01	0.4610E+00	0.1495E-06
75	0.6769E+02	0.7657E+00	0.4884E+01	0.1310E+01	0.1538E+00	0.2687E+02	0.9692E+00	0.8650E+03	0.4578E+00	0.2148E+04	0.7679E-01	0.7265E+00	0.9610E+04	0.1386E+01	0.2470E+00	0.6361E-04
76	0.5753E+02	0.8937E+00	0.1314E+01	0.1593E+01	0.8558E-01	0.1590E+02	0.3349E+00	0.2564E+03	0.2739E+00	0.1025E+04	0.2856E+00	0.8069E+00	0.1028E+05	0.1050E-01	0.8700E-02	0.1153E-09
77	0.5029E+02	0.1284E+01	0.3254E+01	0.3090E+01	0.9767E-01	0.1122E+02	0.9307E-01	0.9072E+03	0.1129E+00	0.1735E+04	0.2981E+00	0.6763E+00	0.6020E+04	0.7702E+02	0.2320E+00	0.6195E-08
78	0.7785E+02	0.7307E+00	0.1439E+01	0.2471E+01	0.1108E+00	0.5326E+01	0.2383E+00	0.6720E+03	0.5291E+00	0.2784E+04	0.4392E+00	0.9553E+00	0.8835E+04	0.2390E-01	0.4300E+01	0.8251E-08
79	0.2303E+02	0.6079E+00	0.3710E+01	0.2974E+01	0.1017E+00	0.1842E+02	0.9435E+00	0.8491E+03	0.5846E+00	0.1578E+04	0.6501E+00	0.7990E+00	0.1053E+05	0.1650E-01	0.6000E-01	0.1017E-07
80	0.5802E+02	0.1172E+01	0.4769E+01	0.1445E+01	0.1496E+00	0.1479E+02	0.8940E+00	0.5070E+03	0.8872E+00	0.1786E+04	0.6302E+00	0.5415E-01	0.9262E+04	0.2350E-01	0.3000E+00	0.4100E-07
81	0.3402E+02	0.1104E+01	0.7140E+00	0.1608E+01	0.1790E+00	0.1930E+02	0.6017E+00	0.8755E+03	0.4819E+00	0.1711E+04	0.2382E+00	0.2878E+00	0.3050E+04	0.9902E-01	0.6130E+00	0.9218E-05
82	0.3850E+02	0.5915E+00	0.3280E+01	0.3780E+01	0.8872E-01	0.8882E+01	0.9487E+00	0.4602E+03	0.5560E+00	0.2470E+04	0.2082E+00	0.9928E-01	0.1173E+05	0.2773E-01	0.4050E+00	0.6615E-03
83	0.1528E+02	0.6697E+00	0.2571E+01	0.1355E+01	0.1041E-01	0.1849E+01	0.2444E+00	0.8544E+03	0.1739E-01	0.3787E+03	0.9871E+00	0.6300E+00	0.6879E+03	0.6863E-02	0.1100E-01	0.6602E-08
84	0.7218E+02	0.9112E+00	0.9252E+00	0.1716E+01	0.4868E-01	0.1365E+02	0.7351E+00	0.9215E+03	0.5908E+00	0.5946E+03	0.5229E+00	0.3370E+00	0.6200E+03	0.2390E-01	0.1150E+01	0.2766E-09
85	0.6602E+02	0.1216E+01	0.3852E+01	0.3045E+01	0.1553E+00	0.2352E+02	0.7392E+00	0.1537E+03	0.8113E+00	0.5705E+03	0.3078E+00	0.6547E+00	0.6997E+04	0.6931E+00	0.1250E+00	0.4780E-11
86	0.3296E+02	0.6986E+00	0.2747E+01	0.2941E+01	0.9951E-01	0.6372E+01	0.6937E+00	0.3003E+03	0.9417E+00	0.2036E+04	0.3336E+00	0.5765E-01	0.2833E+04	0.8774E-02	0.3500E-01	0.9136E-10
87	0.7019E+02	0.8183E+00	0.2099E+01	0.3991E+01	0.1774E+00	0.2664E+02	0.9196E+00	0.9400E+03	0.8187E+00	0.8574E+03	0.2359E+00	0.5736E+00	0.1003E+05	0.1155E+00	0.1170E+00	0.3588E-08
88	0.3574E+02	0.7084E+00	0.2138E+01	0.1838E+01	0.3340E-01	0.6776E+01	0.5835E-01	0.3172E+03	0.1786E+00	0.7176E+03	0.4660E-01	0.3707E+00	0.3478E+04	0.1523E-01	0.8600E-01	0.7073E-09
89	0.7348E+02	0.1926E+00	0.2391E+01	0.1565E+01	0.5076E-01	0.2590E+01	0.2195E+00	0.1146E+03	0.1321E-01	0.6004E+03	0.4866E+00	0.4523E+00	0.4897E+04	0.7702E-02	0.7000E-02	0.5298E-10
90	0.9662E+02	0.1038E+01	0.3026E+01	0.1797E+01	0.6366E-01	0.1099E+02	0.4028E+00	0.8340E+03	0.5199E-01	0.2279E+04	0.3765E+00	0.8078E-01	0.5130E+04	0.4332E-01	0.1300E+01	0.6650E-08
91	0.7967E+02	0.9884E+00	0.1335E+01	0.2370E+01	0.1100E+00	0.5137E+01	0.4470E+00	0.8056E+03	0.7541E+00	0.1105E+04	0.1462E+00	0.4392E+00	0.9101E+04	0.1491E-01	0.3200E-01	0.2211E-03
92	0.1636E+02	0.5291E+00	0.4678E+01	0.3255E+01	0.1160E-01	0.2493E+02	0.5252E+00	0.6649E+03	0.3595E+00	0.1337E+04	0.9791E+00	0.1763E+00	0.4629E+04	0.1155E+00	0.1600E-01	0.2675E-09
93	0.8222E+02	0.9054E+00	0.4953E+01	0.3727E+01	0.5118E-01	0.2093E+02	0.9281E+00	0.5516E+03	0.7424E+00	0.2406E+04	0.1111E+00	0.5902E+00	0.7775E+04	0.8664E-01	0.1040E+00	0.1141E-02
94	0.8647E+02	0.1359E+01	0.2716E+01	0.1718E+01	0.2700E-01	0.2969E+02	0.8475E+00	0.9821E+02	0.5172E+00	0.9987E+03	0.1959E+00	0.5596E+00	0.2287E+04	0.1733E+00	0.1150E+01	0.1015E-06
95	0.7624E+02	0.3506E+00	0.2241E+01	0.1391E+01	0.9999E-01	0.2539E+02	0.2823E+00	0.4105E+03	0.3496E+00	0.2343E+04	0.7470E+00	0.8416E+00	0.1126E+05	0.1650E-01	0.9500E-01	0.2473E-07
96	0.2775E+02	0.1432E+01	0.8940E+00	0.2266E+01	0.1047E+00	0.2306E+02	0.4562E+00	0.7271E+02	0.8583E+00	0.1767E+04	0.8614E+00	0.5682E+00	0.1943E+04	0.3466E+00	0.8000E-01	0.1838E-07
97	0.9968E+02	0.1220E+01	0.4321E+01	0.3460E+01	0.7768E-01	0.1609E+02	0.1954E+00	0.6896E+02	0.3347E+00	0.1386E+04	0.5991E+00	0.9864E+00	0.2778E+04	0.1980E+00	0.2010E+00	0.7684E-07
98	0.4399E+02	0.2647E+00	0.6710E+00	0.3149E+01	0.1815E+00	0.6258E+01	0.6293E+00	0.3899E+03	0.4270E+00	0.2387E+04	0.5719E+00	0.6517E+00	0.9233E+03	0.2567E-01	0.3250E+00	0.2457E-05
99	0.4720E+02	0.4313E+00	0.9026E+00	0.3232E+01	0.1302E+00	0.1214E+02	0.5903E+00	0.6733E+03	0.3782E-01	0.2747E+04	0.5817E+00	0.3905E-01	0.3612E+04	0.6863E-02	0.6533E+01	0.1119E-09
100	0.5962E+02	0.1379E+01	0.2606E+01	0.3073E+01	0.1716E+00	0.9702E+01	0.5858E+00	0.3628E+03	0.1662E+00	0.1167E+04	0.6071E+00	0.7939E+00	0.5349E+04	0.1540E+00	0.1130E+00	0.2059E-04
101	0.6071E+02	0.6509E+00	0.1915E+01	0.2149E+01	0.8078E-01	0.2722E+02	0.3265E+00	0.2069E+03	0.4387E+00	0.1036E+04	0.9148E+00	0.6800E+00	0.1767E+04	0.2236E-01	0.1200E-01	0.3236E-06
102	0.4237E+02	0.2063E+00	0.2791E+01	0.2183E+01	0.2950E-01	0.2027E+01	0.6408E+00	0.7306E+03	0.1739E+00	0.2878E+04	0.5323E+00	0.5365E+00	0.3878E+04	0.9627E-02	0.4400E+00	0.4330E-05
103	0.1273E+02	0.1194E+01	0.4442E+01	0.3161E+01	0.5416E-01	0.2637E+02	0.7655E-01	0.7651E+03	0.6331E+00	0.2928E+04	0.4900E+00	0.1477E-01	0.4285E+04	0.2888E-01	0.5031E+01	0.1519E-12
104	0.9824E+02	0.1444E+01	0.3612E+01	0.1899E+01	0.5884E-01	0.2472E+02	0.9856E+00	0.6895E+03	0.7452E+00	0.1794E+04	0.6714E+00	0.4833E+00	0.2588E+04	0.3648E-01	0.1570E+00	0.1106E-04
105	0.2885E+02	0.4427E+00	0.1766E+01	0.3798E+01	0.2028E-01	0.1286E+02	0.9001E+00	0.5452E+03	0.7295E+00	0.1231E+04	0.9614E+00	0.5211E+00	0.3446E+03	0.3014E-01	0.1110E+03	0.1542E-01
106	0.3153E+02	0.1099E+00	0.3066E+01	0.3396E+01	0.1059E+00	0.4864E+01	0.2421E-01	0.2647E+03	0.3773E+00	0.1246E+04	0.3427E+00	0.1243E+00	0.2669E+04	0.1899E-02	0.2000E-02	0.5758E-06
107	0.7254E+01	0.1210E+01	0.4741E+01	0.3648E+01	0.1388E+00	0.1832E+02	0.3208E+00	0.2428E+02	0.6521E+00	0.1631E+04	0.5180E+00	0.8963E+00	0.1011E+05	0.2311E-01	0.5800E-01	0.1285E-07
108	0.4388E+02	0.5996E+00	0.7489E+00	0.2800E+01	0.6824E-01	0.2524E+02	0.9969E+00	0.2300E+03	0.9177E+00	0.2709E+04	0.5614E+00	0.6693E+00	0.8545E+04	0.2567E-01	0.5100E-02	0.1335E-11
109	0.8942E+02	0.1067E+00	0.3811E+01	0.3922E+01	0.4372E-01	0.2052E+02	0.8073E+00	0.9045E+03	0.6561E+00	0.2481E+04	0.3495E+00	0.9276E+00	0.1141E+05	0.1980E+00	0.5000E-02	0.1158E-09
110	0.5095E+02	0.9293E+00	0.2949E+01	0.2802E+01	0.7341E-01	0.2184E+02	0.8280E+00	0.1337E+03	0.6641E+00	0.1921E+03	0.9034E-01	0.6649E+00	0.3710E+04	0.6301E-01	0.8400E-01	0.1993E-09
111	0.9264E+02	0.1238E+01	0.4587E+01	0.2490E+01	0.1933E+00	0.2009E+02	0.7303E+00	0.1909E+02	0.9932E+00	0.2480E+03	0.1755E-01	0.3612E+00	0.6896E+04	0.1308E-01	0.2800E-01	0.1469E-03
112	0.1179E+02	0.1056E+01	0.2988E+01	0.2420E+01	0.1212E+00	0.1551E+02	0.9942E+00	0.5258E+03	0.7718E-01	0.2704E+03	0.9454E+00	0.6391E+00	0.1045E+05	0.9181E-02	0.6160E+00	0.5708E-03
113	0.6825E+02	0.1278E+01	0.3506E+01	0.3530E+01	0.7640E-01	0.3229E+01	0.3615E+00	0.9971E+03	0.2521E+00	0.1848E+04	0.5893E+00	0.1183E+00	0.1009E+05	0.4163E-02	0.2350E+00	0.5647E-08
114	0.9107E+02	0.5244E+00	0.9999E+00	0.3695E+01	0.1416E+00	0.4416E+01	0.5711E+00	0.3963E+03	0.5337E+00	0.2115E+04	0.3645E+00	0.4754E-01	0.3285E+04	0.8664E-02	0.6400E-01	0.3547E-08
115	0.4453E+02	0.1228E+01	0.8591E+00	0.1153E+01	0.1474E+00	0.1319E+02	0.1134E+00	0.9719E+03	0.1374E+00	0.2682E+04	0.6677E+00	0.6363E+00	0.5470E+03	0.2009E-02	0.1100E-01	0.3824E-03
116	0.9958E+01	0.1112E+01	0.5943E+00	0.3609E+01	0.4612E-01	0.2586E+02	0.3447E+00	0.4128E+03	0.9747E+00	0.2803E+04	0.2676E+00	0.1444E+00	0.1071E+05	0.1899E-02	0.8800E-01	0.6614E-05

	v	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_{ff}
117	0.6710E+01	0.1791E+00	0.4778E+01	0.1028E+01	0.1537E-01	0.2839E+02	0.1714E+00	0.6101E+03	0.7082E+00	0.2246E+04	0.7779E+00	0.2390E+00	0.9278E+04	0.3894E-01	0.3440E+00	0.1315E-07
118	0.9009E+02	0.6148E+00	0.2480E+01	0.3576E+01	0.1138E+00	0.2074E+02	0.9821E+00	0.1946E+03	0.4951E+00	0.1560E+04	0.7587E+00	0.8359E+00	0.1897E+04	0.1320E-01	0.5200E-01	0.1238E-06
119	0.2058E+02	0.5175E+00	0.2861E+01	0.3269E+01	0.1962E+00	0.2509E+02	0.7272E+00	0.8872E+03	0.8647E+00	0.2302E+04	0.6943E+00	0.2793E-01	0.4175E+04	0.2773E+00	0.9600E-01	0.2855E-10
120	0.3973E+02	0.9706E+00	0.3580E+01	0.1338E+01	0.4750E-01	0.2658E+02	0.5290E+00	0.6500E+02	0.5499E+00	0.6981E+03	0.2254E+00	0.2143E+00	0.7095E+04	0.2666E-01	0.1166E+01	0.1585E-05
121	0.5894E+02	0.1454E+01	0.2423E+01	0.2906E+01	0.1589E+00	0.2271E+02	0.9531E+00	0.5616E+03	0.7793E+00	0.1219E+04	0.4238E+00	0.4192E+00	0.5141E+04	0.1980E+00	0.2080E+00	0.1637E-07
122	0.5613E+02	0.2956E+00	0.1084E+01	0.3348E+01	0.1021E+00	0.1958E+02	0.5118E+00	0.9496E+03	0.2841E+00	0.2792E+04	0.2861E+00	0.3837E-01	0.6725E+04	0.1066E+00	0.2330E+00	0.6441E-07
123	0.3445E+01	0.7562E+00	0.4616E+01	0.2365E+01	0.6700E-01	0.1304E+02	0.1410E+00	0.8447E+00	0.1182E+00	0.5605E+02	0.3612E+00	0.9238E+00	0.6377E+04	0.1899E-02	0.2810E+00	0.5604E-07
124	0.6347E+02	0.1477E+01	0.3626E+01	0.2409E+01	0.1506E-01	0.2232E+02	0.5199E+00	0.7136E+03	0.1915E+00	0.3527E+02	0.3297E+00	0.2764E+00	0.3804E+04	0.1980E-01	0.8300E-01	0.3554E-10
125	0.6725E+02	0.8541E+00	0.5107E+00	0.1665E+01	0.1678E+00	0.8596E+01	0.2055E+00	0.5179E+03	0.8090E+00	0.2426E+04	0.5379E+00	0.8633E+00	0.1081E+05	0.1575E-01	0.1930E+00	0.5272E-06
126	0.1441E+02	0.6347E+00	0.1637E+01	0.3209E+01	0.1821E+00	0.1702E+02	0.4196E+00	0.4976E+03	0.7872E+00	0.2861E+04	0.5403E+00	0.1926E+00	0.6836E+04	0.4780E-02	0.3500E-01	0.1216E-07
127	0.1804E+02	0.7914E+00	0.1416E+01	0.1825E+01	0.1616E+00	0.1675E+02	0.6270E+00	0.7726E+03	0.6785E+00	0.2208E+04	0.7387E+00	0.4718E+00	0.1149E+05	0.1593E-01	0.1100E-01	0.1182E-04
128	0.2272E+01	0.1270E+01	0.2463E+01	0.2857E+01	0.2453E-01	0.1365E+01	0.6101E+00	0.8396E+03	0.1499E+00	0.1142E+04	0.8973E+00	0.1835E+00	0.3411E+04	0.1066E+00	0.4760E+00	0.2059E-06
129	0.3121E+02	0.4502E+00	0.3112E+01	0.2956E+01	0.1367E+00	0.2247E+02	0.1589E+00	0.9561E+03	0.8851E-01	0.9912E+03	0.4069E+00	0.9058E+00	0.8454E+03	0.3151E-01	0.7000E-01	0.4677E-02
130	0.4019E+02	0.1092E+01	0.1537E+01	0.3586E+01	0.7975E-01	0.2443E+01	0.4372E+00	0.7721E+03	0.9466E+00	0.1444E+04	0.5835E+00	0.8550E+00	0.4075E+04	0.8351E-02	0.1160E+00	0.1738E-08
131	0.7511E+02	0.8797E+00	0.3153E+01	0.1806E+01	0.2202E-01	0.1516E+02	0.1853E+00	0.2134E+03	0.1085E+00	0.1674E+04	0.5535E+00	0.5150E+00	0.7037E+04	0.7296E-01	0.3484E+01	0.4416E-01
132	0.7699E+02	0.1084E+01	0.2191E+01	0.2741E+01	0.1639E-01	0.1914E+02	0.7819E-01	0.6316E+03	0.6133E+00	0.1606E+04	0.8573E+00	0.1919E+00	0.1034E+05	0.6027E-01	0.2510E+00	0.2774E-04
133	0.8557E+02	0.5494E+00	0.3988E+01	0.3558E+01	0.1435E+00	0.1257E+02	0.9091E+00	0.7913E+03	0.7909E+00	0.1248E+03	0.7655E+00	0.4668E+00	0.7503E+04	0.6301E-01	0.7500E-01	0.1951E+00
134	0.2716E+02	0.7809E+00	0.4163E+01	0.2635E+01	0.1089E+00	0.1175E+02	0.4958E+00	0.8113E+03	0.2258E+00	0.9714E+03	0.4706E+00	0.7340E+00	0.9442E+04	0.3961E-01	0.4020E+00	0.1274E-05
135	0.8090E+02	0.1328E+01	0.1171E+01	0.2715E+01	0.1333E+00	0.2336E+02	0.8420E+00	0.1198E+03	0.9975E+00	0.1956E+04	0.6804E+00	0.1061E+00	0.5769E+04	0.1540E+00	0.9190E+00	0.3978E-06
136	0.4808E+02	0.7156E+00	0.1884E+01	0.3441E+01	0.1622E+00	0.1782E+02	0.3414E+00	0.5774E+03	0.1236E+00	0.1620E+03	0.9648E+00	0.7818E+00	0.1193E+05	0.2829E-01	0.1030E+00	0.5559E-03
137	0.5556E+02	0.6369E+00	0.4036E+01	0.3672E+01	0.3256E-01	0.1142E+02	0.6355E+00	0.3779E+03	0.5970E+00	0.2980E+04	0.9699E-01	0.3008E+00	0.8363E+04	0.1925E-01	0.1800E-02	0.7030E-06
138	0.5654E+01	0.8431E+00	0.7801E+00	0.2314E+01	0.1130E+00	0.8987E+01	0.1233E+00	0.4757E+03	0.9267E+00	0.8358E+03	0.8850E+00	0.7795E+00	0.4825E+03	0.5251E-02	0.5900E-01	0.1755E-05
139	0.2083E+02	0.1133E+01	0.1372E+01	0.1761E+01	0.1582E+00	0.1393E+02	0.3512E+00	0.2259E+03	0.5761E+00	0.2054E+04	0.2148E+00	0.9348E+00	0.1132E+05	0.6027E-01	0.1150E+03	0.1271E-05
140	0.9719E+02	0.6891E+00	0.1375E+01	0.1401E+01	0.1312E+00	0.2859E+02	0.8608E+00	0.3909E+02	0.2591E+00	0.6390E+03	0.9274E+00	0.1269E+00	0.7626E+04	0.1980E-01	0.6540E+01	0.6390E-07
141	0.2141E+02	0.8871E+00	0.4982E+01	0.3650E+01	0.1999E+00	0.2821E+01	0.5945E+00	0.5426E+02	0.1411E+00	0.1754E+04	0.8043E+00	0.8867E+00	0.1174E+05	0.9902E-01	0.1164E+01	0.3396E-09
142	0.2517E+02	0.1368E+01	0.2372E+01	0.2041E+01	0.1727E+00	0.2412E+02	0.2912E+00	0.9384E+03	0.3005E+00	0.2593E+03	0.6463E+00	0.4111E+00	0.5815E+04	0.8155E-02	0.6330E+00	0.1014E-03
143	0.7070E+02	0.2393E+00	0.3913E+01	0.2164E+01	0.2655E-01	0.3277E+01	0.9626E+00	0.7834E+03	0.8583E+00	0.2097E+03	0.4605E+00	0.2702E+00	0.9913E+04	0.1980E-01	0.2900E-01	0.2113E-05
144	0.9511E+02	0.9974E+00	0.6435E+00	0.3375E+01	0.1247E+00	0.5635E+01	0.2950E+00	0.5946E+02	0.8755E+00	0.9189E+03	0.6415E+00	0.4127E+00	0.6216E+04	0.3301E-02	0.2900E-01	0.5753E-06
145	0.6198E+02	0.1463E+01	0.1010E+01	0.3883E+01	0.2103E-01	0.1595E+01	0.6567E+00	0.4443E+03	0.1684E+00	0.2733E+04	0.1282E+00	0.6059E+00	0.3172E+04	0.3555E-01	0.9850E+00	0.6344E-07
146	0.4663E+02	0.2588E+00	0.4212E+01	0.3839E+01	0.2527E-01	0.2970E+01	0.5563E+00	0.1169E+02	0.9595E+00	0.2904E+04	0.8777E+00	0.5542E+00	0.8719E+04	0.6027E-01	0.1200E-01	0.7158E-05
147	0.2362E+02	0.1263E+01	0.4128E+01	0.2699E+01	0.3123E-01	0.1191E+01	0.5521E+00	0.4048E+03	0.4291E+00	0.2655E+04	0.3889E-02	0.7033E+00	0.4371E+04	0.1386E+01	0.1790E+00	0.6007E-07
148	0.9775E+02	0.1029E+01	0.6119E+00	0.1867E+01	0.1633E+00	0.1740E+02	0.2857E+00	0.3858E+03	0.6930E+00	0.1486E+04	0.3238E+00	0.2122E-03	0.8208E+04	0.1066E-01	0.3900E+00	0.1526E-04
149	0.5537E+02	0.1371E+01	0.4361E+01	0.1987E+01	0.4985E-01	0.2930E+02	0.1466E+00	0.4707E+03	0.1597E+00	0.2636E+04	0.3110E-01	0.8282E+00	0.1080E+05	0.5332E-01	0.1085E+01	0.1489E-11
150	0.9579E+02	0.1047E+01	0.3788E+01	0.2389E+01	0.8709E-01	0.8227E+01	0.6828E+00	0.5337E+03	0.5298E-02	0.1531E+04	0.1712E+00	0.7601E+00	0.4771E+04	0.1980E+00	0.1000E+00	0.1443E+01
151	0.3659E+02	0.5790E+00	0.4481E+01	0.3541E+01	0.1857E-01	0.7426E+01	0.3323E-01	0.5779E+03	0.3659E+00	0.2937E+04	0.6565E+00	0.2337E+00	0.7572E+04	0.5023E-02	0.1190E+00	0.2221E-09
152	0.1420E+02	0.1153E+01	0.7605E+00	0.1332E+01	0.4452E-01	0.3651E+01	0.4664E+00	0.8718E+03	0.4551E+00	0.2391E+04	0.6924E+00	0.4588E+00	0.6767E+04	0.1899E-02	0.1330E+00	0.7841E-03
153	0.6307E+02	0.1663E+00	0.4238E+01	0.1248E+01	0.1270E-01	0.1148E+02	0.7955E+00	0.7778E+03	0.5548E+00	0.1508E+04	0.9193E+00	0.3036E+00	0.8781E+04	0.3466E-01	0.7000E-02	0.4467E-07
154	0.8138E+02	0.7735E+00	0.3972E+01	0.3062E+01	0.1259E+00	0.2812E+02	0.9244E+00	0.5406E+03	0.2062E+00	0.2493E+04	0.5130E+00	0.9727E+00	0.6411E+04	0.1195E-01	0.4000E-01	0.3179E+00
155	0.5313E+02	0.2225E+00	0.1747E+01	0.3292E+01	0.5962E-01	0.2707E+02	0.6169E+00	0.4860E+03	0.3285E+00	0.2605E+04	0.2117E+00	0.6040E+00	0.9990E+04	0.1540E+00	0.5000E-02	0.1928E-07
156	0.2808E+01	0.7010E+00	0.1989E+01	0.1381E+01	0.5441E-01	0.3919E+01	0.3062E+00	0.1693E+03	0.4876E+00	0.1883E+04	0.1572E+00	0.4865E+00	0.6505E+04	0.1712E-01	0.1345E+01	0.2461E-06
157	0.5208E+02	0.2801E+00	0.2582E+01	0.2656E+01	0.7165E-01	0.1333E+02	0.9114E+00	0.7353E+03	0.8349E+00	0.2128E+04	0.2509E+00	0.3678E+00	0.8133E+04	0.3466E+01	0.1972E+01	0.1028E-04
158	0.2618E+02	0.1101E+01	0.1686E+01	0.1137E+01	0.1462E+00	0.2736E+02	0.1781E+00	0.8088E+02	0.6077E+00	0.2536E+04	0.4791E+00	0.6156E+00	0.4549E+04	0.1386E+01	0.5060E+00	0.3352E-07
159	0.7261E+02	0.1507E+00	0.4084E+01	0.1697E+01	0.1181E+00	0.1408E+02	0.8779E+00	0.1768E+03	0.3780E+00	0.1354E+04	0.1607E+00	0.8518E+00	0.9571E+04	0.6245E-02	0.5650E+00	0.1119E-05
160	0.8392E+02	0.6775E+00	0.1582E+01	0.1074E+01	0.5770E-01	0.4648E+01	0.5339E-01	0.6844E+03	0.9289E-01	0.2761E+04	0.9523E+00	0.4998E+00	0.9478E+04	0.3301E-01	0.8500E-01	0.1908E-05
161	0.7388E+02	0.1163E+01	0.2444E+01	0.1858E+01	0.7254E-01	0.1007E+01	0.7017E+00	0.4920E+03	0.9368E+00	0.2824E+04	0.1375E+00	0.4446E+00	0.7976E+04	0.1238E-01	0.1700E-01	0.1396E-11
162	0.9148E+02	0.8240E+00	0.2017E+01	0.1620E+01	0.1534E+00	0.2996E+02	0.1753E-01	0.7183E+03	0.2294E+00	0.1900E+04	0.8941E+00	0.5619E+00	0.5296E+04	0.4780E-01	0.8620E+00	0.5530E-05
163	0.8029E+02	0.1302E+01	0.4256E+01	0.1549E+01	0.1443E+00	0.2392E+02	0.5791E+00	0.7393E+03	0.4102E+00	0.2082E+04	0.9057E+00	0.1123E+00	0.2175E+04	0.2236E-01	0.1300E+01	0.6782E-09
164	0.3755E+02	0.3847E+00	0.1519E+01	0.1004E+01	0.1511E+00	0.7977E+01	0.8188E+00	0.2840E+03	0.3918E+00	0.1702E+04	0.7736E+00	0.6739E-01	0.1159E+05	0.5059E-02	0.3550E+00	0.1185E-16
165	0.3942E+02	0.1225E+00	0.2547E+01	0.2322E+01	0.1126E+00	0.1720E+02	0.1190E+00	0.1057E+03	0.1951E+00	0.6803E+03	0.5055E+00	0.7251E+00	0.7292E+04	0.6932E-01	0.8000E-01	0.1101E-05
166	0.3557E+02	0.1429E+00	0.2345E+01	0.2883E+01	0.1031E+00	0.2953E+02	0.7451E+00	0.4173E+03	0.1869E+00	0.1432E+03	0.2570E+00	0.2558E+00	0.7837E+03	0.1800E-01	0.5840E+01	0.4993E-05
167	0.6679E+02	0.5890E+00	0.4566E+01	0.1946E+01	0.6565E-01	0.1656E+02	0.5476E+00	0.5889E+03	0.4754E+00	0.7703E+02	0.9963E-01	0.9599E+00	0.2507E+04	0.1800E-01	0.8160E+00	0.8586E-08
168	0.5420E+02	0.8717E+00	0.3442E+01	0.2590E+01	0.1667E+00	0.2382E+02	0.4923E+00	0.8305E+03	0.6703E+00	0.1285E+04	0.8473E+00	0.8385E-02	0.9040E+04	0.1238E-01	0.2137E+01	0.5612E-05
169	0.1570E+02	0.7434E+00	0.2056E+01	0.2278E+01	0.6937E-01	0.7001E+01	0.8805E-01	0.1605E+03	0.4897E-01	0.3615E+03	0.3930E+00	0.5488E+00	0.2731E+04	0.1980E+00	0.4700E-02	0.1968E-07
170	0.4184E+02	0.1135E+01	0.3888E+01	0.2925E+01	0.1223E+00	0.1054E+02	0.8858E+00	0.3287E+02	0.4614E+00	0.2264E+04	0.8873E+00	0.1491E+00	0.1512E+04	0.3984E-02	0.2800E-01	0.3533E-07
171	0.9287E+02	0.1718E+00	0.4509E+01	0.2549E+01	0.2271E-01	0.2157E+02	0.4678E+00	0.9781E+03	0.9029E+00	0.9400E+03	0.7629E+00	0.2615E+00	0.5982E+04	0.2476E-01	0.1000E+01	0.7241E-03
172	0.6087E+01	0.4412E+00	0.4630E+01	0.1429E+01	0.3503E-01	0.2000E+02	0.9958E-01	0.8917E+03	0.9680E+00	0.2572E+04	0.5361E-01	0.9475E-01	0.1701E+04	0.3224E-02	0.3500E+01	0.5348E-04

	u	h	b	s_1	h_w	ss	$m_{om,ss}$	DW	$m_{om,wb}$	•	•	•	E_x	k	K_{mp}	K_{ff}
173	0.8483E+02	0.1387E+00	0.4401E+01	0.3180E+01	0.3774E-01	0.7856E+01	0.6872E+00	0.1408E+03	0.7948E+00	0.1928E+04	0.7817E-01	0.1694E+00	0.5599E+04	0.1733E+00	0.1800E+03	0.1379E-09
174	0.5993E+02	0.3978E+00	0.3949E+01	0.1041E+01	0.5241E-01	0.1068E+02	0.1364E+00	0.5946E+03	0.9132E+00	0.2556E+04	0.3829E-01	0.7078E+00	0.7231E+04	0.1238E-01	0.1110E+00	0.9674E-07
175	0.4086E+02	0.6598E+00	0.4811E+01	0.2336E+01	0.7926E-01	0.1759E+02	0.7062E-01	0.1800E+03	0.3960E+00	0.3102E+03	0.6601E+00	0.3471E+00	0.3403E+04	0.7374E-02	0.2075E+01	0.5312E-10
176	0.7678E+02	0.3263E+00	0.2892E+01	0.2197E+01	0.1175E+00	0.4873E+01	0.5438E+00	0.1840E+03	0.8943E+00	0.2515E+04	0.3395E+00	0.5854E+00	0.5480E+04	0.6931E+00	0.1000E-03	0.4009E-03
177	0.1235E+02	0.5428E+00	0.1550E+01	0.3424E+01	0.9066E-01	0.4362E+01	0.2588E+00	0.6484E+03	0.9293E+00	0.2071E+04	0.1217E+00	0.4284E+00	0.4011E+04	0.2100E-01	0.6200E+01	0.7114E-07
178	0.5265E+02	0.3101E+00	0.4466E+01	0.2733E+01	0.1116E+00	0.6606E+01	0.3151E-02	0.6262E+03	0.7602E+00	0.2876E+03	0.7997E+00	0.8381E-01	0.6142E+04	0.4621E+00	0.6100E-01	0.6905E-08
179	0.1654E+02	0.2409E+00	0.3389E+01	0.3960E+01	0.1341E+00	0.9266E+01	0.7501E+00	0.9545E+03	0.5787E+00	0.3414E+03	0.3900E+00	0.3851E+00	0.1113E+05	0.3151E-01	0.1420E+01	0.1399E-06
180	0.7953E+02	0.1448E+01	0.2803E+01	0.1109E+01	0.3588E-01	0.2203E+02	0.3718E+00	0.3094E+03	0.6032E+00	0.2202E+04	0.8117E+00	0.8118E+00	0.9706E+04	0.4951E-01	0.1840E+01	0.4966E-07
min	0.1390E+01	0.1067E+00	0.5110E+00	0.1004E+01	0.1040E-01	0.1010E+01	0.3200E-02	0.8000E+00	0.5300E-02	0.3500E+02	0.3900E-02	0.2000E-03	0.3450E+03	0.6904E-04	0.1000E-05	0.1190E-16
max	0.9968E+02	0.1492E+01	0.4982E+01	0.3991E+01	0.1999E+00	0.2996E+02	0.9969E+00	0.9970E+03	0.9970E+00	0.2987E+04	0.9871E+00	0.9864E+00	0.1199E+05	0.7702E+02	0.1800E+03	0.2576E+01
mean	0.5051E+02	0.8000E+00	0.2751E+01	0.2500E+01	0.1034E+00	0.1550E+02	0.4999E+00	0.4998E+03	0.4999E+00	0.1510E+04	0.4950E+00	0.4951E+00	0.6271E+04			

Annex 10 Derivations of the relative sensitivity functions of acute exposure concentrations

$$c = \frac{\dfrac{(b+2hs_1)}{h(b+hs_1)}}{1+\dfrac{DW\cdot(b+2h\sqrt{s_1^2+1})}{h(b+hs_1)}\cdot K_{mp} + ss\cdot m_{om,ss}\cdot K_{om,ss}} \qquad (6.6)$$

For $x = DW$, K_{mp}, $m_{om,ss}$, ss and $K_{om,ss}$, Eq. 6.6. can be written as:

$$c = \frac{A}{Bx+C}$$

with

$$A = \frac{b+2hs_1}{h(b+hs_1)}$$

and

X	B	C	
DW	$\dfrac{b+2h\sqrt{s_1^2+1}}{h(b+hs_1)}\cdot K_{mp}$	$1+ss\cdot m_{om,ss}\cdot K_{om,ss}$	(6.10)
K_{mp}	$\dfrac{b+2h\sqrt{s_1^2+1}}{h(b+hs_1)}\cdot DW$	$1+ss\cdot m_{om,ss}\cdot K_{om,ss}$	(6.11)
$K_{om,ss}$	$ss\cdot m_{om,ss}$	$1+\dfrac{b+2h\sqrt{s_1^2+1}}{h(b+hs_1)}\cdot DW\cdot K_{mp}$	(6.12)
Ss	$m_{om,ss}\cdot K_{om,ss}$	$1+\dfrac{b+2h\sqrt{s_1^2+1}}{h(b+hs_1)}\cdot DW\cdot K_{mp}$	(6.13)
$M_{om,ss}$	$ss\cdot K_{om,ss}$	$1+\dfrac{b+2h\sqrt{s_1^2+1}}{h(b+hs_1)}\cdot DW\cdot K_{mp}$	(6.14)

$$\frac{dc}{dx} = \frac{0\cdot(Bx+C)-A\cdot B}{(Bx+C)^2} = -\frac{A\cdot B}{(Bx+C)^2}$$

Relative sensitivity:

$$s_x = \frac{x}{c} \cdot \frac{dc}{dx} = \frac{x}{\frac{A}{Bx+C}} \cdot -\frac{A \cdot B}{(Bx+C)^2} = -\frac{Bx}{Bx+C}$$

B and C being constants.
For b = 1 m, h =0.5 m, s_1 = 1.5, DW = 0.3 kg.m^{-2}, K_{mp} = 0.129 m^3.kg^{-1}, $m_{om,ss}$ = 0.2, ss = 0.03 kg.m^{-3} and $K_{om,ss}$ = 0.129 m^3.kg^{-1}, it follows:

X	B	C
DW	0.41321	1.00077
K_{mp}	0.96095	1.00077
$K_{om,ss}$	0.006	1.12396
Ss	0.0258	1.12396
$m_{om,ss}$	0.0387	1.12396

For $x = b$, Eq. 6.6 can be written as:

$$c = \frac{\frac{x+D}{h \cdot x+E}}{\frac{G \cdot x+F \cdot G}{h \cdot x+E}+C} = \frac{\frac{x+D}{h \cdot x+E}}{\frac{G \cdot x+F \cdot G}{h \cdot x+E}+\frac{C(h \cdot x+E)}{h \cdot x+E}} = \frac{\frac{x+D}{h \cdot x+E}}{\frac{G \cdot x+F \cdot G+C(h \cdot x+E)}{h \cdot x+E}}$$

$$= \frac{x+D}{G \cdot x+F \cdot G+C(h \cdot x+E)}$$

with

$C = 1+ss \cdot m_{om,ss} \cdot K_{om,ss}$
$D = 2h \cdot s_1$
$E = h^2 \cdot s_1$
$F = 2h\sqrt{s_1^2+1}$
$G = DW \cdot K_{mp}$

Relative sensitivity:

$$s_x = \frac{x}{c}\cdot\frac{dc}{dx} = \frac{x}{\frac{x+D}{G\cdot x+F\cdot G+C(h\cdot x+E}}\cdot\frac{G\cdot x+F\cdot G+C(h\cdot x+E)-(x+D)(G+C\cdot h)}{(G\cdot x+F\cdot G+C(h\cdot x+E))^2}$$

$$= \frac{x}{x+D}\cdot\frac{G\cdot x+F\cdot G+C(h\cdot x+E)-(x+D)(G+C\cdot h)}{G\cdot x+F\cdot G+C(h\cdot x+E)}$$

$$= \frac{x}{x+D}\cdot\frac{G\cdot x+F\cdot G+C\cdot h\cdot x+C\cdot E-G\cdot x-C\cdot h\cdot x-D\cdot G-C\cdot D\cdot h}{G\cdot x+F\cdot G+C\cdot h\cdot x+C\cdot E}$$

$$= \frac{x}{x+D}\cdot\frac{F\cdot G+C\cdot E-D\cdot G-C\cdot D\cdot h}{G\cdot x+F\cdot G+C\cdot h\cdot x+C\cdot E}$$

C, D, E, F and G being constants.

For h =0.5 m, s_1 = 1.5, DW = 0.3 kg.m^{-2}, K_{mp} = 0.129 m^3.kg^{-1}, $m_{om,ss}$ = 0.2, ss = 0.03 kg.m^{-3} and $K_{om,ss}$ = 0.129 m^3.kg^{-1}, it follows:
C = 1.00077
D = 1.5
E = 0.375
F = 1.8028
G = 0.0387

For $x = s_1$, Eq. 6.6 can be written as:

$$c = \frac{\frac{b+2h\cdot x}{hb+h^2x}}{\frac{J+K\sqrt{x^2+1}}{hb+h^2x}+C} = \frac{\frac{b+2h\cdot x}{hb+h^2x}}{\frac{J+K\sqrt{x^2+1}+C(hb+h^2x)}{hb+h^2x}} = \frac{b+2h\cdot x}{J+K\sqrt{x^2+1}+C(hb+h^2x)}$$

with

$J = DW\cdot K_{mp}\cdot b$
$K = 2h\cdot DW\cdot K_{mp}$

Relative sensitivity:

$$s_x = \frac{x}{c} \cdot \frac{dc}{dx}$$

$$= \frac{x}{\frac{b + 2h \cdot x}{J + K\sqrt{x^2 + 1} + C(hb + h^2 x)}} \cdot \frac{2h(J + K\sqrt{x^2 + 1} + C(hb + h^2 x)) - (b + 2h)(Kx(x^2 + 1)^{-½} + C \cdot h^2)}{(J + K\sqrt{x^2 + 1} + C(hb + h^2 x))^2}$$

$$= \frac{x}{b + 2hx} \cdot \frac{2h(J + K\sqrt{x^2 + 1} + C(hb + h^2 x)) - (b + 2h)(Kx(x^2 + 1)^{-½} + C \cdot h^2)}{J + K\sqrt{x^2 + 1} + C(hb + h^2 x)}$$

C, J, and K being constants.

For b = 1 m, h =0.5 m, DW = 0.3 kg.m^{-2}, K_{mp} = 0.129 m^3.kg^{-1}, $m_{om,ss}$ = 0.2, ss = 0.03 kg.m^{-3} and $K_{om,ss}$ = 0.129 m^3.kg^{-1}, it follows:

J = 0.0387
K = 0.0387

For $x = h$ Eq. 6.6 can be written as:

$$c = \frac{\frac{b + 2s_1 x}{bx + s_1 x^2}}{\frac{J + Hx}{bx + s_1 x^2} + C} = \frac{\frac{b + 2s_1 x}{bx + s_1 x^2}}{\frac{J + Hx + C(bx + s_1 x^2)}{bx + s_1 x^2}} = \frac{b + 2s_1 x}{J + Hx + C(bx + s_1 x^2)}$$

with

$$H = 2DW \cdot K_{mp}\sqrt{s_1^2 + 1}$$

Relative sensitivity:

$$s_x = \frac{x}{c} \cdot \frac{dc}{dx} = \frac{x}{\frac{b + 2s_1 x}{J + Hx + Cbx + Cs_1 x^2}} \cdot \frac{2s_1(J + Hx + Cbx + Cs_1 x^2) - (b + 2s_1 x)(H + Cb + 2Cs_1 x)}{(J + Hx + Cbx + Cs_1 x^2)^2}$$

$$= \frac{x}{b + 2s_1 x} \cdot \frac{2s_1(J + Hx + Cbx + Cs_1 x^2) - (b + 2s_1 x)(H + Cb + 2Cs_1 x)}{J + Hx + Cbx + Cs_1 x^2}$$

H being a constant

For b = 1 m, s_1 = 1.5, DW = 0.3 kg.m^{-2}, K_{mp} = 0.129 m^3.kg^{-1}, $m_{om,ss}$ = 0.2, ss = 0.03 kg.m^{-3} and $K_{om,ss}$ = 0.129 m^3.kg^{-1}, it follows:

H = 0.1395