

CS 04 The regional climate impact of aerosols

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Context / Social problem

'Aerosol' is the term given to minuscule solid or liquid particles suspended in air. We breathe them in on a daily basis. Particulate matter (PM), as these aerosols are called in relation to air pollution, is harmful for health. Their high concentrations are a major problem in the Netherlands. Aerosols also reflect sunlight, which makes them an important agent in atmospheric cooling. The air in the Netherlands contains the highest concentration of aerosols in Europe and the cooling effect of these aerosols should therefore be greatest in the Netherlands. The droplets in clouds are formed around aerosols and the degree to which they reflect sunlight is determined in the first instance by the aerosols themselves. As clouds are the source of precipitation, this is also influenced by aerosols.

What do we know/not know?

The reflection of sunlight has become better understood in recent years, but it is not known how aerosols affect clouds and the regional climate. This requires the use of a regional climate model which incorporates aerosols and their effects. Moreover, the composition of the aerosols above the Netherlands is different than in other regions because of the combination of high population density and intensive cropping and livestock farming. The aerosols produced by these sources are not well known, but include ammonium nitrate, for example.

What is being studied?

The project investigates the effect of 'national' aerosols on the regional climate, based in the first instance on measurements designed to determine the composition of the aerosols in a cloud chamber. These facilities are right next to the sea so that aerosols produced naturally from the sea can also be measured. The measurements will be made with specially developed new instruments,

which will also be used at the CESAR Observatory (project CS02). The differences between the marine and inland measurements will be used to derive the effects of the additional aerosols produced in the Netherlands. The data and knowledge gained about aerosols will be used to develop a module for the new national climate model RACMO-2, following development of a model to describe the aerosol fields.

What are the results, and who are they for?

First, the results will be incorporated as a module into the RACMO-2 regional climate model for a study of the impacts of aerosols on the regional climate. The data will also be used for an evaluation of the modelled aerosol fields and sources, particularly agricultural emissions. In turn, this can be used to estimate the effects of changes in land use on aerosol emissions. This is an important spin-off from the research into local sources of aerosols in air pollution. The results will be disseminated to international groups working on quantifying the global role of aerosols in the climate and in air pollution.

