Steady state version of SMART2

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Introduction

- For the call for data of RIVM/CCE Alterra has computed new critical loads with SMB and targetloads with VSD for forest ecosystems in the Netherlands as well as critical loads and targetloads for nature targets with SMART2-MOVE in co-operation with the NFC at RIVM. For critical loads for vegetation the steady state version of SMART2 was used. For plot wise analysis a simulation framework was made (Smart2Studio).

Why SMART2-MOVE

- With SMART2-MOVE we try to link critical loads and target loads to biodiversity expressed by plant species composition targets. Targets on biodiversity are set in e.g.
  - EU-Habitatdirective
  - Convention of biodiversity (speed of loss of biodiversity has to halted in 2010)
  - Agreement between EU-ministers of environment (loss of biodiversity has to be halted in 2010).

Critical limits for SMART2-MOVE

- Critical limits used for SMART2-MOVE are minimum pH and maximum N-availability (sum of deposition and N-mineralization), defined for each nature target:

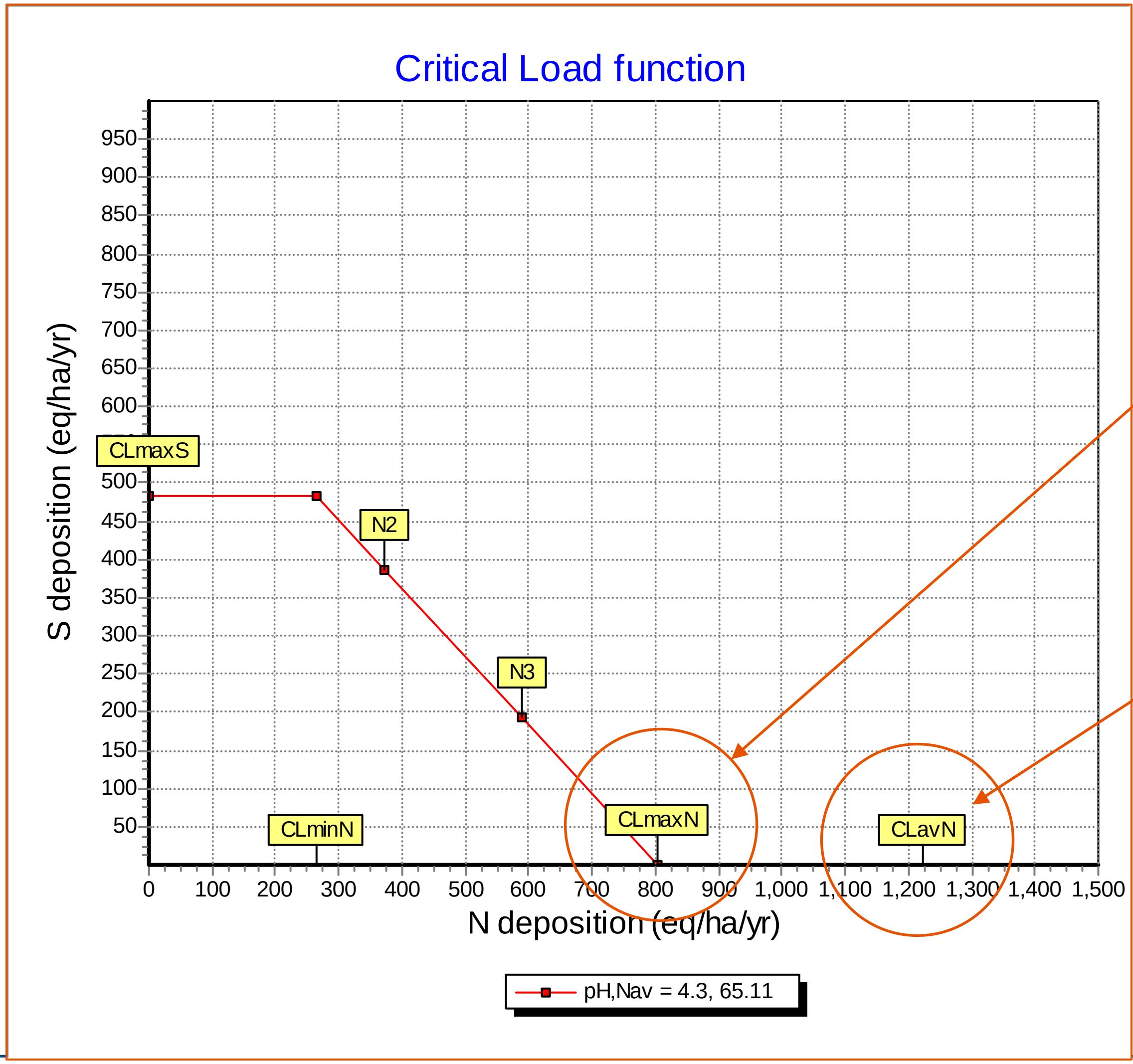
NUM	NAAM	EUNIS	SOILT	VEG	NAV_MAX	PH_MIN
17	Hz-3.3 rietland en ruigte	D4.1	PN	GRP	11.1890	4.200
17	Hz-3.3 rietland en ruigte	D4.1	SR	GRP	11.1890	4.621
18	Hz-3.4 ven	C1.1	ALL	GRP	5.3772	4.652
19	Hz-3.5 droog grasland	E1.94	ALL	GRP	5.6194	3.900
20	Hz-3.6 bloemrijk grasland	E1.7	SP	GRP	3.0283	4.400
20	Hz-3.6 bloemrijk grasland	E2.2	SR	GRP	3.0283	4.400
20	Hz-3.6 bloemrijk grasland	E2.2	SC	GRP	1.7691	6.196
20	Hz-3.6 bloemrijk grasland	E2.2	CC	GRP	4.5781	6.196
20	Hz-3.6 bloemrijk grasland	E2.2	CN	GRP	8.5253	4.400

Critical loads with SMART2 (1)

- The following Critical loads with SMART2-MOVE were computed:

1. CLmaxS; the S deposition that at 0 N deposition leads to the desired pH
2. CLmaxN; the N deposition that at 0 S deposition leads to the desired pH
3. CLnutN (CLavN); the N deposition that (at any S deposition) leads to the desired N availability
4. CLminN; the N deposition below which further reduction does not lead to a higher pH

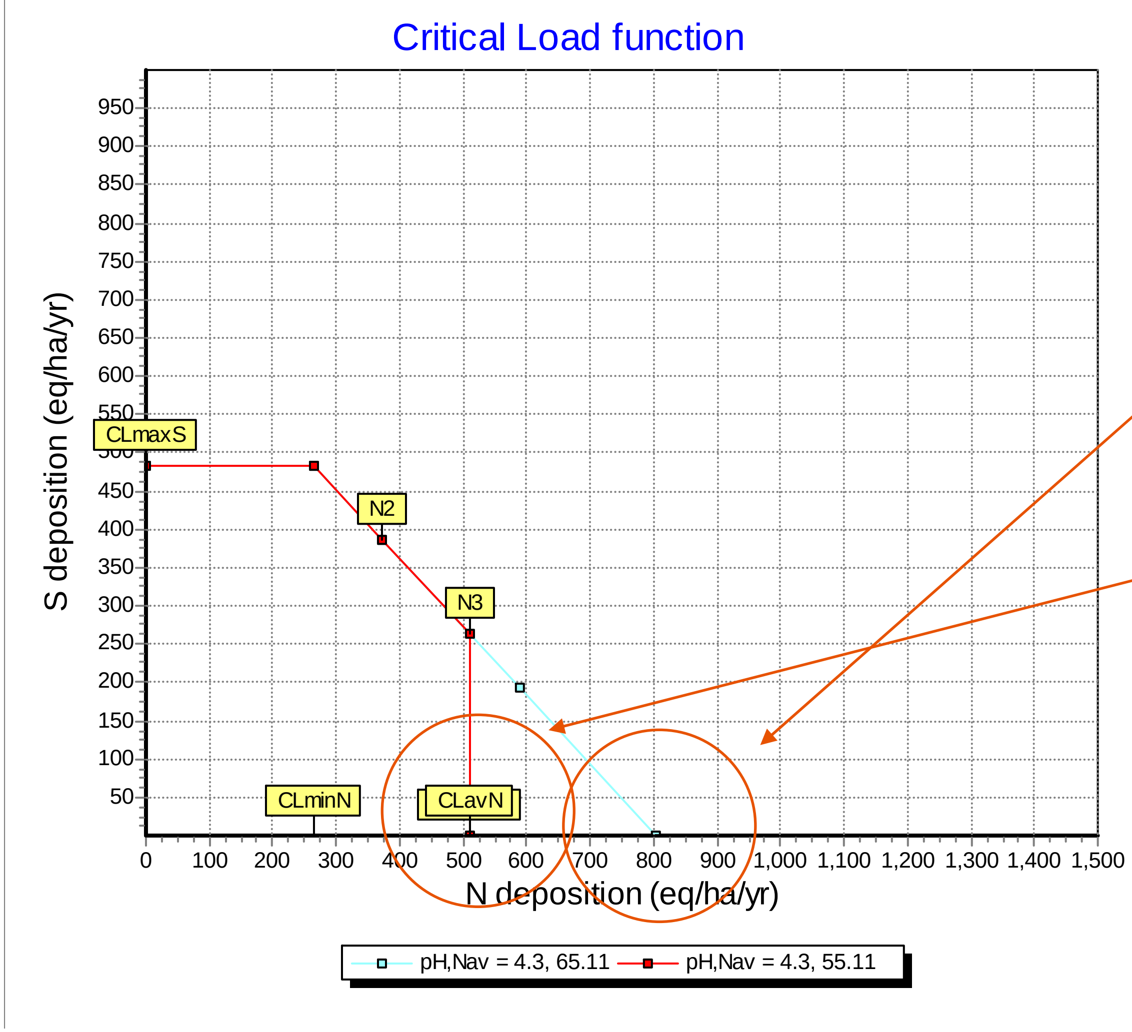
Critical loads (sandy soil, Pine, free drainage)



N dep that leads to pH 4.3

N dep that leads to N avail 65.11

Critical loads (same system, adapted $Navail_{max}$)

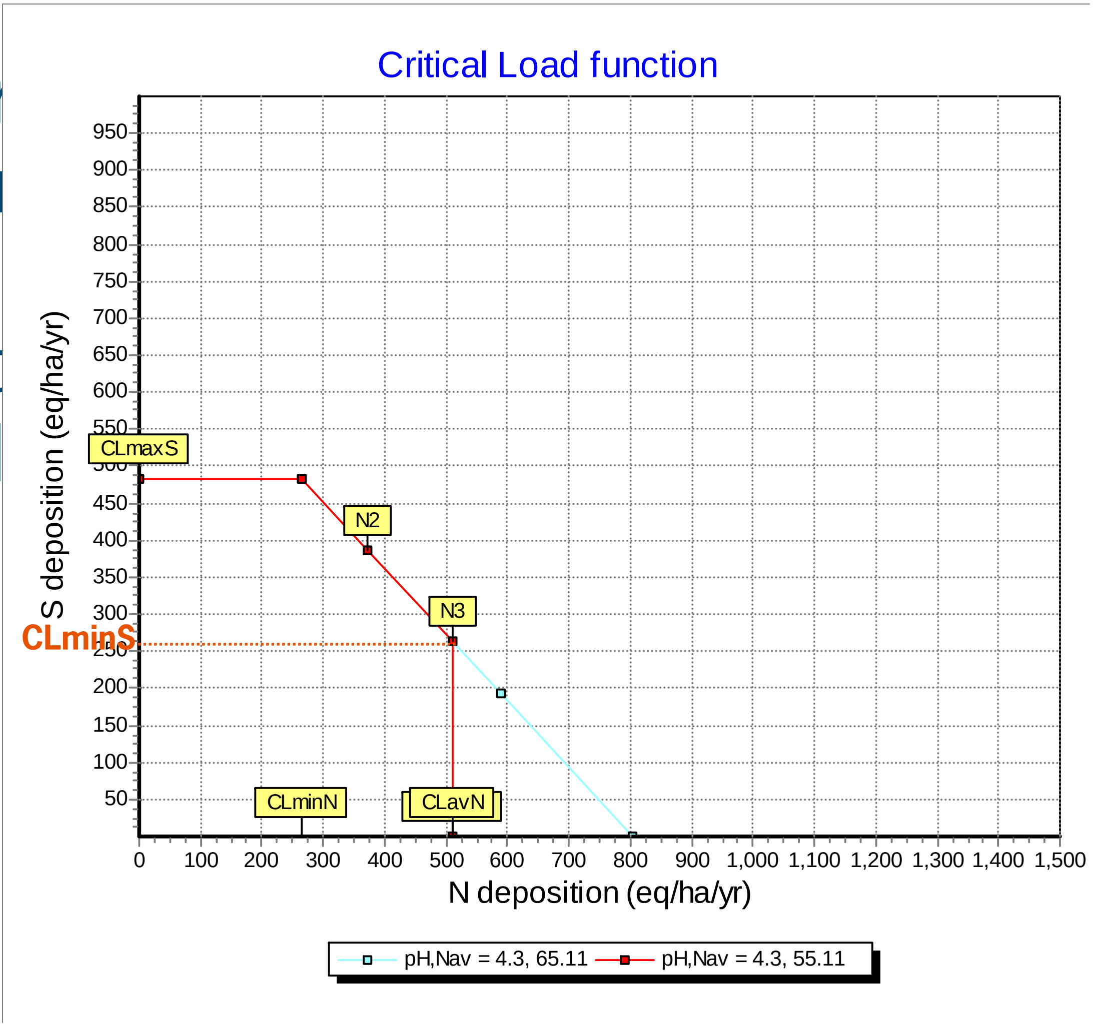


N dep that leads to pH 4.3

N dep that leads to N avail 55.11

Critical loads

- If one wants to pr
should be met, a
critical load. This
critical load funct
stringent than pH



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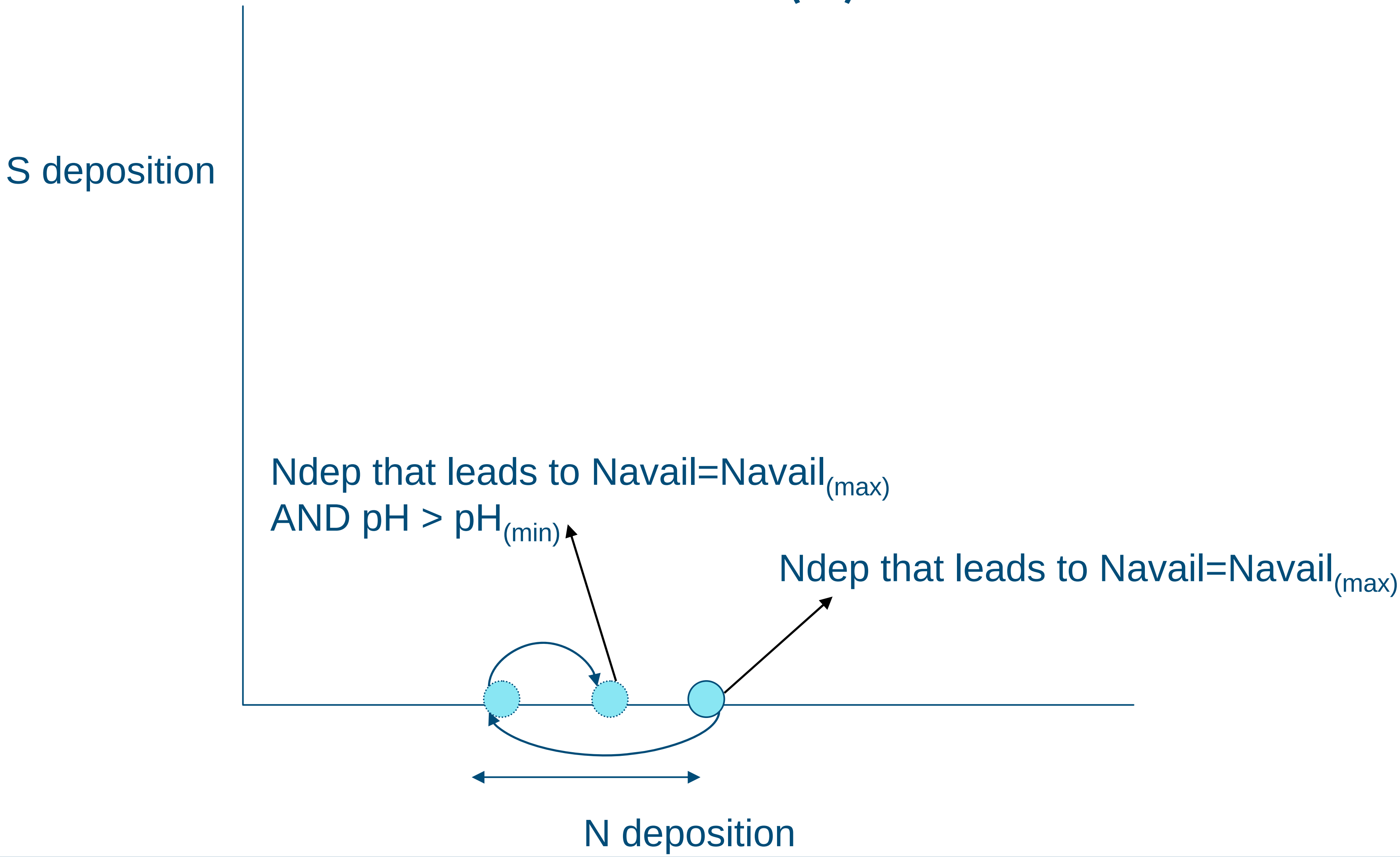
Target Loads

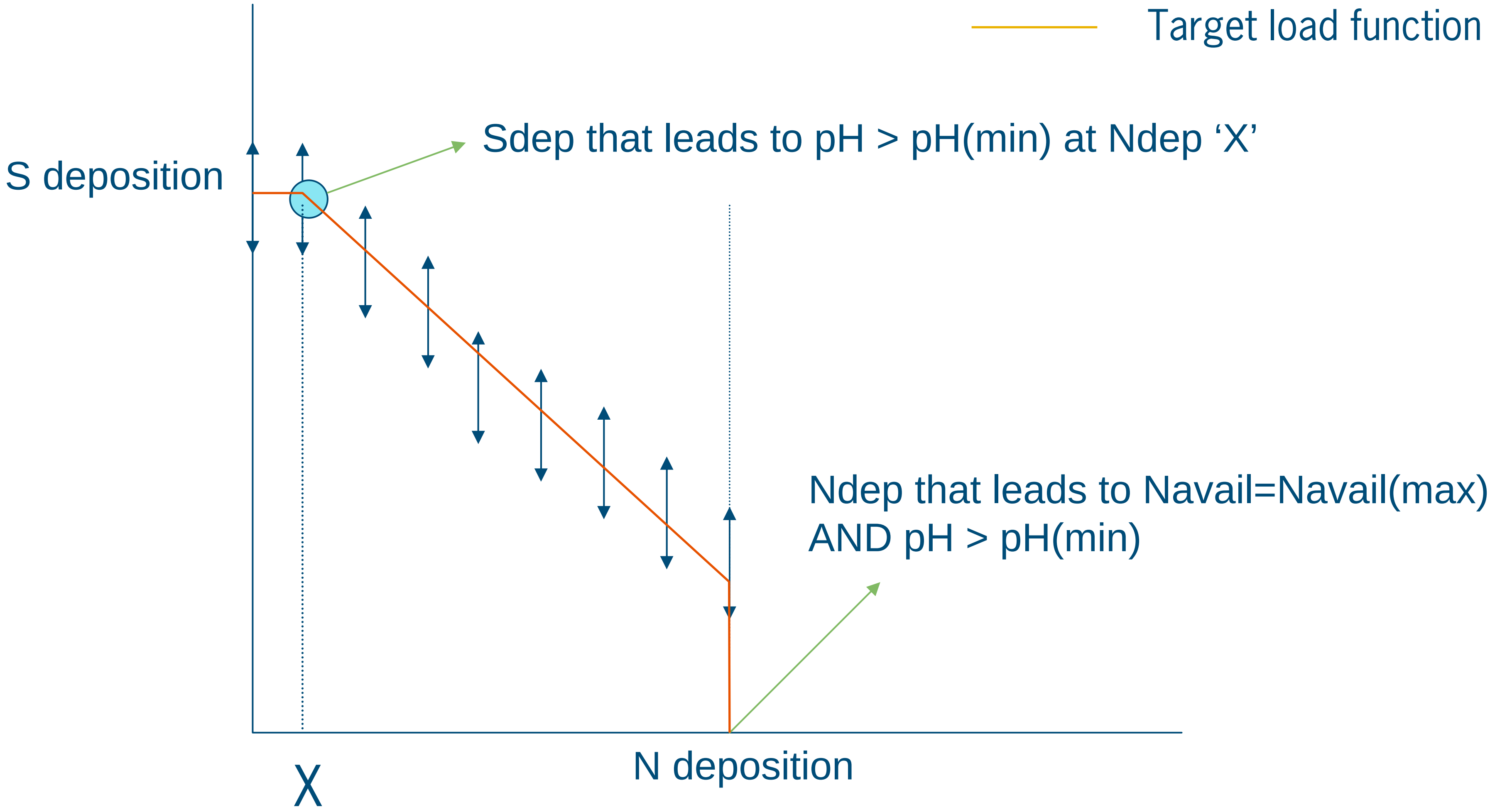
- Target load functions were computed such that pH is above the minimum pH for the nature type and N availability is below the maximum N availability for the nature type

- The use of 2 instead of 1 criterion for optimizing makes computing TLF's more complicated, but the framework provided by CCE for VSD can still be used as a basis for development

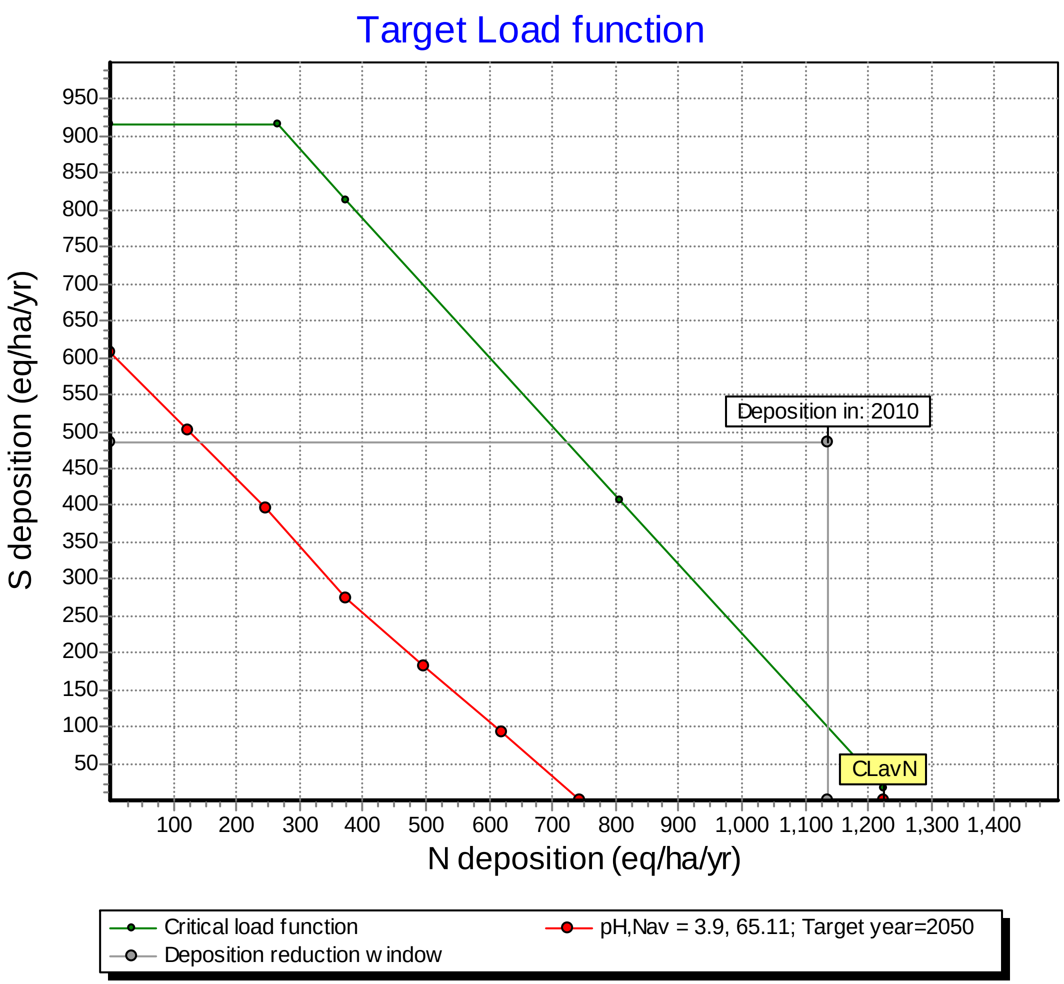
TLF's for SMART2: method (1)



TLF's for SMART2: method (2)



Targetloads



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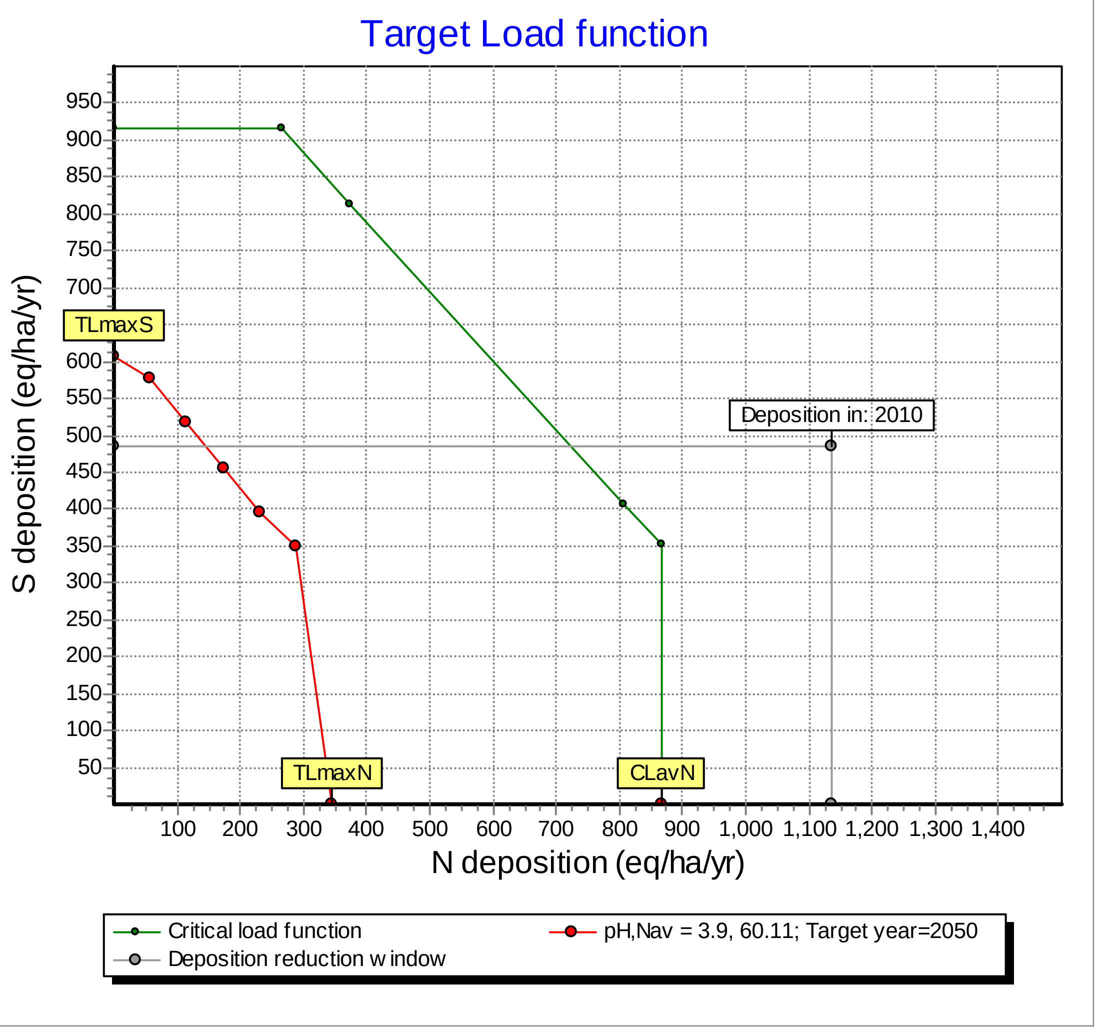
Targetloads (same system, adapted Navail$_{max}$)



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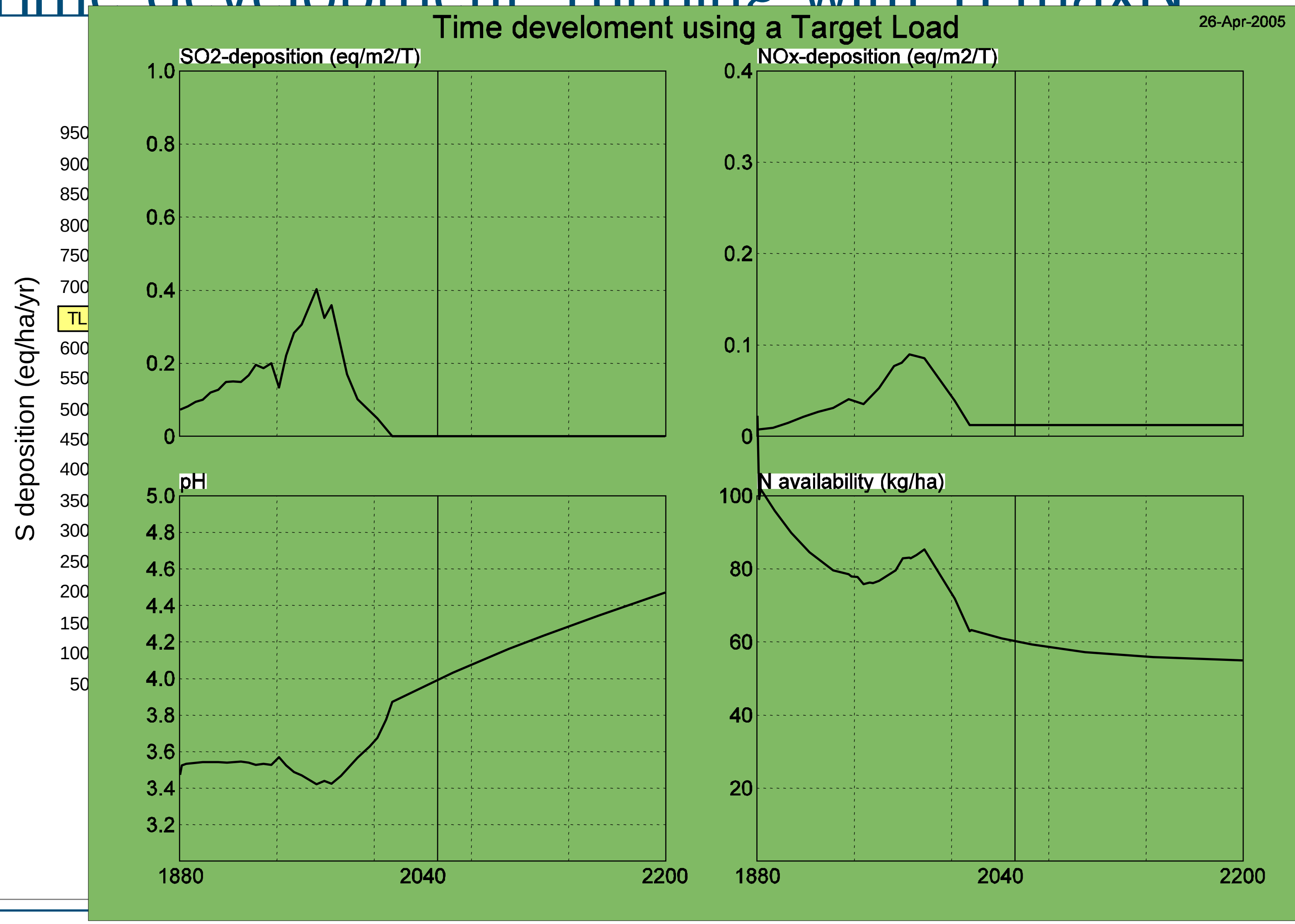
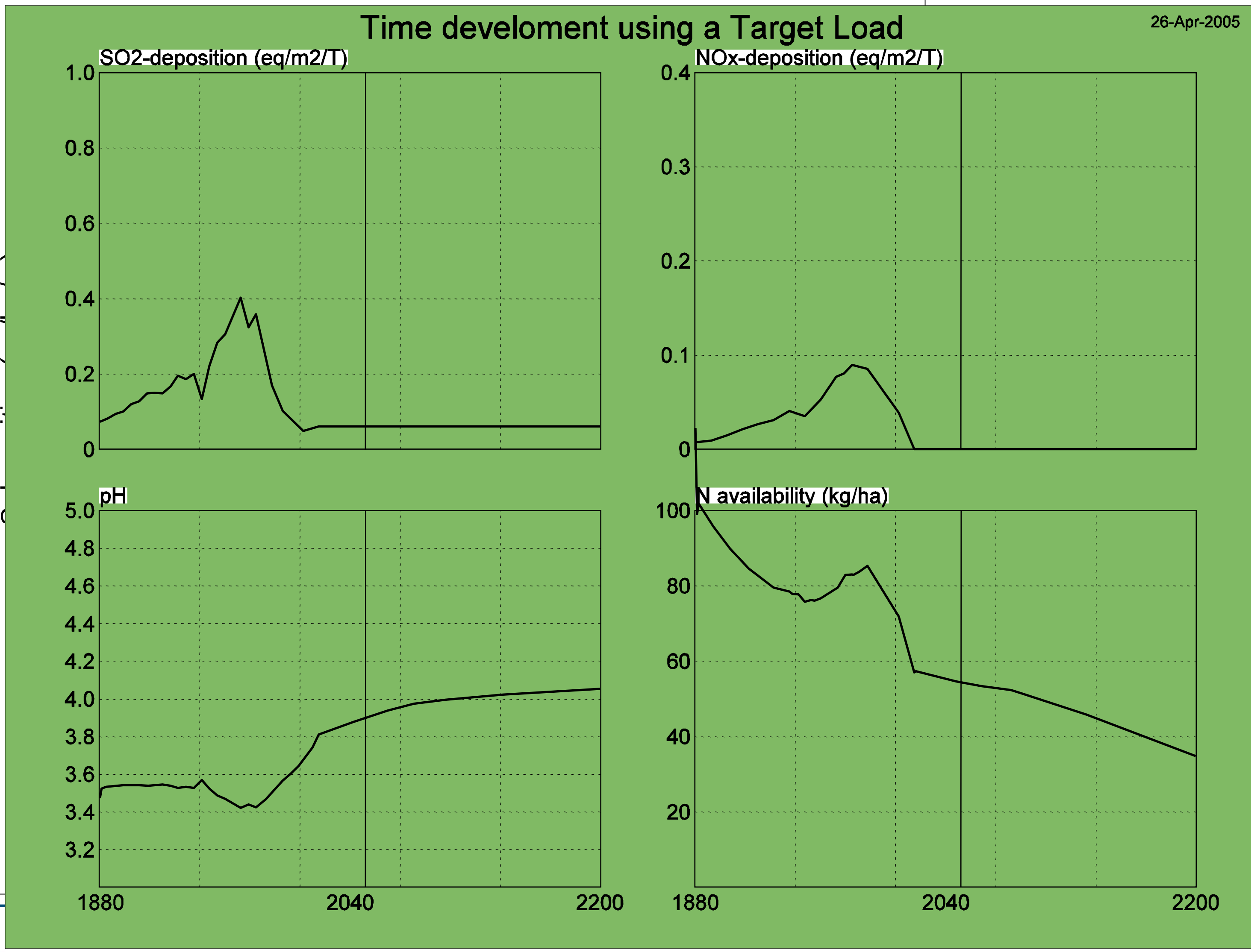
Time development, running with TLmaxN

should be



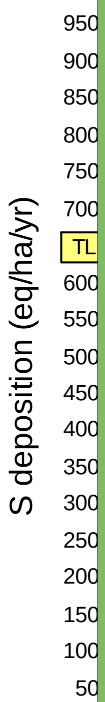
Time development running with TLmaxS

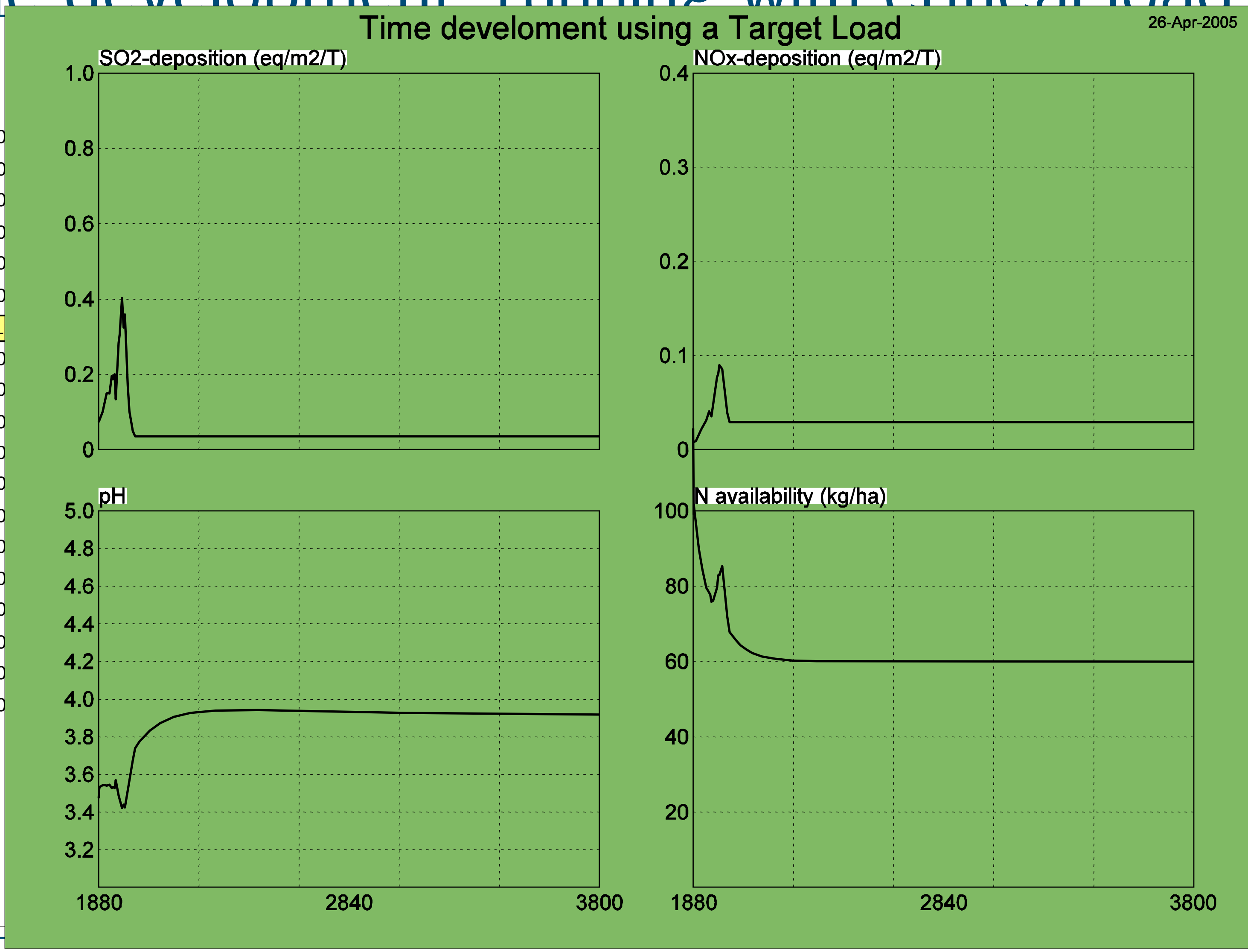
y should
=3.9



Time development: running with critical load

ould give
1 on an





Conclusions

- SMART2-MOVE is more complicated to apply for CLF's and TLF's than VSD due to its multiple criterion principle, its model-complexity and data demands
- For some ecosystems with e.g. high seepage fluxes, the results are questionable; these systems have been left out of the current submission (about 5 % of the area)
- Currently pH and N-availability are used, but it is in principle also possible to e.g. use another N criterium (N-mineralisation, N concentration, N pool)

Todo

- (try to) reproduce all ‘cases’ that the critical load function may have (with incomplete nitrification, high seepage etc.) to determine if all these cases occur in practice
- Improve modelling for grasslands
- Improve modelling and calibration for seepage systems
- Establish sensitivity of CLnutN
- …

End