

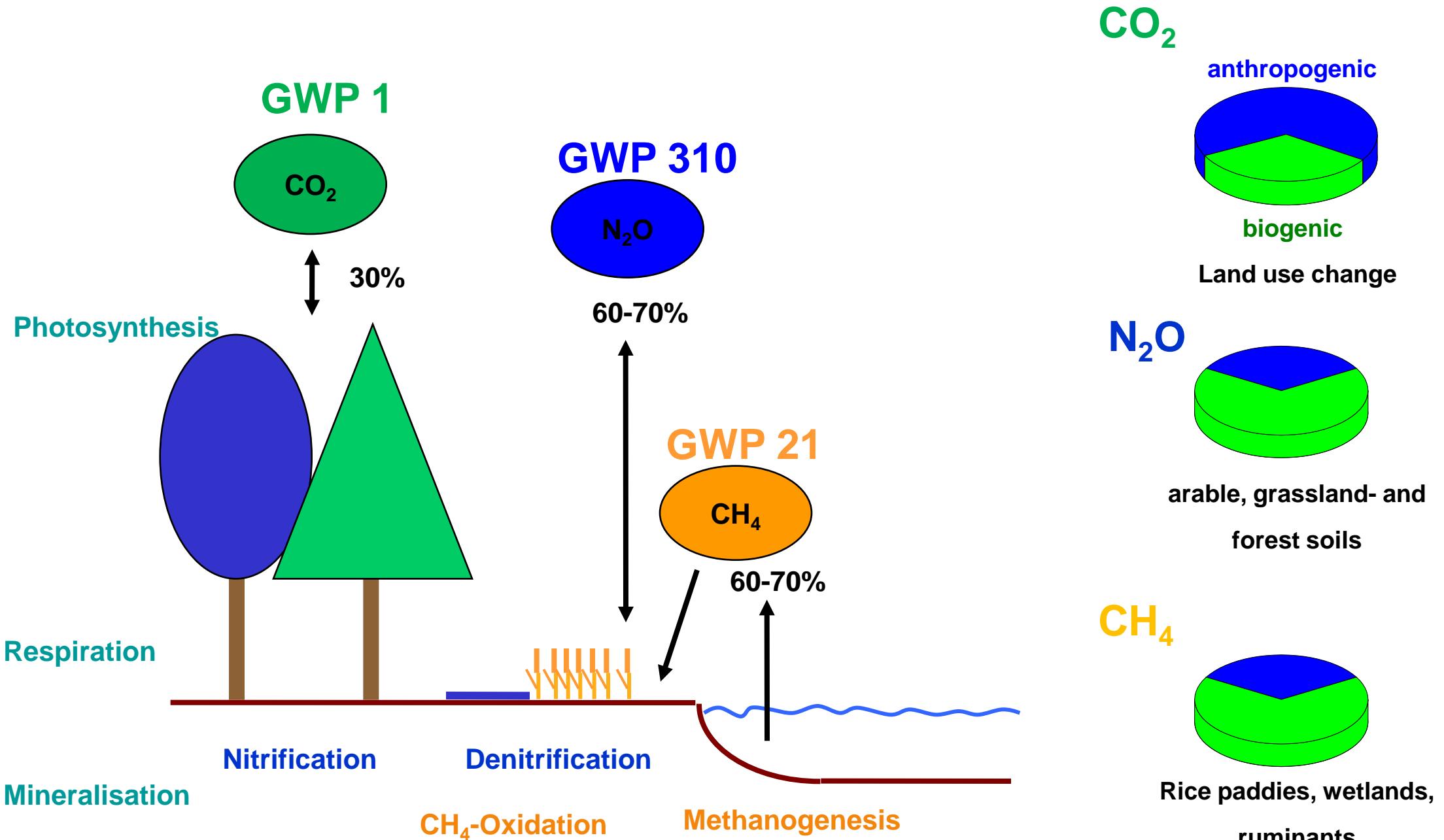
Modelling soil greenhouse gas exchange of terrestrial ecosystems and upscaling procedures



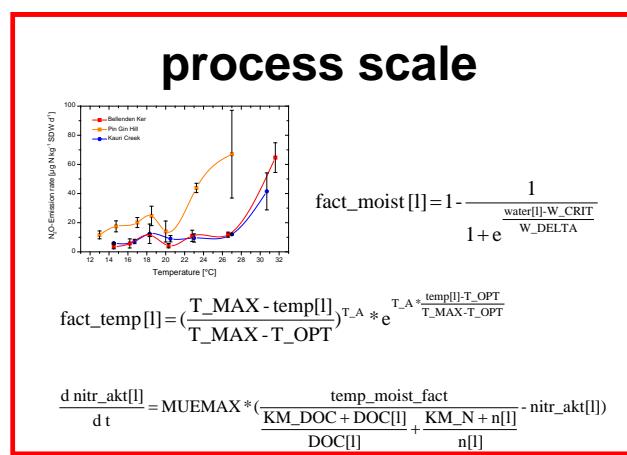
Ralf Kiese, Christian Werner, Edwin Haas, Klaus Butterbach-Bahl,
Youngsun Kim, Hojeong Kang

IMK-IFU Garmisch-Partenkirchen, Karlsruhe Institute of Technology

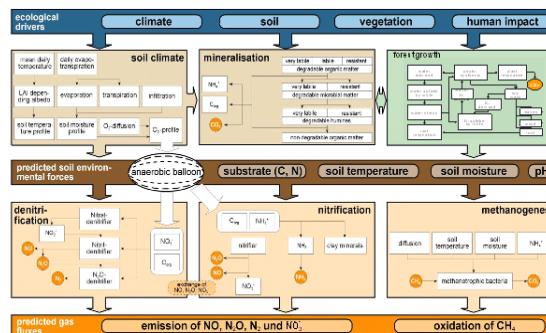
Biosphere as sink and source for atmospheric GHGs



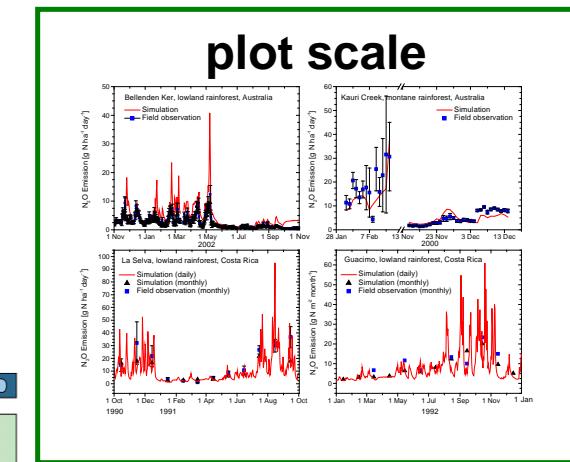
Integrated interdisciplinary research concept at IMK-IFU



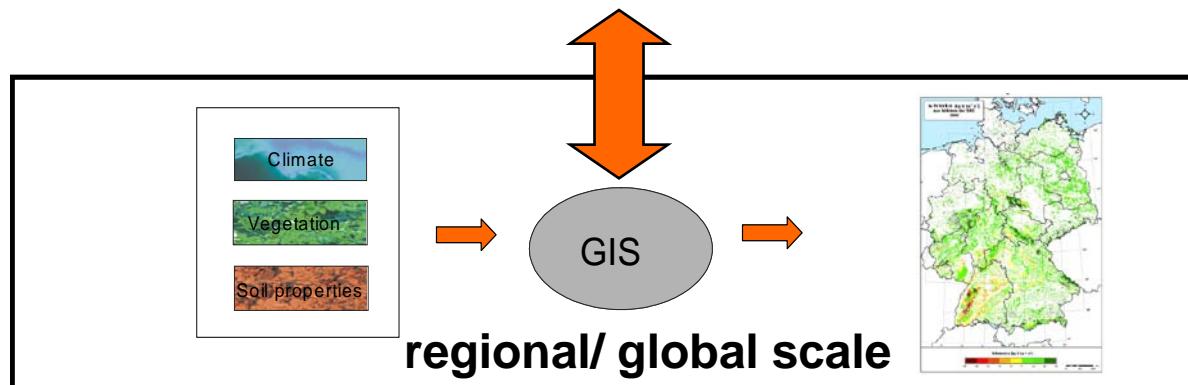
process based model



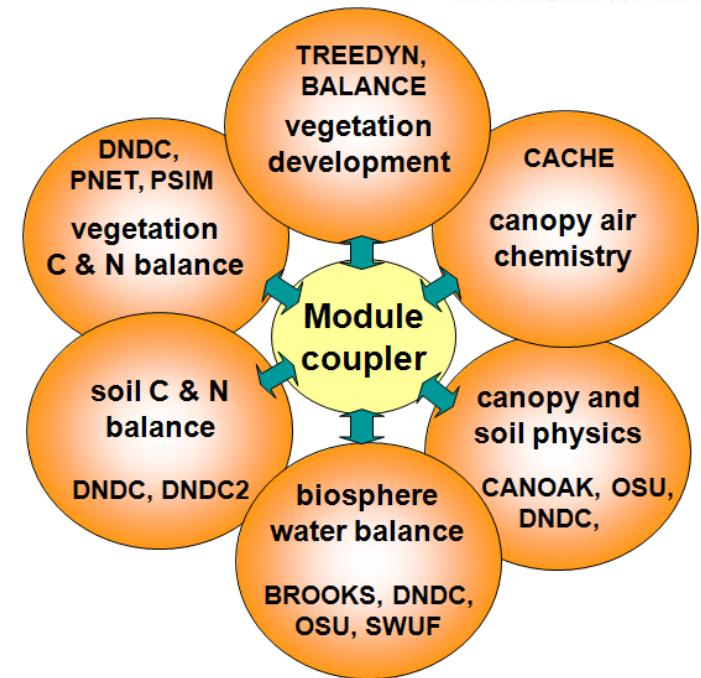
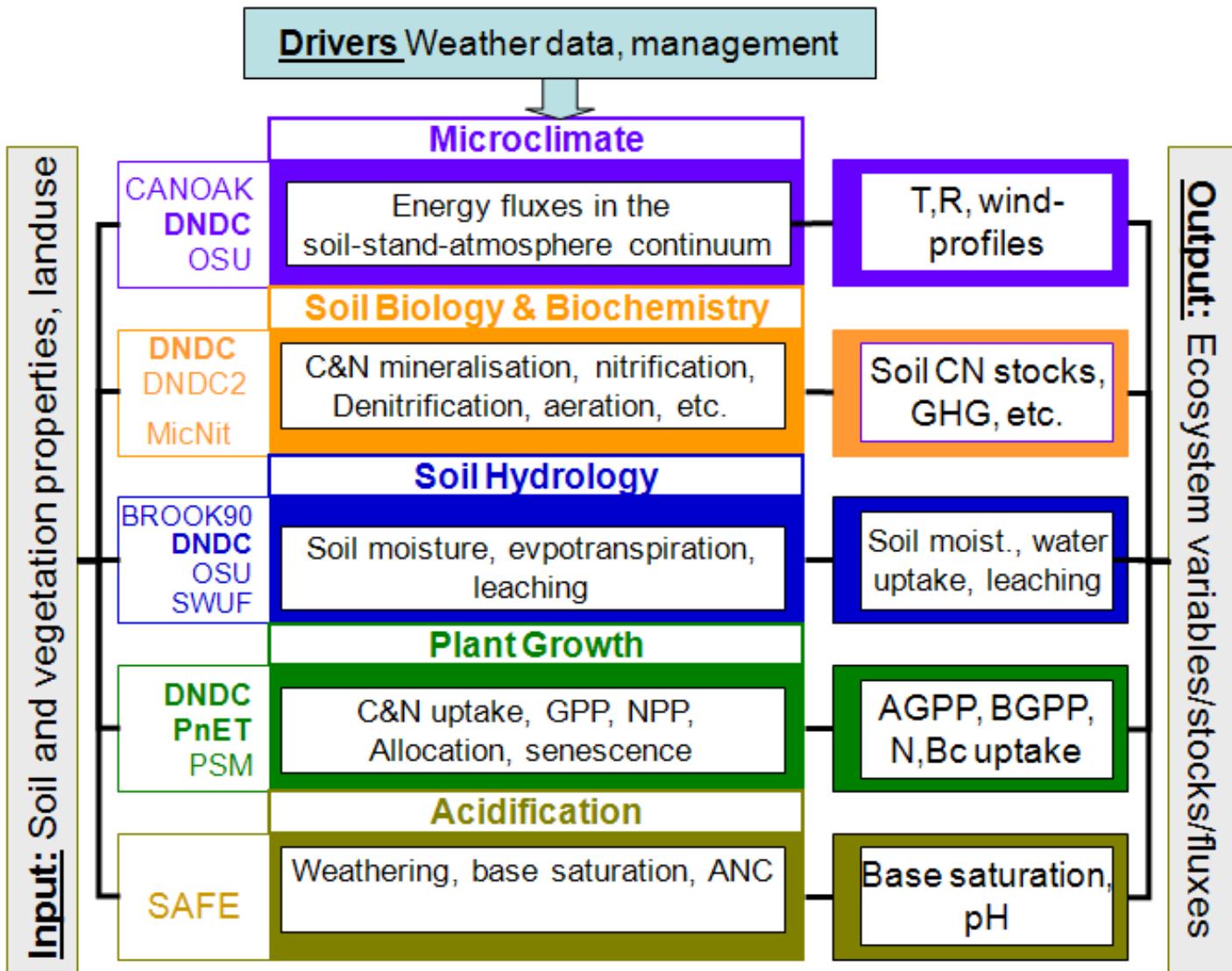
parameterisation



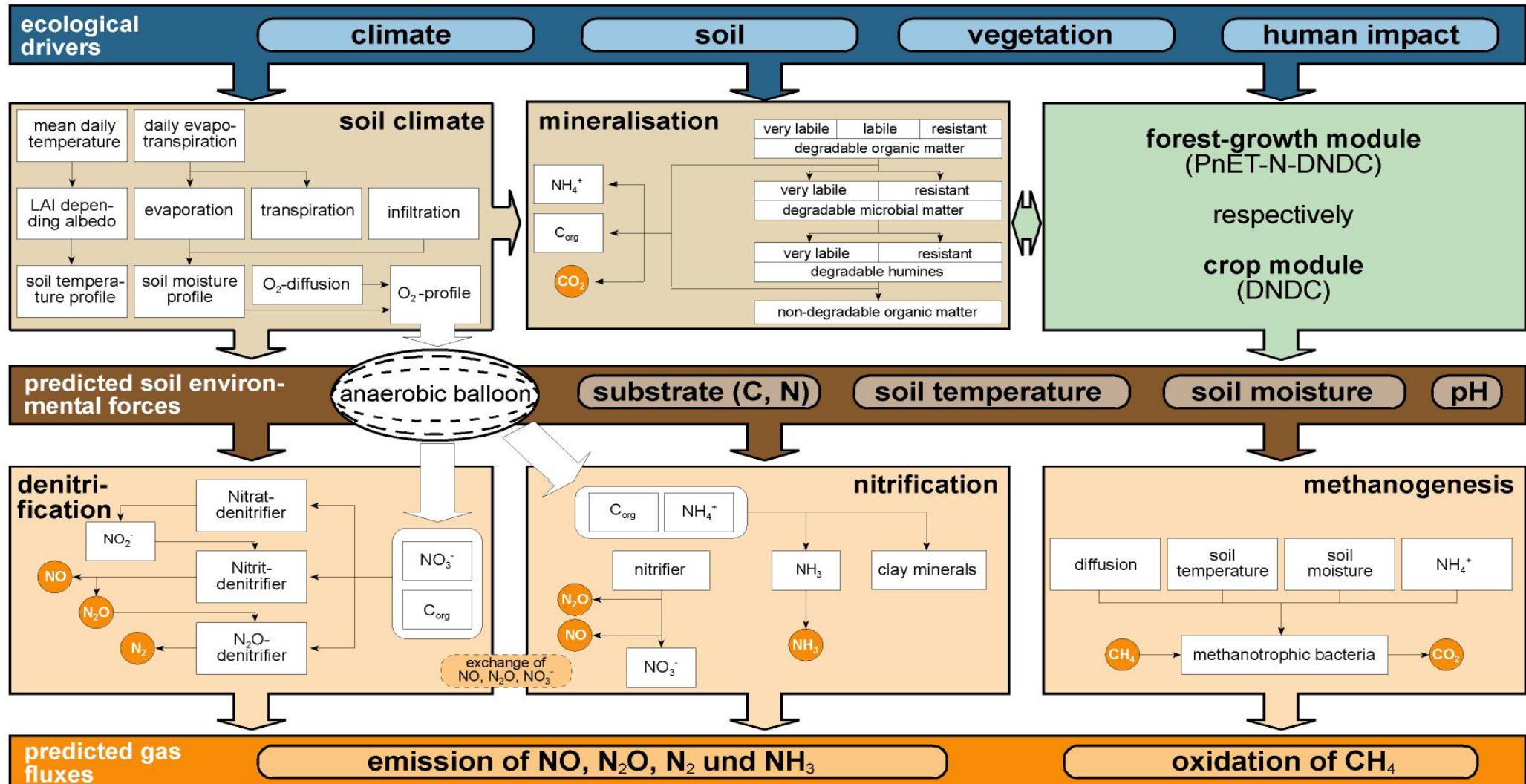
calibration/ testing



Model Framework: Mobile-DNDC



Scheme: Mobile-DNDC

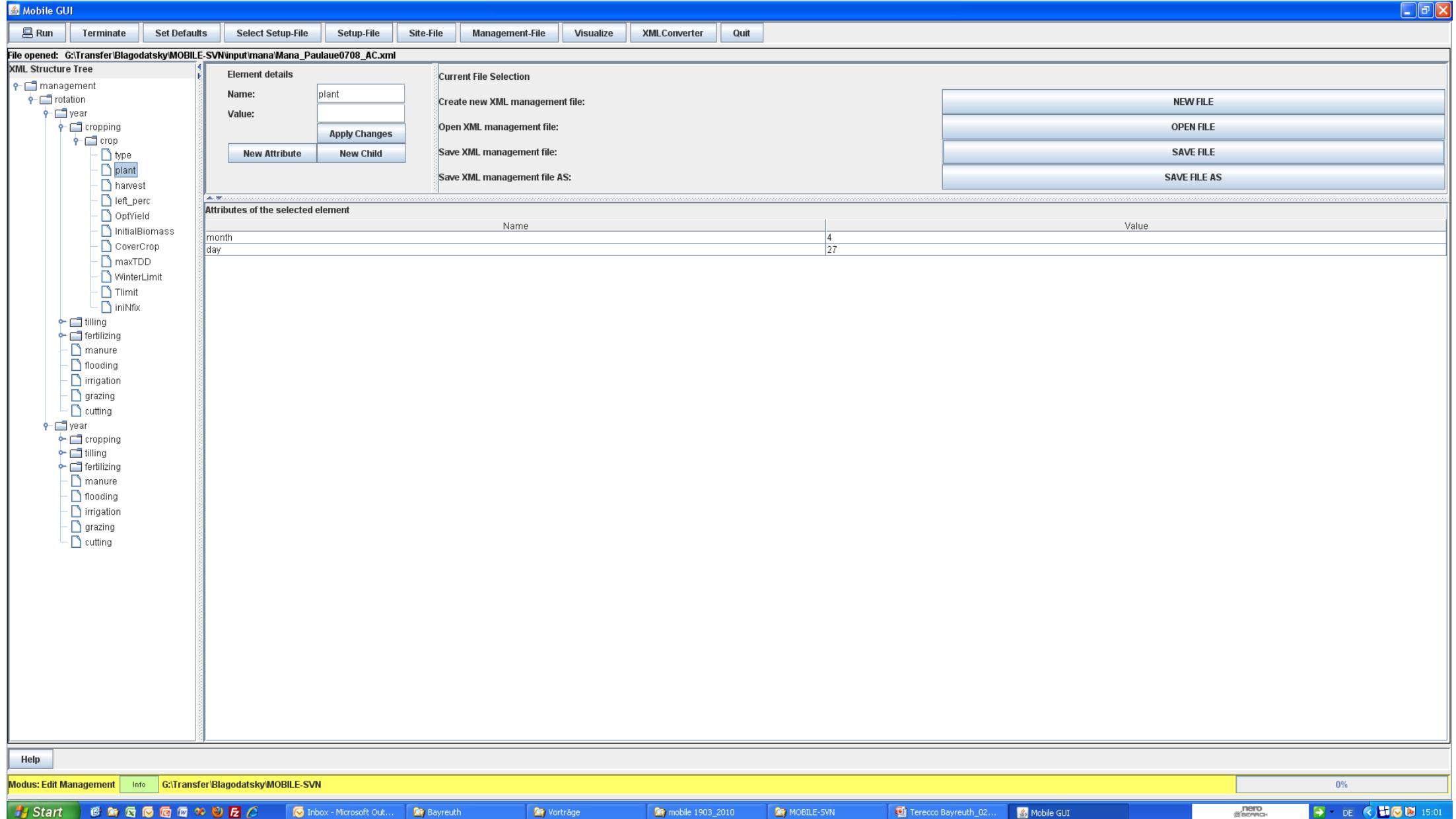


Input: Mobile-DNDC



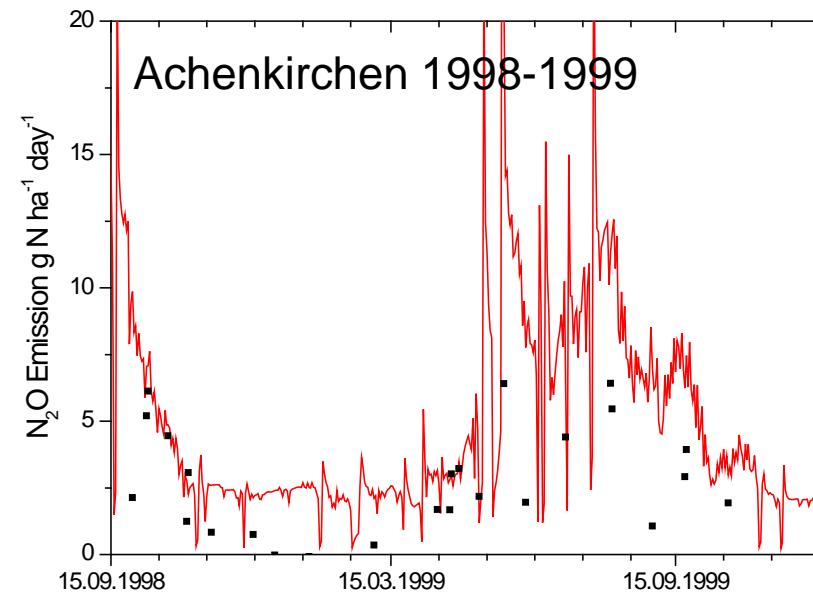
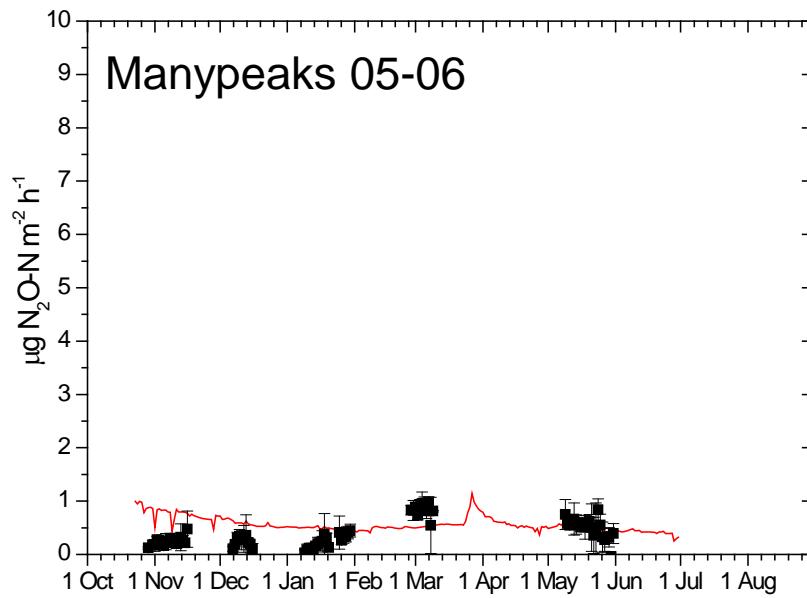
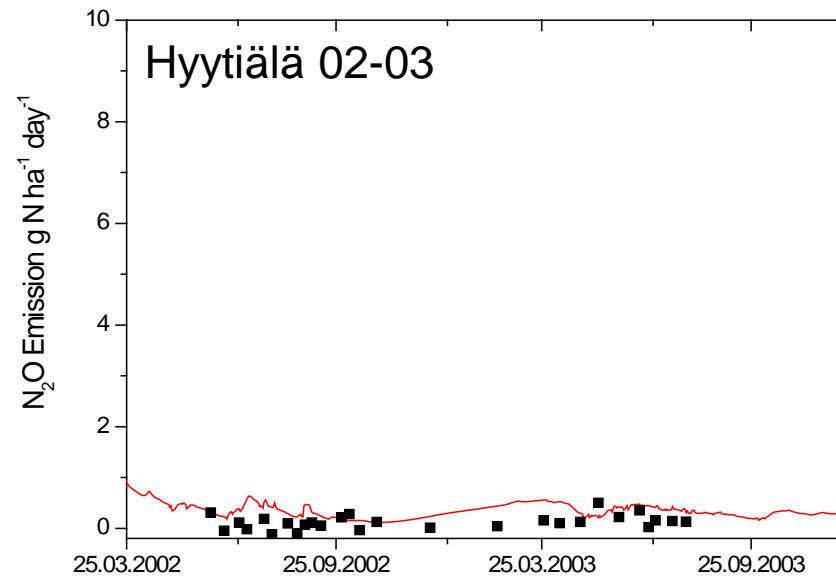
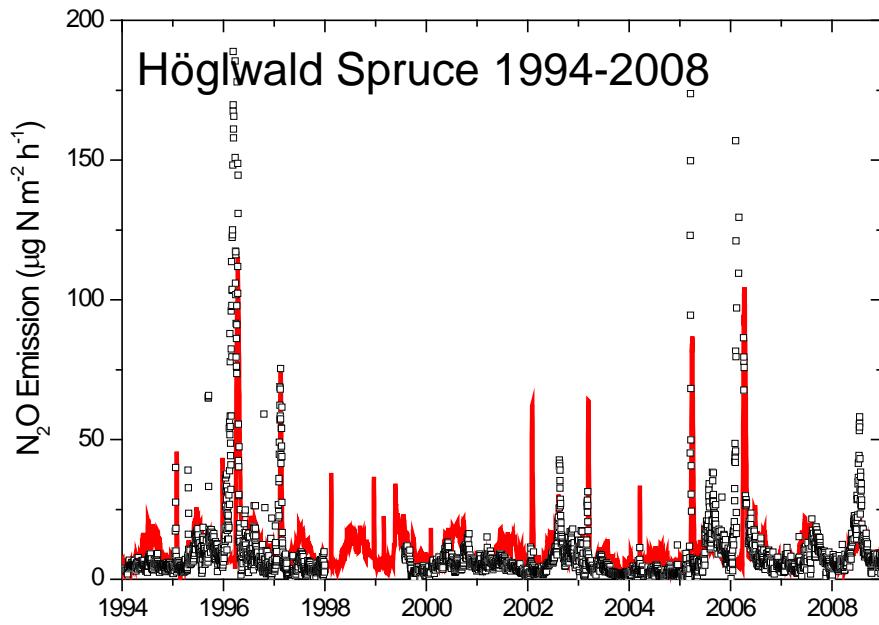
<u>daily:</u>	<u>Number thickness of soil layers:</u>	<u>Layer specific:</u>
Min-Max- Airtemperature	soil type e.g. scL, L , S	root biomass shoot biomass
Precipitation		leaf biomass
Global radiation	texture (sand, silt, clay in %)	peak plant height
rel. Humidity	bulk density	mean/ max rooting depth
wind speed	soil hydraulic conductivity	fertilization
Atmospheric CO ₂ conc.	field capacity	tilling
N-Deposition	wilting point	LAI
	Total organic C	harvesting
	Total organic N	relative species composition
	pH	irrigation
	depth of groundwater table	growth parameters leaf, wood, root C/N ratio

GUI: Mobile-DNDC



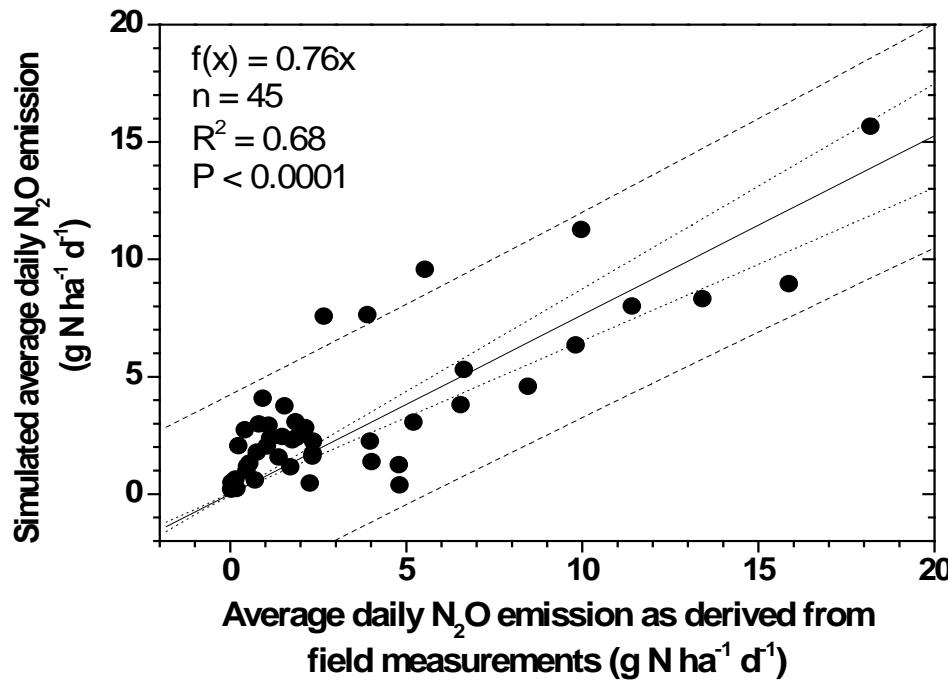
The screenshot shows the 'Mobile GUI' application window. The menu bar includes 'Run', 'Terminate', 'Set Defaults', 'Select Setup-File', 'Setup-File', 'Site-File', 'Management-File', 'Visualize', 'XMLConverter', and 'Quit'. A status bar at the bottom shows 'Modus: Edit Management' and the file path 'G:\Transfer\Blagodatsky\MOBILE-SVN'. The main area features an 'XML Structure Tree' on the left with a hierarchical tree structure of XML elements like 'management', 'rotation', 'year', 'cropping', 'crop', 'type', 'plant', 'harvest', etc. To the right of the tree is the 'Element details' panel, which currently displays 'Name: plant' and 'Value:' (empty). It also includes buttons for 'Apply Changes', 'New Attribute', and 'New Child'. Below this is the 'Current File Selection' section with options for creating, opening, or saving XML management files. The 'Attributes of the selected element' table shows 'month' with value '4' and 'day' with value '27'. The taskbar at the bottom includes icons for Start, Microsoft Office, Bayreuth, mobile 1903_2010, MOBILE-SVN, Terecco Bayreuth_02..., Mobile GUI, and system status.

Mobile-DNDC Forest Simulations

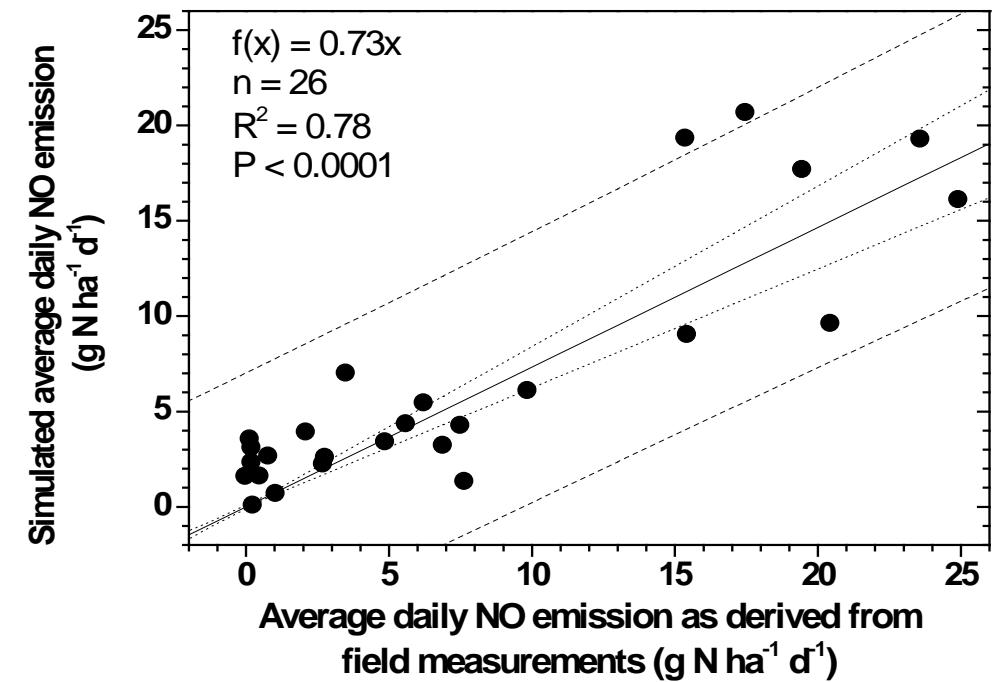


Mobile-DNDC Forest Simulations

N₂O emissions

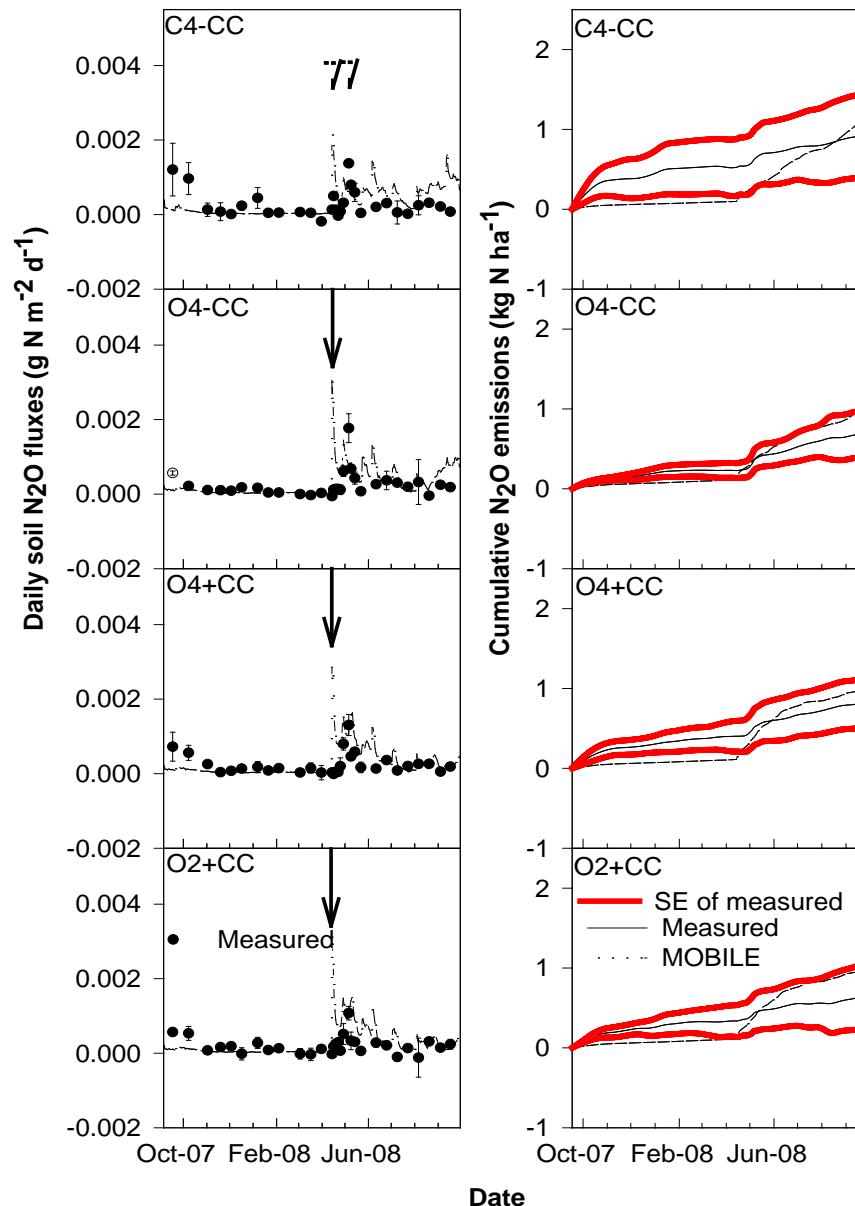


NO emissions



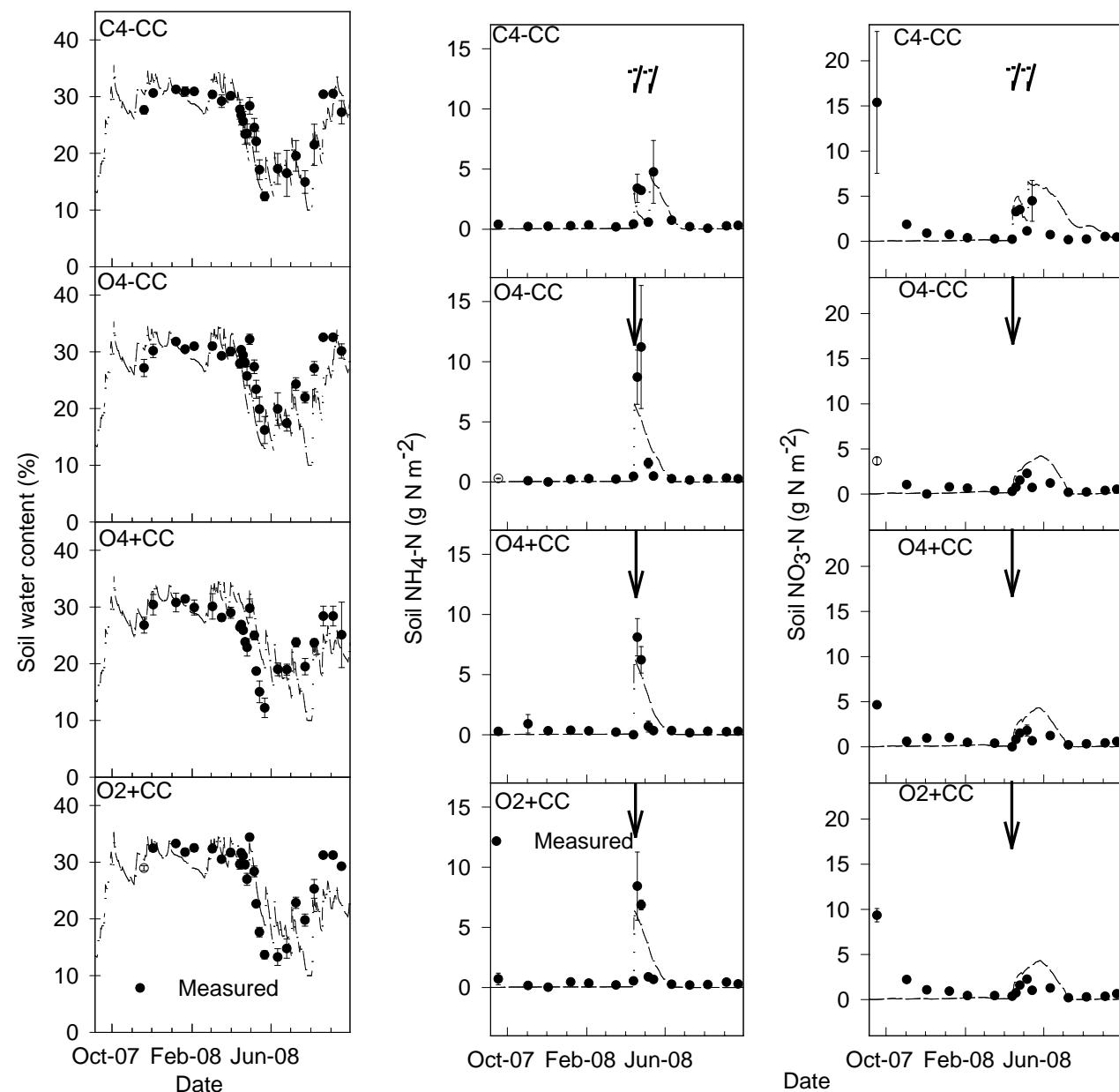
Mobile-DNDC Arable Simulations

Long-term experiment at Foulum Western-Denmark



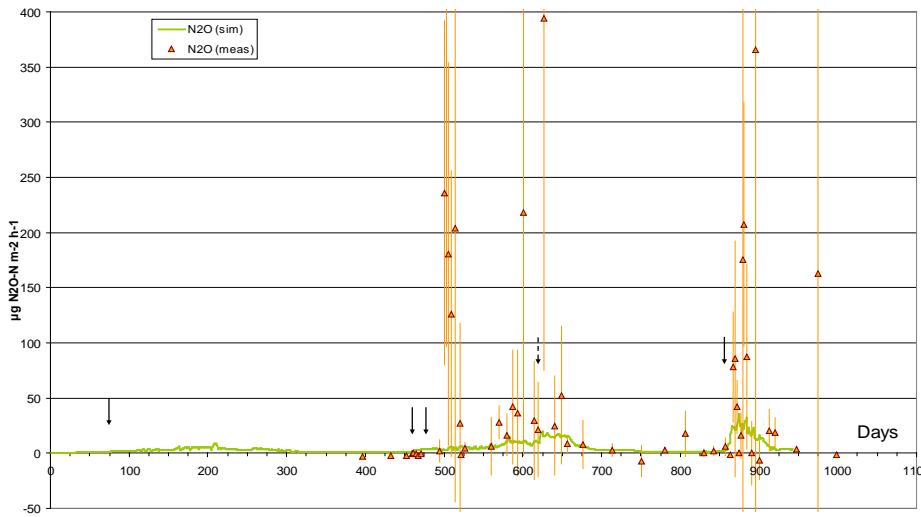
Mobile-DNDC Arable Simulations

Long-term experiment at Foulum Western-Denmark

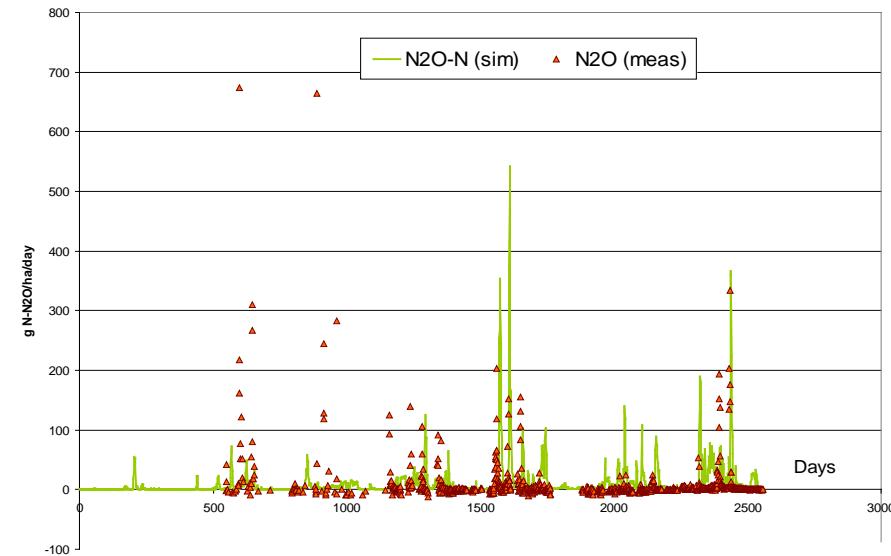


Mobile-DNDC Arable Simulations

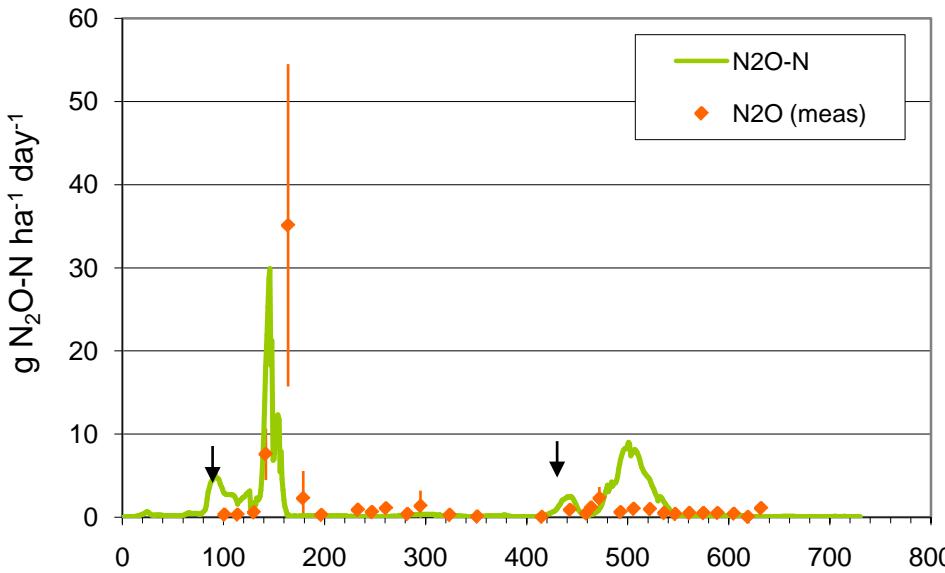
Moulde 06-08



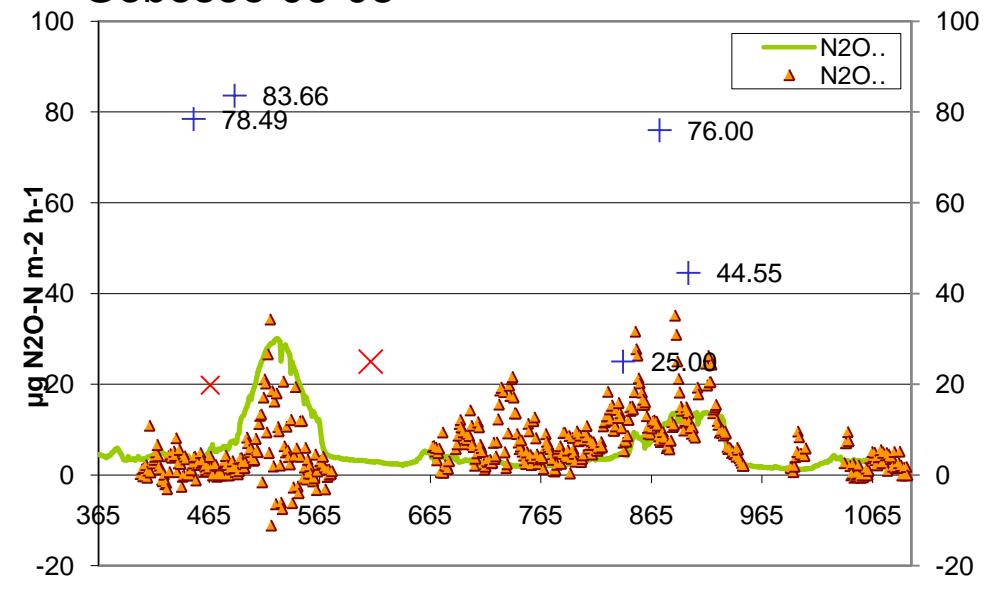
Oensingen 02-08



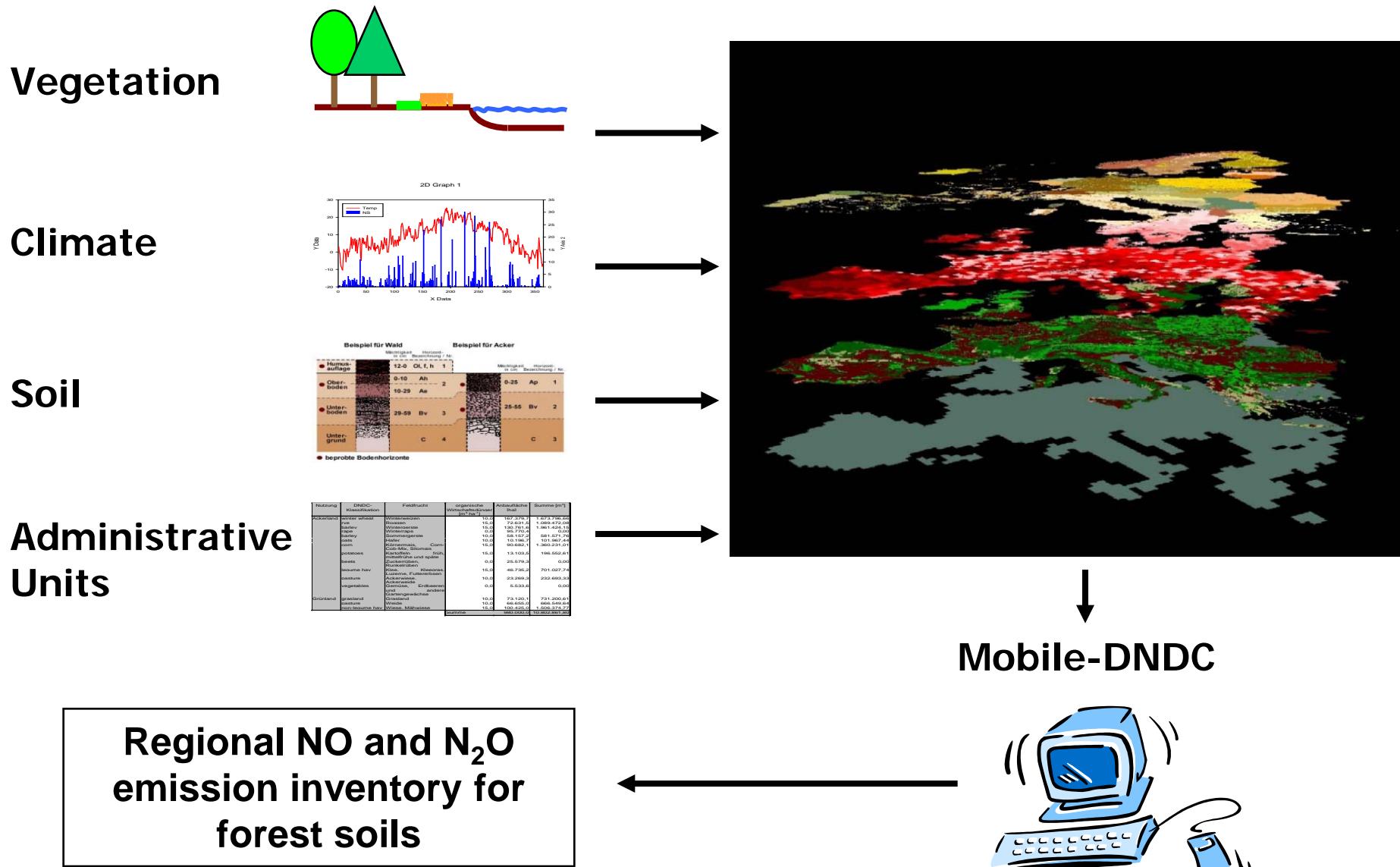
Paulinenaue 07-08



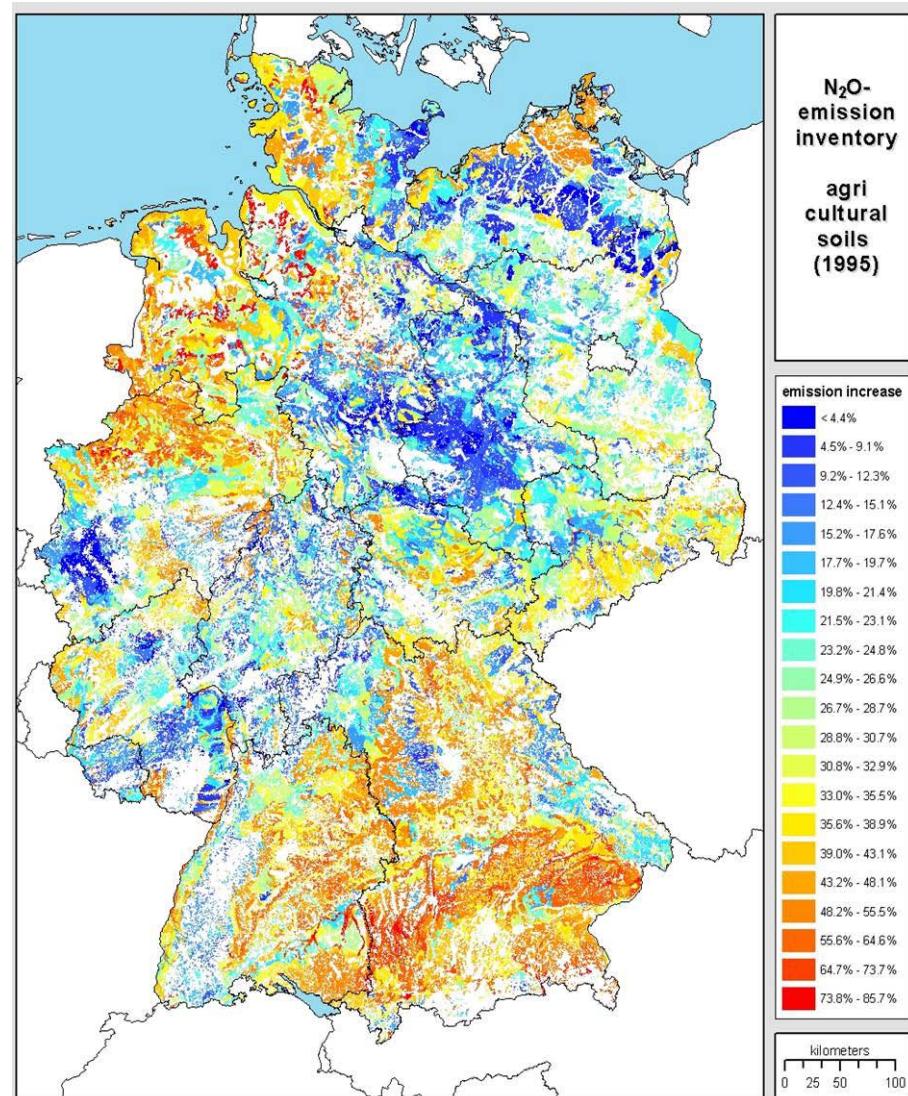
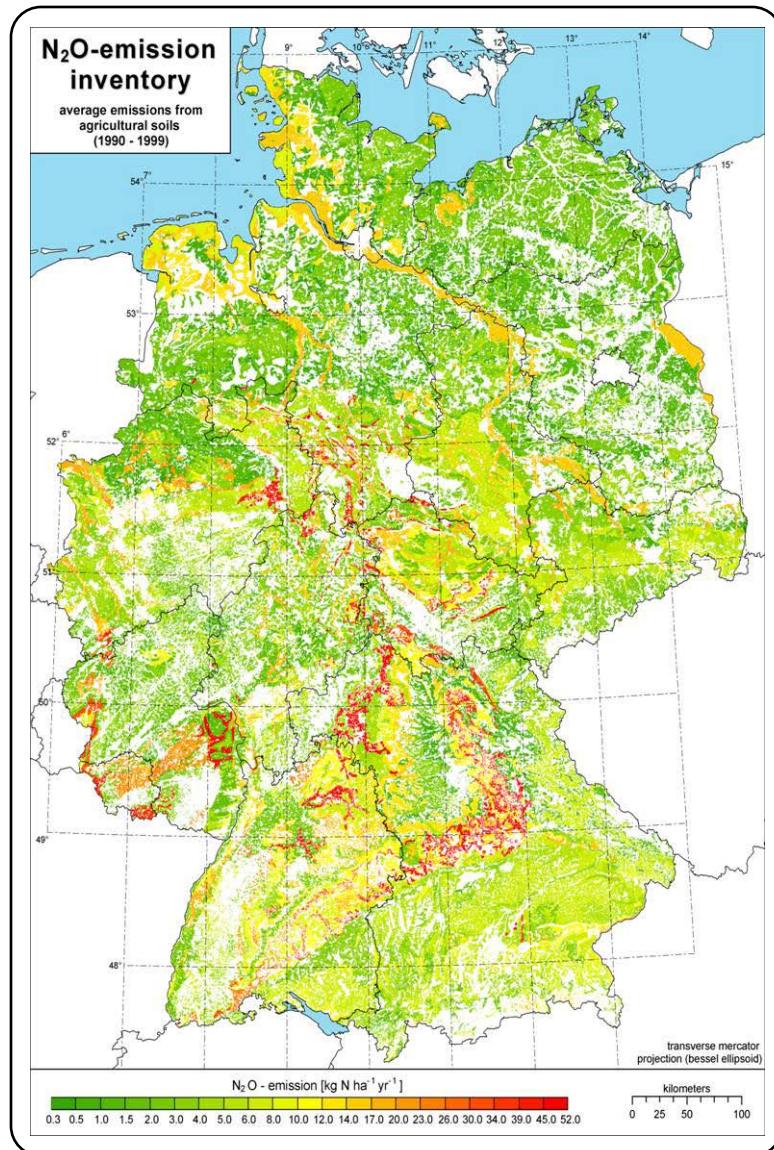
Gebesee 06-08



Mobile-DNDC Regional Application Approach



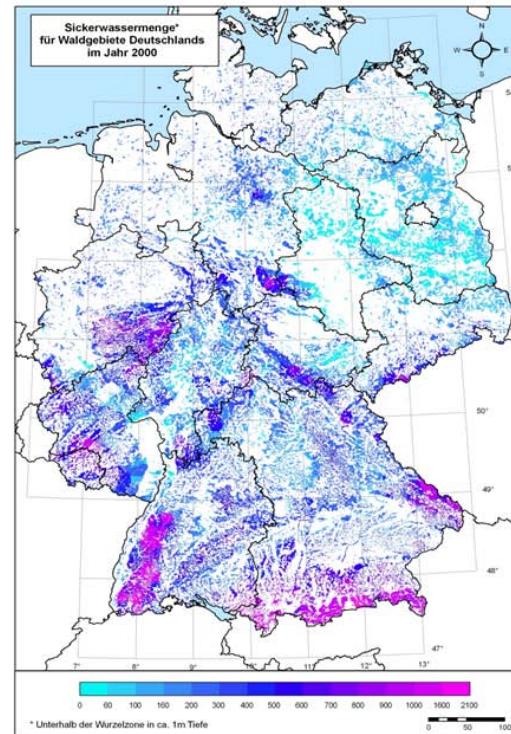
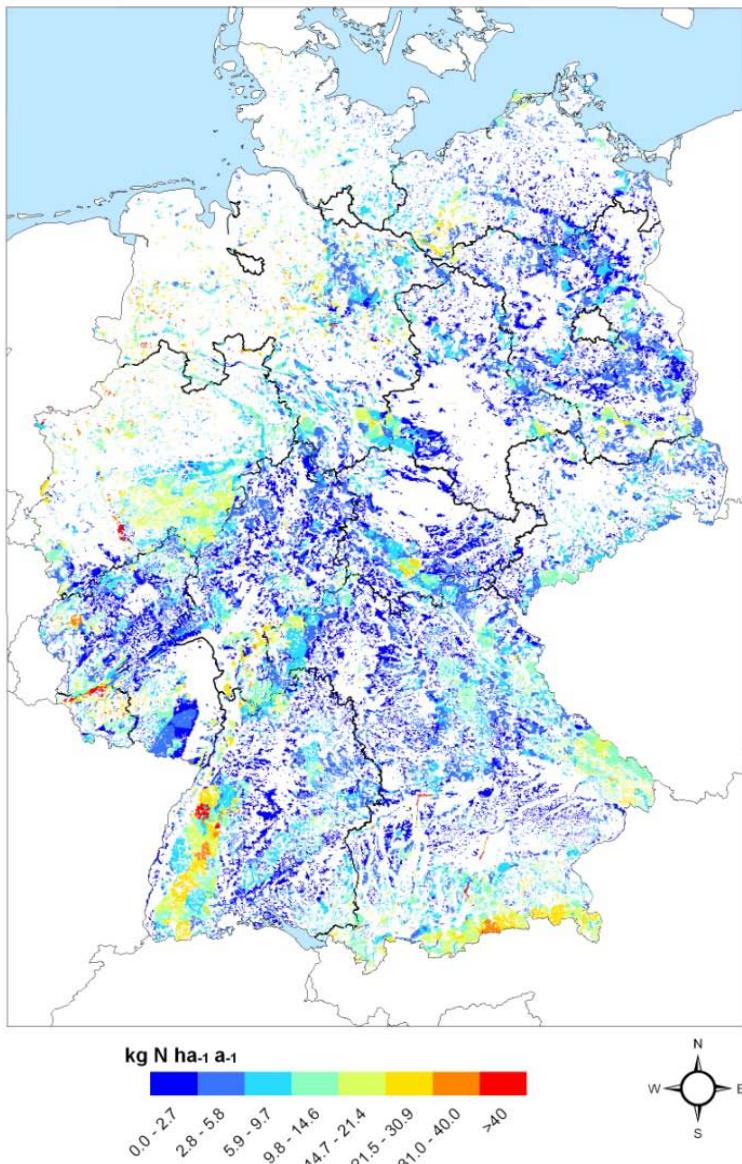
N₂O Emission Arables Germany



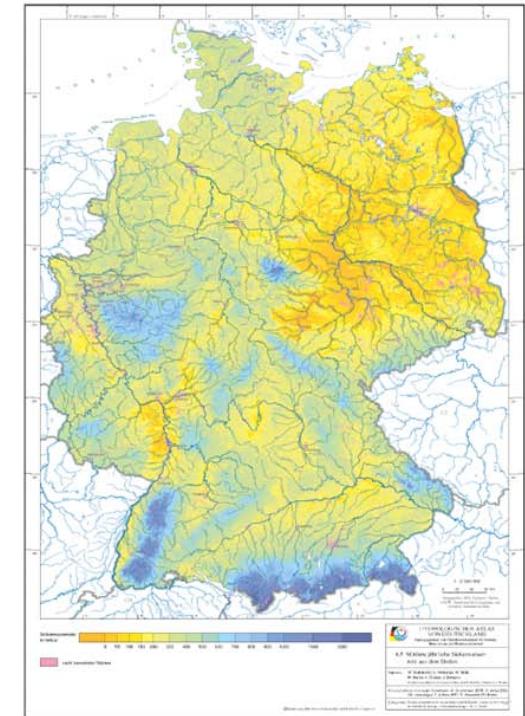
fertilizer induced N₂O emissions (%)

Nitrate leaching under forests Germany

NO₃ Leaching



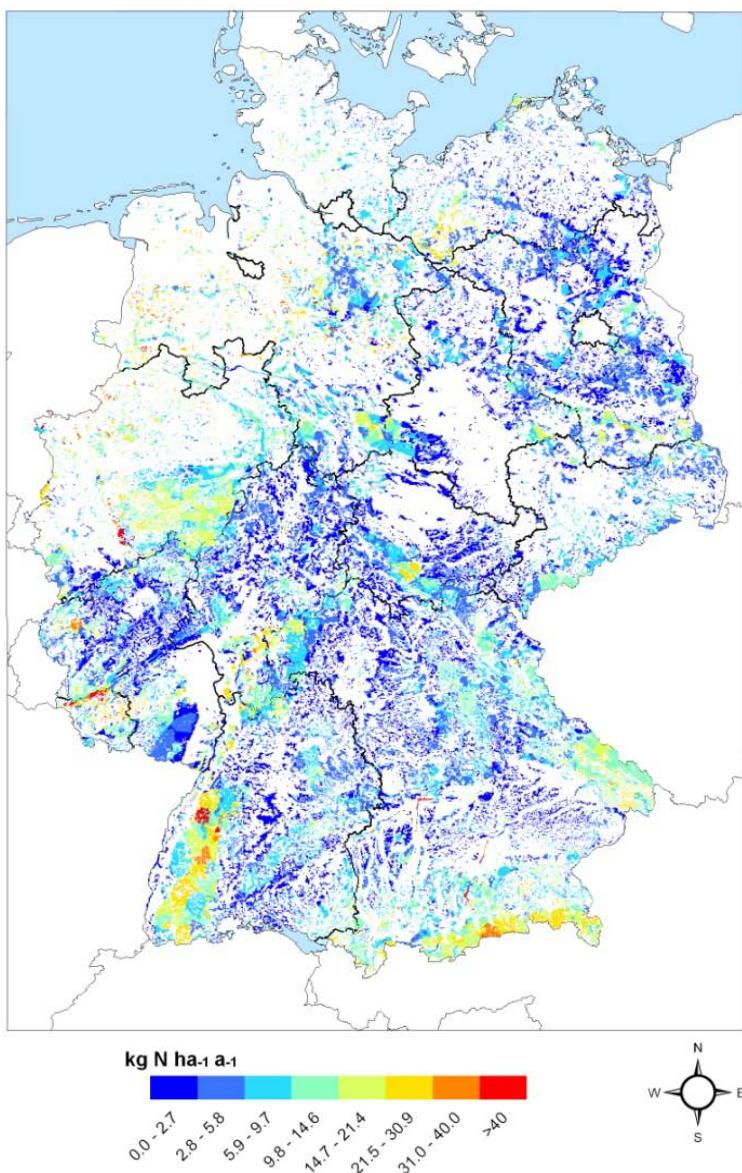
simulated seepage water
MOBILE Forest-DNDC



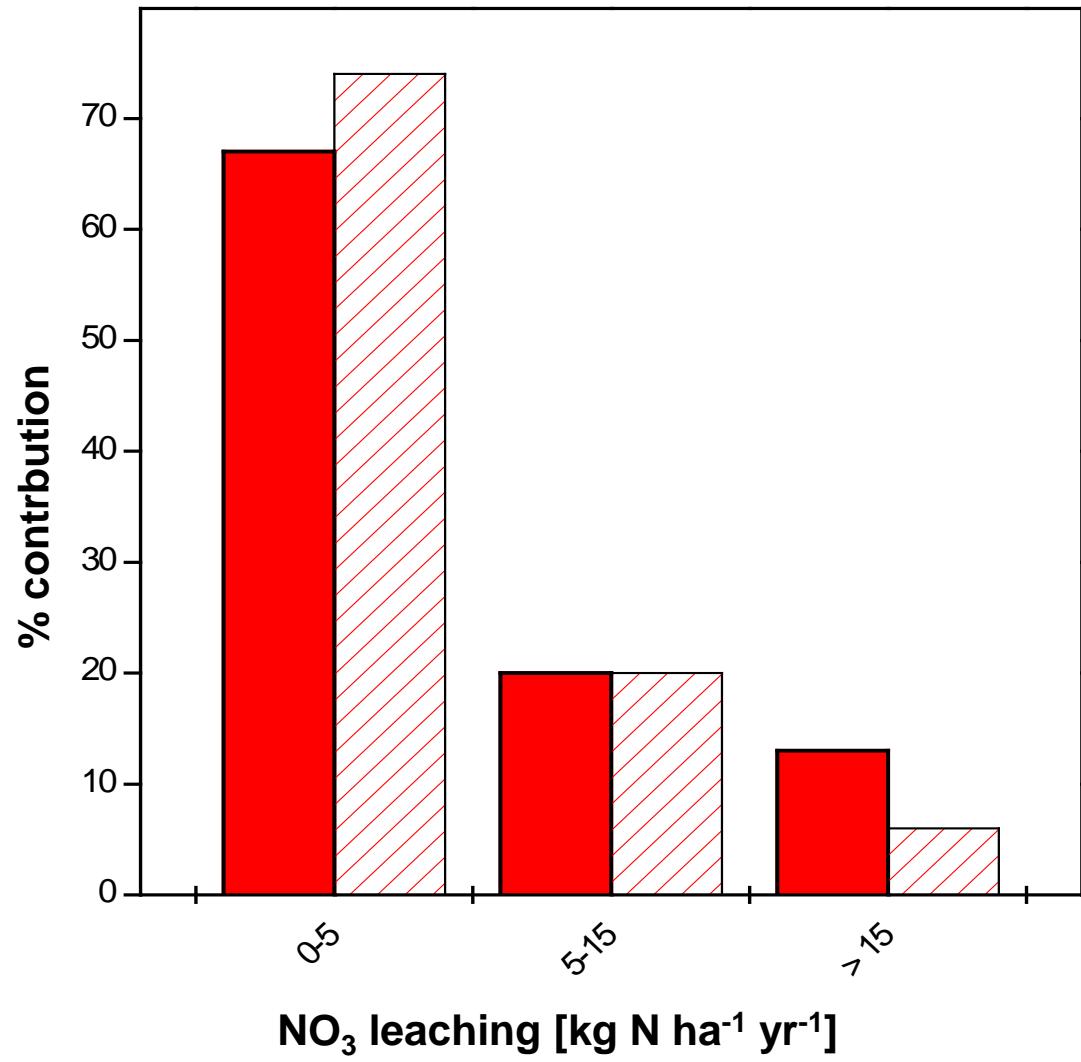
simulated seepage water hydr.
Atlas Germany

Nitrate leaching under forests Germany

NO₃ Leaching

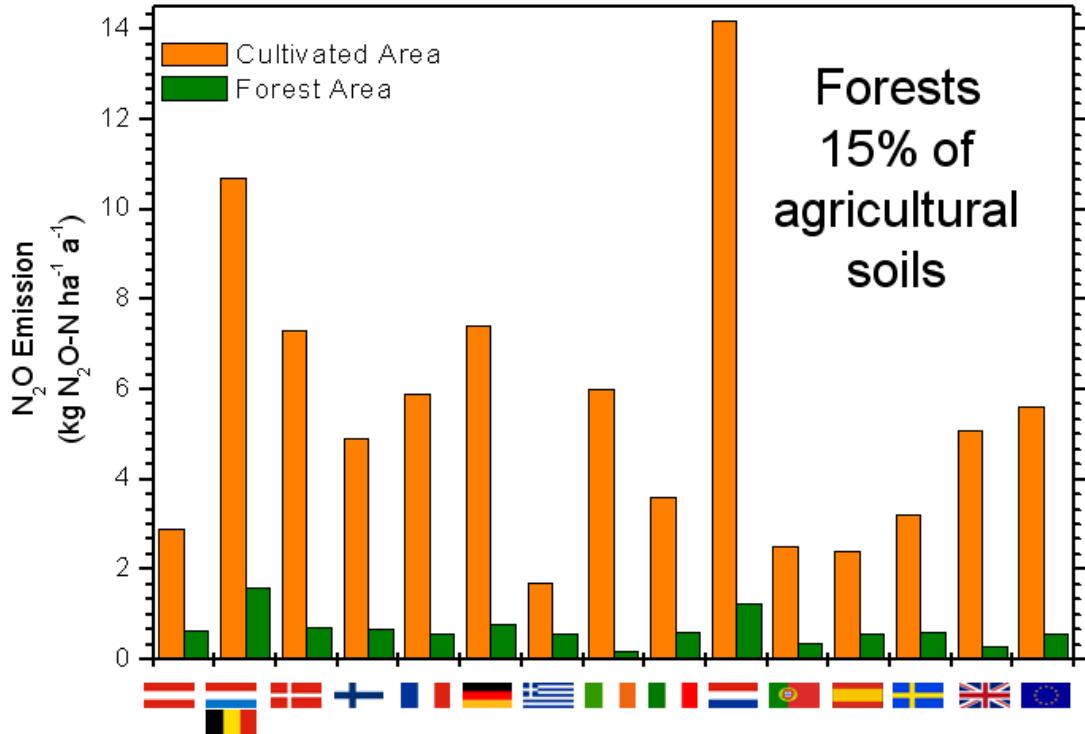
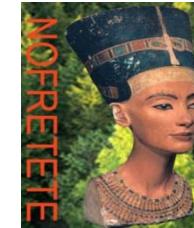


nitrate leaching study bavaria

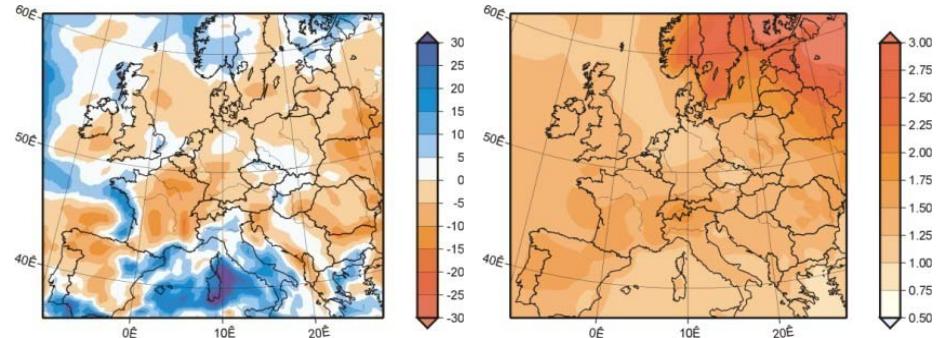


Mellert et al., 2005

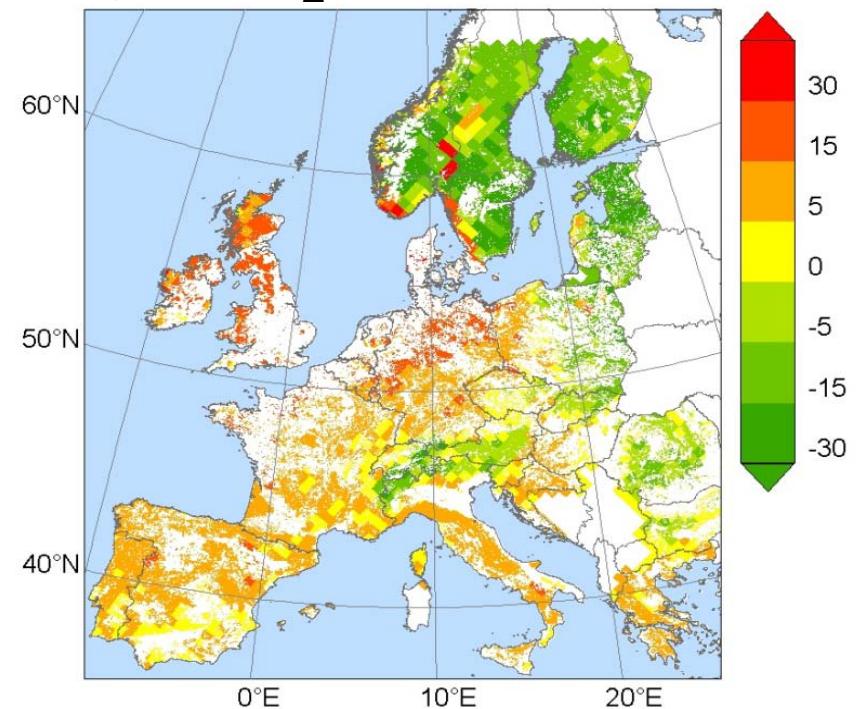
N_2O Emission inventory Europe



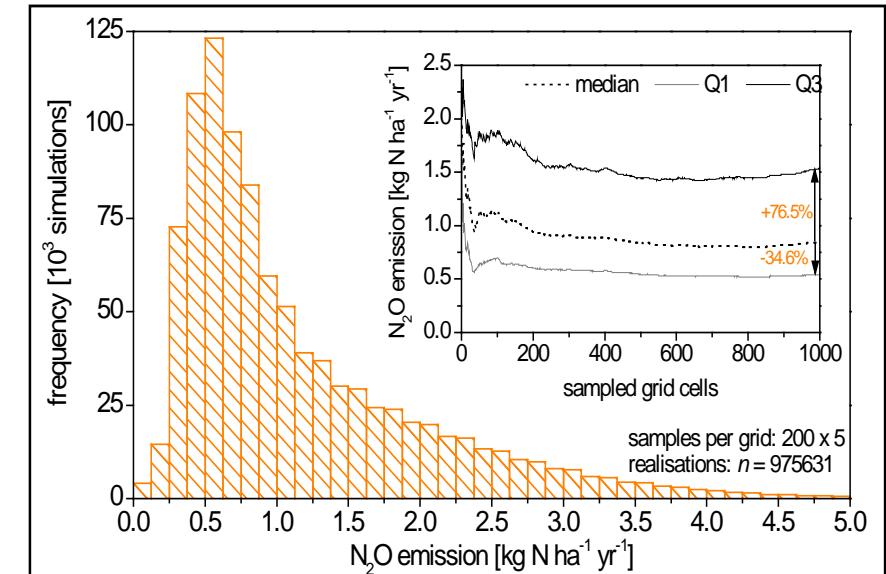
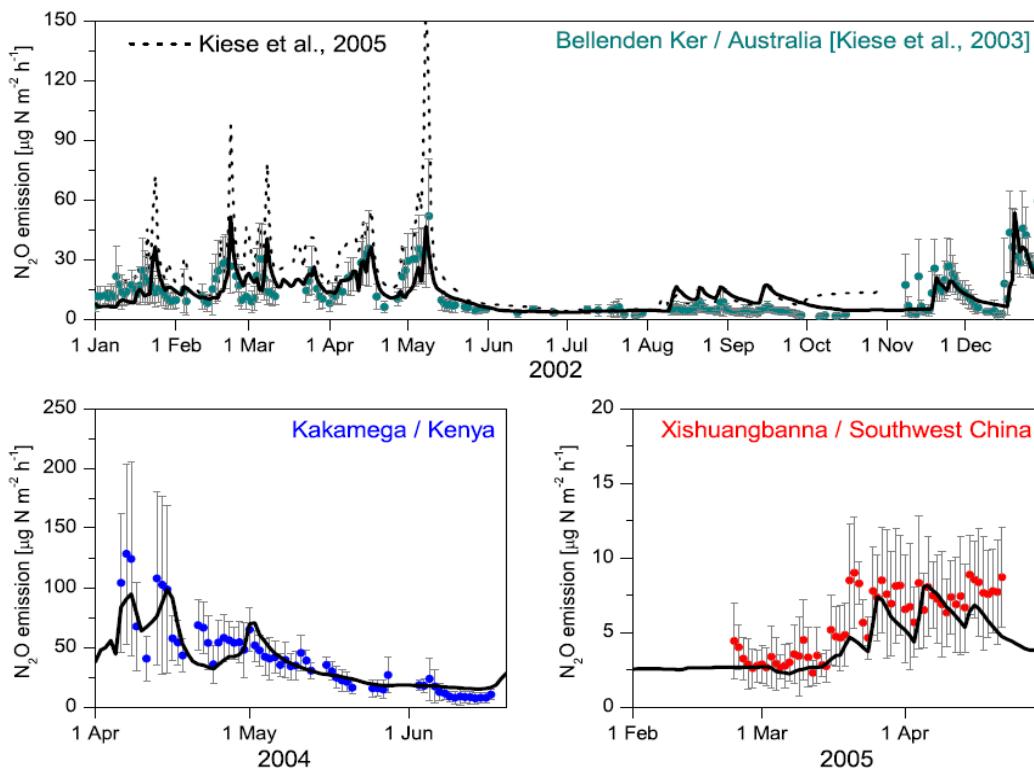
Climate change scenario 2070



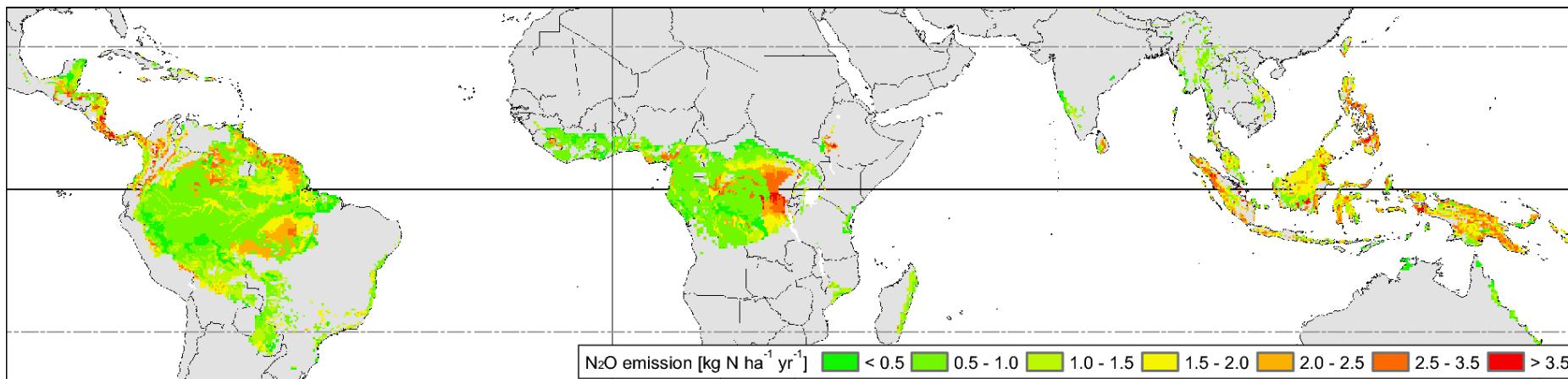
Change in N_2O emission – 6.0 %



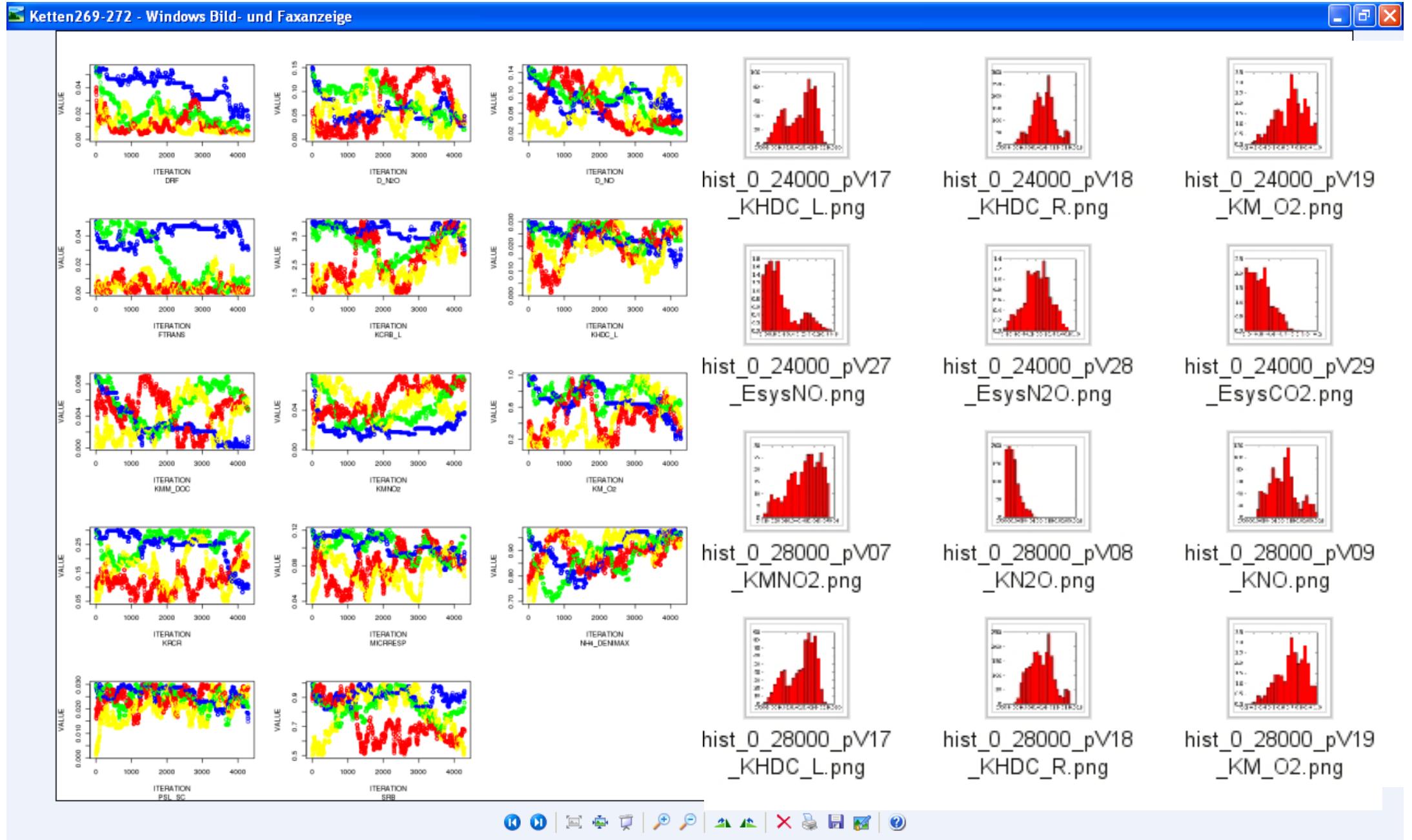
Global N_2O emissions inventory tropical forests

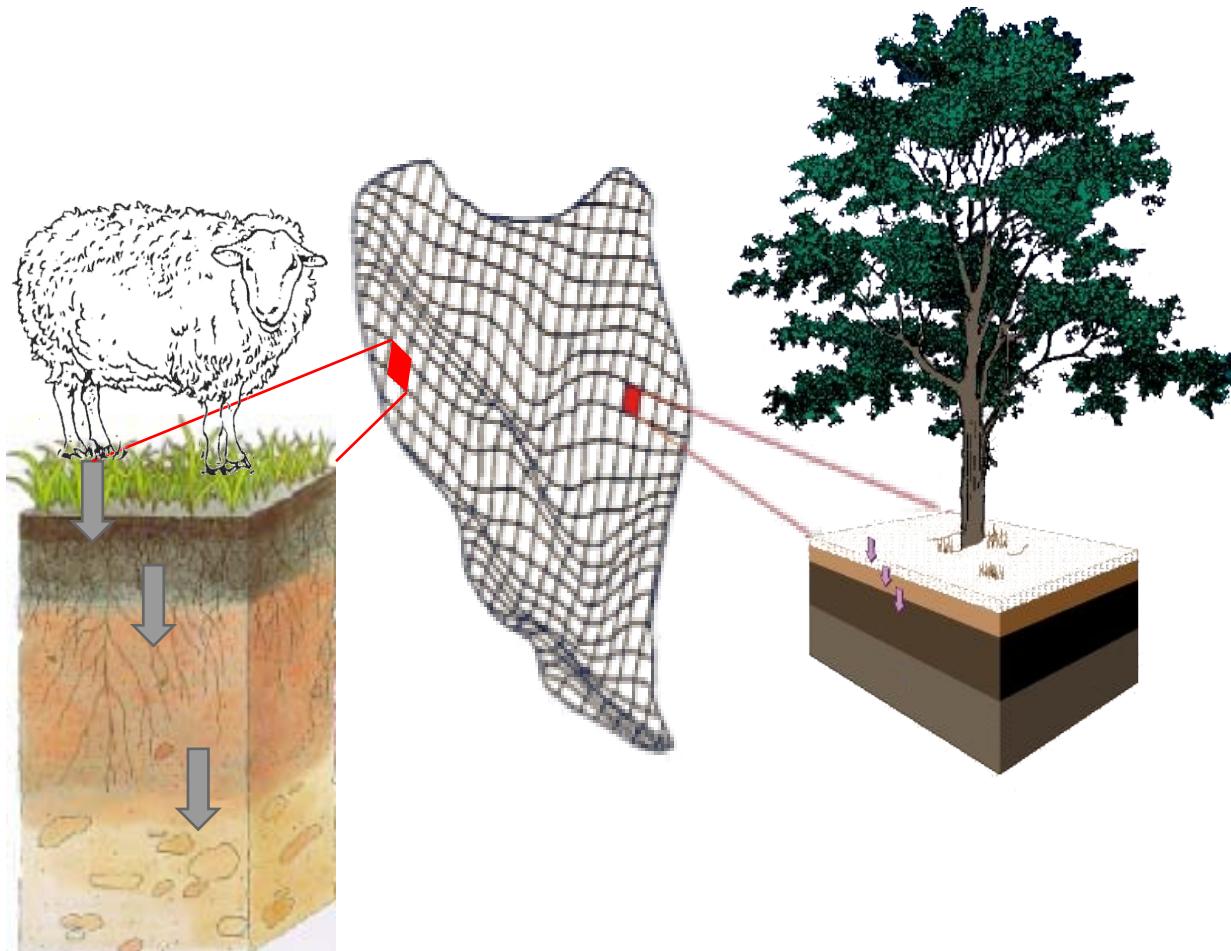


0.9 - (1.3) – 2.4 Tg N yr^{-1}



Bayesian Calibration of parameters in soil chemistry sub modul





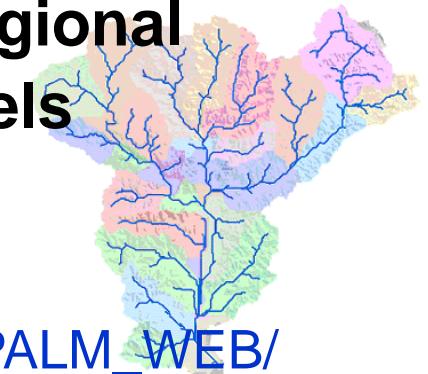
Model coupling



[http://www.cerfacs.fr/globc/PALM_WEB/
EN/OVERVIEW/index.html](http://www.cerfacs.fr/globc/PALM_WEB/EN/OVERVIEW/index.html)

Mobile2D Model Structure:

- ~ 5 regional input files (XML)
- ~15 regional output files/ database connection
- Parallelization for HPC / Multicore Workstations
- Pre / Postprocessing Tools
- Coupling to Regional Hydrologic Models





Thank you for your attention