



Application of Biome-BGC MuSo in managed grassland ecosystems in the Euro-Mediteranean region

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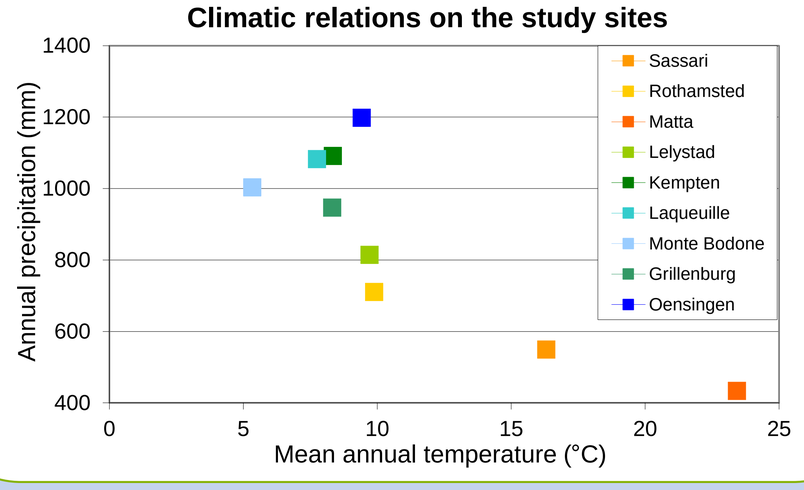
Introduction

Simulation of the biogeochemical cycles of managed grasslands and croplands are of particular interest due to the strong connection between ecosystem production, animal husbandry and food security. In the frame of MACSUR LiveM activities, we conducted a series of uncalibrated model simulations („blind tests") with previously optimized model on differently managed grasslands within Europe and Israel.


Climatic relations on the study sites



Material and Methods

Model: **Biome-BGC MuSo**, the modified version of the widely used biogeochemical Biome-BGC model, with structural improvements, development of management modules, and the extension of the model to simulate carbon and water cycles of herbaceouos ecosystems.

The studied ecosystems: **meadows and pastures** located in the temperate zone including atlantic, continental, highland and Mediterranean sites.

Managements: intensive or extensive **grazing** or **mowing**;

with or without **fertilizers** (NH_4^+, NO_3^-, liquid manure, HPO_4^{2-} or urea).

Simulated ecosystem variables: e.g. Gross Primary Production (**GPP**), Net Ecosystem Exchange (**NEE**), Ecosystem Respiration ($\mathbf{R_{eco}}$), Standing and Harvested Aboveground Biomass (**SAB**, **HAB**) at daily and annual scales.

Results and Discussion

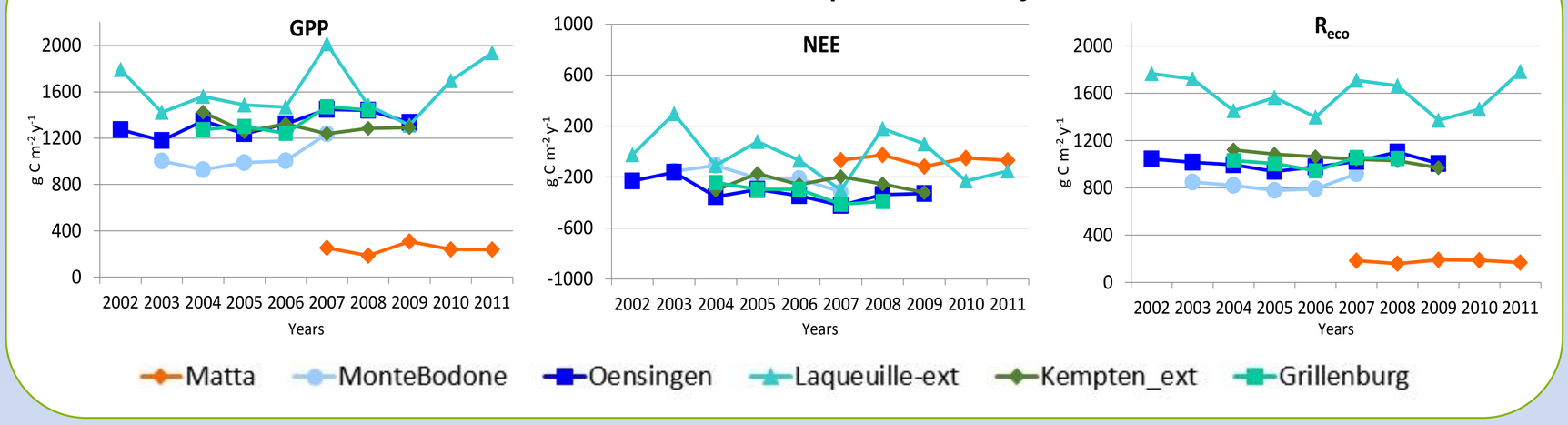
Our experiences show that different sites have different sensitivity to the parameters, i.e. maximum root depth, soil parameters.

Climate relations also may have large influence on the model performance as under humid conditions LAI seemed to be consequently overestimated, while under more arid conditions underestimated. Overall the model provided realistic fluxes.

As Biome-BGC MuSo had not previously been tested on intensively managed grasslands, the tests pointed out structural problems associated with aboveground and belowground storage of carbon and nitrogen that is used in next year's initial growth, or also with fixed groundwater level.

Experiences gained during the blind tests led us to further improve the model.

Simulated fluxes at some examples of the study sites



Virtual laboratory modelling environment

The Biome-BGC MuSo can run on standalone computers, but sensitivity analysis, model optimization ('calibration') or spatial extension has much higher computational demands and complexity. The Taverna workflow management system (http://www.taverna.org.uk), model specific web services and desk top grid technology, the Biome-BGC Project database (http://ecos.okologia.mta.hu/bbgcdb), and the Biodiversity Virtual e-Laboratory (BioVeL - http://www.biovel.eu) environment were applied, that can be also an appropriate IT tool for further analysis.

References

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