Karlsruher Institut für Technologie

Quantifying environmental impacts of poplar short-rotation-coppice on marginal land

Summary results from the Probiopa experiment

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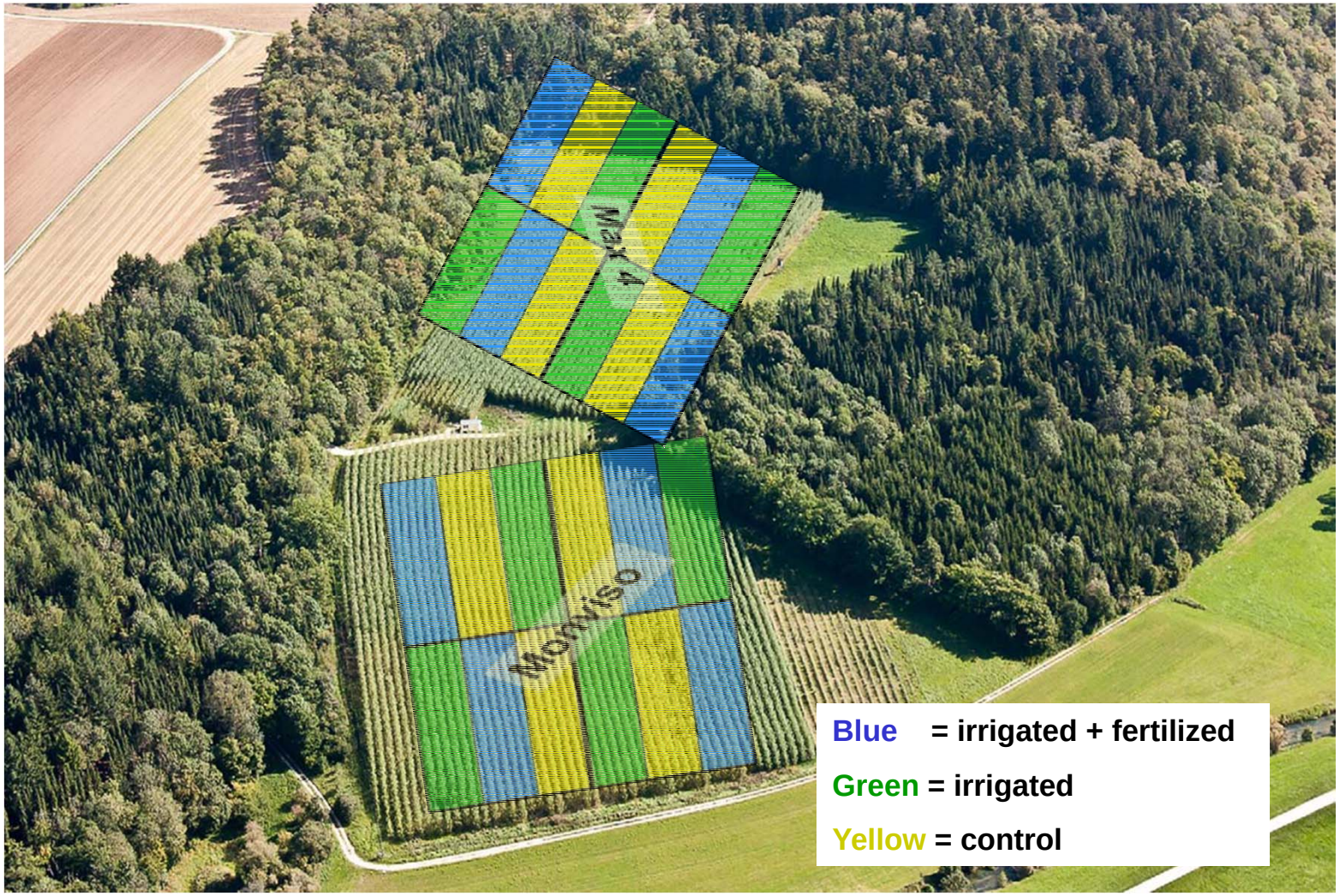
http://bilder.wald-zentrum.de/waldagentur/profil/pappelstecklinge-3-monate.jpg

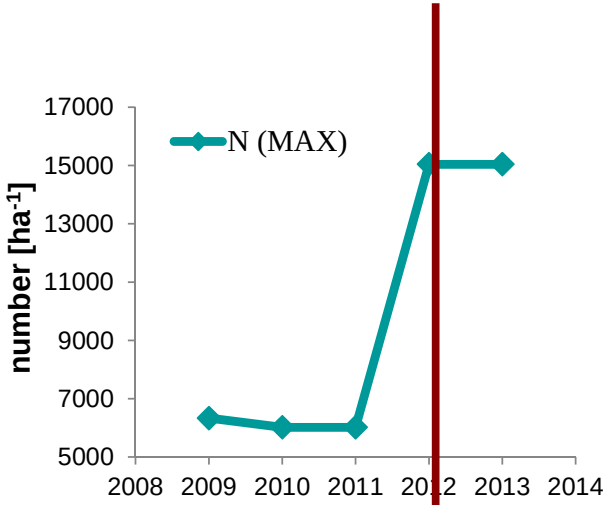
The Probiopa experimental plantation

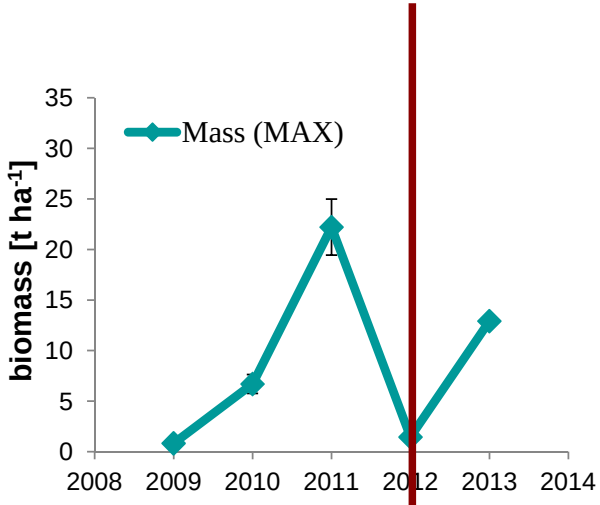
1. Two poplar clones: Max4 (*P. nigra* × *P. maximowiczii)*
   and Monviso (*P. interamericana* × *P. nigra)*
2. Irrigation and fertilization in 2010, 2011, 2012
   (to prevent drought; 40-50 kgN)
3. Experimental observations from 2009 to 2013; Harvest end of 2011
   (growth, soil gas exchange, leaching, …)
4. Modelling with Landscape-DNDC

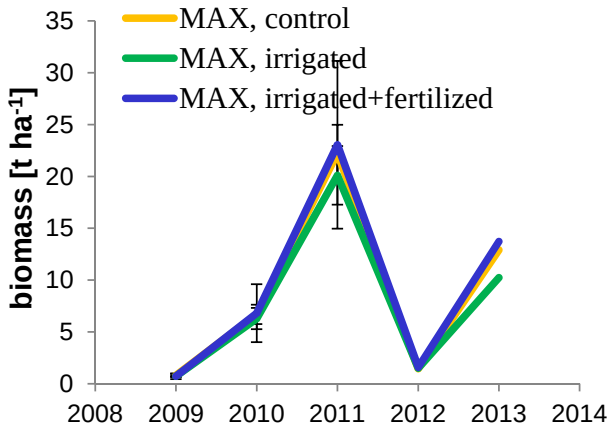
The Probiopa experimental plantation

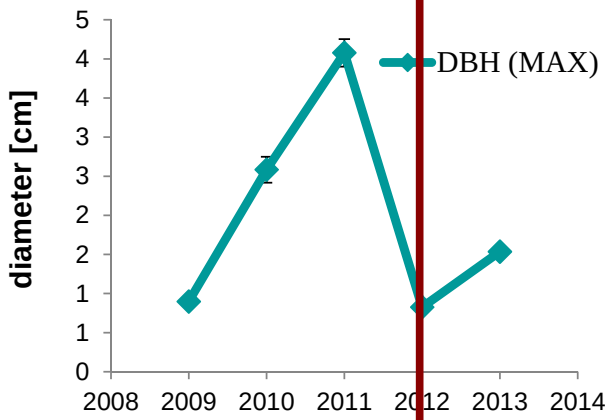


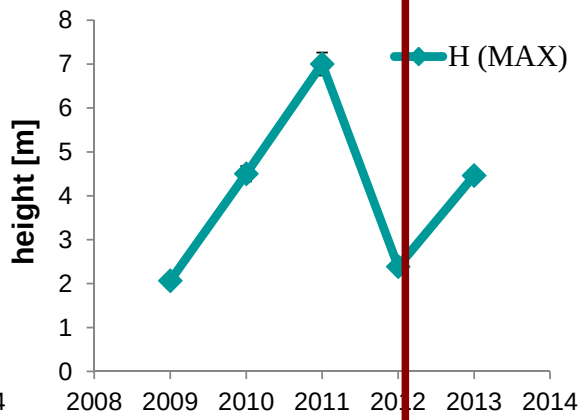
Tree growth

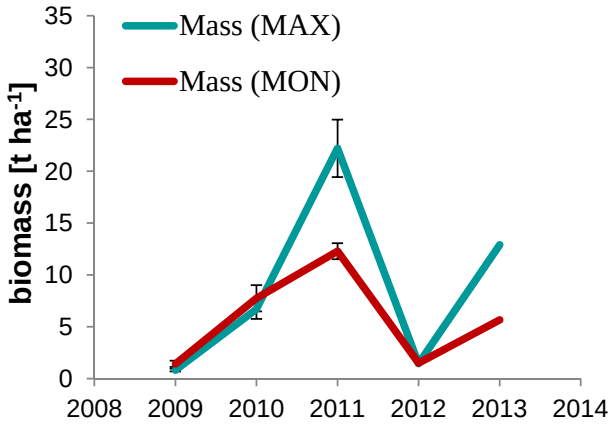






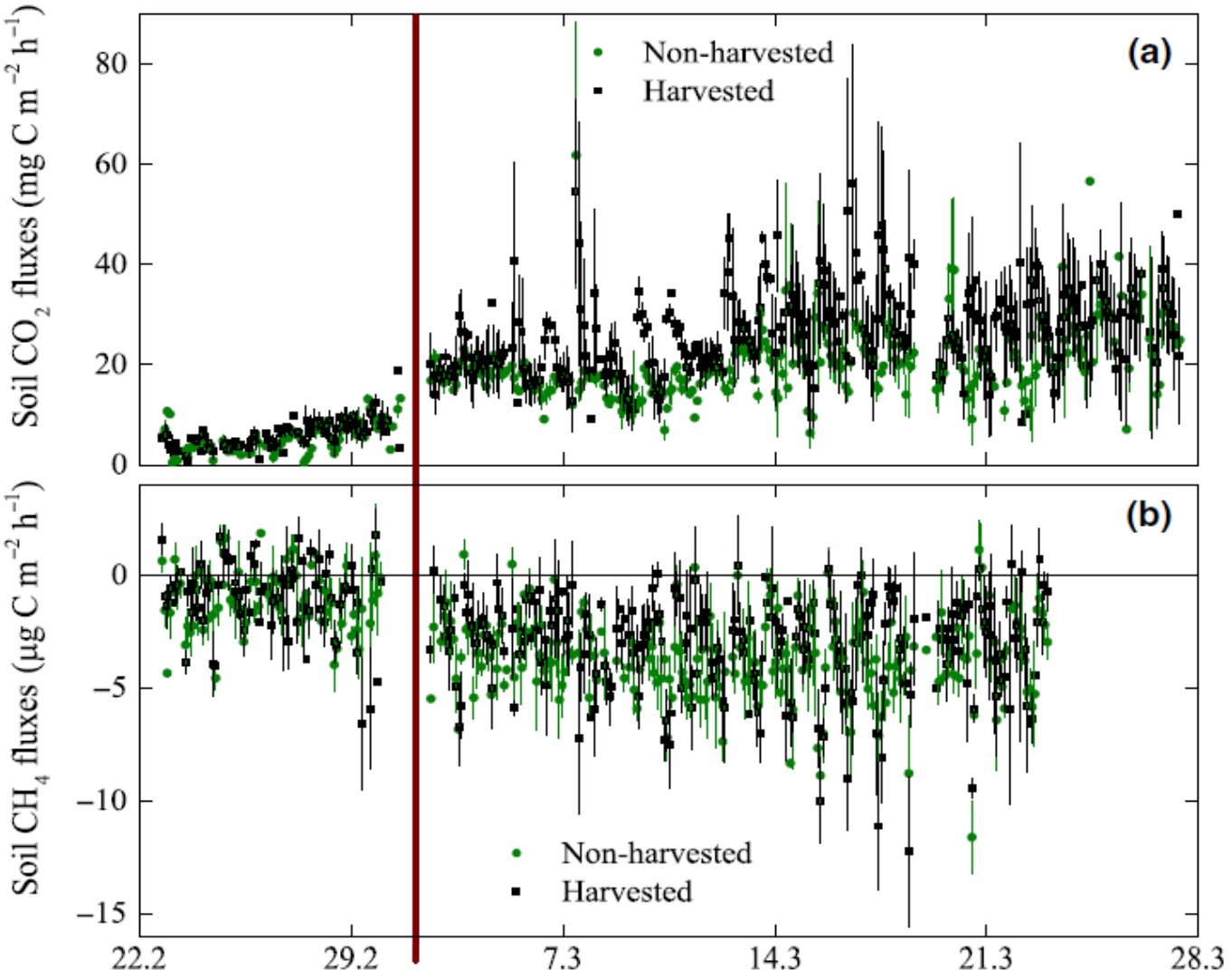






coppicing

Greenhouse-gas emissions

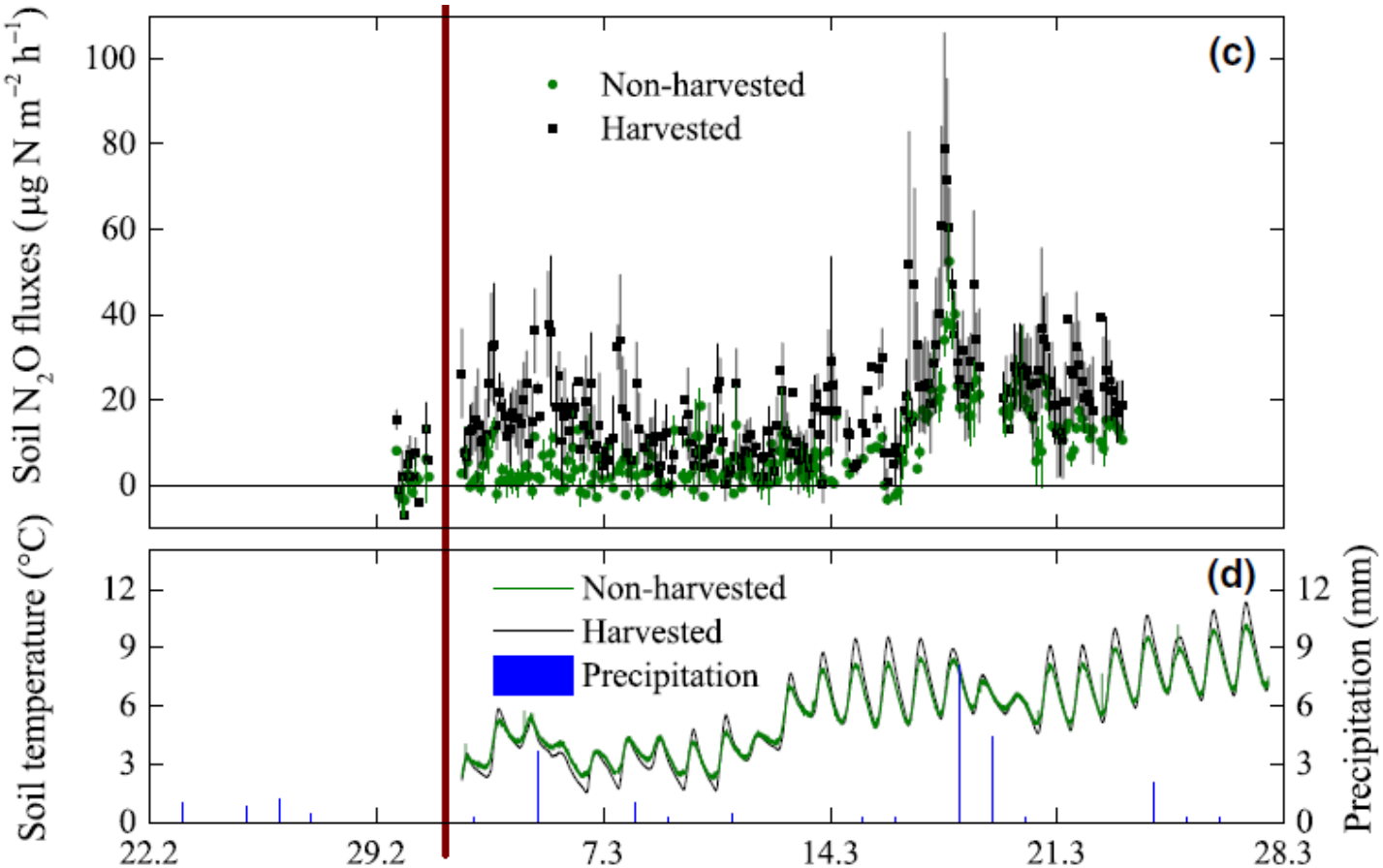


coppicing

2012

Díaz-Pinés et al., in press (GCB)

Greenhouse-gas emissions



coppicing **2012**

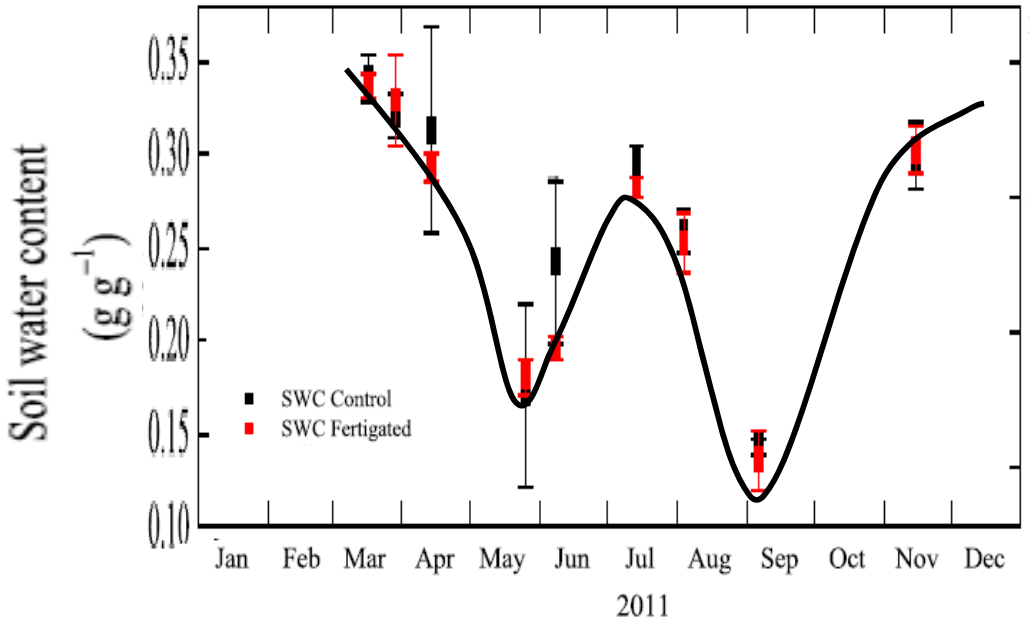
Díaz-Pinés et al., in press (GCB)

Modeling: Evaluation and scaling

Objectives

1) Providing measurement gaps

2) Extrapolation of processes beyond observation periods based on mechanisms.



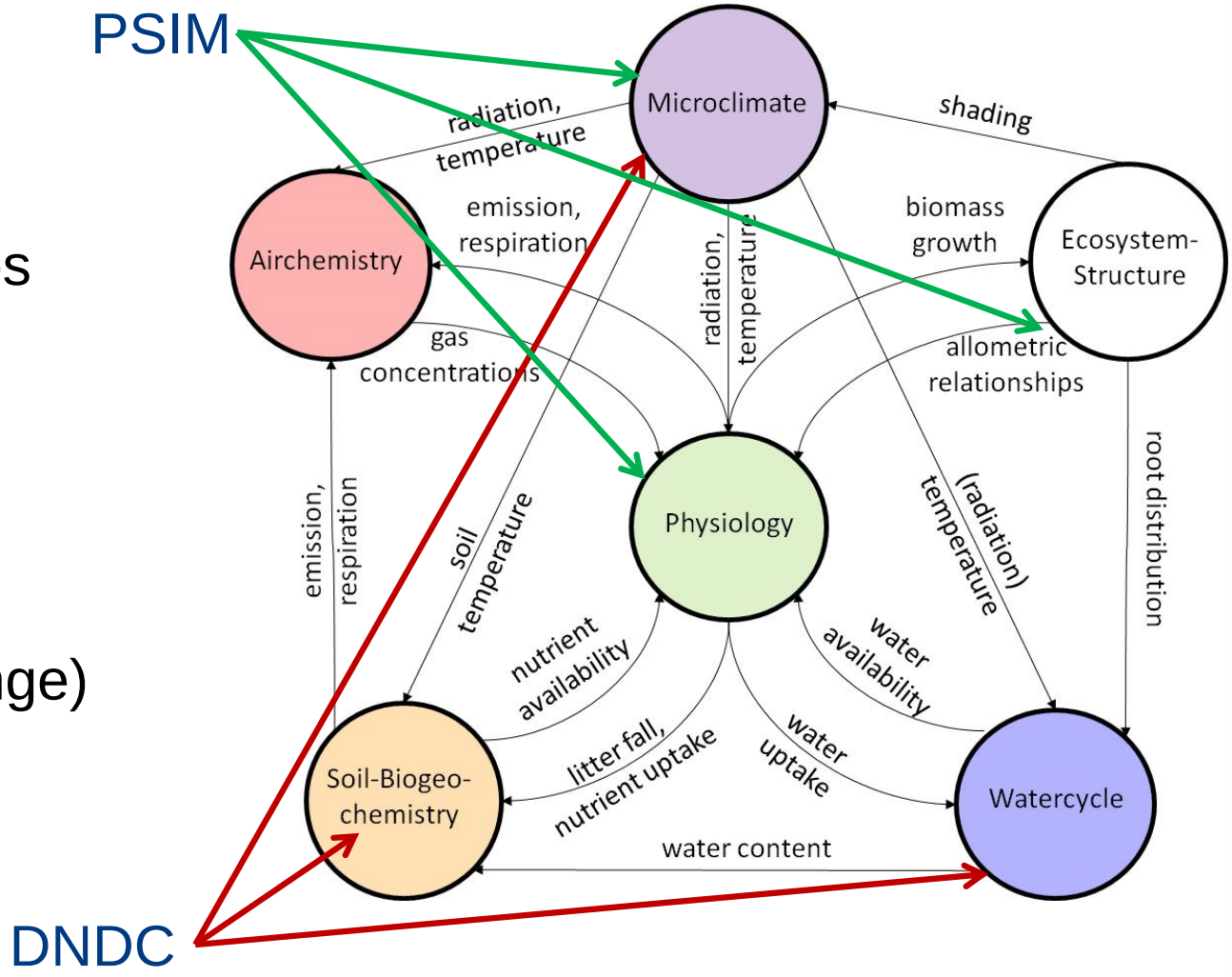
→ LandscapeDNDC model

Díaz-Pinés et al., in press (GCB)

LandscapeDNDC: Characterization

- Coupled ecosystem model
- Biogeochemical processes
- Sub-daily to daily time steps
- Variable vertical structure
- Modular process groups
- Multi-purpose

  (focus on trace gas exchange)



Grote et al. 2011 (Forest Systems)

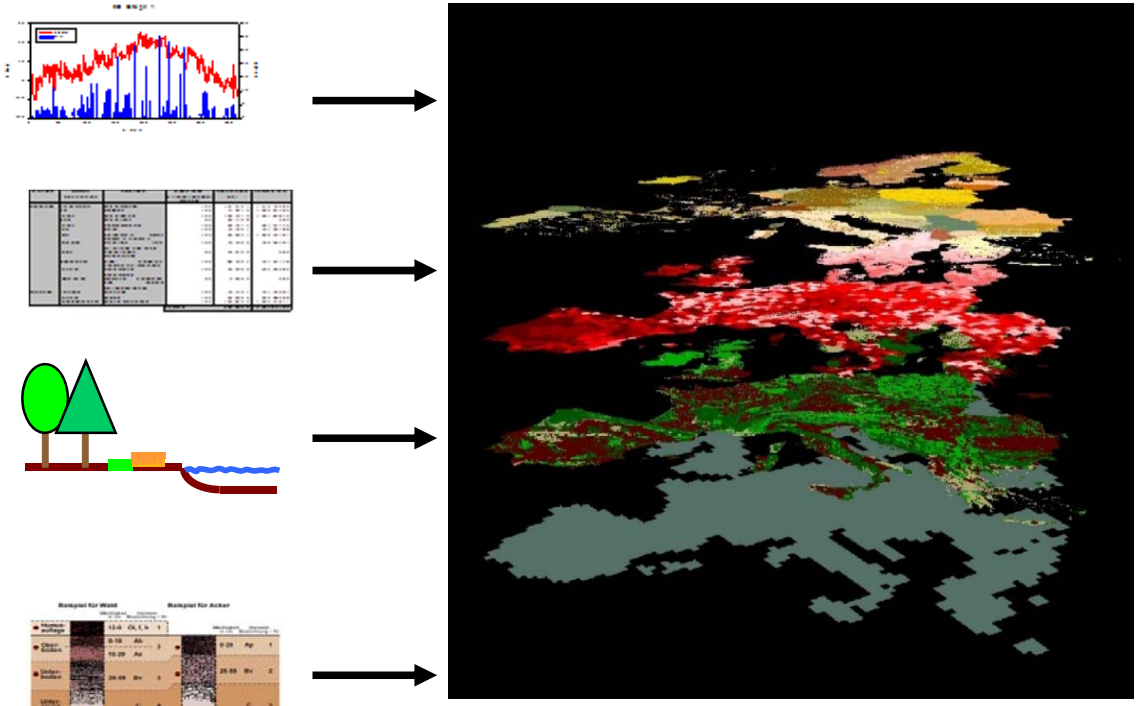
LandscapeDNDC: Input

Weather (T, I, P,...), air chemistry

Setup (start and duration, occurrence of events)

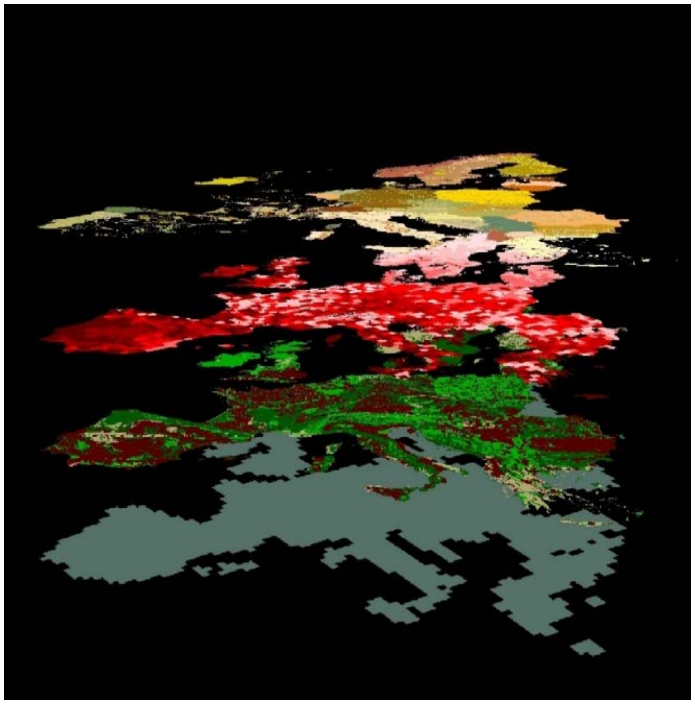
Initial vegetation (species, height, biomass…)

Soil (carbon, nitrogen, water holding capacity, etc.) per soil layer



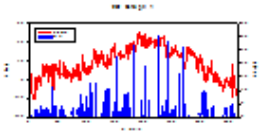
L-DNDC

LandscapeDNDC: Output

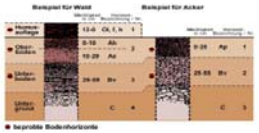


L-DNDC

→ Water balance (e.g. evapo-transpiration, water content)

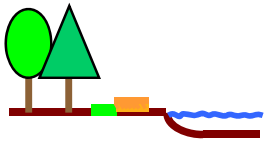


→ Carbon and nitrogen balance (e.g. contents in biomass and soil, GEP, TER)

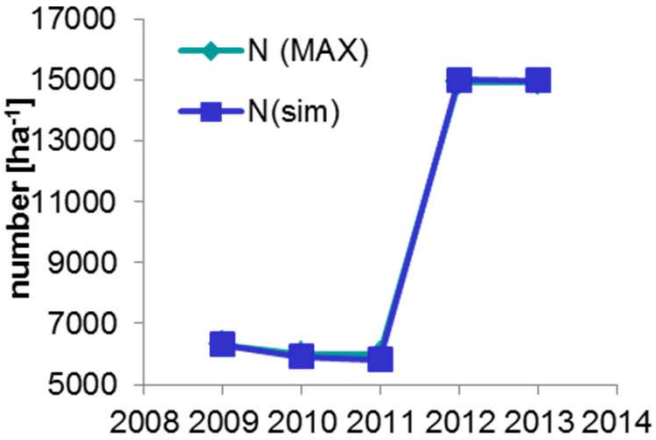


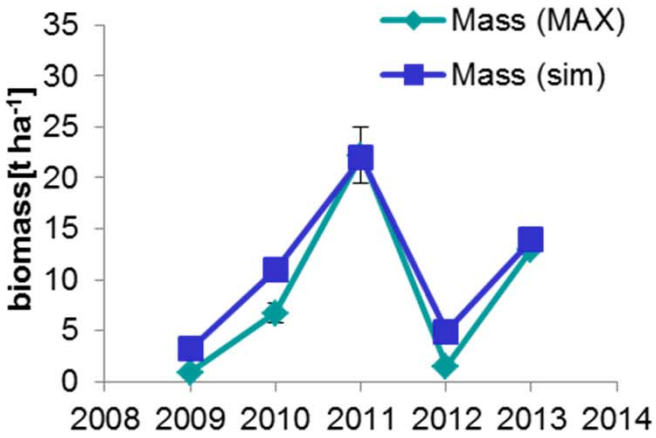
→ Trace gas exchange (e.g. N2O, NO, CH4, VOC)

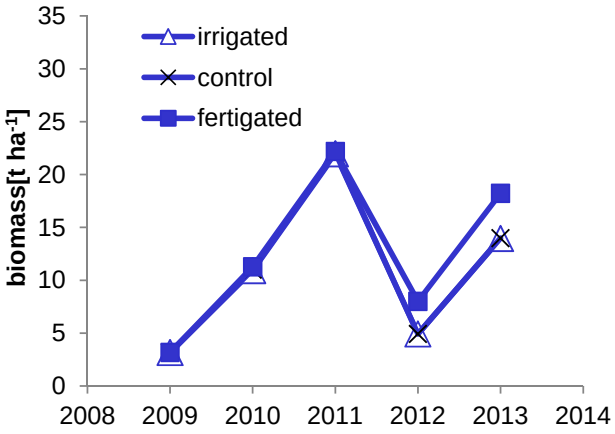
→ Tree dimensions (e.g. height, diameter, rooting depth)

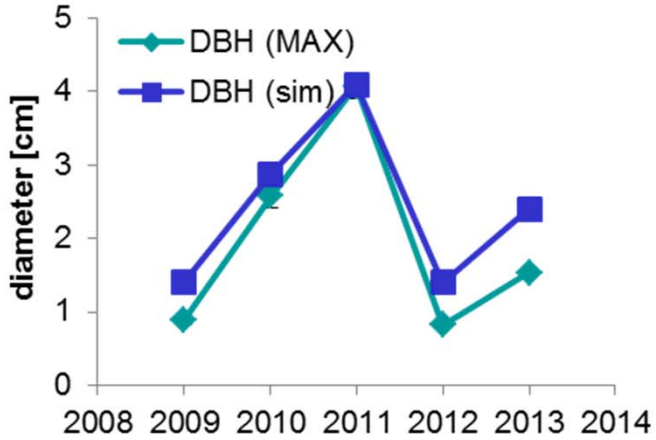


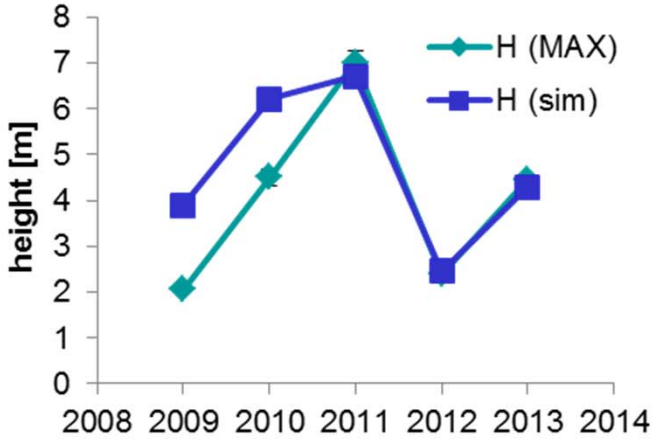
Evaluation: Tree growth

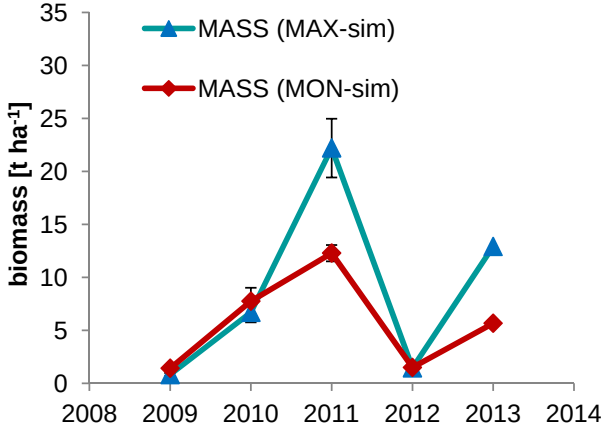




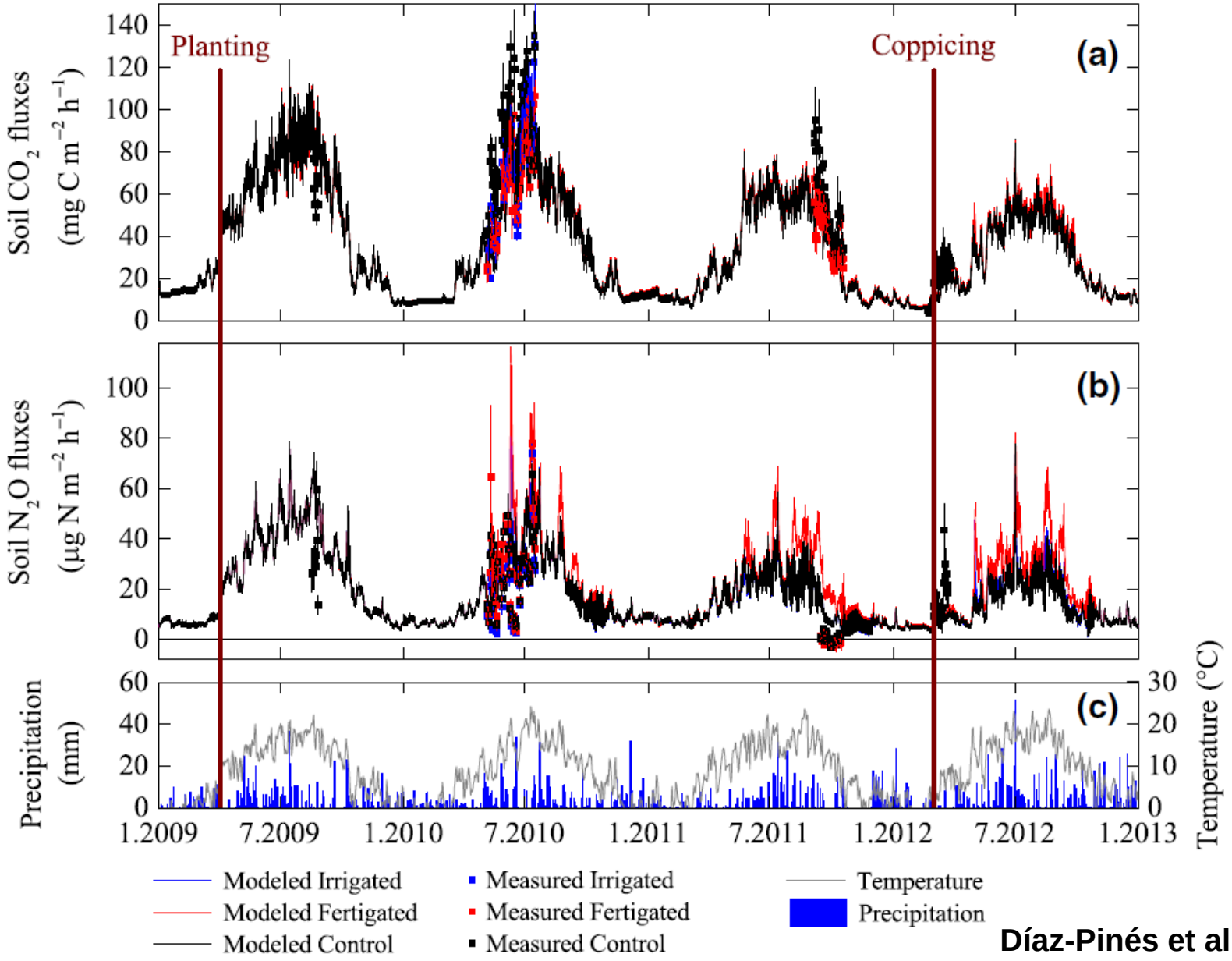






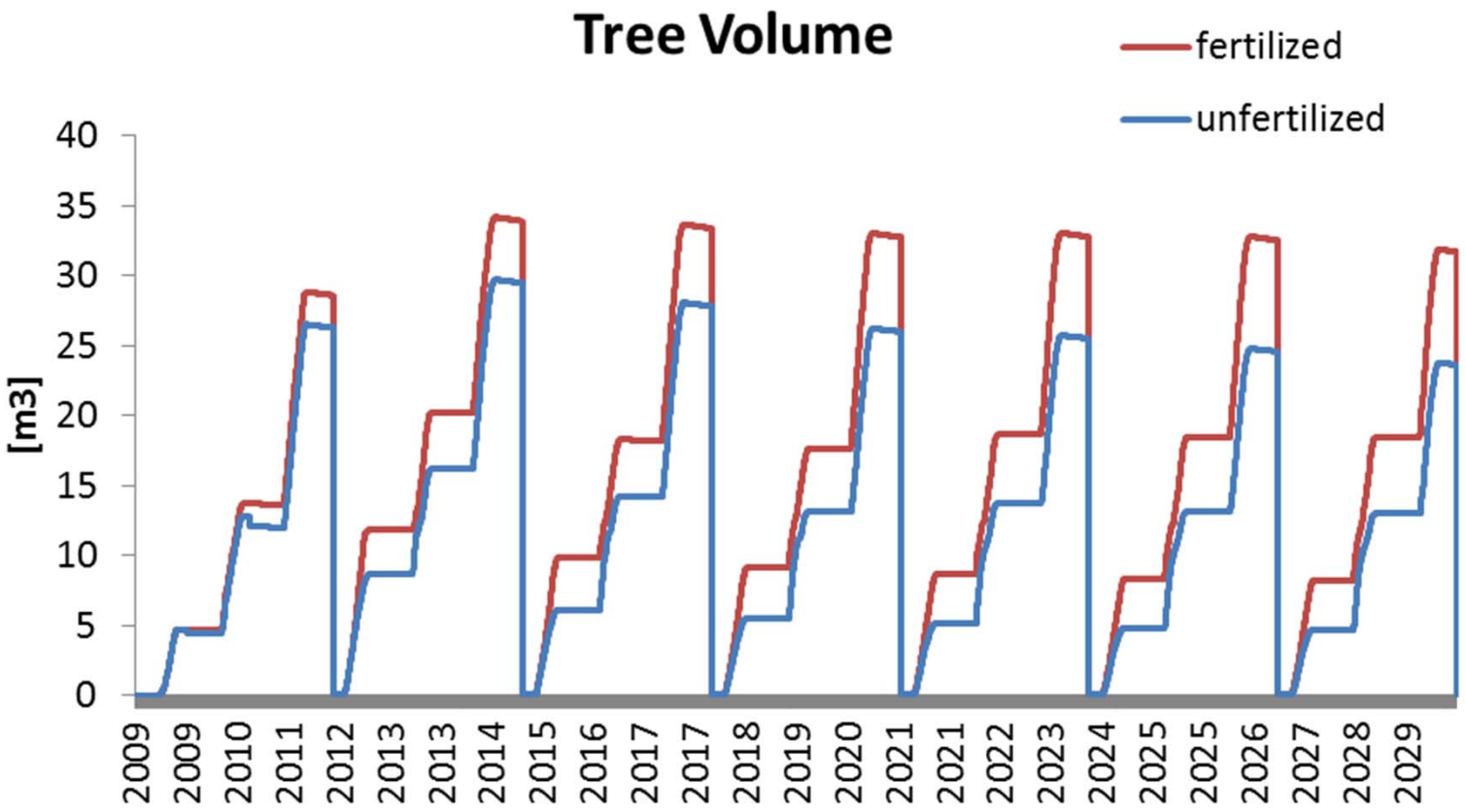


Evaluation and gap filling: Soil fluxes



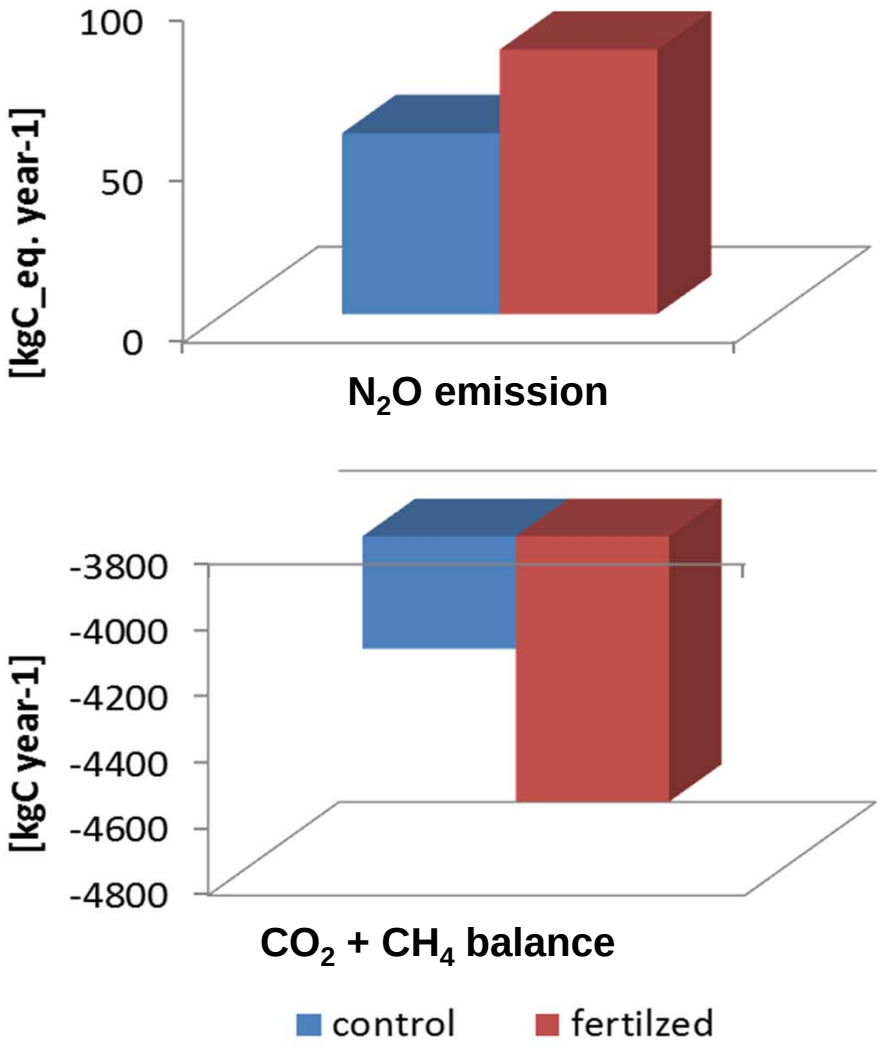
Díaz-Pinés et al., in press (GCB)

Scenario analysis: Impact of fertilizer

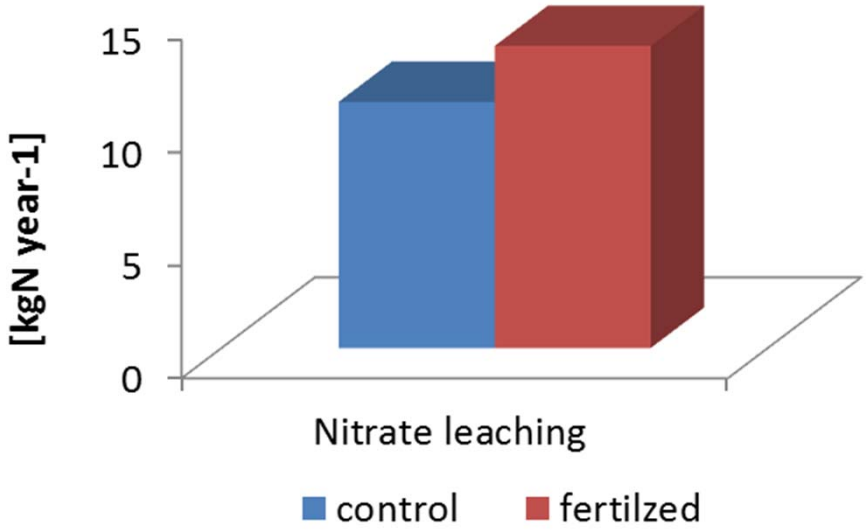


Scenario analysis: Impact of fertilizer

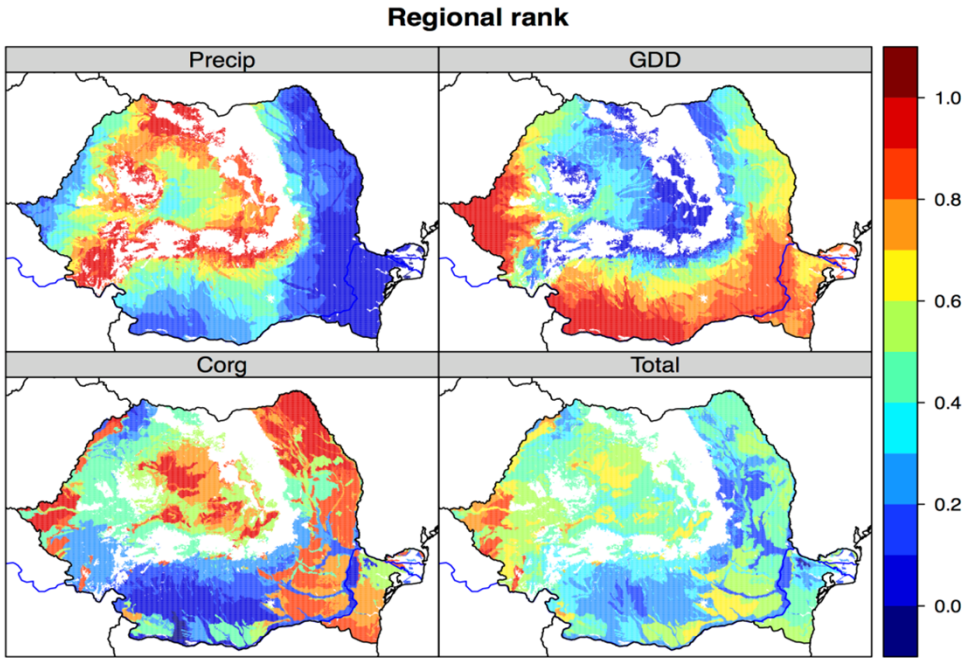
GHG Balance

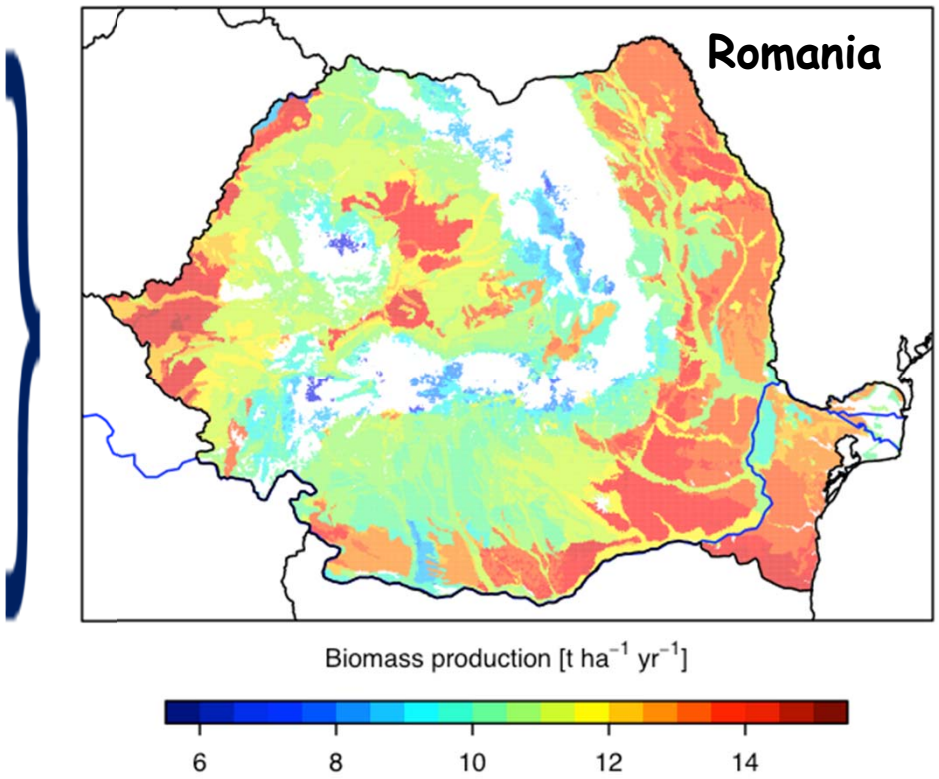


Nitrate Leaching



Further Applications: Site suitability





→ Estimate impacts of climate change

→ Estimate impacts on ground water and air quality

Werner et al., 2013 (GCBB)

Poplar short rotation coppice of age 5 month © Janine Fischbach