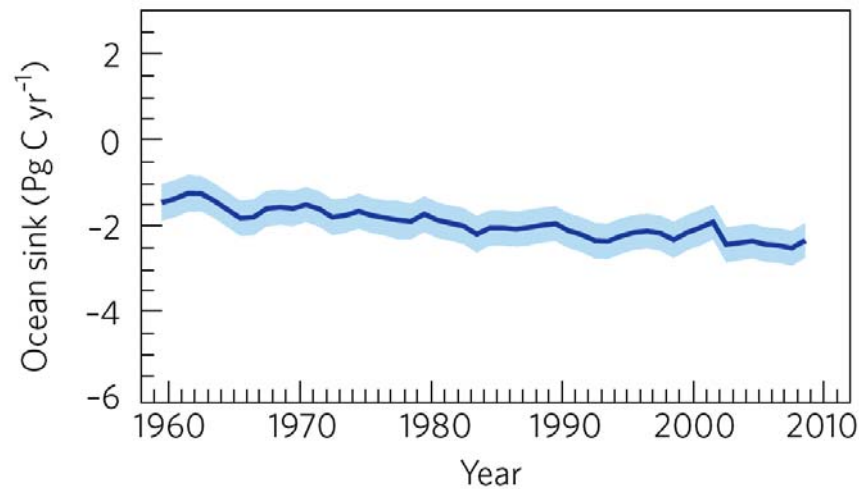
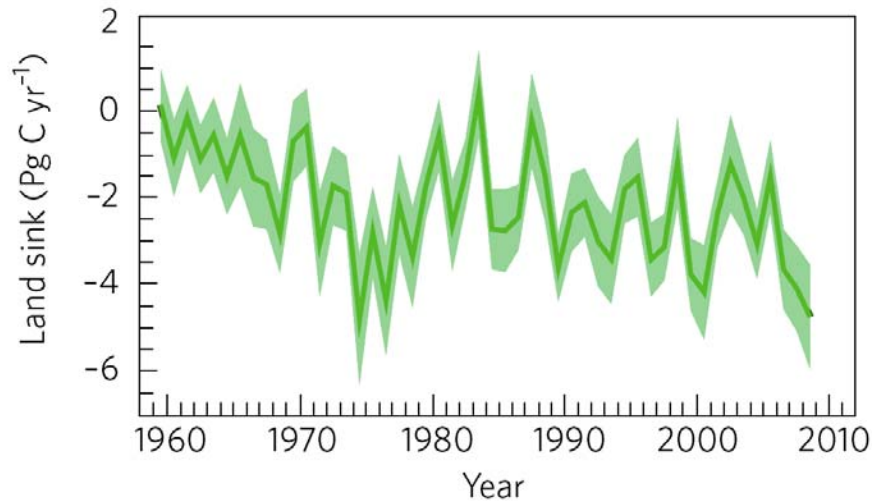

DGVM runs for Trendy/RECCAP

S. Sitch, P. Friedlingstein, A. Ahlström, A. Arneth, G. Bonan, P. Canadell,
F. Chevallier, P. Ciais, C. Huntingford, C. D., P. Levy, M. R. Lomas, B.
Mueller, M. Reichstein, S. Running, S. I. Seneviratne, N. Viogy, F. I.
Woodward, S. Zaehle, M. Zhao

Modelled Natural CO₂ Sinks



Le Quéré et al. 2009, Nature-geoscience

Regional Trends in C-sinks and Annual Global Budget

- ✓ Global Annual Budget
- ✓ Regional Trends in Land C-Sinks (Trendy)
- ✓ Compare DGVM-based estimates with other evidence
 - Satellite derived data
 - Fluxtower data
 - Atmospheric Monitoring Stations

Trendy Protocol

GCP- Land trends: modelling protocol

Contact: Stephen Sitch (s.sitch@leeds.ac.uk) & Pierre Friedlingstein (p.friedlingstein@exeter.ac.uk) <http://dgvm.ceb.ac.uk>

Goal: To investigate the trends in NEE over the period 1980-2009

Participating models

JULES, LPJ, LPJ-GUESS, O-CN, Orchidee, HyLand, SDGVM, NCAR-CLM4, *GFDL/Princeton, VEGAS*

Model simulations

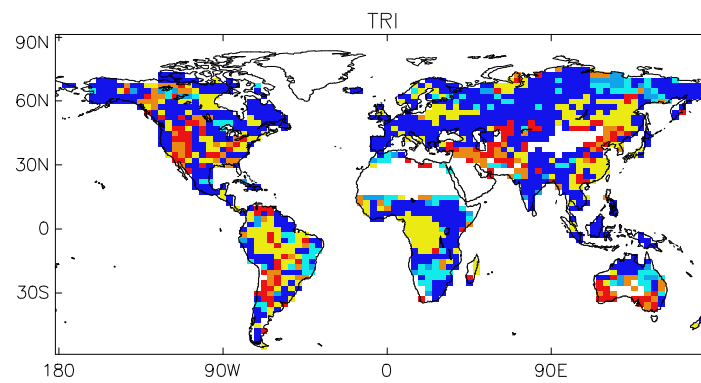
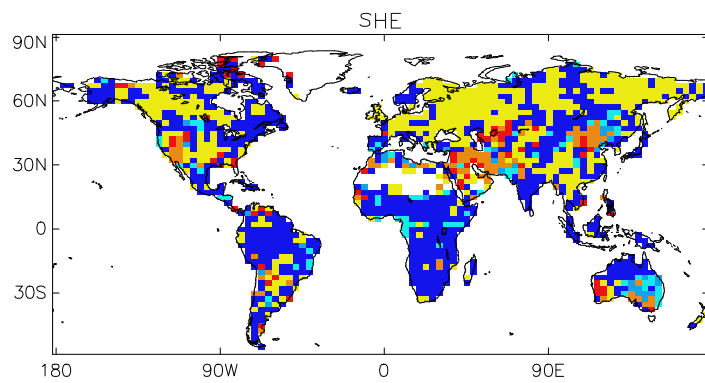
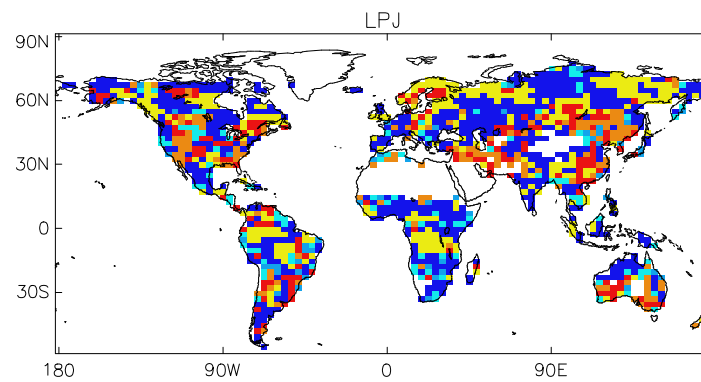
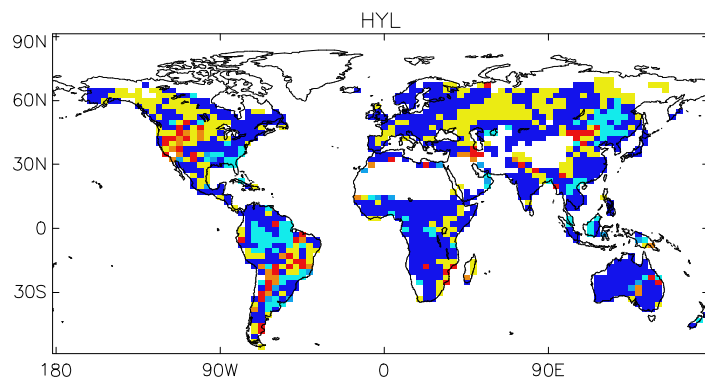
The models were forced over the 1901-2009 period with changing CO₂, climate (CRU/NCEP) and land use:

S1: CO2 only

S2: CO2 and climate

S3 (optional): CO2, climate and land use

Trends in Land Processes



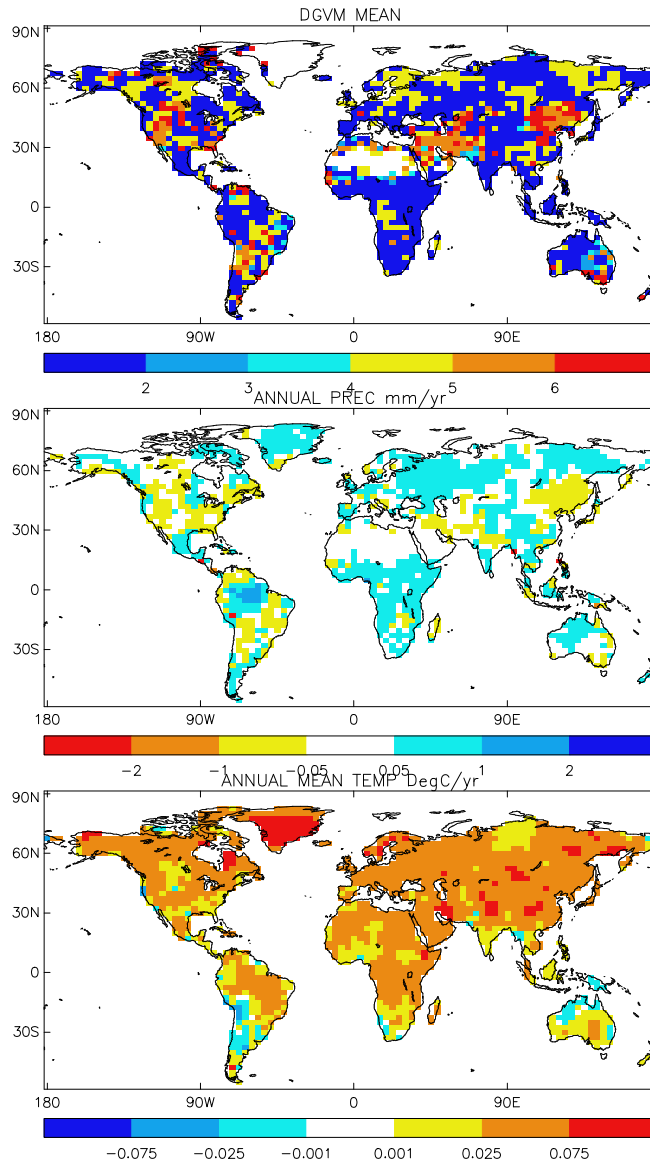
Land Sink trend

positive NPP trend > positive RESP trend
negative NPP trend > negative RESP trend
positive NPP trend, negative RESP trend

Land Source trend

positive NPP trend < positive RESP trend
negative NPP trend < negative RESP trend
negative NPP trend, positive RESP trend

Climatic Drivers of Trends in Land Processes



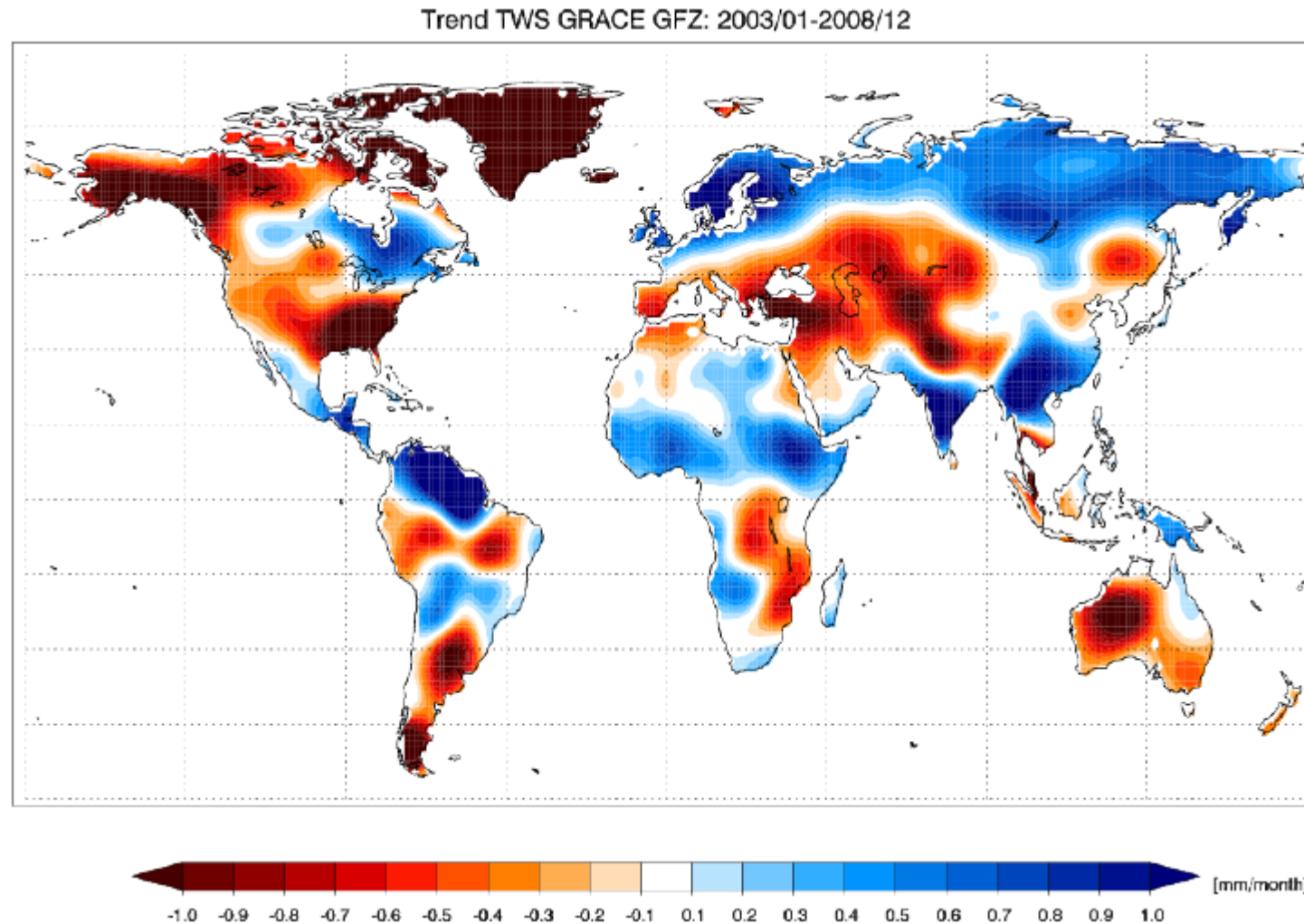
Land Sink trend

positive NPP trend > positive RESP trend
negative NPP trend > negative RESP trend
positive NPP trend, negative RESP trend

Land Source trend

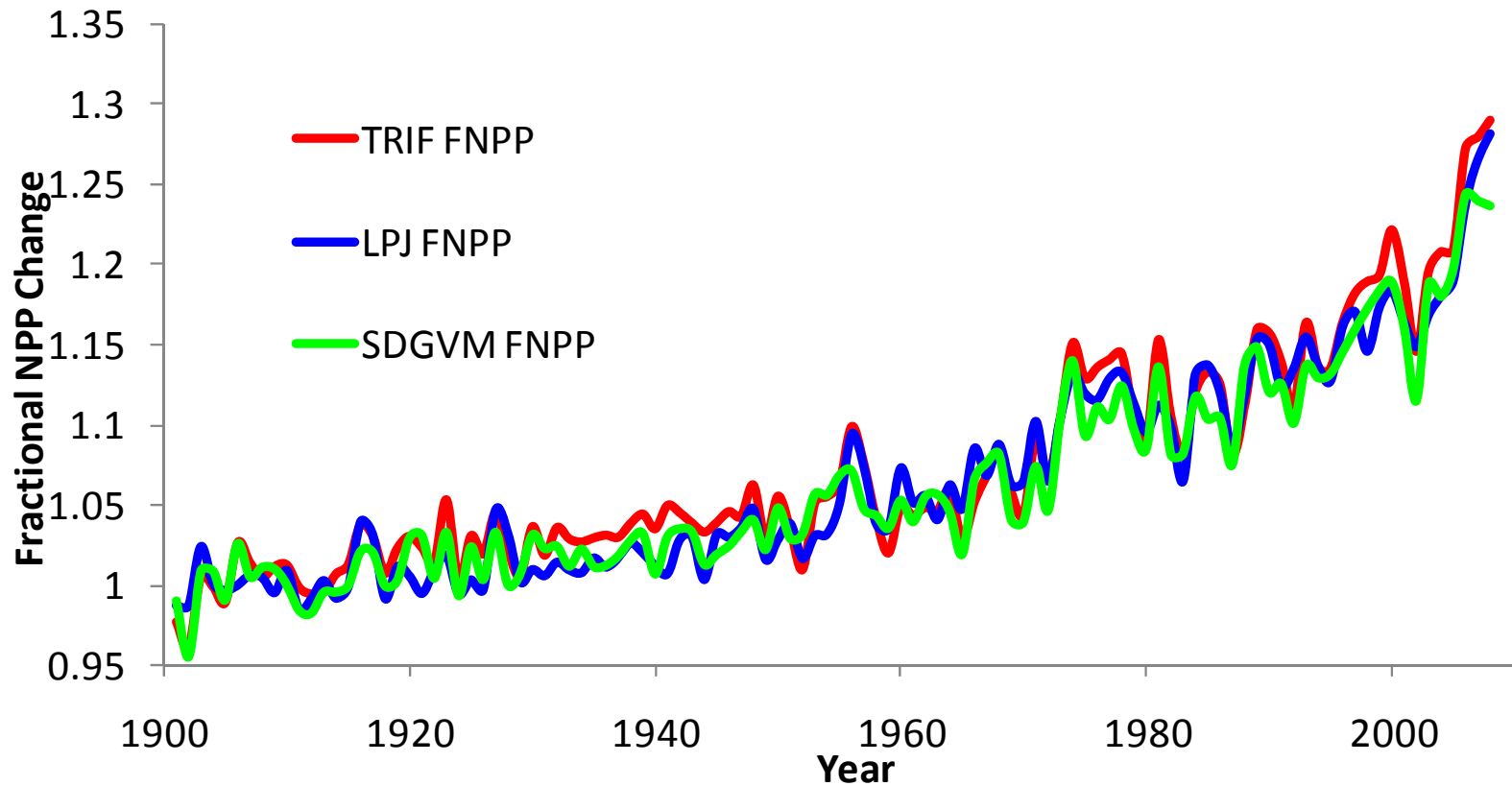
positive NPP trend < positive RESP trend
negative NPP trend < negative RESP trend
negative NPP trend, positive RESP trend

Satellite Evidence: Trends in Soil Moisture

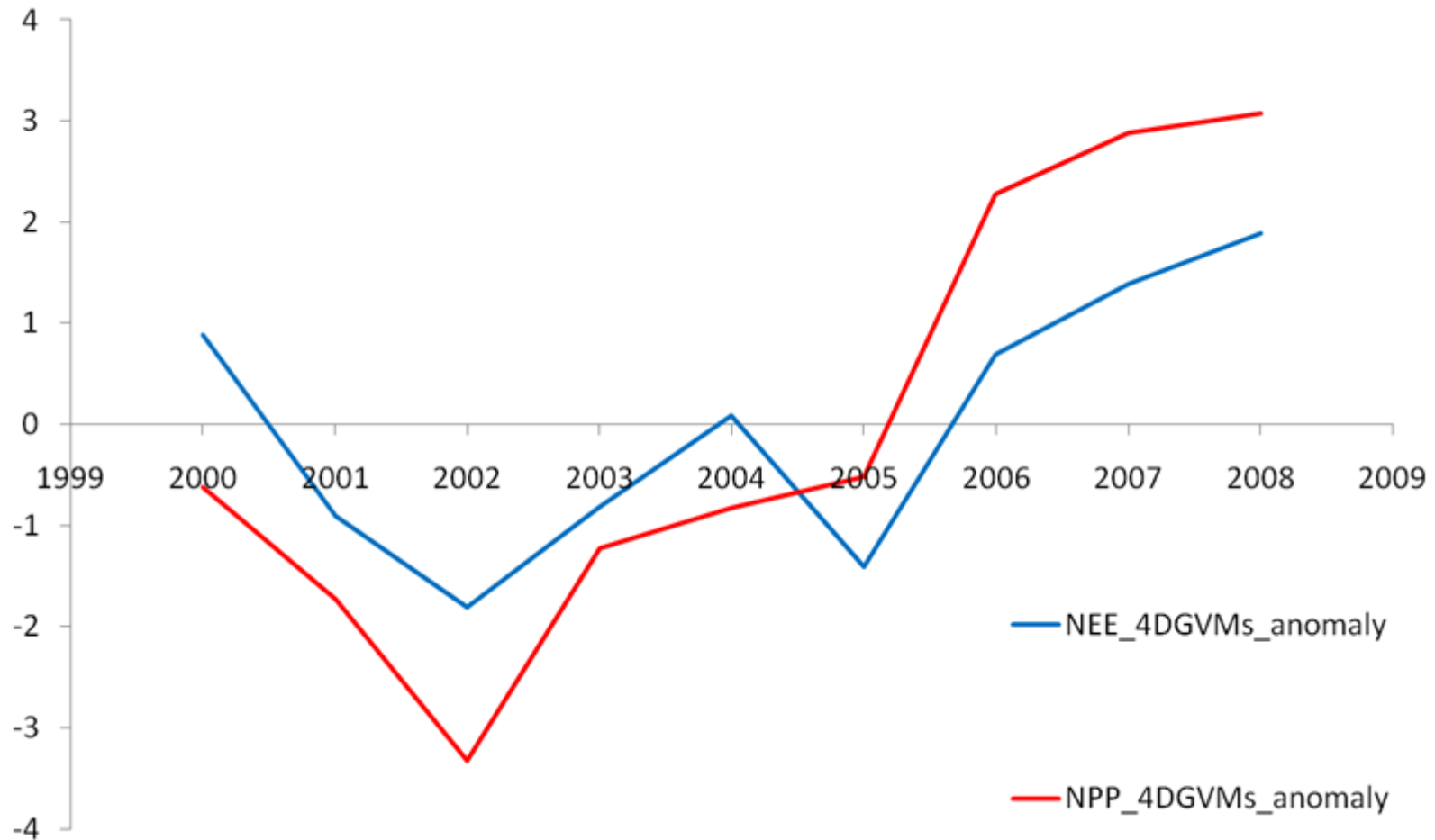


B. Mueller, ETH Zurich

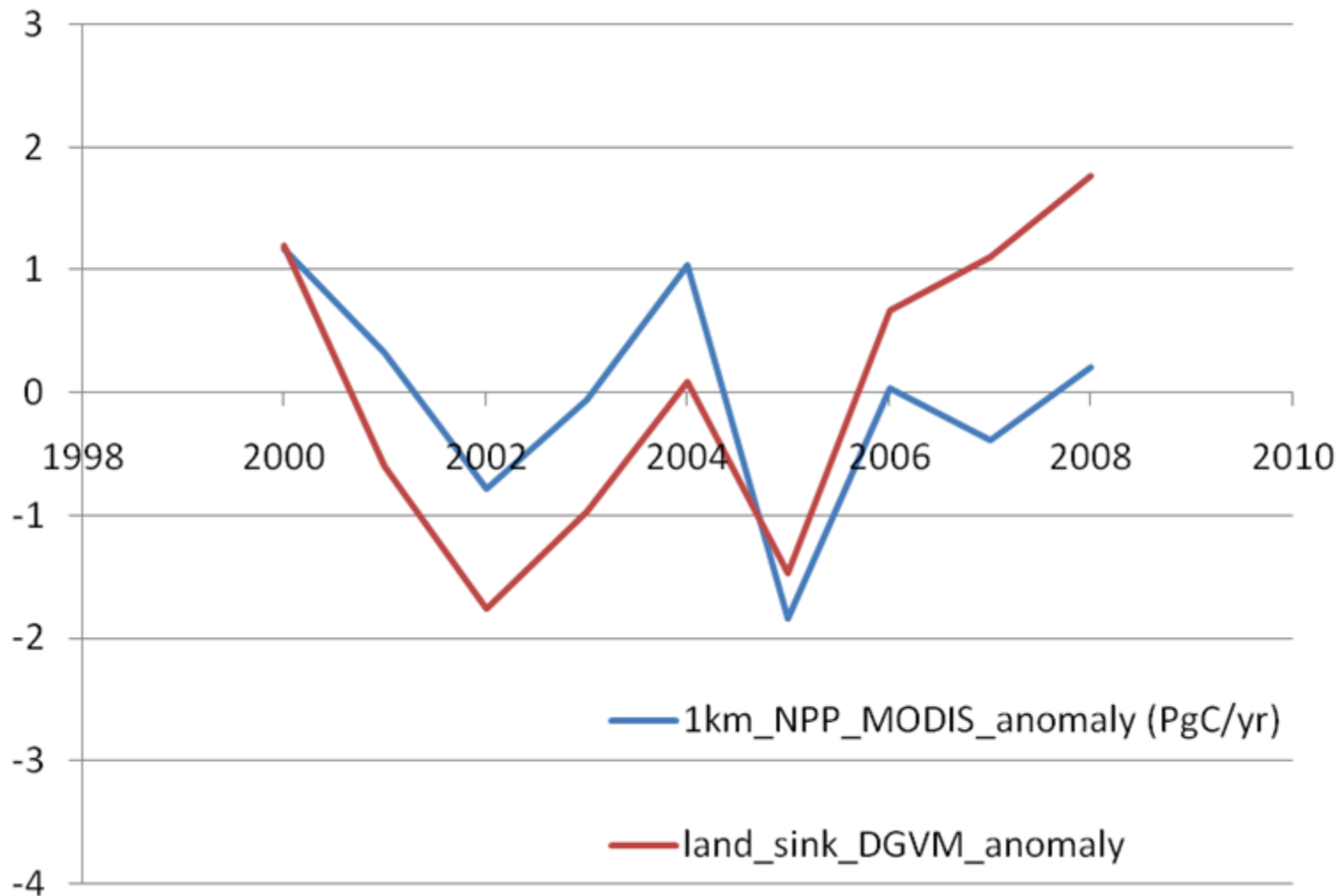
Remarkable Similarity between NPP evolution from DGVMs



Global NPP explains most of the NEE variability



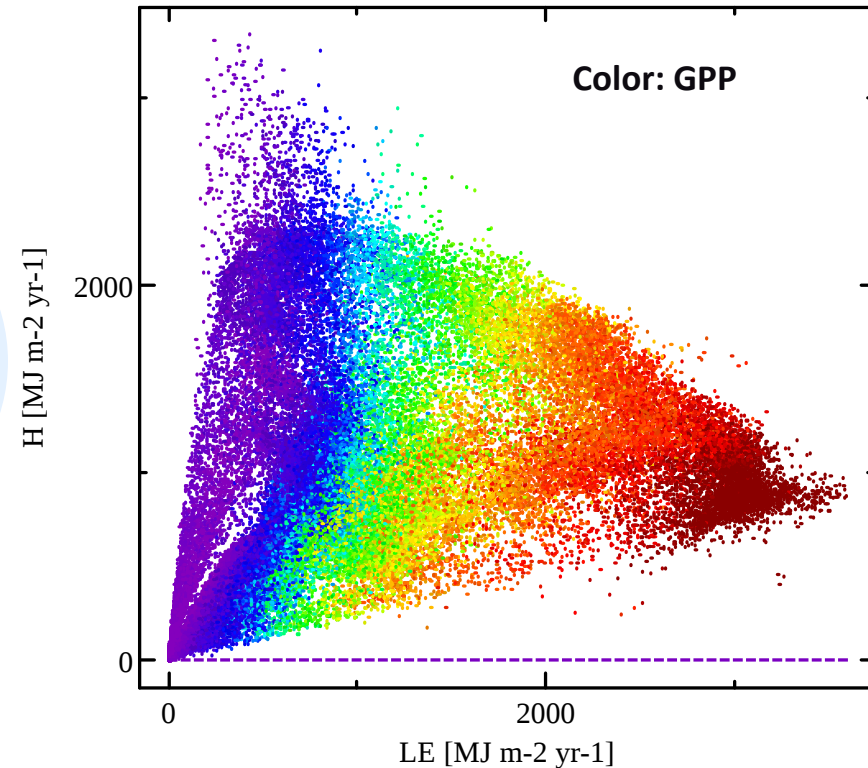
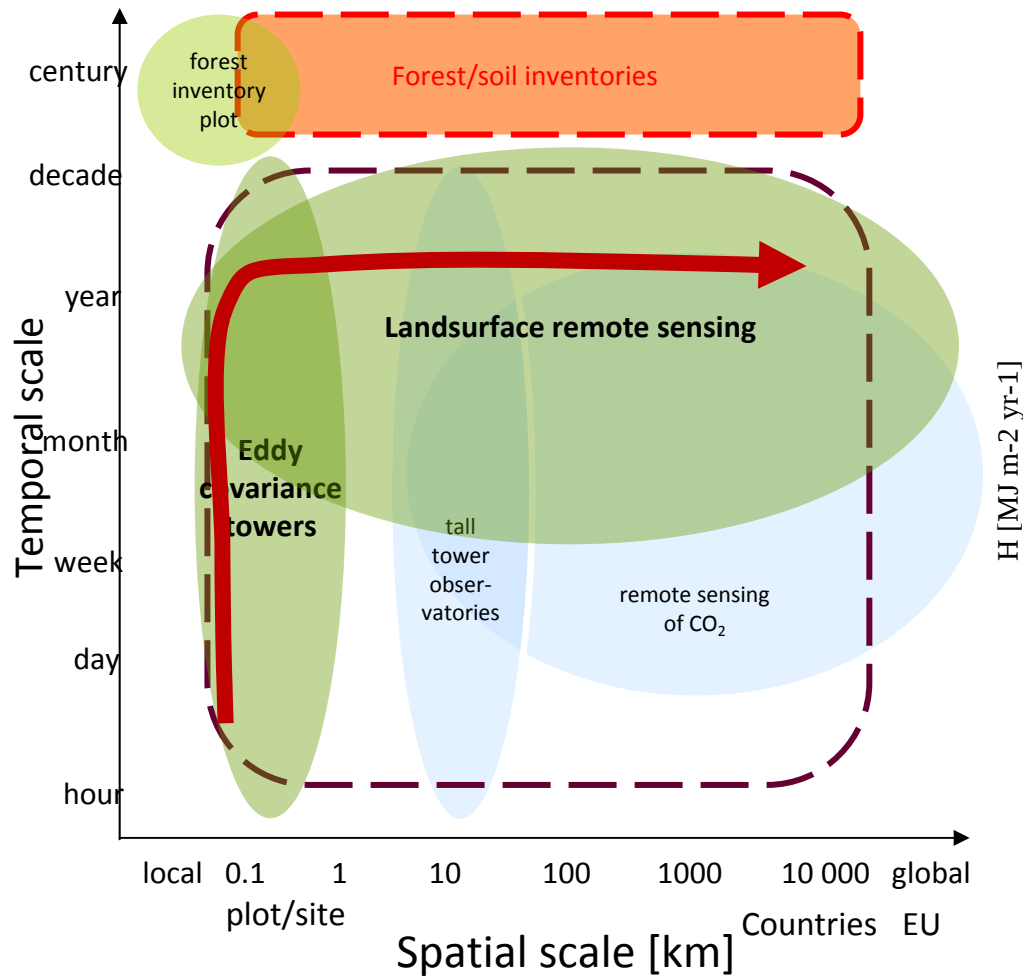
DGVM sink vs MODIS-NPP



M Zhao

Alternative Upscaling Approaches

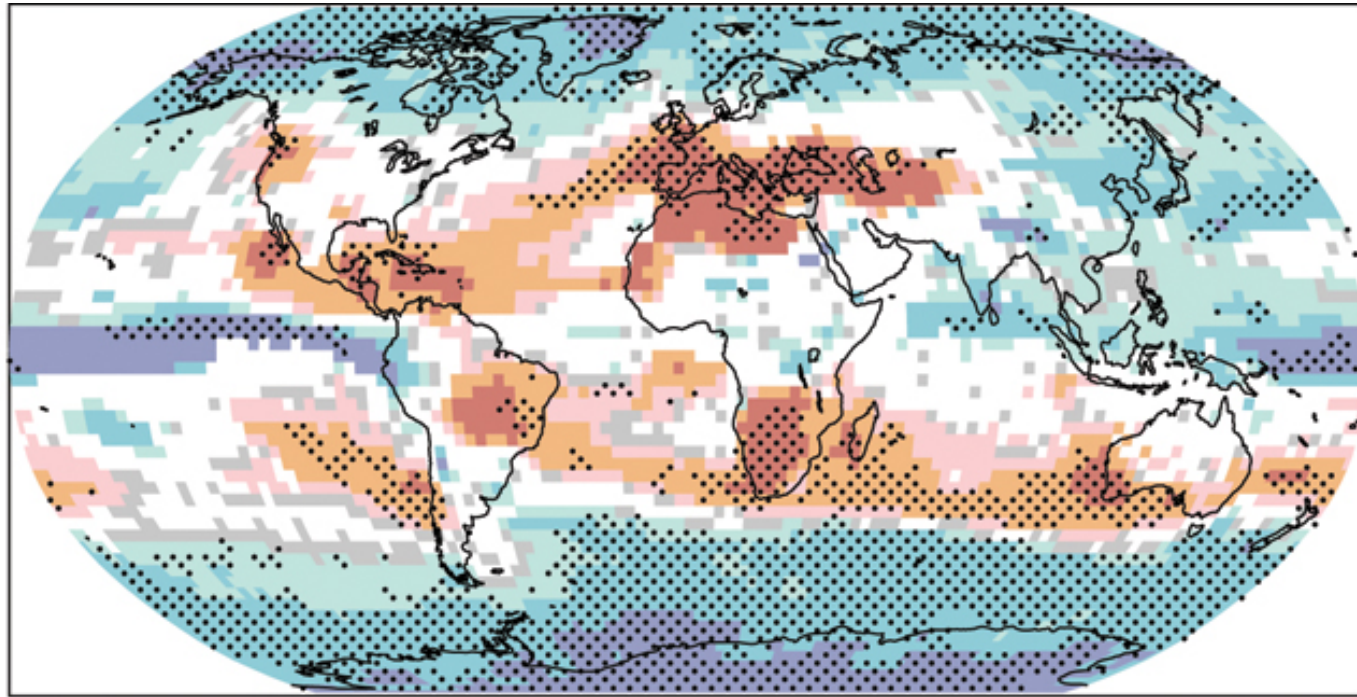
Multidimensional flux patterns...



... models to be cross-evaluated against.

Future Precipitation Changes (Summer Droughts?)

JJA



<http://www.ipcc.ch/>

Stippled areas > 90% of the models agree in the sign of the change

Summary

- ❑ Use set-up to produce global/regional annual C-budgets
- ❑ Drought may be an important driver of the present-day trends in the land carbon cycle
- ❑ Climate Models Project Summer Drought in Continental Regions
- ❑ Drought may be an important driver of the future trends in the land carbon cycle
- ❑ Critical to understand Ecosystem Response to Drought for future Earth System feedbacks