DGVM runs for Trendy/RECCAP

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**

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**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 CO$_2$, climate (CRU/NCEP) and land use:

S1: CO2 only
S2: CO2 and climate
S3 (optional): CO2, climate and land use
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

Trend TWS GRACE GFZ: 2003/01-2008/12

B. Mueller, ETH Zurich
Remarkable Similarity between NPP evolution from DGVMs
Global NPP explains most of the NEE variability
DGVM sink vs MODIS-NPP

1km_NPP_MODIS_anomaly (PgC/yr)

land_sink_DGVM_anomaly

M Zhao
Alternative Upscaling Approaches

Multidimensional flux patterns...

... models to be cross-evaluated against.

Reichstein
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