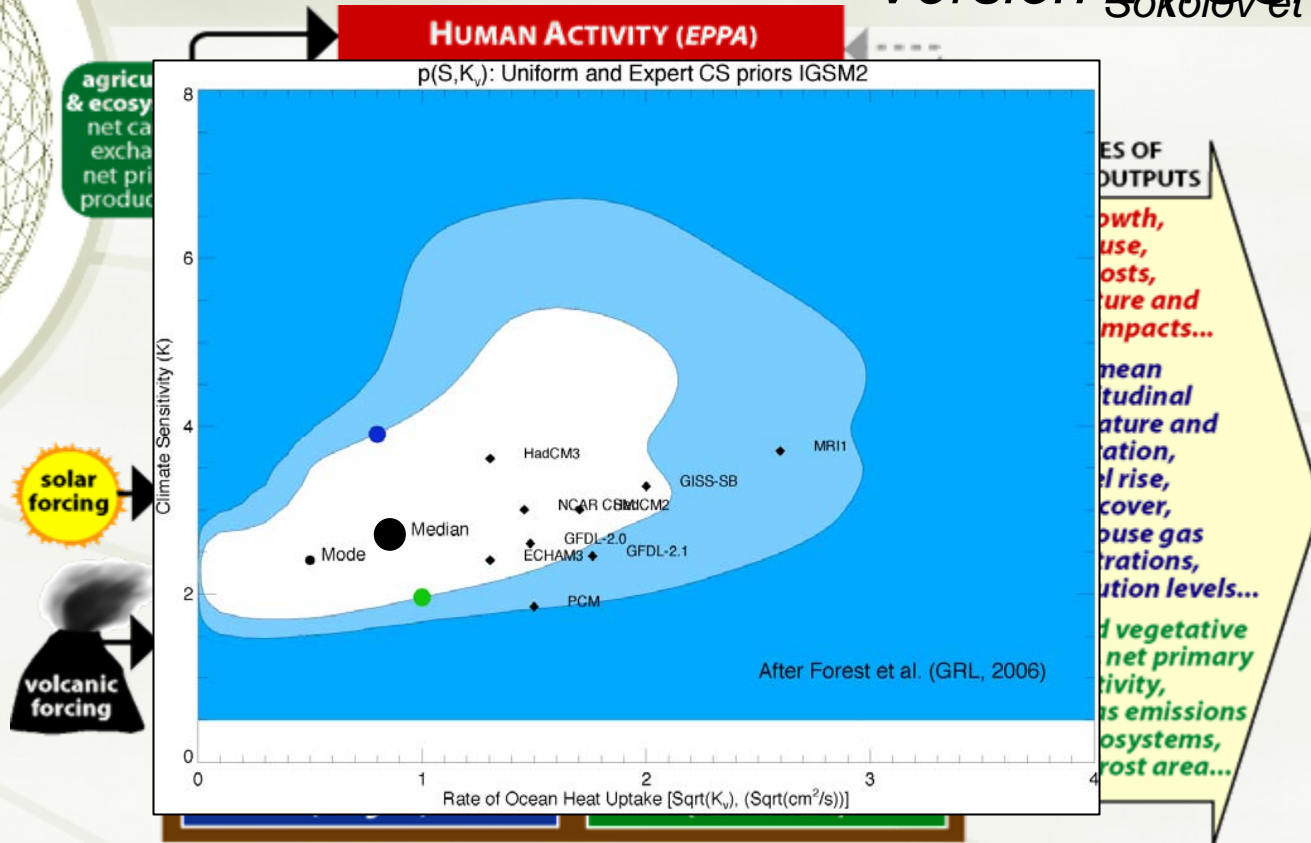


# A Global Land System (GLS) Framework for Integrated Climate-Change Assessments

C. Adam Schlosser, Andrei Sokolov, David Kicklighter, Tim Cronin, Ben Felzer, Chris Forest, Angelo Gurgel, Eunjee Lee, Jerry Melillo, Sergey Paltsev, John Reilly, Ron Prinn, Jeff Scott, Xiaodong Wang, and Mort Webster

Sokolov, A.P., C.A. Schosser, S. Dutkiewicz, S. Paltsev, D.W. Kicklighter, H.D. Jacoby, R.G. Prinn, C.E. Forest, J. Reilly, C. Wang, B. Felzer, M.C. Sarofim, J. Scott, P.H. Stone, J.M. Melillo and J. Cohen. 2005. *The MIT Integrated Global System Model (IGSM) Version 2: Model Description and Baseline Evaluation*. MIT Joint Program Report 125  
[http://mit.edu/globalchange/www/MITJPSPGC\\_Rpt124.pdf](http://mit.edu/globalchange/www/MITJPSPGC_Rpt124.pdf).

Schlosser, C.A., D. Kicklighter and A. Sokolov, 2007. *A Global Land System Framework for Integrated Climate-Change Assessments*. MIT Joint Program on Science and Policy of Global Change Report No. 147. Massachusetts Institute of Technology, Cambridge, Massachusetts.  
[http://mit.edu/globalchange/www/MITJPSPGC\\_Rpt147.pdf](http://mit.edu/globalchange/www/MITJPSPGC_Rpt147.pdf)



### Designed for:

- **Analyzing global environmental changes from anthropogenic causes and quantifying uncertainties in these projected changes.**
- **Assessing the costs and environmental effectiveness of proposed policies to mitigate climate risk.**

### Includes:

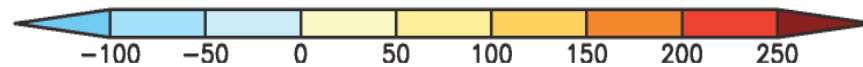
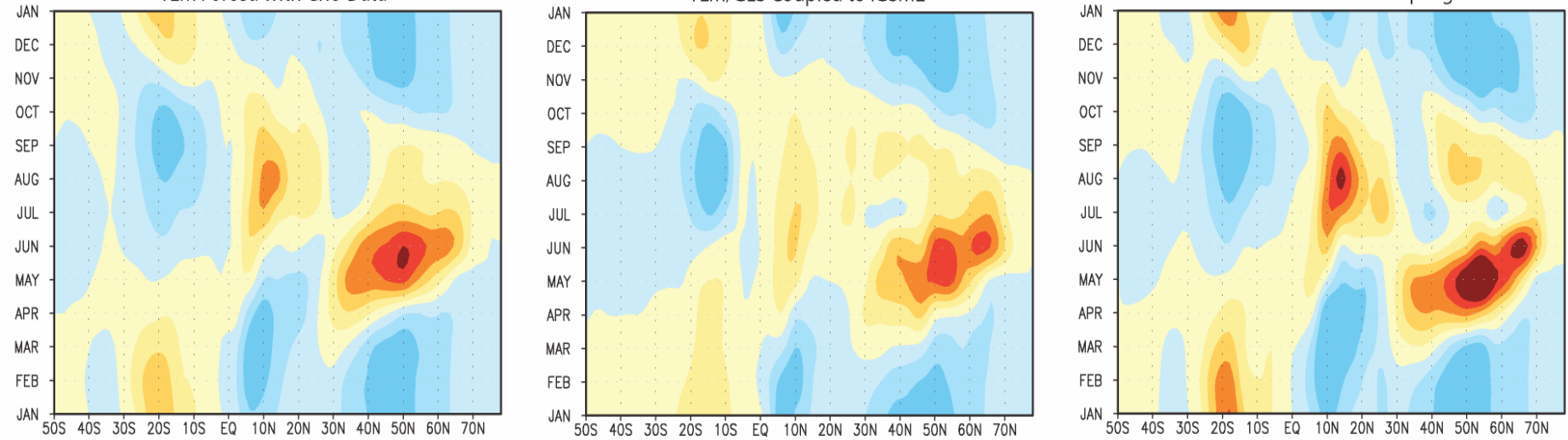
- **Economic model for analysis of greenhouse gas and aerosol precursor emissions and mitigation proposals.**
- **Outputs of emissions models drive the coupled atmospheric chemistry and climate models.**
- **Climate model outputs drive a terrestrial model predicting water/energy budgets, trace gas**

# Biogeophysical and Biogeochemical Pathways in the IGSM Global Land System (GLS)

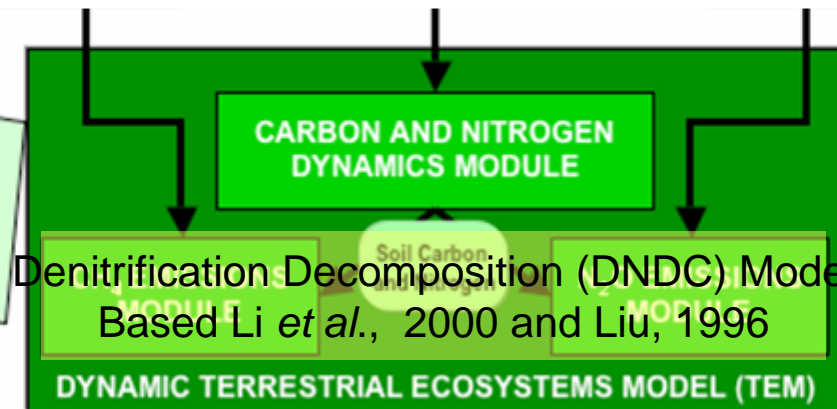
TEM Forced with CRU Data

TEM/GLS Coupled to IGSM2

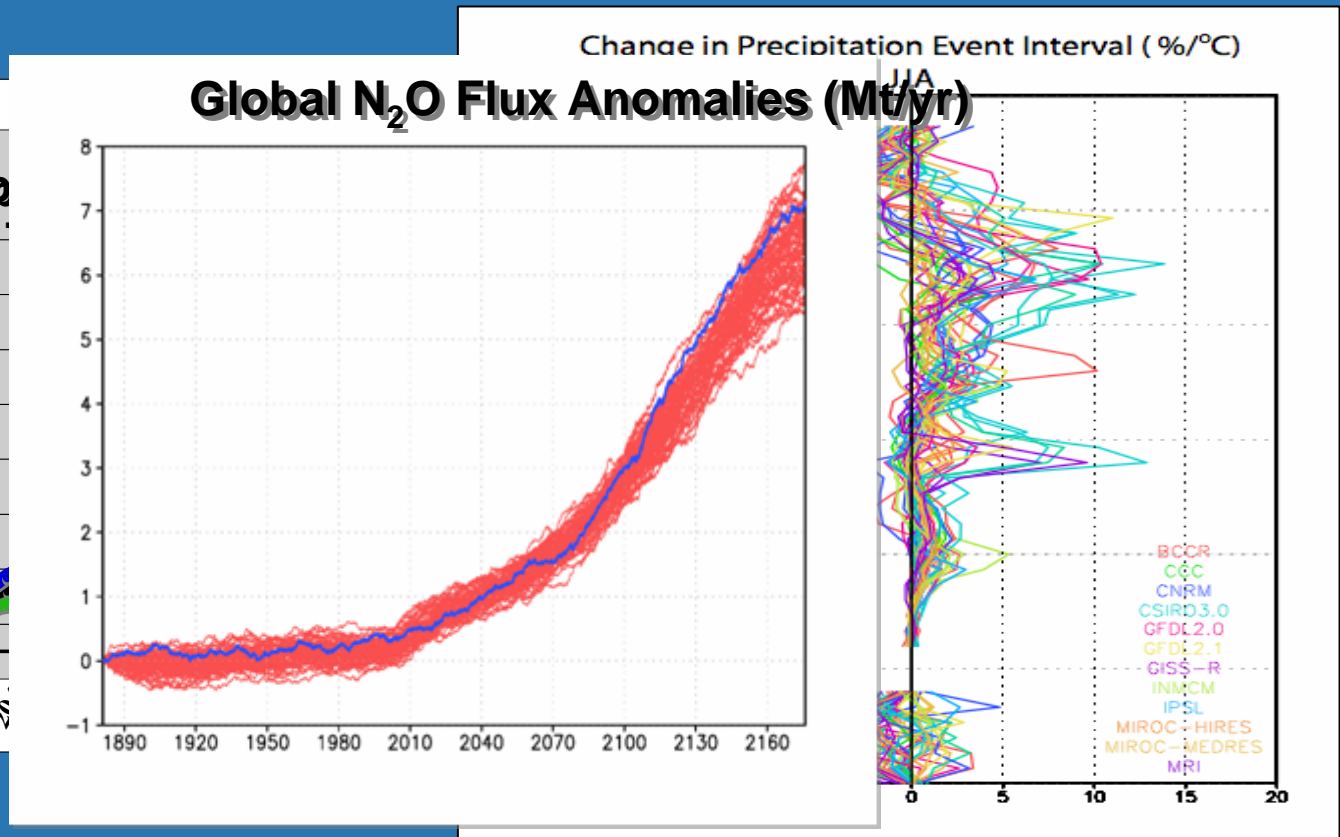
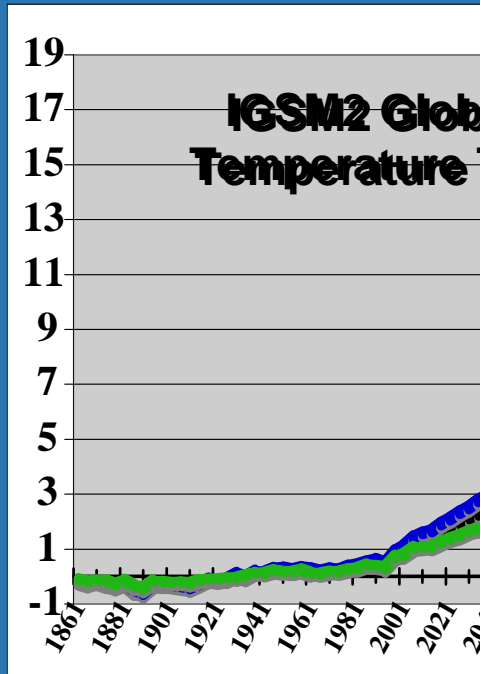
TEM with IGSM1 Coupling



Mtons of C/mth



# Application of Land Precipitation-Interval Trend Uncertainty From AR4 GCMs



- Pool AR4 transient 2xCO<sub>2</sub> runs by season (DJF, MAM, JJA, SON) and latitude zones.
- Fit pooled data to PDFs (Webster *et al.*, 2003) and construct randomly sampled profiles
- Scale change in expected interval according to global temperature trend.
- Overall impact of applied GCM precipitation frequency trends (with uncertainty) is to dampen the natural system's response to climate warming (alone).



# Ongoing Research

- ★ Analyze multiple IGSM2 ensemble runs spanning range of climate-change uncertainties and mitigation policies.
- ★ Updates to GLS (implement in IGSM2 and standalone version) :
  - ★ CLM3.5 (does this include urban land type?)
  - ★ DNDC code as well as alternatives to N<sub>2</sub>O and CH<sub>4</sub>
  - ★ Improved dynamic coupling/competition between CLM, TEM, and DNDC.
- ★ Evaluate new urban airshed model coupling.
- ★ Assess response to EPPA predicted land use change under a variety of policies (e.g. aggressive biofuel economies).
- ★ Assess impact of land (model) on effective climate sensitivity.