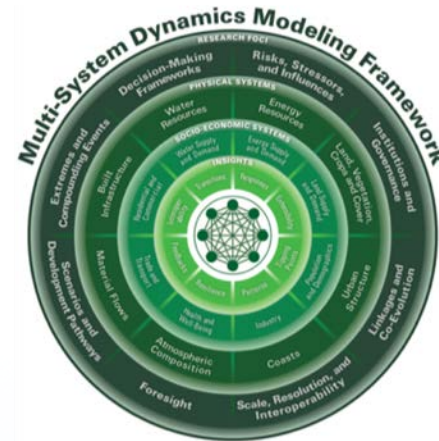


# Sectoral Interactions, Compounding Influences and Stressors, and Complex Systems: Understanding Tipping Points and Non-Linear Dynamics: The Mississippi River Basin

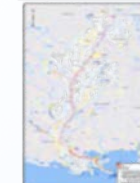
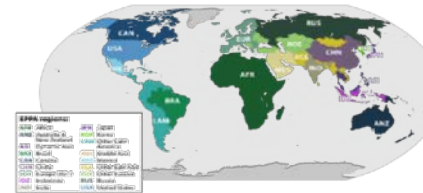


**MIT** JOINT PROGRAM ON THE SCIENCE AND POLICY of **GLOBAL CHANGE**

*Advance and utilize multi-system, multi-sector modeling framework to explore stressors, risks and responses of complex, interconnected physical and socioeconomic systems*



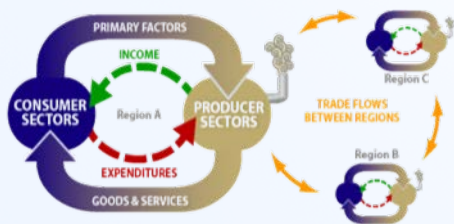
## Multi-Scale Interactions



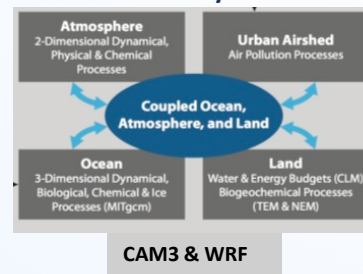
Global Drivers ➤ Teleconnections ➤ Local Systems ➤ Decision-Making

## Toolbox for Multi-Sector Modeling

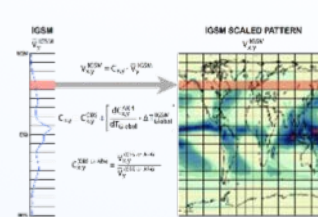
### Human System



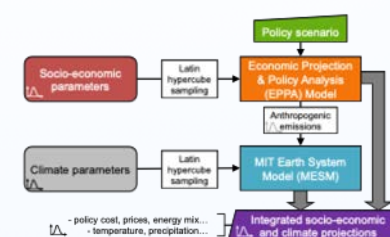
### Natural Systems



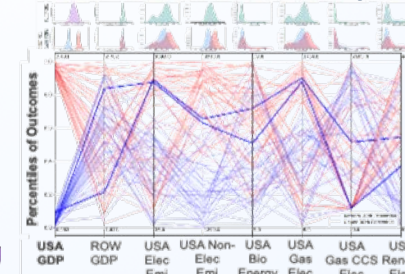
### Pattern Scaling Extremes



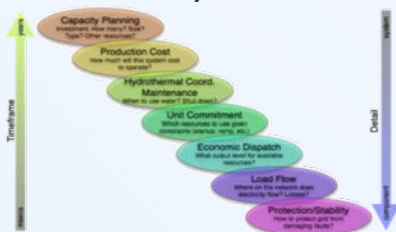
### Probabilistic Ensembles



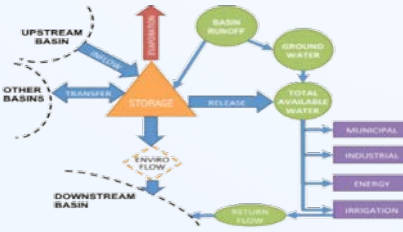
### Scenario Discovery



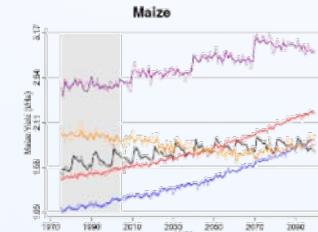
### Electricity Models



### Water Resources



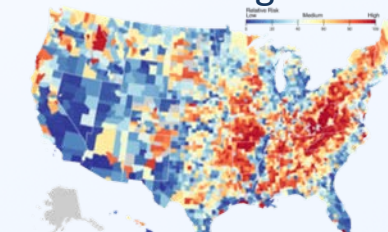
### Emulators



### Decision Frameworks



### Risk Triage



## Major Tasks:

- Human-Natural System Interactions
- Transportation Infrastructure
- Stress-Testing Paired Systems

# Research Team

PIs



**Ron Prinn**  
Earth Systems,  
Atmospheric Chemistry



**Adam Schlosser**  
Extremes, Hydro-climates,  
Land Biogeophysics



**Jen Morris**  
Uncertainty, Energy,  
Economic Modeling



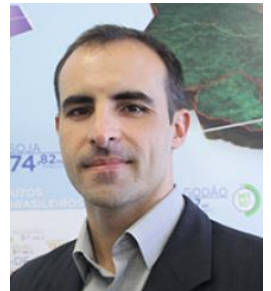
**Sergey Paltsev**  
Energy Economics,  
Transportation



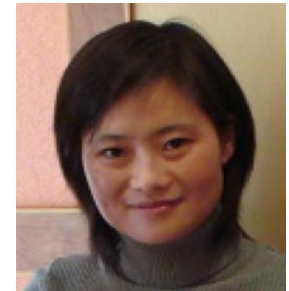
**Anne Slinn**  
Executive Director of  
Research



**Mark Dwortzan**  
Communications Officer



**Angelo Gurgel**  
Land, Agriculture,  
Energy-Economics



**Xiang Gao**  
Land-Climate,  
Extremes, Water



**Seb Eastham**  
Atmospheric Chemistry,  
Air Quality, Health



**John Reilly**  
Economics,  
Model Coupling



**Cypress Frankenfeld**  
Software  
Development



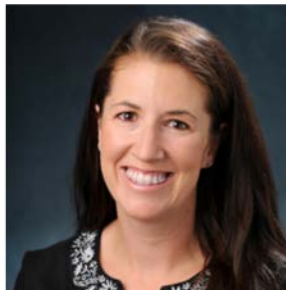
**Mei Yuan**  
Regional Economic  
Modeling



**Henry Chen**  
CGE Modeling



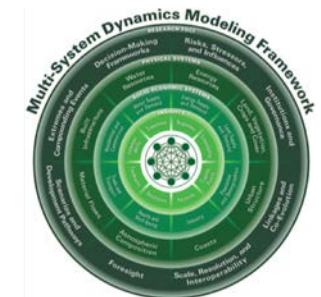
**Andrei Sokolov**  
Climate,  
Ocean-Atmosphere



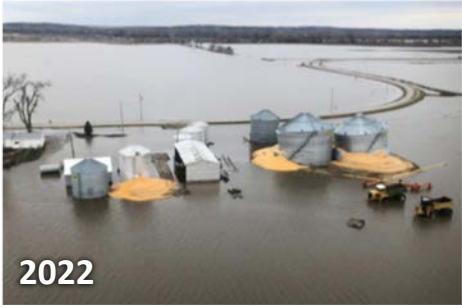
**Alyssa McCluskey**  
GIS, Spatial Analysis

## Career Development

- 2 postdoctoral researchers
- 2-3 graduate students
- Undergrad (UROP) researchers



# Example Publications



[Assessing Compounding Risks Across Multiple Systems and Sectors: A Socio-Environmental Systems Risk-Triage Approach](#)

Schlosser, CA, C Frankenfeld, S Eastham, X Gao, A Gurgel, A McCluskey, J Morris, S Orzach, K Rouge, S Paltsev and J Reilly  
*MIT Joint Program Report 361*



[The Changing Nature of Climate-Related Risks in Global Wind Power Resources](#)

Schlosser, CA, S Uzquiano Perez and A Sokolov  
*MIT Joint Program Report 357*



[Representing Socio-Economic Uncertainty in Human System Models](#)

Morris, J, J Reilly, S Paltsev, A Sokolov and K Cox  
*Earth's Future*



[Toward a just energy transition: A distributional analysis of low-carbon policies in the USA](#)

García-Muros, X, J Morris and S Paltsev  
*Energy Economics*



[Agricultural and forest land-use change in the continental United States: Are there tipping points?](#)

Gurgel, AC, JM Reilly and E Blanc  
*iScience*



[Predictability of U.S. regional extreme precipitation occurrence based on large-scale meteorological patterns](#)

Gao, X and S Mathur  
*Journal of Climate*



[Challenges in simulating economic effects of climate change on global agricultural markets](#)

Gurgel, AC, J Reilly and E Blanc  
*Climatic Change*



[A consistent framework for uncertainty in coupled human-Earth system models](#)

Morris, J, A Sokolov, A Libardoni, C Forest, S Paltsev, J Reilly, CA Schlosser, R Prinn and H Jacoby  
*MIT Joint Program Report 349*



[The role of cross-border electricity trade in transition to a low-carbon economy in the Northeastern U.S.](#)

Yuan, M, K Tapia-Ahumada and J Reilly  
*Energy Policy*



[Statistical emulators of irrigated crop yields and irrigation water requirements](#)

Blanc, E  
*Agricultural and Forest Meteorology*