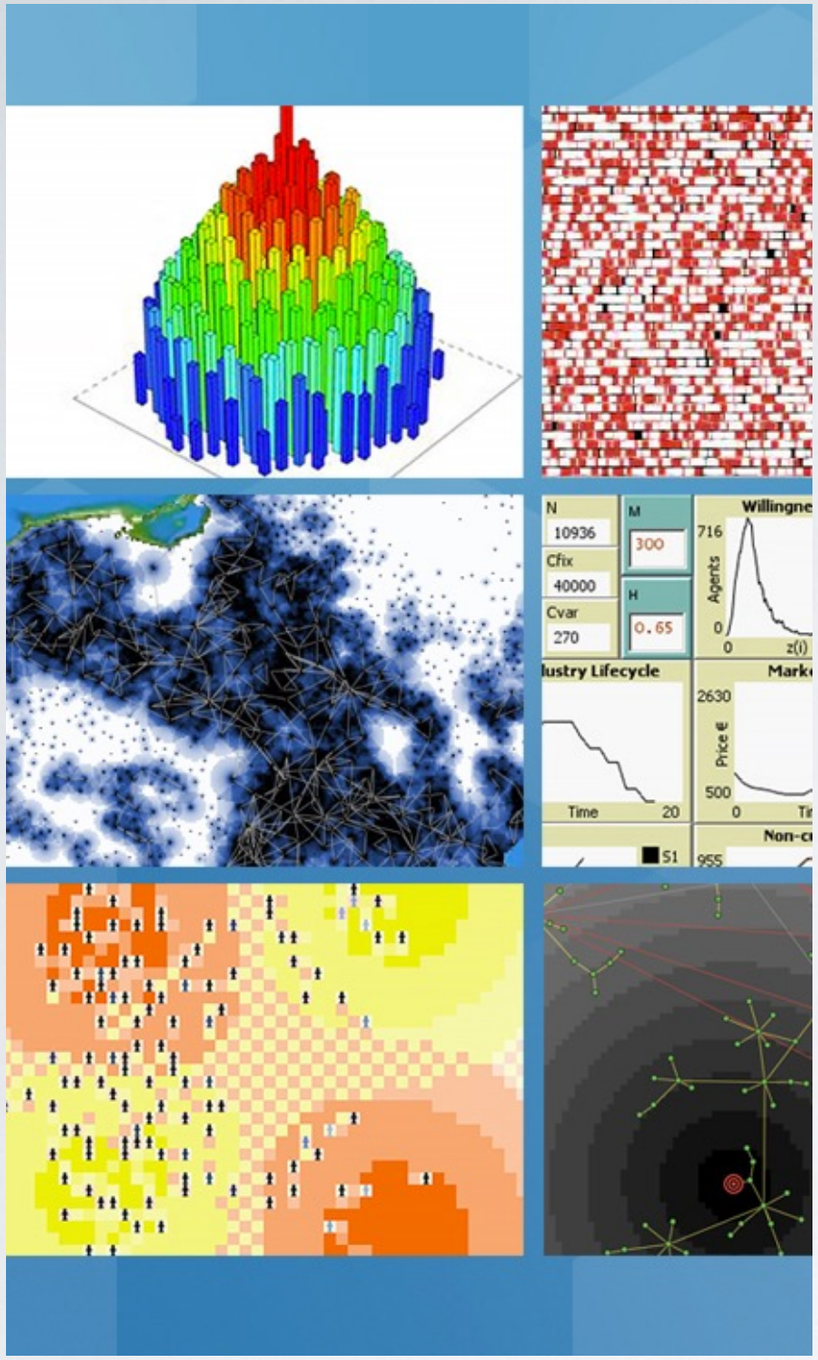
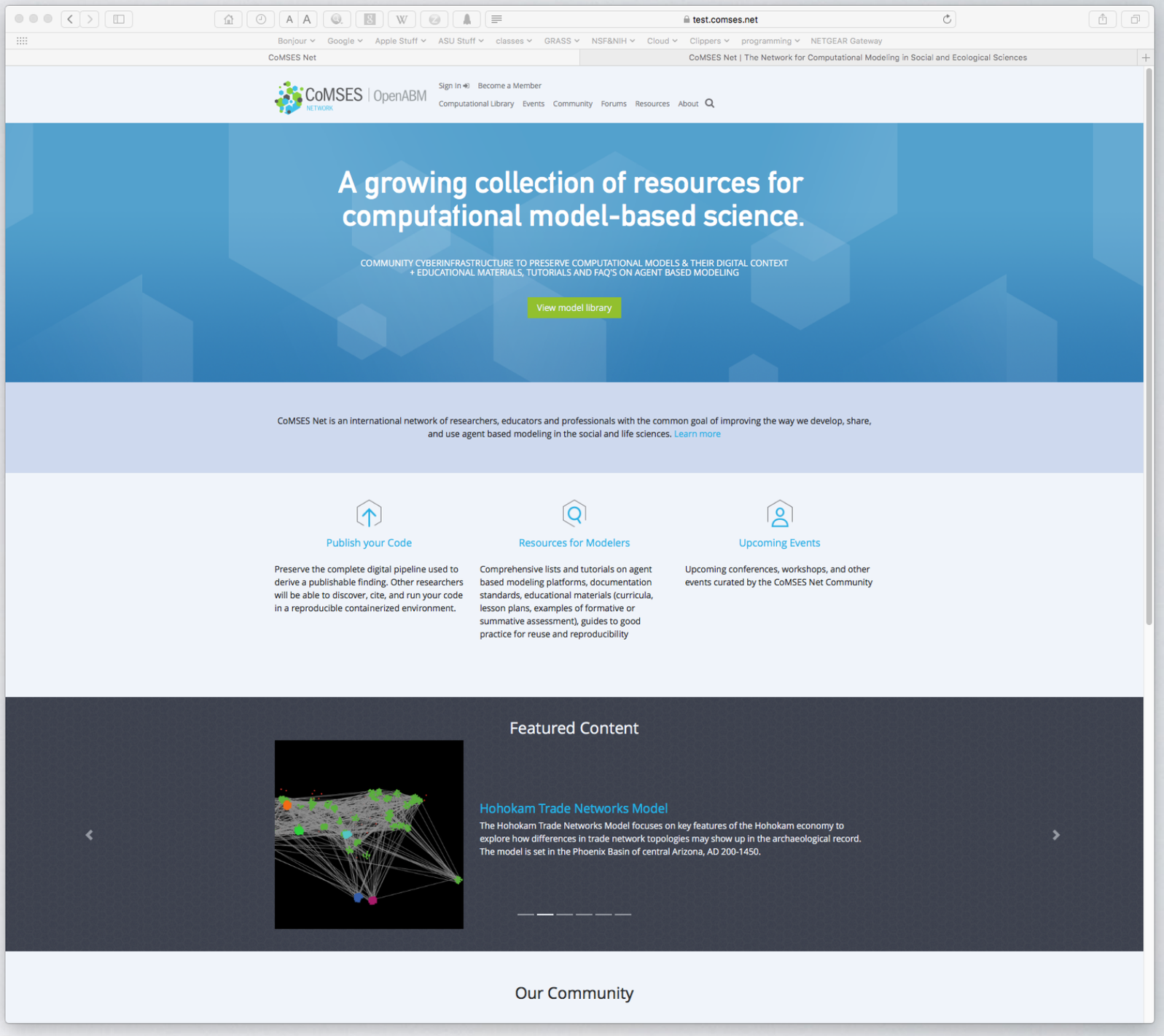


COMSES@CSDMS: A DYNAMIC DUO

Michael Barton, Director, Network for Computational Modeling in Social and Ecological Sciences

COMSES NET

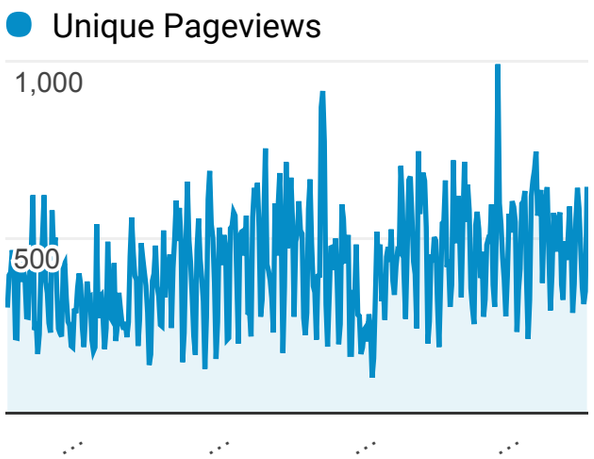
- Parallel organization to CSDMS
- Focus on social and ecological sciences



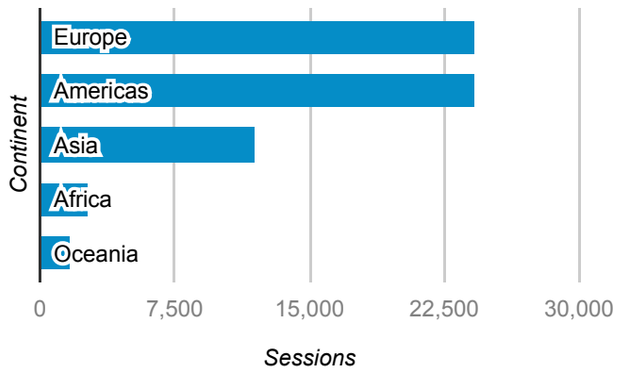
http://www.comses.net

INTERNATIONAL SCIENTIFIC NETWORK

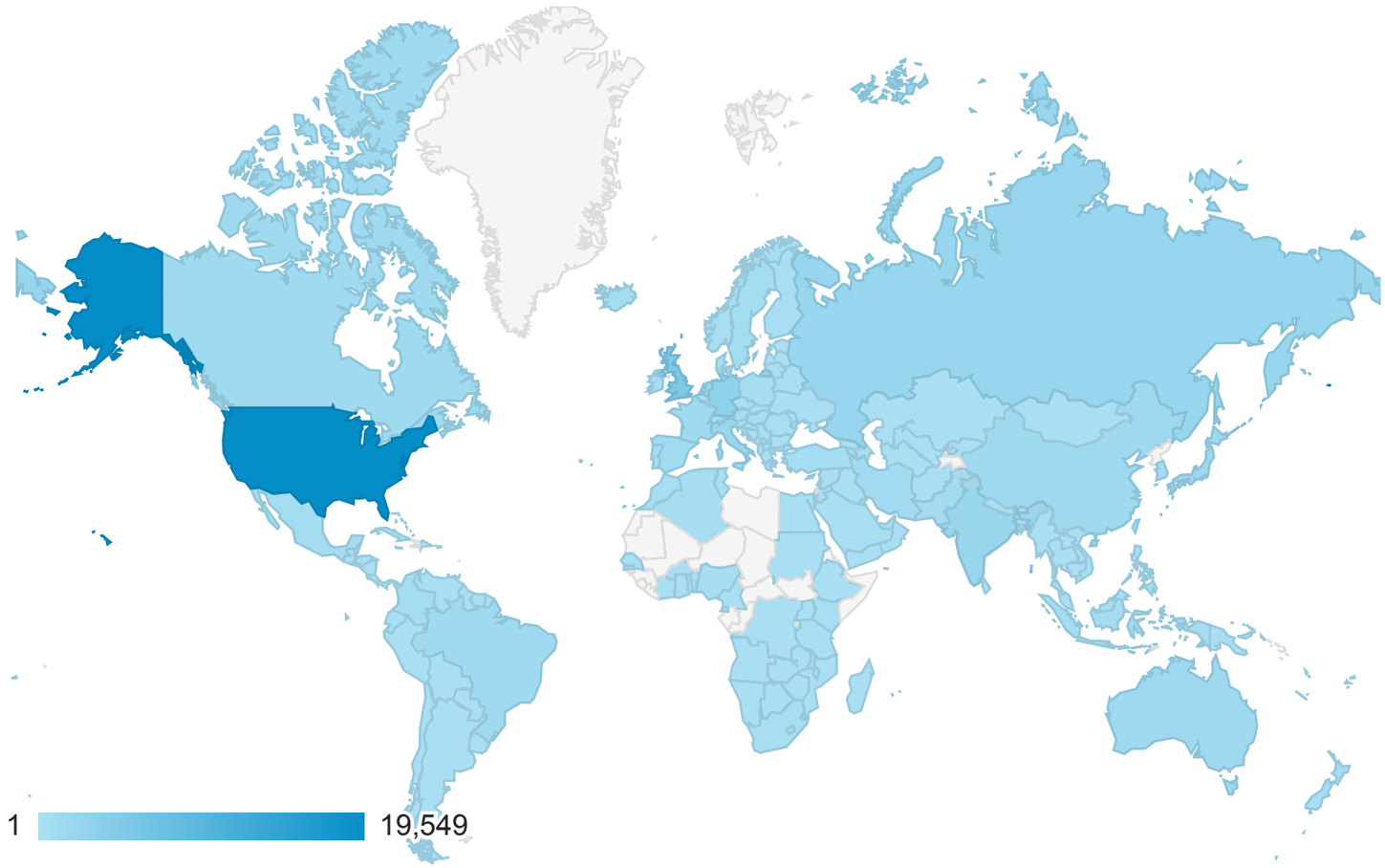
Unique Pageviews



Sessions by Continent



Sessions

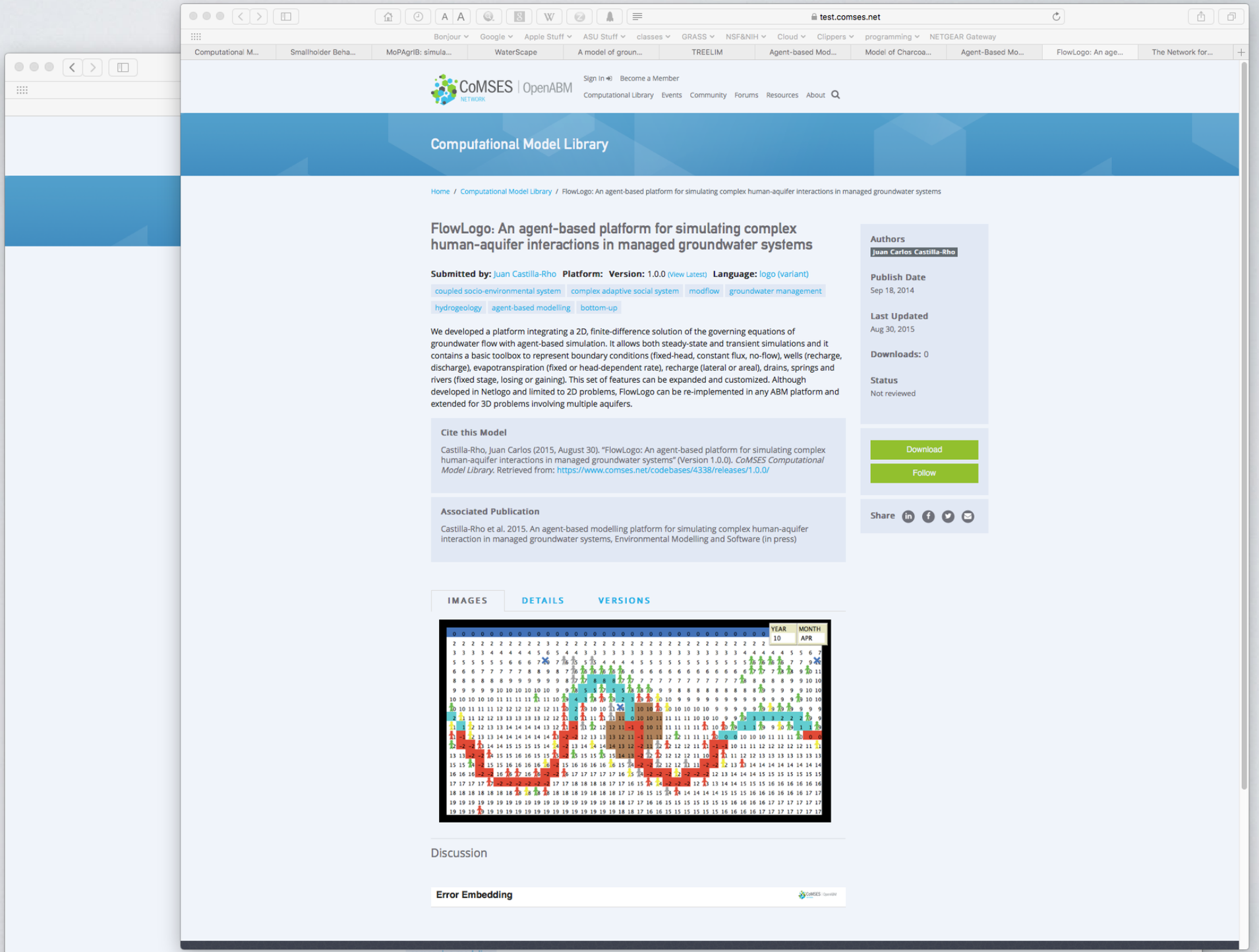


CoMSES NETWORK

1817 Affiliate Members & 307 Full Members

COMPUTATIONAL MODEL LIBRARY

- 412 published models
- Other resources for modeling science



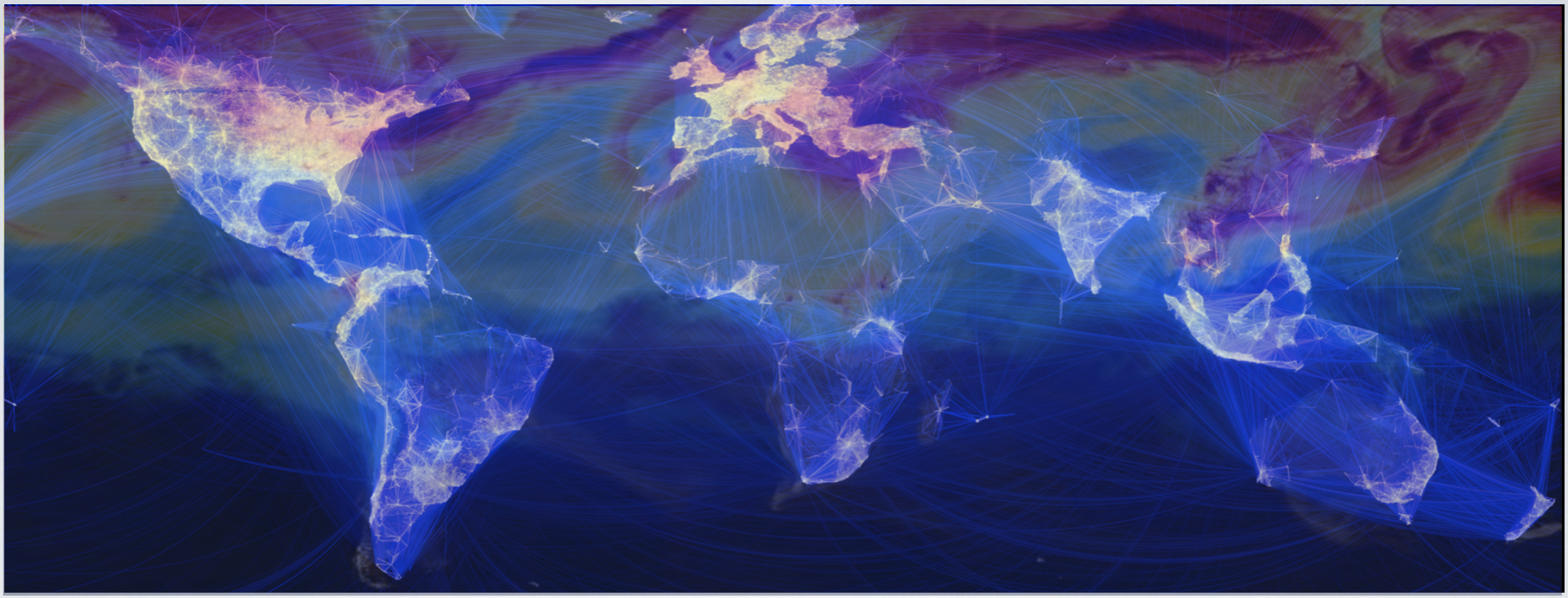
CoMSES NETWORK

COMSES CORE CENTER

- ‘Spoke’ in NSF national big data network
- Technology and best practices for open science
- Transparency, reproducibility, and reuse in scientific computation
- Topic of Allen Lee’s clinic

CoMSES CoRe

MODELING EARTH & HUMAN SYSTEMS



- Welcome to this interdisciplinary meeting of modeling scientists
- We need the dynamic duo of Earth and human systems modeling today

WHY WE NEED THIS DYNAMIC DUO

- A few centuries ago, most people lived in small communities

- An individual could observe social and natural phenomena and extrapolate the consequences of their actions on fellow humans and the natural world

- This is no longer the case

A UNIQUE SOCIAL WORLD

- In a few short millennia, humankind has transformed from a normal terrestrial animal to a unique global phenomenon.
- 7.5+ billion humans
- Over half live in urban hives of millions of individuals

A UNIQUE SOCIAL WORLD

- Digital media and rapid transportation now connect humanity economically, socially, and culturally in a planetary network of multiple, cross-cutting ties.
- A highly complex social-natural system
- **Unprecedented for any organism in earth's history**.

A UNIQUE SOCIAL WORLD

- The multi-dimensional, multi-scale causality and non-linear dynamics of this global complex system **exceed our innate abilities** to anticipate the consequences of decision-making

- It is also now a **major driver of Earth's biophysical environment**

A COUPLED NATURAL & HUMAN PLANET

- > 50% of land in crops or pasture

- > 50% of forests cleared; more reforested

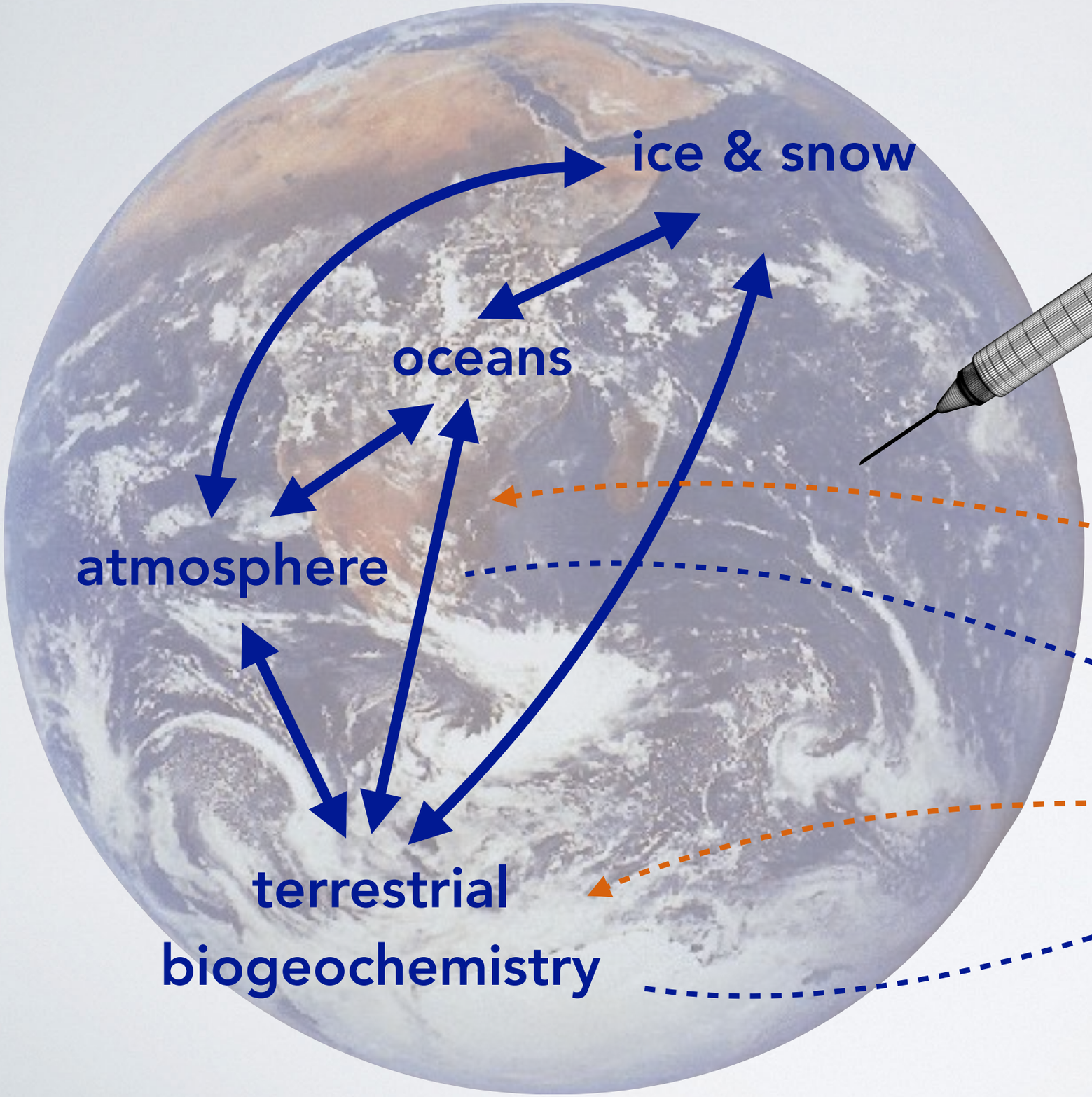
A COUPLED NATURAL & HUMAN PLANET

- Coastlines engineered
- > 50% of fresh water used and 6x more water stored
- More N cycled
- More sediment transported

MODELING EARTH SYSTEM TODAY

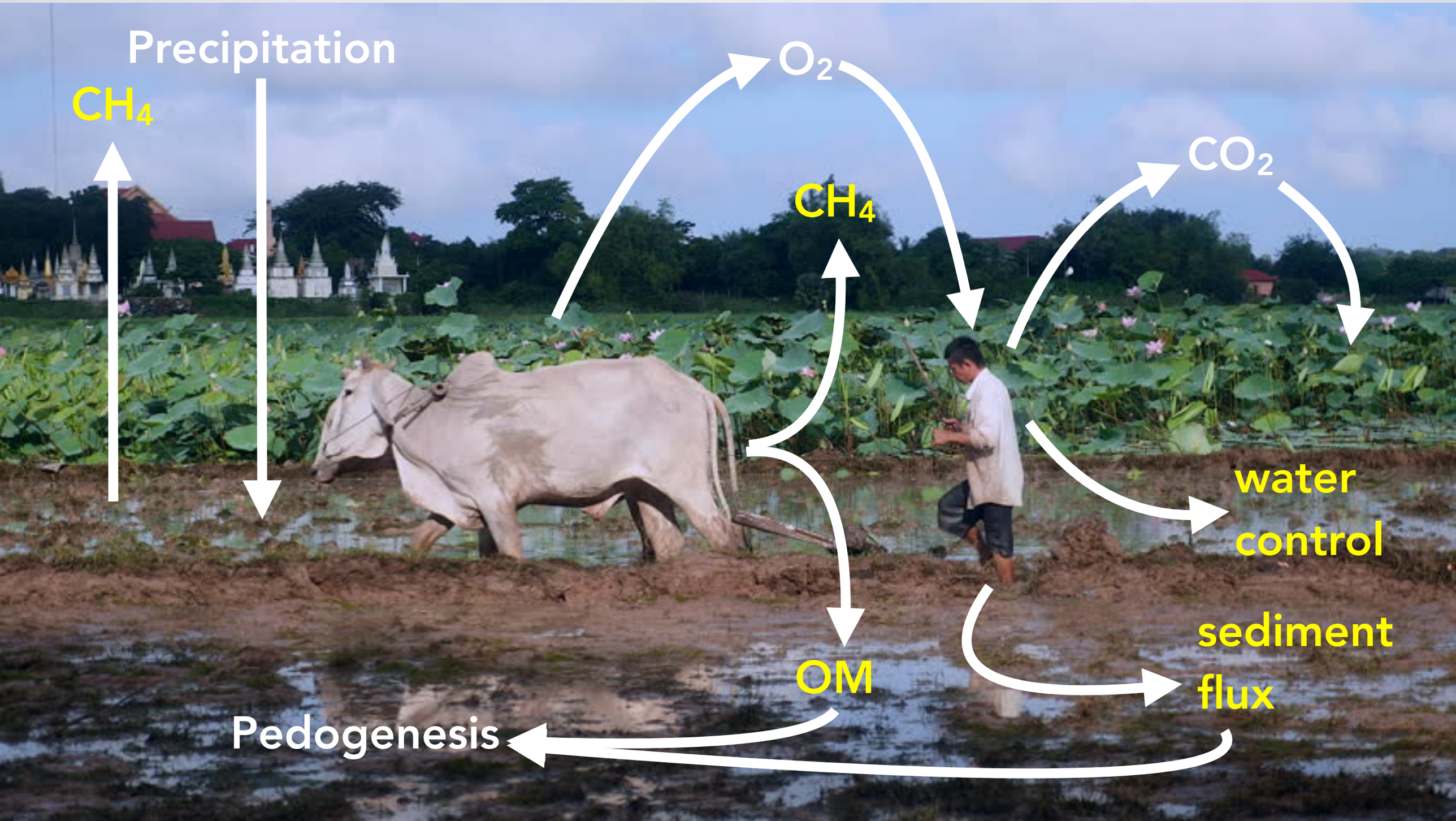
- But our ability to model the processes that drive Earth systems does not yet represent this reality

MODELING EARTH SYSTEM TODAY



Human System Models

THE REAL EARTH SYSTEM (A SMALL PART)



NEXT GENERATION MODELING FOR PLANETARY MANAGERS

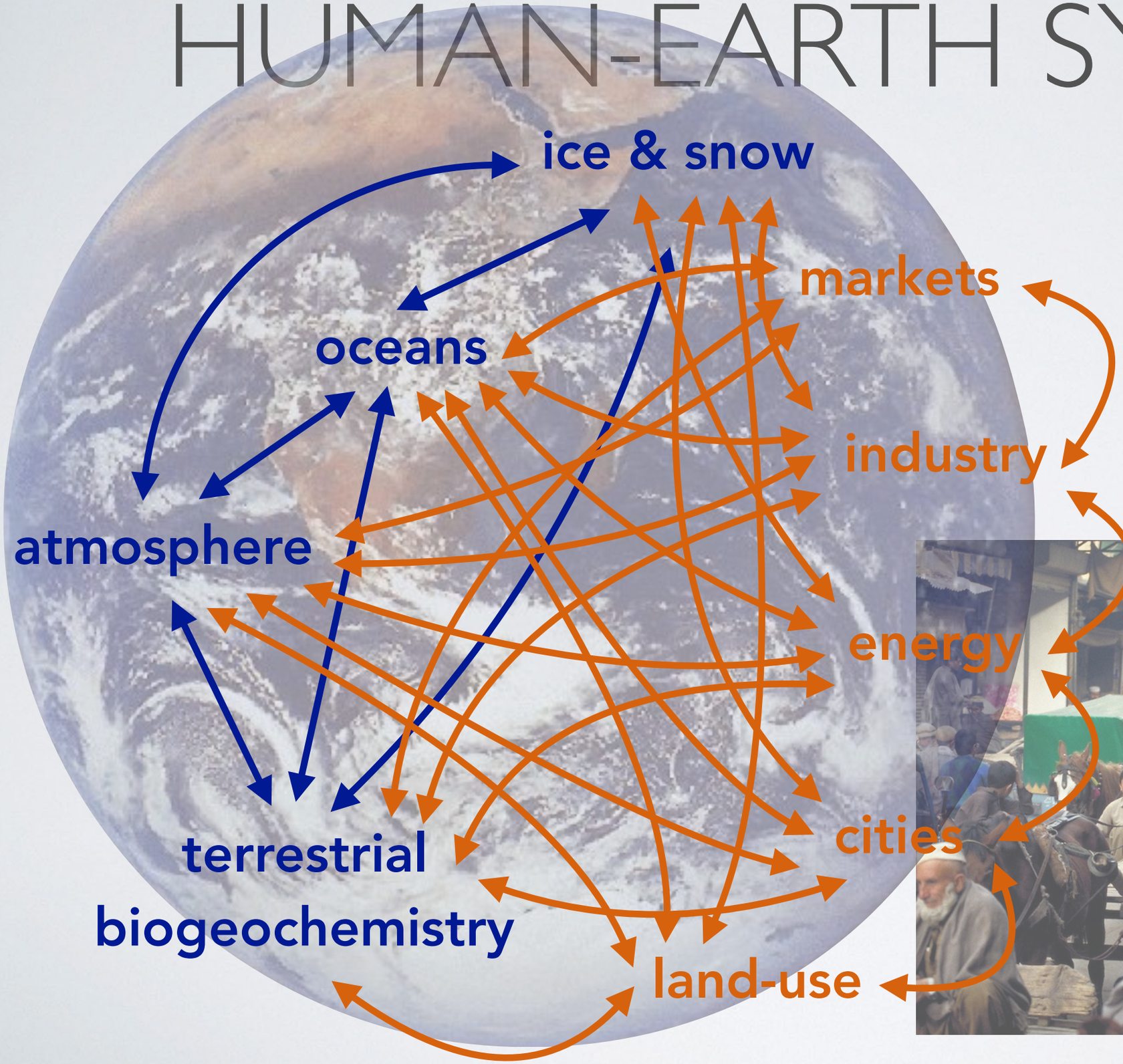
- Modeling Earth systems without people, and people without Earth systems is getting the science wrong

- The stakes for getting it right are high and growing

NEXT GENERATION MODELING FOR PLANETARY MANAGERS

- In an Earth dominated by rapidly changing, telecoupled human and biophysical processes…
- we can no longer depend on human intuition and simple statistics to plan our future.
- Need **next generation data-driven science and modeling** to enable us to sustainably manage dynamics of a planetary socio-ecological-technological system

INTEGRATIVE MODELING OF HUMAN-EARTH SYSTEMS



cellular automata

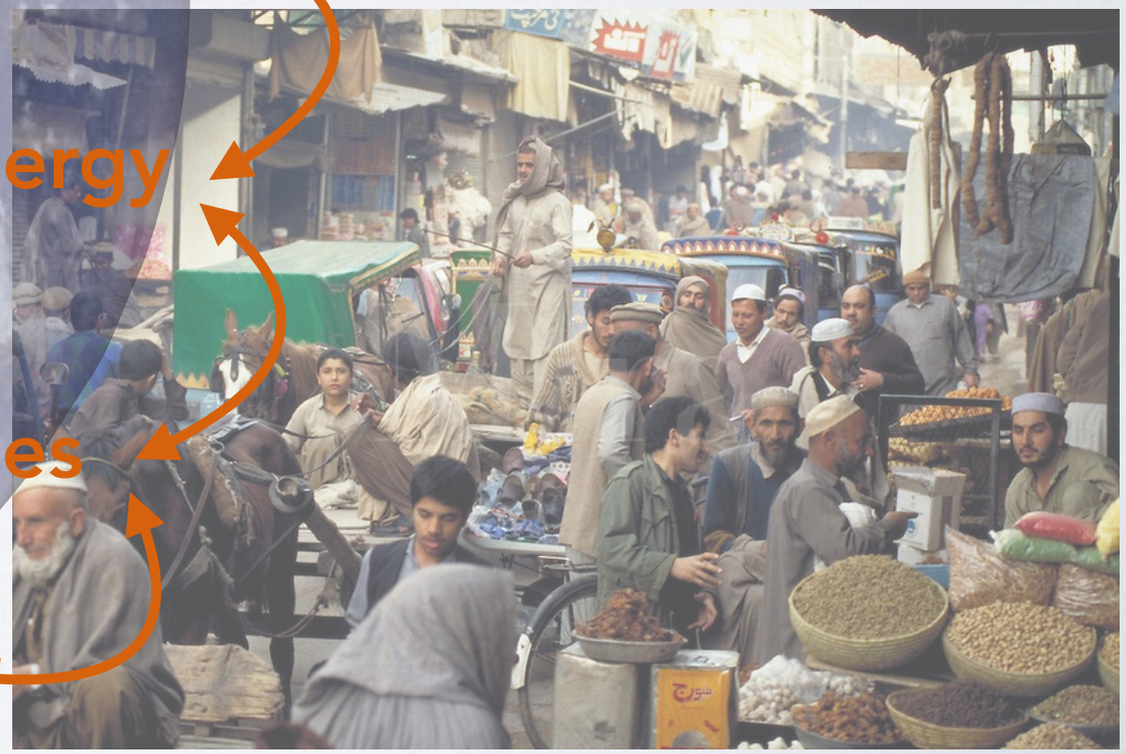
ABMs

sector models

IAMs

system dynamics models

LULC models



COMSES/CSDMS COLLABORATION

- Six years ago, Jai and I began discussions about need for integrative modeling of human and earth systems.
- Led to series of collaborations between CSDMS and CoMSES
    - Human Dimensions FRG, co-chaired by CSDMS/Future Earth and CoMSES Net members
    - Participation and clinics by CoMSES Net members in CSDMS annual meetings
    - Workshop on integrative modeling organized by HDFRG, May 2016
    - Collaboration with Future Earth on other initiatives for integrative modeling
    - CoMSES Net invited to co-sponsor this year's CSDMS annual meeting

CSDMS
COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

NEXTGEN MODELING INITIATIVE

- Especially important activity has been planning for a next generation modeling environment that can support integrative simulation of human and Earth system dynamics

- Meetings of modeling scientists in Boulder, Kyoto, Potsdam in 2016 & 2017

- Also discussed at NSF ABM symposium in San Diego (March 2017) and topic of this CSDMS annual meeting

- We need to move beyond discussion and begin to create environments for integrative modeling of natural and human systems

CSDMS
COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

LOOKING AHEAD

- You are on the front line of new directions in modeling science

- Creating the information tools we need to understand our planet and manage it sustainably

- Need to combine our expertise in simulating biogeochemical and social processes and their important feedbacks at multiple scales

CSDMS
COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

LOOKING AHEAD

- Breakout groups today: *modeling coupled Earth & human systems*
- Other keynotes, clinics, and breakouts deal with these topics
- How can CSDMS, CoMSES Net, and other modeling scientists pool technologies and intellectual capacity to begin to create the NextGen modeling systems we need?
- Need you to discuss issues & ideas, propose goals & solutions
- What are the next steps?

CSDMS
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