Overview:
Multi-Scale Synthesis and Terrestrial Biospheric Model Intercomparison Project (MsTMIP)

DATAONE ILAMB WORKING GROUP
EXPLORATION, VISUALIZATION, AND ANALYSIS (EVA)
SANTA BARBARA, CALIFORNIA
NOVEMBER 18TH

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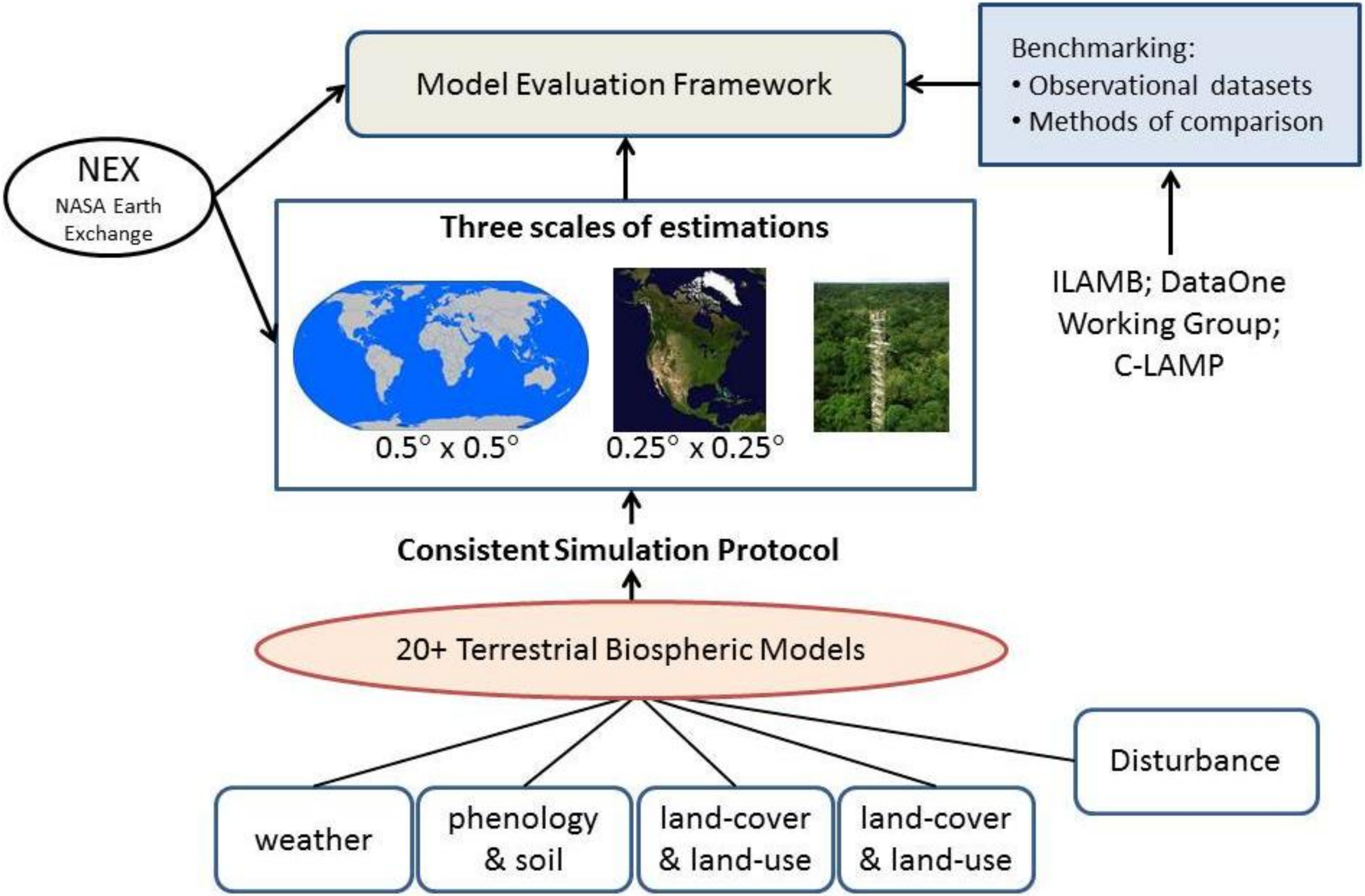

Model Evaluation Framework
Benchmarking:
• Observational datasets
• Methods of comparison
NEX
NASA Earth Exchange
Three scales of estimations
0.5° x 0.5°
0.25° x 0.25°
ILAMB; DataOne Working Group; C-LAMP
Consistent Simulation Protocol
20+ Terrestrial Biospheric Models
Disturbance
weather
phenology & soil
land-cover & land-use
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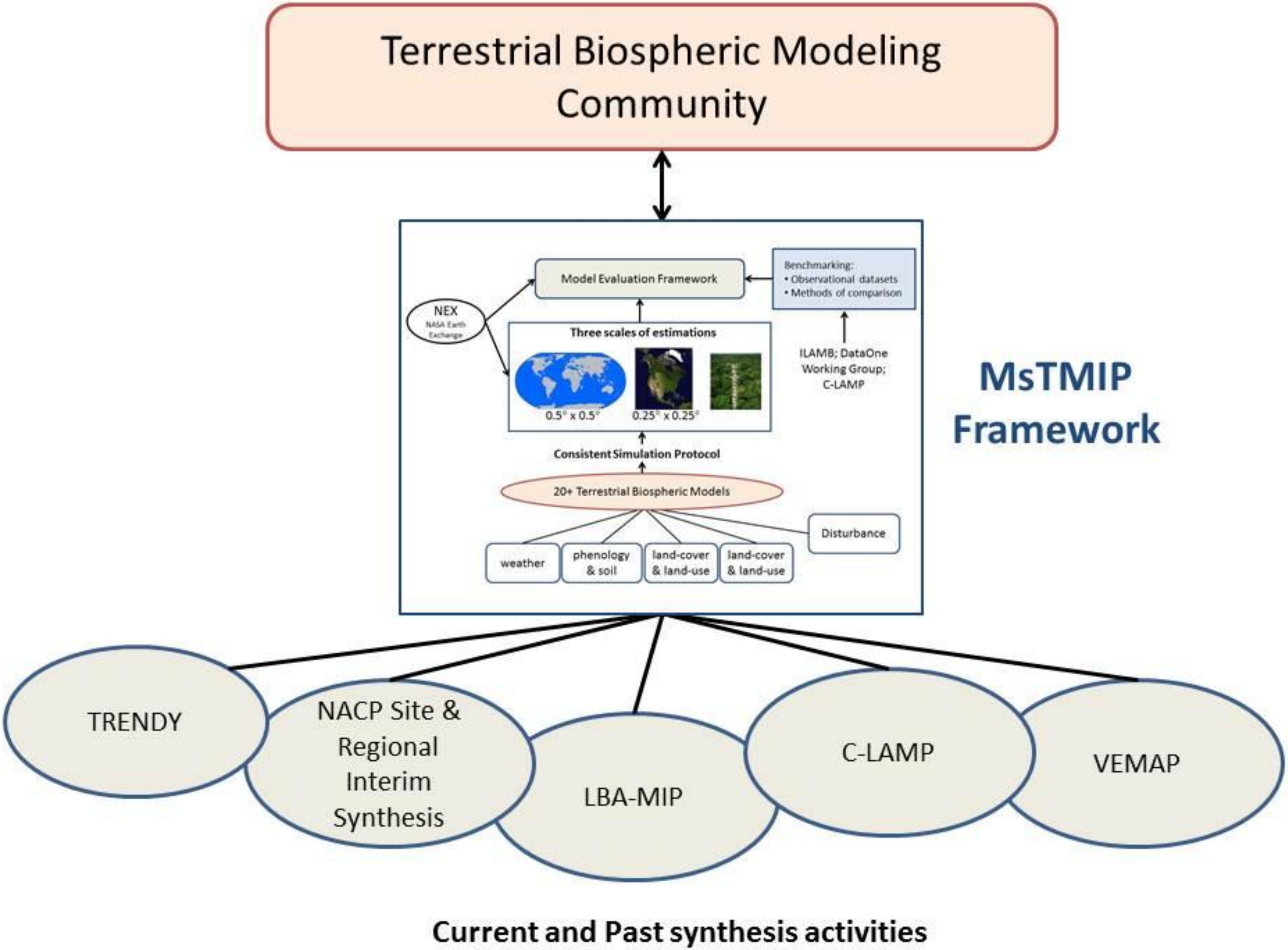
Terrestrial Biospheric Modeling Community
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TRENDY
NACP Site & Regional Interim Synthesis
LBA-MIP
C-LAMP
VEMAP
Current and Past synthesis activities

MsTMIP Participants

- Over 19 different institutions
- Over 20 different models
  - ~6 dynamic vegetation models
  - ~9 models have prognostic fire
  - ~2 data assimilation models
- Most models participated in NACP site and/or regional interim synthesis activities

VEGAS	DLEM	CLM-VIC	ISAM
SIPNET	PRIPLEX-GHG	LPJ-wsl	Ecosys
MC1	CLASS-CTEM-N+	GEMS	ORCHIDEE
SiB	SiB-CASA	TEM	CLM-CN
Biome-BGC	IRC	ED	GTEC

+ multiple models out of JPL

MsTMIP **workshop 1** was held at NASA Ames Research Center on October 13th and 14th, 2011.

Next MsTMIP **workshop** will be held the beginning of March, 2012 (location TBD).

Ten Simulations (1801-2010)

Order	Domain	Code	Climate	LULUC	Atm. CO_2	Nitrogen
1	Global 	RG1	Constant	Constant	Constant	Constant
2		SG1	CRU+NCEP			
3		SG2		Hurtt et al.		
4		SG3			Observed	
5		BG1				Observed
6	North Amer. 	RR1	Constant	Constant	Constant	Constant
7		SR1	NARR			
8		SR2		Hurtt et al.	Observed	
9		SR3				
10		BR1				Observed

Simulations (1801-2010) Cont.

Reference simulations → spin-up run out to 2010

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Baseline simulations → model's best estimate of net land-atmosphere carbon flux (everything turned on)

Sensitivity simulations → turn one variable component on at a time to systematically test the impact of climate variability, CO_2 fertilization, nitrogen limitation, and land cover / land-use change on carbon exchange.

Timeline for Simulations

- Spin-up datasets are ready & available on the ftp site;
- The global reference simulations (RG1) should be submitted by **December 17, 2011**;
- The global sensitivity and baseline simulations (SG1-3 & BG1) results should be submitted by **March 1, 2012**; and
- All North American simulations (RR1, SR1-3 & BR1) results should be submitted by **June 1, 2012**.

Model Evaluation Approach

In collaboration with the International Land Model Benchmarking Project (ILAMB) we are currently:

- Identifying observational data sets to compare against model results; and
- Examining how best to compare observations with model estimates (e.g., what metrics to use and in what ways?)

Rather than thinking about comparison itself, focus instead on the science questions we would like to address.

What types of observations & metrics do we need to answer those questions?

Science Questions (Example)

- **What are the most dominant controls on land-atmosphere carbon exchange (globally, regionally)?**
  - To answer we will examine the relative change in carbon stocks, net fluxes from including (or removing) land-use, CO_2, N-deposition as predicted by the models.
  - In comparison among models:
    - How does each model estimate compare to benchmark observations in each case? (*what metrics are most useful for this level of comparison?*)
    - Using these metrics, examine whether by adding in land-use, CO_2, and N-deposition, the models move closer or further away from benchmarks.

Questions Continued (from workshop)

- What is driving the variability in model estimates of GPP and how do biases in GPP influence estimates of net productivity or exchange?
  - Tier 1: Observations and metrics to examine differences
    - Tier 2: Observations and metrics to attribute causes or drivers of model differences.
- Why are model estimates very similar to one another at the start of simulations, but diverge over time? What is driving this spread?
- Why are there such large differences in model estimates of permafrost in the Arctic? To what degree are these differences due to the snow model?

Questions Continued (from workshop)

Disturbance related:

- Some of the models in MsTMIP account for fire (and other) disturbances either prognostically or diagnostically
  - How close are the fire regimes between the prognostic models and the diagnostic products?
  - How important are these fire regimes in the model's ability to match observed carbon pools?
  - What fraction of biomass is lost annually due to direct emissions from fires versus fraction of biomass that is lost to soils due to fire?