International Land Model Benchmarking (ILAMB) Project

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ILAMB Goals

- Develop benchmarks for land model performance, with a focus on carbon cycle, ecosystem, surface energy, and hydrological processes. The benchmarks should be designed and accepted by the community.
- Apply the benchmarks to global models.
- Support the design and development of a new, open-source, benchmarking software system for either diagnostic or model intercomparison purposes.
- Strengthen linkages between experimental, monitoring, remote sensing, and climate modeling communities in the design of new model tests and new measurement programs.

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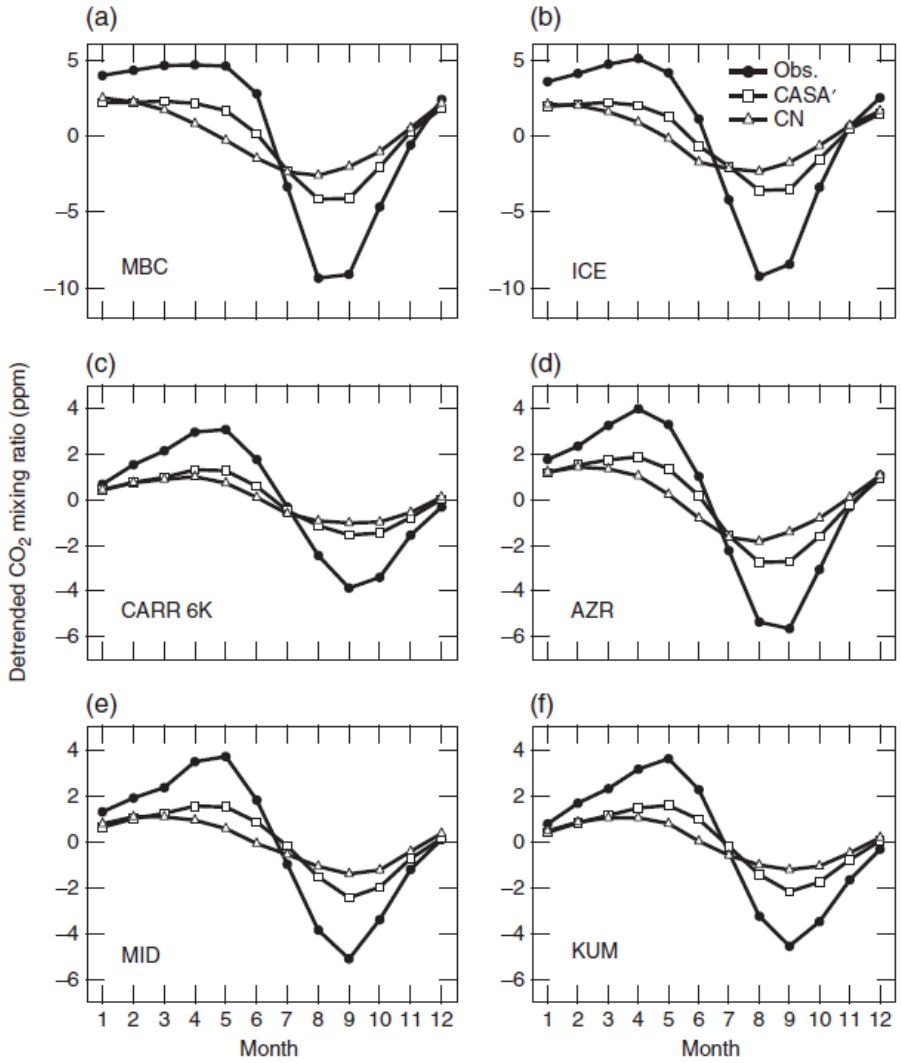
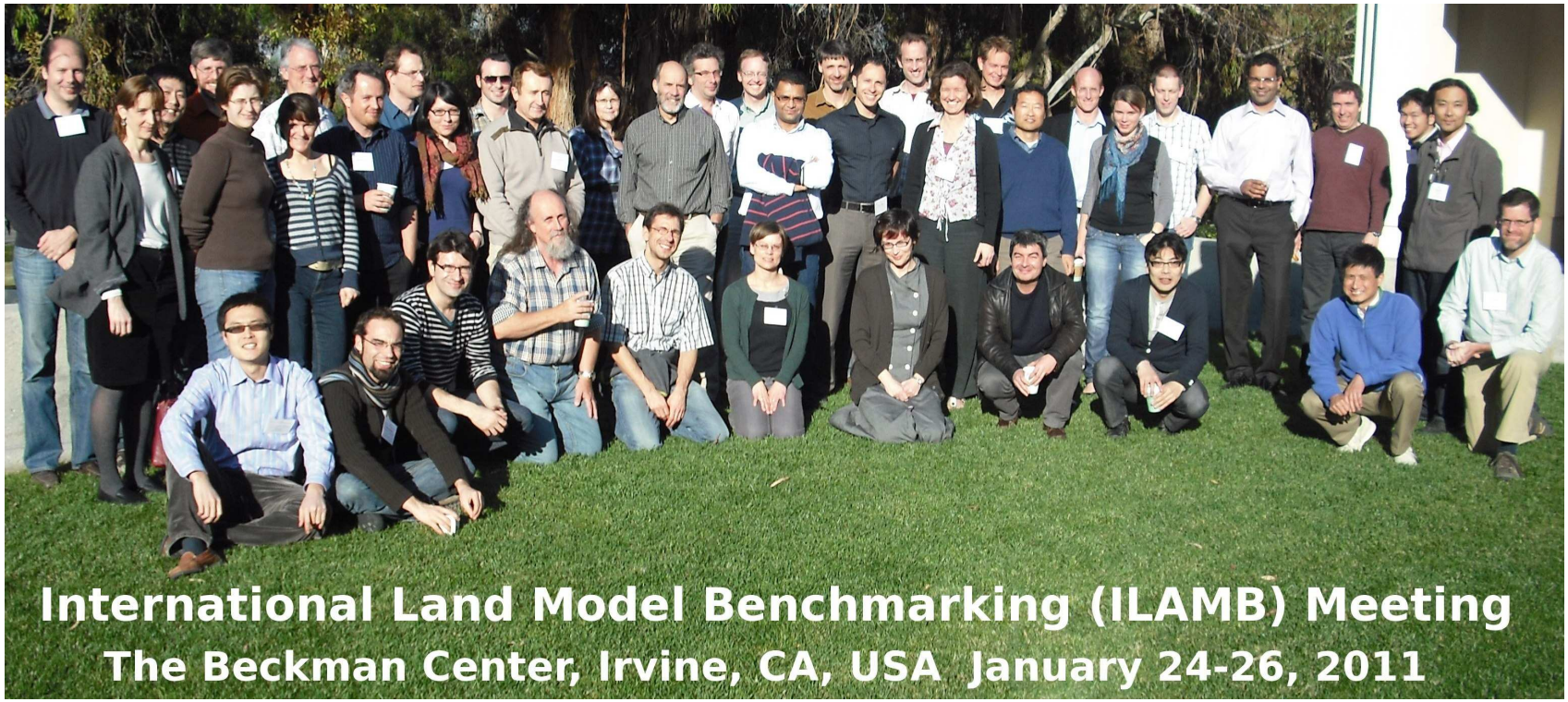
http://www.ilamb.org/

What is a Benchmark?

- A benchmark is a quantitative test of model function, for which the uncertainties associated with the observations can be quantified.
- Acceptable performance on benchmarks **is a necessary but not sufficient condition** for a correctly functioning model.
- Since all datasets have strengths and weaknesses, an effective benchmark is one that draws upon a broad set of independent observations to evaluate model performance on multiple spatial and temporal scales.



From Randerson et al. (2009)



- Five break-out groups met, one for each benchmark category, to identify cost functions, graphics, measurement uncertainty, and scale mismatch.
- Key objectives are to use publicly available data and freely available software tools. R will be used for statistical results and diagnostics.
- Software architecture team identified. Five benchmarks will be developed for evaluating TRENDY and CMIP5 results. ESG will host model results.

Extra Slides

	Annual Mean	Seasonal Cycle	Interannual Variability	Trend	Data Source
Atmospheric CO_2					
Flask/conc. + transport		✓	✓	✓	NOAA, SIO, CSIRO
TCCON + transport		✓	✓	✓	Caltech
Fluxnet					
GPP, NEE, TER, LE, H, RN	✓	✓	✓		Fluxnet, MAST-DC
Gridded: GPP	✓	✓	?		MPI-BGC
Hydrology/Energy					
river flow	✓		✓		GRDC, Dai, GFDL
global runoff/ocean balance	✓				Syed/Famiglietti
albedo (multi-band)		✓	✓		MODIS, CERES
soil moisture		✓	✓		de Jeur, SMAP
column water		✓	✓		GRACE
snow cover	✓	✓	✓	✓	AVHRR, GlobSnow
snow depth/SWE	✓	✓	✓	✓	CMC (N. America)
T_{air} & P	✓	✓	✓	✓	CRU, GPCP and TRMM
Gridded: LE, H	✓	✓			MPI-BGC, dedicated ET
Ecosystem Processes & State					
soil C, N	✓				HWSD, MPI-BGC
litter C, N	✓				LIDET
soil respiration	✓	?	✓	✓	Bond-Lamberty
FAPAR	✓	✓			MODIS, SeaWIFS
biomass & change	✓			✓	Saatchi, Pan, Blackard
canopy height	✓				Lefsky, Fisher
NPP	✓				EMDI, Luyssaert
Vegetation Dynamics					
fire — burned area	✓	✓	✓		GFED3
wood harvest	✓			✓	Hurtt
land cover	✓				MODIS PFT fraction

References

J. T. Randerson, F. M. Hoffman, P. E. Thornton, N. M. Mahowald, K. Lindsay, Y.-H. Lee, C. D. Nevison, S. C. Doney, G. Bonan, R. Stöckli, C. Covey, S. W. Running, and I. Y. Fung. Systematic assessment of terrestrial biogeochemistry in coupled climate-carbon models. *Global Change Biol.*, 15(9):2462–2484, Sept. 2009. doi:10.1111/j.1365-2486.2009.01912.x.