A New Model Evaluation Framework for the International Land Model Benchmark (ILAMB) Project
Forrest M. Hoffman1,2 and James T. Randerson1
1University of California-Irvine and 2Oak Ridge National Laboratory (ORNL)

Introduction
The need to capture important climate feedbacks in general circulation models (GCMs) has resulted in new efforts to include atmospheric chemistry and land and ocean biogeochemistry into the next generation of production climate models, now often referred to as Earth System Models (ESMs). While many terrestrial and ocean carbon models have been coupled to GCMs, recent work has shown that such models can yield a wide range of results (Friedlingstein et al., 2006), suggesting that a more rigorous set of offline and partially coupled experiments, along with detailed analyses of processes and comparisons with measurements, are warranted. The Carbon-Land Model Intercomparison Project (C-LAMP) provides a simulation protocol and model performance metrics based upon comparisons against best-available satellite and ground-based measurements (Hoffman et al., 2007). C-LAMP provides feedback to the modeling community regarding model improvements and to the measurement community by suggesting new observational campaigns.

Experimental Results for CASA© and CN

Comparison of MODIS MOD15A2 for month of maximum leaf area index (LAI). White direct comparison of model results with MODIS LAI values is problematic; it is expected that the month of maximum LAI from MODIS has a much lower uncertainty. Both models exhibited a 1–3-month delay in maximum LAI.

Comparison of MODIS MOD15A2 for month of maximum leaf area index (LAI). White direct comparison of model results with MODIS LAI values is problematic; it is expected that the month of maximum LAI from MODIS has a much lower uncertainty. Both models exhibited a 1–3-month delay in maximum LAI.

C-LAMP Score Sheet for CASA© and CN

C-LAMP produced a standard set of common output quantities for climate-carbon cycle models and recommendations for carbon accounting. These are being proposed as additions to the NexCIP Climate and Forecast (CF) Metadata Convention for output field names and units in addition to those produced by terrestrial biogeochemistry components of Earth System Models for IPCC AR5.

The complete protocol, metrics for evaluation, and output approach are described at http://www.climatemodeling.org/c-lamp

International Land Model Benchmarking (ILAMB) Project

The First ILAMB Meeting was co-organized by Forrest Hoffman, Chris Jones, Pierre Friedlingstein, and Jim Randerson. About 45 researchers participated from the United States, Canada, the United Kingdom, the Netherlands, France, Germany, Switzerland, China, Japan, and Australia.

The goals of the meeting were to:
1) coordinate the design of the first set of benchmarks for global models,
2) coordinate the carbon cycle and land model evaluations for TRENDY and CMIP5 results,
3) develop an implementation plan for application of ILAMB benchmarks to TRENDY and CMIP5 output,
4) decide upon an approach for developing ILAMB software, and
decide upon a future schedule and means to secure funding.

Five break-out groups met, one for each benchmark category, to identify cost function metrics and graphics.
Measurement and model uncertainty must be characterized and spatial scaling mismatch considered.
Key objectives are to use publically available data and freely available software.
The R package will be used for generating statistical results and diagnostics.
Initial benchmarks will be implemented to evaluate the existing TRENDY and CMIP5 model results.

For more information, see http://www.ilmamb.org/

Initial ILAMB Benchmarks and Datasets

An initial set of benchmarks and available observational data sets identified by the break-out groups is shown in this table.

Depending upon the type of measurements available, the annual mean, seasonal cycle, interannual variability, and long-term trend of the model results will be assessed.

Observational data sets span scales from site/point in situ measurements to global remote sensing observations.

Acknowledgments: Research partially sponsored by the Climate and Environmental Sciences Division (CESD) of the Office of Biological and Environmental Research (BER) within the U.S. Department of Energy’s Office of Science. This research and resources of the National Center for Computational Sciences (NCS) at Oak Ridge National Laboratory (ORNL), which is managed by UT-Battelle, LLC, for the U.S. Department of Energy under Contract No. DE-AC05-00OR22725. The National Center for Atmospheric Research is operated by the University Corporation for Atmospheric Research (UCAR) and receives research funding primarily from the National Science Foundation (NSF).