Modeling WG Report

NEWS PI Meeting Dec 2-3 2009

Discussion Leads

MERRA Preliminary Analysis: Water and Energy Budgets, Evaporation and Extreme Events – Bosilovich

Climate Variability and the Tropical Oceans During the Satellite Era: Integrating Observations and Reanalyses - Robertson

Examining the relationships between precipitation and surface temperature by means of MERRA and GPCP products – Gu

Goddard Multi-Scale Modeling System with Unified Physics– Tao

A perturbed physics ensemble climate modeling study for defining satellite measurement req. of energy and water cycle – Y. Hu

Modeling Components of LandFlux – Peters-Lidard/Mocko

Climate Variability

- MERRA
  - Discontinuities in the time series, but also need to take advantage of the climatology and interannual variability (e.g. ENSO signal, teleconnections)
  - a bridge between model and observations - Analysis increments provide a key link between model and obs
  - MERRA system replay with improved precipitation assimilation (e.g. A. Hou, S. Zhang)
  - Regional biases - but any improvement compared to existing reanalyses
  - Does the higher resolution in MERRA and other recent reanalyses contribute to water and energy studies?

Multi decadal data sets useful to IPCC? Energy imbalance too much for constraints, and IPCC looking for something without the jumps seen in reanalyses

Validation Metrics and Diagnostics

- Develop a set of metrics from NEWS to better assess model/reanalysis data
  - Applications may need different metrics than research
- Regional studies - do MERRA global/tropical biases/ variability affect regions and basins
- Reanalysis tends to fit in where no other observations are available
  - which observations are reliable enough
- How does MERRA reproduce variability on different time scales (less and issue for the trends, can MERRA contribute to NEWS predictability, and how to use the information)
  - e.g. coupling land states
  - Are predictions still a component of NEWS and should it be pursued? GMAO runs predictions can we use these in research? (e.g. 2006/2007)

Model Experiments

- Points raised in discussions
  - Weather experiments (e.g. GCE) can contribute to understanding imbalance in MERRA surface radiation
  - Comparing GCE, MERRA and CloudSat Calipso
  - ARM GPM MC3E experiment (2011) compare MERRA, WRF
  - LIS/WRF 2006/2007 simulations with MERRA and LoCo (Local Coupling) experiments
    - What is a key region/domain for process studies
  - Relaxation of MERRA SST experiment?
    - Lag correlations in the SST influence on nonlocal anomalies
    - AMIP fluxes can't reproduce the right relationships, can reanalyses experiments?
  - MERRA Aerosol replay, may be useful to NEWS

Uncertainty of Analyses

- Climate and/or Climatology Ensemble?
  - Significant variability among reanalyses, which is correct? Some work suggests an ensemble may be useful
  - MERRA data relative to the spread of existing reanalyses (e.g. the Water/Energy Climatology)
- Replay MERRA with new GEOS5 (with/without coupled ocean, short experiment, 1 year)
- Tropical Land precip observations and models need further investigation
- High latitude model and observed data

Evaporation/Landflux

- Synthesis needed to examine various approaches:
  - Offline land model ensembles (GSWP, WATCH, MERRA-LIS)
  - Offline land models with data assimilation (GLDAS)
  - Reanalyses fluxes (NCEP, ERA, MERRA)
  - Energy budget approaches (Wood)
- Validation plan for Landflux
  - Parameter datasets (soils, landcover, greenness/LAI, albedo)
  - Atmospheric inputs (precipitation, radiation, wind, temperature, humidity, pressure)
  - Runoff/Discharge to validate basin scales
  - Output fluxes (evap/latent, sensible heat, net radiation)
    - Means, diurnal cycles, extremes, stratify by site/ landcover, etc.

Near Term: Integration Projects/Papers

Water Vapor Transport and Climate Variability - L'Ecuyer, Olson, Robertson, Hilburn, Liu, Clayson, Bosilovich

A NEWS Contribution to LandFlux - Peters-Lidard, Bosilovich, Rodell, Mocko, Robertson (Others not in the Model WG discussion, e.g. Wood)

GCE forced by MERRA (explain MERRA cloud forcing compared to field experiments, Tao/Bosilovich)

MERRA Special Issue? - Any suggestions for an integration paper, target J Clim, submissions starting in Spring '10

Longer Term: Integration Projects

Metrics/Diagnostics for model evaluations and quality of water and energy budget data, and process studies (Wood, Smith and others)

MERRA Replay experiments - Ocean surface evaporation parameterization (Bourassa/Hilburn)

Ensemble of Reanalyses - Including uncertainty identifying outliers, and better explaining MERRA (looking forward to subsequent reanalyses) May contribute to LandFlux and Metrics/Diagnostics

Addditional field experiments - MC3E

Going Forward

Model group members really doing work related to other working groups as well

Should model group telecons go on, or more project specific telecons? Even outlining specific experiments don't necessarily span the interests of the modeling group.

So, given that model-centric NEWS projects are more process oriented than big picture modeling/prediction.

Holes: Key points with little current NEWS activity, What does NEWS (modeling) need?

Models are essential for

- Prediction: diurnal, seasonal, interannual (extremes)
  - Does NEWS need a prediction aspect, what projects have already proposed it?
- Understanding: process studies, interactions--missing aerosols, carbon
- Impacts: link to applications
  - This will affect the development of metrics (which would be different for science or application purposes)