AGU Fall Meeting 2014
15-19 December 2014
San Francisco, CA
Moscone Center

Session: *Toward Reducing Systematic Errors in Weather and Climate Models: Evaluation, Understanding, and Improvement*

Session Description:
Despite recent advances in both weather and climate models, large errors persist in their simulated weather and climate. Understanding nature and causes of these errors through in-depth analysis and evaluation with observations is a first and critical step to improving models This session invites presentations in the following areas: (1) Global and regional evaluation of weather and climate models such as those used in numerical weather prediction (NWP) and climate centers and from major model intercomparison projects (e.g., CMIP3/CMIP5); (2) Process studies that utilize single-column models, cloud-resolving models, and NWP techniques in climate models; (3) Diagnostics that utilize both surface and satellite observations; and (4) Observational studies that have a direct bearing on understanding and improving convection, clouds, radiation, precipitation and their interactions in weather and climate models. Errors in mean state or variability (diurnal, seasonal, etc.), in atmosphere or land, in atmosphere-only or coupled model, are all of interest.

Authors
Carol Anne Clayson[1], J. Brent Roberts[2]
[1] Woods Hole Oceanographic Institution
[2] NASA/MSFC, Earth Science Office

Title
Assessing air-sea interaction in the evolving NASA GEOS model

Abstract

In order to understand how the climate responds to variations in forcing, one necessary component is to understand the full distribution of variability of exchanges of heat and moisture between the atmosphere and ocean. Surface heat and moisture fluxes are critical to the generation and decay of many coupled air-sea phenomena. These mechanisms operate across a number of scales and contain contributions from interactions between the anomalous (i.e. non-mean), often extreme-valued, flux components. Satellite-derived estimates of the surface turbulent and radiative heat fluxes provide an opportunity to assess results from modeling systems. Evaluation of only time mean and variability statistics, however only provides limited traceability to processes controlling what are often regime-dependent errors.

This work will present an approach to evaluate the representation of the turbulent fluxes at the air-sea interface in the current and evolving Goddard Earth Observing System (GEOS) model. A temperature and moisture vertical profile-based clustering technique is used to identify robust weather regimes, and subsequently intercompare the turbulent fluxes and near-surface parameters within these regimes in both satellite estimates and GEOS-driven data sets. Both model reanalysis (MERRA) and seasonal-to-

interannual coupled GEOS model simulations will be evaluated. Particular emphasis is placed on understanding the distribution of the fluxes including extremes, and the representation of near-surface forcing variables directly related to their estimation. Results from these analyses will help identify the existence and source of regime-dependent biases in the GEOS model ocean surface turbulent fluxes. The use of the temperature and moisture profiles for weather-state clustering will be highlighted for its potential broad application to 3-D output typical of model simulations.