Multi-RCM ensemble downscaling of global seasonal forecasts (MRED)

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Regional climate models (RCMs) have long been used to downscale global climate simulations. In contrast the ability of RCMs to downscale seasonal climate forecasts has received little attention. The Multi-RCM Ensemble Downscaling (MRED) project was recently initiated to address the question, Does dynamical downscaling using RCMs provide additional useful information for seasonal forecasts made by global models? MRED is using a suite of RCMs to downscale seasonal forecasts produced by the National Centers for Environmental Prediction (NCEP) Climate Forecast System (CFS) seasonal forecast system and the NASA GEOS5 system.

The initial focus is on wintertime forecasts in order to evaluate topographic forcing, snowmelt, and the usefulness of higher resolution for near-surface fields influenced by high resolution orography. Each RCM covers the conterminous U.S. at approximately 32 km resolution, comparable to the scale of the North American Regional Reanalysis (NARR) which will be used to evaluate the models. The forecast ensemble for each RCM is comprised of 15 members over a period of 22+ years (from 1982 to 2003+) for the forecast period 1 December – 30 April. Each RCM will create a 15-member lagged ensemble by starting on different dates in the preceding November. This results in a 120-member ensemble for each projection (8 RCMs by 15 members per RCM). The RCMs will be continually updated at their lateral boundaries using 6-hourly output from CFS or GEOS5. Hydrometeorological output will be produced in a standard netCDF-based format for a common analysis grid, which simplifies both model intercomparison and the generation of ensembles.

MRED will compare individual RCM and global forecasts as well as ensemble mean precipitation and temperature forecasts, which are currently being used to drive macroscale land surface models (LSMs). Metrics of ensemble spread will also be evaluated. Extensive process-oriented analysis will be performed to link improvements in downscaled forecast skill to regional forcings and physical mechanisms. Our overarching goal is to determine what additional skill can be provided by a community ensemble of high resolution regional models, which we believe will define a strategy for more skillful and useful regional seasonal climate forecasts.