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

J. Roads, R.W. Arritt, C.J. Anderson, C.J. Anderson, M. Ek, W.J. Gutowski, Jr., H.-M. H. Juang, L.-Y. Leung, X.-Z. Liang, C. Lu, L. Lu, R.A. Pielke, Sr., S. Schubert, E.S. Takle, P. Tripp, Y. Xue and R. Yang

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 by CPPA to address the question, *Do RCMs provide additional useful information for seasonal forecasts?* MRED will systematically test the RCM downscaling methodology by using a suite of RCMs to downscale seasonal forecasts produced by the new National Centers for Environmental Prediction (NCEP) Climate Forecast System (CFS) seasonal forecast system and the NASA GEOS5 system. The initial focus will be on wintertime forecasts in order to evaluate topographic forcing, snowmelt, and the potential to demonstrate the usefulness of higher resolution, especially for near-surface fields influenced by high resolution orography.

Each RCM will cover the conterminous US (CONUS) at approximately 32 km resolution, comparable to the scales of the North American Regional Reanalysis (NARR) which will be used to evaluate the models. The forecast ensemble for each RCM will be comprised of 15 members over a period of 22+ years (from 1982 to 2003+) for the forecast period 1 December – 30 April. The RCMs will be continually updated at their lateral boundaries using 6-hourly output from CFS or GEOS5. Each RCM will provide hydrometeorological output in a standard netCDF-based format for a common analysis grid covering the CONUS. 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), as well as wind, humidity, radiation, turbulent heat fluxes, which are important for more advanced coupled macro-scale hydrologic models. Metrics of ensemble spread will also be evaluated. Extensive 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 eventually define a strategy for more skillful and useful regional seasonal climate forecasts.