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Ensemble Downscaling of Winter Seasonal Forecasts over the United States

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The Multi-Regional climate model Ensemble Downscaling (MRED) project is a multi-institutional project to generate and evaluate large ensembles of downscaled winter seasonal forecasts for the continental U.S. Seven regional climate models have downscaled 15-member ensembles from the National Centers for Environmental Prediction (NCEP) Climate Forecast System (CFS) for each winter season (December-April) of 1982-2003. Results show that added value from downscaling depends on location, with the most consistent added value being for portions of the western United States. Added value for this region and season tends to be greater for precipitation than for temperature. The global-regional downscaled forecasts have greatest skill for seasonal precipitation anomalies in strong El Niño events such as 1982-83 and 1997-98. Ensemble means of area-averaged seasonal precipitation for the regional models generally track the corresponding results for the global model, though there is considerable inter-model variability amongst the regional models. There is also very large spread amongst the 15 CFS ensemble members; given the tendency for each regional model to track with the driving data, this spread carries through to the regional model ensemble. Our results emphasize that an ensemble approach (both multi-realization and multi-model) is essential to realizing the added value from the combined global-regional modeling system.