Evaluation of Regional Downscaling Predictions of Future Drought Probabilities in the Western United States

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In order to investigate regional predictions of future climate for the Western United States, a number of different regional statistically and dynamically downscaled products were compared to determine how each method represents current and future drought probabilities. Each downscaled product was forced with Coupled Global Climate Model output from the WCRP CMIP3 multi-model dataset for the SRES- A2 emissions scenario. The analysis focused on comparison of the dynamically downscaled simulations using the Desert Research Institute's Regional Climate Model (DRI-RCM) based on the Weather and Research Forecasting Model (WRFV3.2.1) with other downscaling products. DRI-RCM output consists of 36 and 12 km resolution products for the periods 1971-2000 and 2041-2070. In order to determine the skill and uncertainty of these simulations, DRI-RCM simulated data were compared to the Global Climate Model projections (Scenario SRES-A2) and previous statistical and downscaled results from the Bureau of Reclamation Bias Corrected and Spatially Downscaled Climate Projections (BoR), the University of Idaho's modified Bias Corrected and Spatially Downscaled Climate Products (ID-BCSD), and the North American Regional Climate Change Assessment Program (NARCCAP) dynamically downscaled projections. BoR projections provide 1/8th degree (12 km) resolution and the ID-BCSD provides 1/32nd degree (4 km) resolution statistically downscaled climate variables through 2099 for the United States. NARCCAP dynamically downscaled predictions provide 50 km resolution products (both surface and upper air) using four different GCMs and a number of regional climate models (RCMs) driven with the emissions scenario SRES-A2 over most of North America. Using the Standardized Precipitation-Evapotranspiration Index (SPEI), the probability of drought was analyzed for specific regions of the Western United States over the period 2040-2070 for each downscaling method described above. Statistical tools were then applied to compare the results.