4b.3 Assessing the fidelity of dynamical downscaling with the NASA Unified-WRF Model

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NASA is conducting a project to assess the credibility of dynamically-downscaled climate projections using the NASA Unified-WRF (NU-WRF). The current NU-WRF is based on version 3.5.1 of the ARW and integrates unique physics modules and capabilities developed at NASA GSFC. The purpose is to understand how much fidelity one should expect from dynamical downscaling with GCM-like boundary conditions, and to test the effects of grid resolution and spectral nudging on model performance. The project uses MERRA-2 reanalyses from 2000-2010 as boundary conditions to NU-WRF for a series of experiments covering the CONUS. Results are then compared to observational datasets and the GEOS-5 AGCM replay simulations during the same period. The project focuses on evaluating results using metrics developed uniquely for three high-impact phenomena affecting the CONUS: Pacific atmospheric rivers, Great Plains warm-season precipitation / mesoscale convective systems, and Northeastern U.S. snowstorms. With boundary conditions at approximately 0.5-degree resolution, experiments are run at 24-, 12-, and 4-km horizontal grid spacing using NASA supercomputing resources. Future experiments will drive NU-WRF with an AMIP configuration of GEOS-5 over a similar period to emulate regional downscaling, again under conditions where historical observational data are available for comparison and assessment.