Session: B2 Oral presentation

Regional extreme daily precipitation in global and regional climate simulations of North America

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We analyze the ability of global and regional climate models to simulate extreme daily precipitation and supporting processes for regions of North America. Global model output comes primarily from the CMIP5 and CMIP3 archives; regional model output comes from the archive of the North American Regional Climate Change Assessment Program (NARCCAP). The NARCCAP results also include output from a time-slice, high-resolution global simulation. All NARCCAP output is at half degree resolution, whereas the CMIP resolutions vary but are coarser than NARCCAP resolutions. The combined analysis allows us to assess added value of finer resolution in simulating extreme precipitation. Analysis focuses on selected regions of North America for winter (DJF) and summer (JJA), building on several previous analyses focused on this region. In addition to comparing results from the different models, we also compare simulated precipitation and supporting processes with those obtained from observed precipitation and reanalysis atmospheric states. Precipitation observations are from the University of Washington gridded data set. Reanalysis fields come from the North American Regional Reanalysis. In both seasons, the high resolution models generally reproduce well the precipitation-vs.-intensity spectrum seen in observations, with a small tendency toward producing overly strong precipitation at high intensity thresholds, such as the 95, 99 and 99.5 percentiles. Coarse-resolution global model output analyzed to date shows threshold values that are roughly one half the magnitude of those in the models and observations, most likely because of the coarser resolution. Further analysis focuses on precipitation events exceeding the 99.5 percentile that occur simultaneously at several points in the region, yielding so-called "widespread events". Collectively, the high-resolution models tend to produce somewhat more widespread events than the observations. Widespread events in the gobal model occur over areas of similar size, though its magnitude for the 99.5 percentile is substantially lower than for the other models. Further analysis focuses on 500 hPa and near-surface circulation and other fields such as temperature and humidity to compare atmospheric states and processes leading to extreme events in the models and observations. The finer resolution models generally reproduce the physical behavior of extreme events, with the coarser model showing a smoother rendition, especially in summer. Further analysis will consider future extremes and their consistency with present extremes and supporting physical processes.