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IDF relationships for the conterminous U.S.: Historical reconstructions and future projections

Dennis Lettenmaier, Julia kim, and Kimberley Wang
University of California, Los Angeles (dlettenm@ucla.edu)

We apply a method of downscaling gridded climate model precipitation predictions to produce intensity-duration-frequency (IDF) relationships at a set of several hundred long-term, high quality hourly precipitation gauges across the conterminous U.S. The method, previously applied in Australia, involves a first step spatial downscaling from annual maximum precipitation estimated at the climate model grid cell level to stations based on regression. Temporal downscaling is then accomplished using scaling relationships defined by the Generalized Extreme Value (GEV) distribution fitted to the downscaled climate model data, initially using reanalysis (CFSR in our case) for an historic period. Subsequent to bias correction and downscaling, we applied the method using future climate model projections (NARCCAP 50-km regional climate model output over the conterminous U.S. in our case). We evaluate the ability of the model-based historical runs to reproduce station-based IDF relationships, with particular attention to the fidelity of the scaling relationships for sub-daily precipitation extremes (climate model output is limited to daily). We also evaluate uncertainty in future IDF predictions using multiple NARCAP combinations of regional and global climate models for a time slice in the mid-21st century.