

GC8-Hydro-9, updated on 25 Apr 2024

<https://doi.org/10.5194/egusphere-gc8-hydro-9>

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Constraining Climate Model Projections of Regional Precipitation Change

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As communities prepare for the impacts of climate change, policy makers and stakeholders increasingly require locally-resolved projections of future climate. Statistical downscaling uses low-resolution outputs from climate models and historical observations to both enhance the spatial resolution and correct for systematic biases. By examining the downscaled rainfall over land, we show that although bias corrections are effective in reducing biases in the current climate, they do not reduce the intermodel spread in future rainfall projections. This failure stems from the strong dependence of future rainfall change upon the current climatological rainfall patterns. Even after bias corrections are applied, the downscaled projections of precipitation change retain this dependence upon their native climatology. However, we show that this dependence can be exploited; even very simple methods to sub-set models according to their ability to resolve the observed rainfall climatology can substantially reduce the intermodel spread in rainfall projections.