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Regionalization of future projections on the high-impact weather and climate extremes with observational constrain

Cheng-Ta Chen†; Yu-Shiang Tung
† National Taiwan Normal University, Taiwan
Leading author: chen@rain.geos.ntnu.edu.tw

Changes in the frequency or intensify of extreme weather and climate events could have profound impacts on both human society and the natural environment. The IPCC 4th assessment concludes that frequency (or proportion of total rainfall from heavy falls) of heavy precipitation events are very likely to increase over most areas as the climate warms. These future projections are mainly reply on the simulation of extreme rainfall distribution in the current generation of climate model. It is often argued that relatively low resolution climate model can't properly reproduced the high-impact weather extremes. This raises issues on the reliability of their future projections on extremes. In response to the question, very high resolution version of climate models run under the time-slices experiment design or fine-scaled regional climate models forced by global model result from lateral boundaries are used to explore the problem. Although it generally matched better with station rainfall data or high-resolution gridded observational analysis, the cost of such high resolution model runs are excessive to be affordable to create multi-models and multiple-member ensembles that better sample the uncertainty in future projections. Recently high temporal and spatial resolution ground station analysis and satellite estimates are available for climate study. The length of data record are starting to provide enough sampling on the extreme weather events. It is well know that there is spatial scaling issue concerning on the study on the extreme weather events. By studying the statistical properties that link the different spatial scale in the observational data. One can develop statistical downscaling method for the extreme weather and climate indices. By applying the observed statistical relationship to the relatively low resolution CMIP3 climate models, it is possible to derive very high resolution extreme statistics at regional scale. The result should be welcomed by the community working on the impact and adaptation study that need more local projection on the extreme events.