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Regional Climate Impacts from a 0.5C Increase in Global Mean Temperature

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Global temperature targets have become the linchpin for global climate science and policy discussions. Given the mandate in the Paris accord to limit the rise in global temperature to well below 2.0oC above pre-industrial levels and pursue efforts toward the more ambitious 1.5oC goal, there is increasing focus in the climate science community on what the relative climate impact realities may be for these two scenarios. Despite major climate modeling efforts (e.g., CMIP) which successfully target climate outcomes as the result of various future GHG projection scenarios, there is still a significant information gap as to the regional and seasonal climate impacts due to a 0.5 oC increase in global mean temperature.

According to the IPCC AR5 the 1983-2012 period is likely the warmest 30-year epoch of the last 1400 years and includes an approximate 0.5 oC global mean temperature increase. As such, it can be used as a testbed to evaluate characteristic changes in regional and seasonal climate parameters for a one half degree global temperature change. Global and regional temperature and precipitation changes are probed from the perspective of over 1000 climate realizations afforded by the availability of reforecast climate model runs from the NCEP Climate Forecast System Version 2 over the 1983-2012 period. This unique approach allows for isolation of the GHG forced changes in an extremely high number of ensemble members, facilitating the analysis of regional, spatial, and seasonal climate statistics as the result of a recently observed 0.5 oC shift in global mean temperature. Additionally, new climate modeling experiments from the Half a Degree of Additional Warming, Projections, Prognosis, and Impacts Model Intercomparison Project (HAPPI-MIP) will be analyzed to understand relative climate impacts of a 1.5 oC and 2.0 oC world, which given nonlinearities, may not be similar to that of the recently observed 0.5oC temperature change.