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Extended-range prediction of heatwave events over North India: role of atmospheric blocking over North Atlantic

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Abstract:

During the summer of 2015, heatwave events claimed 2422 lives in India. Following that disaster, India's National Disaster Management Authority (NDMA), formulated a Heat Action Plan to protect citizens and minimize fatalities. Improved forecasts from the India Meteorological Department (IMD) together with NDMA's heat action plan played a major role in the reduction of heatwave mortality since 2016. However, forecasts at longer lead times are required to improve action plans ahead of the heatwave events.

IMD uses extended-range forecast products provided by the National Centre for Medium Range Weather Forecasting (NCMRWF), but we show the improved prediction of high probability from a multi-model ensemble of the subseasonal-to-seasonal (S2S) database (Vitart et al. 2017). The S2S prediction project that provides Global weather forecasts at lead time of 15 to 60 days, is a joint project of the World Weather Research Program (WWRP) and the World Climate Research Program (WCRP). This provides an opportunity to study the skill of predicting heatwaves over India at extended-range (15 to 30 days).

In a recent study Ratnam et al., 2016 showed that atmospheric blocking patterns over the north Atlantic region have linkages with heatwave events over northwest India at 2-day lag using ERA-Interim reanalysis and IMD observation. Using ERA5 reanalysis, we found that during 1979-2018, a third of the blocking events over North Atlantic caused heat events over India.

Using the "reforecast" outputs in the S2S database to bias correct the real-time extended range forecast results in improved prediction of frequency, timing, and spatio-temporal pattern evolution of heatwaves and severe heatwaves at 2 to 3 weeks forecast lead time. The atmospheric blocking anomalies at high-latitudes which precede the heatwave events in India could be predicted three weeks in advance. Based on the S2S models' skills, the prospects for early warning and disaster preparedness look promising in the coming years.

References:

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