

Impacts of rising heat on crop yields in India

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Food security in changing climate remains one of the most important aspects in India. Growing season air temperature in India has significantly increased during the last 4 decades and likely to increase in future under anthropogenic warming. Observed and projected increase in growing season air temperature results in a significant increase in growing degree days and cumulative heat (day and nighttime), which in turn has implications for crop yields and food production. Here using the combination of observations and climate model projections, we show a significant increase in growing season temperature, growing degree days (GDD), and cumulative heat (CUM_HEAT) under the 1.5, 2.0, and 3.0 deg warming world from the pre-industrial global mean temperature. We first establish the relationship between crop yield of rice and wheat (the two major crops in India) with temperature indices for the observed climate for each district in India. The developed statistical models were then used to evaluate the sensitivity of crop yields under the projected future climate. Apart from CMIP5 model projections, we also use simulations from EC-EARTH for the current climate using 4000 runs to capture the risk of extreme heat. Using these simulations, we identified extreme heat of 100, 500, and 1000 year return levels and its impact of rice and wheat production in India.