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# Near surface temperature changes over India - a detection and attribution study.

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The IPCC Fifth Assessment Report concluded, “More than half of the observed increase in global mean surface temperature (GMST) from 1951 to 2010 is very likely due to the observed anthropogenic increase in greenhouse gas (GHG) concentrations.” Detecting and attributing the changes over regional scales can provide more relevant information to policymakers at the national level but the low signal-to-noise ratios at smaller spatial scales make this a harder problem.

In this study, we analyze annual and seasonal mean changes in minimum ($T_{min}$), maximum ($T_{max}$), and mean ($T_{mean}$) temperatures over 7 homogeneous temperature zones of India using models from the CMIP5 database and multiple observational datasets (CRU-3.22, and IITM). We perform Detection and Attribution (D&A) analysis using fingerprint methods by defining a signal that concisely express both spatial and temporal changes found in the model runs with the CMIP5 individual forcing runs; greenhouse (historicalGHG), natural (historicalNat), anthropogenic (historicalAnthro), and anthropogenic aerosols (historicalAA). We use three different combinations of individual forcing patterns (2-pattern, 3-pattern and 5-pattern cases) in our analysis to quantify the contributions resulting from individual forcings.

Results indicate warming attributable in most regions to anthropogenic forcings and Greenhouse gases with a negligible contribution from natural forcings using the 2- and 3-pattern analyses for the 1901-2005 and 1956-2005 time periods. The results are sensitive to observational data set used, as these tend to differ at the regional level.