

Climate Extremes Over South Asia: Understanding The Role Of Natural And Anthropogenic Forcings

*Aswin Sagar¹, Sabin T P²

1. Cochin University of Science And Technology, 2. IITM

Climate or weather extremes were rare events at the beginning of the 20 th century, however in the context of the profound climate change signal the occurrence of extreme events became more frequent than ever before in the past few decades. Extremes can result from the Anthropogenic variability such as increasing greenhouse gases, aerosols, land use land cover changes, or from natural variability, or more likely some combination of both. The quantification of Natural and Anthropogenic variability in climate extremes has profound importance in planning the strategies, policies and measures undertaken now, and in the future, to reduce adverse impacts and future vulnerability due to climate variability and change. The study mainly used a state of the art variable resolution global climate model with a telescopic zooming over South Asia (~ 35 km in longitude x 35 km in latitude). We have conducted century-long simulations include both natural (varying solar irradiance and volcanic aerosols) and anthropogenic (varying GHG, aerosols, ozone and land-use changes); Historical (1886-2005) and the second one with only natural forcings: HistNAT (1886- 2005). From these two experiments, we have quantified the robustness of anthropogenic climate change signals related to extremes in temperatures (March to May) over the South Asian region.

We quantified the increase in the percentage of warm days, warm nights and decrease in the cold days and cold nights, especially from 1950's are mainly due to the anthropogenic forcing. The fine scale details such as significant reductions in cold days over western ghats and increase in warm nights are clearly visible due to the high resolution compared to IPCC-AR5 models which are coarse and inadequate to provide such regional details. On a larger scale, the warm spell duration index distinctly increased over the northern plains of India. Through this study, we showcased eleven climate indices and quantified the anthropogenic and Natural variability in the each extremes indices over South Asia.

Keywords: Precipitation Extremes, Temperature Extremes, Anthropogenic Variability, Natural Variability