Research BRIEFS

NCAP-COALESCE

CarbOnaceous AerosoL Emissions, Source apportionment & ClimatE impacts

Understanding scientific complexities related to carbonaceous aerosols focussing on issues underlying their origin and fate, and their role as drivers of regional climate change over India.

Future projections of Indian Summer Monsoon under multiple RCPs using a high resolution global climate model multiforcing ensemble simulations

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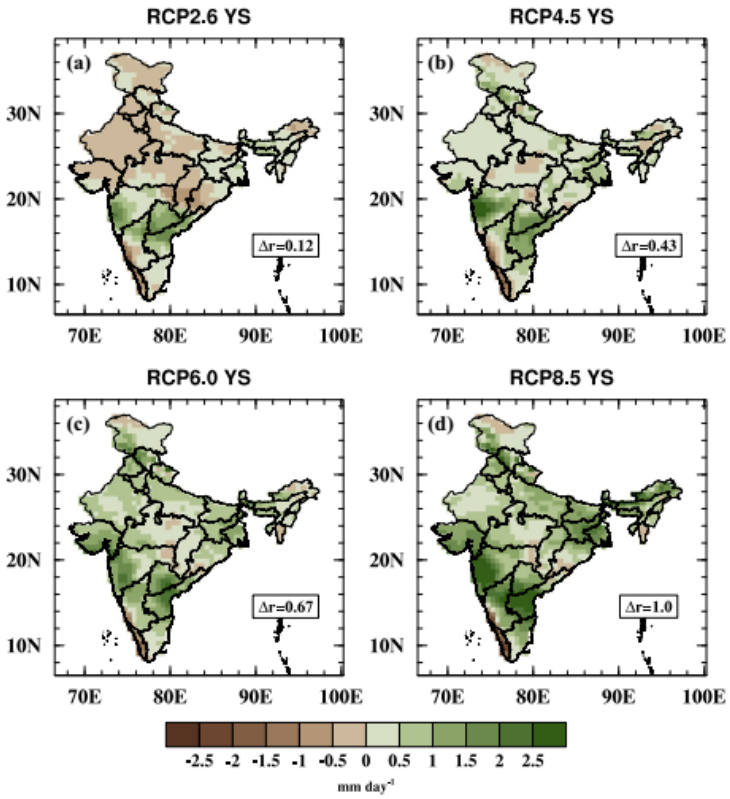

Figure 1: Projected future change in JJAS rainfall towards the end of 21st century under **a** RCP2.6, **b** RCP4.5, **c** RCP6.0 and **d** RCP8.5 scenarios. The corresponding change averaged over the Indian region is given in the lower-right of each panel

Key highlights:

- Comprehensive understanding of spatial temporal changes in ISM parameters such as temperature and rainfall are done both for the country as a whole and also at various homogeneous zone levels
- From analysis, it is found that a uniform increase exists for both temperature and precipitation for all the homogenous zones
- YS deep convection scheme at 60-km horizontal resolution have the highest ability in simulating present-day climate

Summary of your Research:

Present-day simulations (1983–2003) of a global climate model of 60-km resolution with three deep convection schemes are analysed to find the best scheme for simulation of mean Indian summer monsoon rainfall (ISMR) and its variability.

Multiforcing ensemble projections with the best scheme are carried out under multiple Representative Concentration Pathways (RCPs) (based on various socio-economic and technological development at the end of the century), viz. RCP2.6, RCP4.5, RCP6.0 and RCP8.5, forced with four patterns of future sea surface temperature (SST) change for each scenario; one with mean SST changes projected by 28 Coupled Model Intercomparison Project Phase-5 (CMIP5) models and the rest obtained from subgroups of CMIP5 models grouped through cluster analysis of tropical SST changes.

. We find that combination of enhanced atmospheric water vapour content and increased vertically integrated low level moisture transport into the subcontinent as the major contributing factors for future intensification of ISMR. Extreme events show increase in warm days with significant increase in warm nights.

The high-resolution model enables to study projected changes over India at homogeneous zones level. The maximum increase in Ts and rainfall occurs over Western Himalaya and Northeast hilly region respectively. Consistent with future increase in Ts and rainfall, their extreme events also increase over all the homogeneous zones.

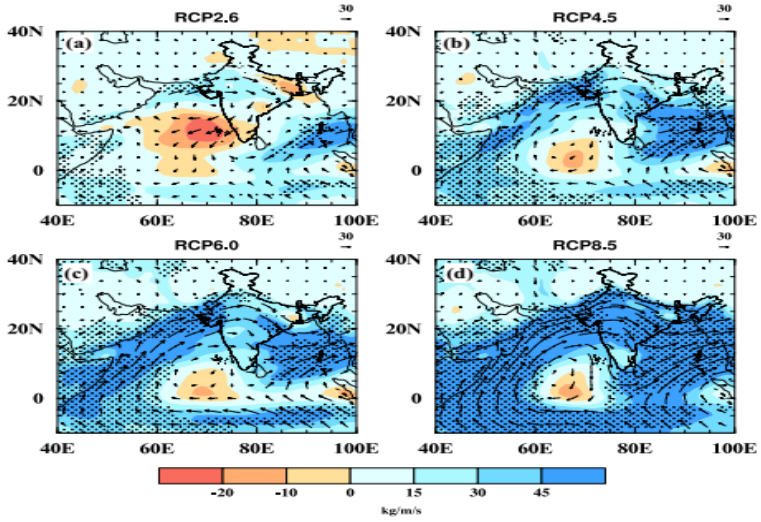

Figure 2: Projected future changes(JJAS) in vertically integrated moisture transport (VIMT) upto 500 hPa, under **a** RCP2.6, **b** RCP4.5, **c** RCP6.0 and **d** RCP8.5 scenarios, with respect to the present-day climate simulation over India. VIMT is given as vectors and shading shows the magnitude of it. Values which are statistically significant at 95% level are stippled.

Take away/conclusion :

- Future projection of ISM under different RCPs enabled in understanding the impact they are going to have on different regional scales.
- Future changes in surface air temperature and rainfall are then examined and they show an overall increase over India.
- The mechanisms that drive the monsoon changes are analysed and we find that a combination of both increased atmospheric water vapour content along with increased moisture.

Research Article citation

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Link:
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