

An investigation of long-term changes in rainfall over the equatorial Indian Ocean trough region during northern summer using multisatellite data

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Abstract: During the Indian monsoon season, organized convection in the form of inter-tropical convergence zone (ITCZ) originates from the equatorial trough (ET) region over the equatorial Indian Ocean, propagates northward towards the heated Indian landmass at intraseasonal timescales (30–60 days). In this paper, the long-term changes in rainfall over the ET region during the northern summer season has been investigated for a 34-year (1979–2012) period using gauge-adjusted multisatellite Global Precipitation Climatology Project (GPCP) rainfall data set. Rainfall over this region shows a pronounced seasonality and the eastern ET (EET) receives higher rainfall than the western ET (WET) during the northern summer season. Moreover, the northern summer rainfall over the WET and EET are not significantly correlated with each other. Linear trend analysis of domain-mean seasonal rainfall shows a statistically significant increasing trend of $0.4 \text{ mm day}^{-1} \text{ decade}^{-1}$ during the northern summer over the WET, whereas no significant trend is observed over the EET. The long-term changes in the associated variables linked through the moisture budget equation are also examined over both regions of ET for the study period. Even though evaporation over both WET and EET shows statistically significant increasing trend associated with an increase in sea surface temperature and near-surface wind, the vertically integrated moisture convergence shows no significant change over the WET whereas it shows a decrease over the EET during the study period. These might be the possible reasons behind a significant increase in rainfall over the WET with an insignificant change in rainfall over the EET.