

Past and future trends of hydroclimatic intensity over the Indian monsoon region

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Journal of Geophysical Research: Atmospheres, 122(2), 896-909

Abstract: The hydroclimatic intensity index (HY-INT) is a single index that quantitatively combines measures of precipitation intensity and dry spell length, thus providing an integrated response of the hydrological cycle to global warming. The HY-INT index is a product of the precipitation intensity (PINT, intensity during wet days) and dry spell length (DSL). Using the observed gridded rainfall data sets of 1951-2010 period, the changes in HY-INT, PINT, and DSL over the Indian monsoon region have been examined in addition to changes in maximum consecutive dry days (MCD). We have also considered 10 Coupled Model Intercomparison Project Phase 5 (CMIP5) climate models for examining the changes in these indices during the present-day and future climate change scenarios. For climate change projections, the Representative Concentration Pathway (RCP) 4.5 scenario was considered. The analysis of observational data during the period 1951-2010 suggested an increase in DSL and MCD over most of central India. Further, statistically significant (95% level) increase in HY-INT is also noted during the period of 1951-2010, which is mainly caused due to significant increase in precipitation intensity. The CMIP5 model projections of future climate also suggest a statistically significant increase in HY-INT over the Indian region. Out of the 10 models considered, seven models suggest a consistent increase in HY-INT during the period of 2010-2100 under the RCP4.5 scenario. However, the projected increase in HY-INT is mainly due to increase in the precipitation intensity, while dry spell length (DSL) showed little changes in the future climate.