



Subseasonal extremes of precipitation and active-break cycles of the Indian summer monsoon in a climate change scenario

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Changes to the behaviour of subseasonal precipitation extremes and active-break events during the Indian summer monsoon are assessed in this paper using pre-industrial and $2 \times \text{CO}_2$ integrations of the HadCM3 coupled GCM, which is able to reasonably simulate the monsoon seasonal cycle. The mean monsoon undergoes slight increases with increased greenhouse gas forcing. The mean intensity of daily precipitation during the monsoon is found to increase consistent with fewer wet days, and there are increases to heavy rain events beyond changes in the mean alone. The increase in maximum precipitation intensity is found to be broadly in-line with the degree of atmospheric warming and associated increases in specific humidity. The chance of reaching particular thresholds of heavy rainfall over northern India is found to approximately double. The spatial pattern of increases in heavy events is, however, tied to changes in the seasonal mean and is thus model dependent. The model has some skill at simulating northward propagation commonly associated with active-break cycles. The active (break) events are found to be wetter (drier) at $2 \times \text{CO}_2$, particularly when measured against the annual cycle. There is no suggestion of any change to the duration or likelihood of break events.