

Trends, Oscillations, and Anomalies in the Indian Summer Monsoon Rainfall

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Observations show that Indian summer monsoon rainfall over large parts of South Asia has declined over the past five to six decades. Identifying the primary drivers of this weakening trend is crucial to assess whether it is due to anthropogenic forcing and thus expected to continue or due to natural climate variability and thus transitory. Recent experiments with climate models attribute the drying trend to anthropogenic forcing. However, any attribution of 'forced' changes in the Monsoon rainfall warrants a careful consideration of its natural variability on decadal to sub-centennial timescales. Here we present a speleothem oxygen isotope based reconstruction of the summer monsoon rainfall over northern India over the last 6 millennia. We find that within the long-term context of our record, the current drying trend is not outside the envelope of monsoon's oscillatory variability, albeit at the lower edge of this variance. Furthermore, the magnitude of multidecadal oscillatory variability in monsoon rainfall inferred from our proxy record is comparable with model estimates of anthropogenic-forced trends of mean monsoon rainfall in the 21st century under various emission scenarios. These results suggest that anthropogenic-forced changes in monsoon rainfall may remain difficult to detect against a backdrop of large natural variability.