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Indian Monsoon Rainfall Variability and associated Climatic forcings in the last two millennia inferred by a Stalagmite from the peninsular India

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We present high temporal (near-annually) resolved $\delta^{18}\text{O}$ values from absolutely dated stalagmite record that represents the Indian Summer Monsoon (ISM) rainfall variations for the Indian subcontinent spanning from 207 AD to 2014 AD. This rainfall reconstruction shows ISM variations for four major global climatic periods viz., Roman Warm Period (RWP), Dark Ages Cold Period (DACP), Medieval Warm Period (MWP) and Little Ice Age (LIA). Cave records from different parts of the sub-continent synchronously show enhanced precipitation during DACP. This wet period was forced by Solar-induced El-Niño Southern Oscillation (ENSO) and Tibetan Plateau Temperature. Climatic conditions were wetter during LIA than that during MWP, as the former witnessed more number of wet monsoon years. However, MWP witnessed the strongest and the weakest monsoon years in the last two millennia. The direct influence of Solar activity on the position of Inter Tropical Convergence zone (ITCZ) might have caused the observed ISM variability of MWP. Although ISM shows largest variability during MWP, the overall monsoon state was moving towards wetter conditions, forced by ENSO. Solar induced forcings on ENSO influenced ISM during LIA. Our results suggest of non-stationary dynamical forcings over ISM during different periods in the last two millennia.