

Holocene Monsoon variability using stalagmite record from Dandak cave, India

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Variability of Indian Summer Monsoon (ISM) during Holocene has been studied using two stalagmite samples (DAN-I and DAN-II) from Dandak Cave, central India. Oxygen isotope measurements on these stalagmites were investigated earlier, however due to coarse sampling resolution it could not be used to understand changes at decadal scale. A fresh continuous high-resolution $\delta^{18}\text{O}$ measurement after re-sampling of these stalagmites using micro-mill method has been now completed. COPRA derived age model using 14 U-Th ages was used to generate chronology for the $\delta^{18}\text{O}$ profile that shows that these stalagmites grew between 10500-9000 yr BP and 6500 yr BP to the present with a small hiatus near the base, respectively. The highly resolved record at the beginning of Holocene between 10500-9000 yr BP suggests that monsoon intensified on a millennium scale showing 3‰ overall depletion in $\delta^{18}\text{O}$ values, with four step-like punctuations by decade long draught events. Some episodes of strengthening of ISM were also observed during 6500-5800 yr BP, 5100-4700 yr BP and 3200-2600 yr BP manifested as depletion by ~1.5‰ in $\delta^{18}\text{O}$ values. These stronger ISM conditions were intervened by severe drought conditions at ~4700 yr BP and 4200-3900 yr BP. Stalagmite DAN-I had a growth hiatus for ~200 years between 2200-2000 yr BP. Post hiatus, gradual increase in monsoon is seen until present, again punctuated by nine weak monsoon events. During 'Little Ice age' when glacier advances were noticed in Northern hemisphere, a phase of prolonged weak monsoon, between 600 and 150 yr BP, with severe drought like conditions at 300 yr BP (1700 AD) is seen in the reconstruction.