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High Resolution deglacial monsoon δ18O record from a new stalagmite from the Kailash Cave, Central India

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Abstract
High resolution δ18O and δ13C data from absolutely dated stalagmites have been useful for reconstructing the Asian monsoon variability (e.g., Yadava et al., 2004; Laskar et al., 2013; Allu et al., 2014; Lone et al., 2014; Sinha et al., 2015). However, many studies lack high resolution spatial and temporal records leaving significant gaps which need to be filled for a vivid understanding of monsoonal variability. We report here the first high resolution stalagmite δ18O isotope results during the last deglacial obtained from the Kailash cave located from the core monsoon region. The length of stalagmite was 480 mm, with an average diameter of 120 mm. The sample was cut for continuous micro milling at 400μm intervals along the growth axis (using new wave research micro-mill-101288) for the analyses of stable oxygen and carbon isotopes using a Delta V plus IRMS at the Physical Research Laboratory, Ahmedabad. The physical appearance of the sample section reveals very fine, straight and clear laminations from the top to 310 mm from below, which have thick laminae. U-Th dates obtained from a Thermo Fisher NEPTUNE multi-collector inductively coupled plasma mass spectrometer (MC-ICP-MS) at High-Precision Mass Spectrometry and Environment Change Laboratory (HISPEC), National Taiwan University, Taiwan (Shen et al., 2012) showed the record spanned ∼2400 years from ∼14.6 ka to ∼12.2 ka. Linear Age-Depth model constructed from dates suggests that the sample grew for ∼2.400 years from ∼14.6 ka to ∼12.2 ka with varying resolutions from ∼6 months to ∼8 years. Hendy's test from 8 distinct layers shows poor correlation between δ18O and δ13C suggesting the isotopic equilibrium conditions at the time of crystallization. δ18O and δ13C results appear to be cyclic in nature varying in the range from +0.37‰ to -6.07‰ and -1.59‰ to -10.59‰ respectively. Enriched δ18O in top portion represents poor monsoon during the onset of Younger Drayas. Later, the δ18O signals corresponding to Bølling-Allerød Interstadial appear to be cyclic in nature. We performed time-series analyses on the δ18O record to investigate the periodicities to understand the influence of both solar and non-solar frequencies during last deglacial. REDFIT (Schulz & Mudelsee, 2002) with Monte Carlo simulation was used to calculate the red noises. Spectral analysis of the δ18O time series show statistically most significant periodicity (>95%) centered at 592 years. The other significant periodicities found are 42, 37, 19, 18, 16, and14.5 years.