SPELEOTHEM TRACE ELEMENT RESPONSES OVER THE LAST DEGLACIATION AND HOLOCENE IN NORTHERN LAOS

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Paleoclimate records from the Indochina Peninsula, where the climate is dominated by the Southeast Asian Monsoon (SEAM), offer insight into the climatic history of a terrestrial region that lacks extensive paleo-archives. Additionally, speleothem trace element records, which potentially add valuable information and aid interpretations of speleothem stable isotope records ($\delta^{18}O$ and $\delta^{13}C$), are not as frequently acquired and have not been studied to the same extent. The *prior calcite precipitation* (PCP) mechanism, which is often a major control on speleothem trace elements (e.g. Mg, Sr, Ba) and $\delta^{13}C$, is thought to reflect local hydrologic conditions. The relative changes in trace element ratios (X/Ca) can therefore give past regional precipitation information that is difficult to derive from the more complex $\delta^{18}O$ and $\delta^{13}C$ signals, which can be affected by several other factors such as upstream rainout and local soil/vegetation processes, respectively.

We present here a new record of trace elements from a U-Th dated speleothem sample from Tham Mai Cave in Northern Laos that spans the last 37.8 kyr. We analyzed 1,213 powdered samples (~30 year resolution) for Mg/Ca, Sr/Ca, Ba/Ca and U/Ca via Nu Instruments Attom HR-ICPMS. The results are compared with previously analyzed $\delta^{18}O$ and $\delta^{13}C$ data from splits of the same micromilled samples. Mg/Ca and Sr/Ca are significantly correlated (r=0.65) with each other, but uncorrelated or weakly correlated with Ba/Ca, U/Ca, and $\delta^{13}C$. We interpret Mg/Ca and Sr/Ca as reflecting PCP, with higher values indicative of drier conditions, whereas other mechanisms likely control Ba/Ca, U/Ca, and $\delta^{13}C$. Elevated Mg/Ca, Sr/Ca and $\delta^{13}C$ values during the early Holocene (~11-6 kyr BP) and ~30-35 kyr BP are consistent with locally dry conditions during summer insolation maxima, contrasting with the increased monsoon intensity inferred from speleothem $\delta^{18}O$. The wettest conditions of the Holocene occur from ~4-6 kyr BP, during a period of increasing $\delta^{18}O$. A lack of consistent trace element and $\delta^{13}C$ responses to abrupt climate events (Heinrich Stadial 1, Younger Dryas, 8.2 kyr event) suggests a variable hydroclimate response to these events in SE Asia and/or that different processes may control these proxies on millennial timescales. Ongoing cave monitoring and sampling in the region, including analysis of drip waters, modern calcite, soil, and bedrock, along with multiple speleothem samples from the same site and other caves in Northern and Southern Laos, offer the potential for better interpretations and future work, which will enhance the understanding of speleothem trace elements as climate proxies and provide insight into the history of the SEAM.