Moisture transport pathway effect evidenced by triple oxygen isotopes in central Myanmar speleothems

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The interpretation of the iconic Chinese speleothem $d^{18}O$ records remains debated, in part because the records contain muted glacial-interglacial variability, distinctly different from the majority of other proxy records from the Asian monsoon region. Here, we extended a speleothem record from central Myanmar, now covering a large portion of the past 40,000 years. When comparing with other cave records from locations along the trajectory of the Indian summer monsoon, our record from central Myanmar confirms our previous observations, that is, a larger $d^{18}O$ gradient along the moisture trajectory during the glacial time relative to today. We also performed triple oxygen isotope (^{16}O-^{17}O-^{18}O) analysis on the speleothems. We found that ^{17}O-excess of monsoon precipitation during the last glacial maximum (LGM) is ~26 ±2 per meg, substantially higher than the value of ~15 ±5 per meg in modern times. The decrease of 10 per meg in ^{17}O-excess from the LGM to Holocene probably indicates an increase in relative humidity (RH) of monsoon moisture. Thus, during the glacial time, there existed a significant drop in RH, corresponding to a stronger continental re-evaporation and possibly suppressed plant transpiration. Both our speleothem $d^{18}O$ and ^{17}O-excess results therefore support our hypothesised mechanism of the moisture transport pathway effect in addressing the $d^{18}O$ variability in Chinese speleothem records.

Keywords: moisture transport pathway, triple oxygen isotopes, speleothems, Asian monsoon

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