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Understanding climate, precipitation and $\delta^{18}O$ linkages over Eastern Asia

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The interpretation of East Asian monsoon speleothem $\delta^{18}O$ records is heavily debated in the paleoclimate community. Besides developing new speleothem proxies, the use of isotope-enabled climate simulations is one of the key tools to enhance our understanding of speleothem $\delta^{18}O$ records. Here we present results from novel climate simulations performed with the fully coupled isotope-enabled Community Earth System Model (iCESM1.2), which simulates global variations in water isotopes in the atmosphere, land, ocean, and sea ice. The model closely captures the major observed features of the isotopic compositions in precipitation over East Asia for the present-day conditions. To better understand the physical mechanisms causing interannual to orbital timescale variations in $\delta^{18}O$ in East Asian speleothems, we ran a series of experiments with iCESM. We perturbed solar, orbital, bathymetry, ice-sheet, and greenhouse gas radiative forcings. The simulations supporting of observations/reconstructed records (GNIP/SISAL) from East Asia, help understand the controls on the isotope composition of East Asian monsoon rainfall and how speleothem $\delta^{18}O$ records may be interpreted in terms of climate. The study provides new insights into the mechanisms of East Asian monsoon changes on different timescales.