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Synchronous Changes of East Asian Monsoon and Polar Climates

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The relative timings of the last deglacial warming in the Southern and Northern Hemisphere are not well constrained, but are important in understanding the mechanisms of deglaciation. Here we present a continuous and high-resolution(about 20-year on average) of the East Asian Monsoon spanning the last 22kyrBP, based on over 2000 oxygen isotope data and 36 high-precise Th-230 dates of three stalagmites from Xiniu Cave, Central China. The Stalagmite-based monsoon record generally follows changes in solar insolation with time at N65. Splicing our data with the previously-published Hulu isotope record, we are able to determine the onset of the last deglacial monsoon climates at 22kyrBP that exactly coincides with the Minimum of the solar insolation during the last glacial period. As the deglaicial onset can be used as one of control points for testing the phase relationship among different climate systems, we compared our record with different records from the polar ice cores and tropical deep-sea sediments. The comparison indicates that the onset of the deglacial monsoon climate, also strongly supported by changes in sea surface temperature of South China Sea, is identically similar to that of deglacial warming of Antarctic temperature recorded in Byrd ice cores and of Arctic temperature well-expressed in GISP2 O-isotope record. The similarity in age of the last deglacial onset across the polar-equatorial-polar climates suggests that the tropical oceanic/atmospheric circulation is important in transporting initial solar changes globally. Two abrupt weakened monsoon events, however, have been observed from our record, which can be considered as responses to the Heinrich event 1 and Younger Dryas cooling reversal around North Atlantic, inferring that decreased thermohaline circulations exert a profound impact on the East Asian monsoon climate on millennial timescale.