



Early warnings and missed alarms for abrupt monsoon transitions

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Palaeo-records from China demonstrate that over millennial timescales the East Asian Summer Monsoon (EASM) is dominated by abrupt and large magnitude monsoon shifts, switching between periods of high and weak monsoon rains. It has been hypothesised that over these timescales, the EASM exhibits two stable states with bifurcation-type tipping points between them. Here we test this hypothesis by looking for early warning signals of past bifurcations in a speleothem record from Sanbao Cave, China, spanning the penultimate glacial cycle, and in multiple simulations of a model derived from the data. We detect critical slowing down prior to an abrupt monsoon shift at the penultimate deglaciation, but such signals are only detectable when the change in system stability is sufficiently slow to be detected by the sampling resolution of the dataset.