Speleothem-based geochronological benchmarks over the past 60,000 years

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Abstract

In the last two decades, significant advances in understanding the climatic controls on δ18O in precipitation and speleothems, together with continued developments in U-Th dating techniques, have propelled speleothems to the forefront of paleoclimatology, and provided a set of geochronological benchmarks for correlating and calibrating the past climate variability on various timescales. Up till now, a large array of records has revealed the hydroclimate variability worldwide around 4.2-3.9 ka BP. It appears that the so-called '4.2 ka event', as the GSSP between the mid- and late-Holocene, is not a synchronous event globally, and it is unclear either whether the events around 4.2-3.9 ka BP is a representative of one time-transgressive event in different geographical regions. Additionally, our new high-resolution and well-dated speleothem records from Mawmluh Cave in NE India do not appear to replicate the GSSP based on the speleothem KM-A record from the same cave. The new high-resolution and precisely dated speleothem records of the 8.2 ka event from Madagascar, Southern Indian Ocean and Beijing, China reinforce the double peak structure (at _˜8.25 and _˜8.11 ka BP), manifestinging an interhemispherically anti-phased relation. These new dates confirm the GAS between the early- and mid-Holocene based on the speleothem PAD07 record from Padre Cave, Brazil. A number of well-dated speleothem records pinpoint the timing of the Younger Dryas (YD) event worldwide. The YD abrupt termination process was dated from 11,700 ±40 to 11,610 ±40 yr BP, consistent to the GSSP of the Holocene onset established from Greenland ice core records, but more precise. I will also show a set of speleothem-based age benchmarks in the last glacial period, which allow us to correlate and calibrate the global millennial climate oscillations throughout the period.

Keywords: U Th dating, speleothems, benchmarks, timing, millennial events

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