Geophysical Research Abstracts
Vol. 19, EGU2017-17654, 2017
EGU General Assembly 2017

Similar speleothem δ18O signals indicating diverging climate variations in inland central Asia and monsoonal south Asia during the Holocene

Liya Jin (1,3) and Xiaojian Zhang (2,3)

(1) School of Atmospheric Sciences, Chengdu University of Information Technology, Chengdu, China (jinly@lzu.edu.cn), (2) School of Geographic and Oceanographic Sciences, Nanjing University, Nanjing 210023, China, (3) MOE Key Laboratory of Western China's Environmental System, College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000, China

High-resolution and precisely dated speleothem oxygen isotope (δ18O) records from Asia have provided key evidence for past monsoonal changes. It is found that δ18O records of stalagmites from Kesang Cave (42°52′N, 81°45′E, Xinjiang, China) in inland central Asia were very similar to those from Qunf Cave (17°10′N, 54°18′E, southern Oman) in South Asia, shifting from light to heavy throughout the Holocene, which was regarded as a signal that strong Asian summer monsoon (ASM) may have intruded into the Kesang Cave site and/or adjacent areas in inland central Asia to produce heavy rainfall during the high insolation times (e.g. the early Holocene). However, this is in contrast to conclusions based on other Holocene proxy records and modeling simulations, showing a persistent wetting trend in arid central Asia during the Holocene with a dryer condition in the early Holocene and the wettest condition in the late Holocene. With an analysis of model-proxy data comparison, we revealed a possible physical mechanism responsible for the Holocene evolution of moisture/precipitation in Asian summer monsoon (ASM)-dominated regions and that in the inland central Asia. It is revealed that a recurrent circumglobal teleconnection (CGT) pattern in the summertime mid-latitude circulation of the Northern Hemisphere was closely related to the ASM and the climate of inland central Asia, acting as a bridge linking the ASM to insolation, high-latitude forcing (North Atlantic sea surface temperature (SST)), and low-latitude forcing (tropical Ocean SST). Also, the CGT influence speleothem δ18O values in South Asia via its effect on the amount of precipitation. In addition, the moisture source from the Indian Ocean is associated with relatively high δ18O values compared with that from the North Atlantic Ocean, leading to increased precipitation δ18O values. Hence, the CGT has probably been the key factor responsible for the in-phase relationship in speleothem δ18O values (Kesang Cave and Qunf Cave), but out-of-phase relationship in moisture/precipitation evolutions between inland central Asia and the ASM region during the Holocene. In addition, since boreal winter (December–January–February, DJF) precipitation in northwestern China (a part of the core zone in inland central Asia) during the Holocene has been revealed to contribute a great deal to moisture evolution in inland central Asia, and the changes in the seasonal cycle of incoming solar radiation driven by Earth's orbital changes have probably played an important role in the out-of-phase relationship in the moisture evolution between the inland central Asia and ASM regions during the Holocene.