Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14686

Global climate dynamics across Heinrich Stadials in the last glacial period.

HAI CHENG, XIYU DONG, JINGYAO ZHAO, HANYING LI, HAIWEI ZHANG, GAYATRI KATHAYAT AND YANJUN CAI

Institute of Global Environmental Change, Xi'an Jiaotong University

Presenting Author: cheng021@xjtu.edu.cn

Heinrich Stadials (HSs) in the last glacial periods are marked by severe cooling in the North Atlantic along with attendant changes in the Asian Monsoon (Asian Heinrich Periods, AHPs) and South American Monsoon (South American Heinrich Periods, SAHPs). Up till now our understanding of global climate dynamics across HSs remains incomplete, largely due to the lack of high-resolution and precisely dated climate records that can provide precise phase analyses between diverse HS-related climate variations globally. Here we present a set of high-resolution and well dated cave $\delta^{18}O$ records to characterize AHPs and SAHPs in the last glacial period. It appears that onsets of HSs/AHPs/SAHPs are synchronous within sub-centennial age uncertainties, which led the corresponding Antarctic warming by a few hundred years as previously reported. Notably however, the onset durations of AHPs/SAHPs are significantly longer than the Greenland counterparts, suggesting an oceanic propagation process and a trigger resided at the North Atlantic. On the other hand, the terminations began with centennial-scale reductions in the Amazon River runoff inferred from cave records from the South American Monsoon domain, which is associated with shifts in the temperature and d_{ln} trend in the Atlantic sector of Antarctica. These precursor events may have contributed to the abrupt termination of HSs via an increase of the North Atlantic sea-surface salinity and in turn an abrupt resumption of the Atlantic Meridional overturning circulation. As such we suggest a more active role of low-latitude hydroclimate dynamics during the termination of the millennial events than previously thought. Additionally, our phase analyses also indicate that the Antarctic cooling lags the Asian Monsoon waxing by hundreds of years, thus inconsistent with the hypothesis that the Antarctic cooling was a dominant control on the millennial-scale Asian Monsoon variability during glacial times.