



Synchronous mid-Holocene climate deteriorations in circum-Mediterranean and their links with ancient civilizations: first speleothem and archeological evidences from N-Algeria

Jiaoyang Ruan (1), Farid Kherbouche (2), Dominique Genty (1), Hai Cheng (3,4), Fabien Dewilde (1), and Dominique Blamart (1)

(1) Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France (jiaoyangruan@gmail.com), (2) Centre National de Recherches Préhistoriques, Anthropologiques et Historiques, Algeria (f_kherbouche@hotmail.com), (3) Institute of Global Environmental Change, Xi'an Jiaotong University, Xi'an, China, (4) Department of Geological Sciences, University of Minnesota, Minnesota, USA (cheng021@umn.edu)

Over the last decades, ancient civilizations during the Holocene were heavily studied at many places around the Mediterranean region such as Libya and Italy, and changes in the past social activities were widely assumed to be linked to regional climate variability. However, in many cases the climatic records were apart from the archaeological sites and the archaeological chronologies were not well constrained, which makes these links uncertain. Here we present a 230Th-dated decadal resolution climate record for 6034-3185yr BP based on the $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ analyses of two overlapping stalagmites from Gueldaman GLD1 Cave ($36^{\circ}26'\text{N}$, $4^{\circ}34'\text{E}$, 507 m asl), N-Algeria. Recent archaeological work in this cave brought first information about the Neolithisation process since ca 7000yr cal BP in the region where little was known before. Together with new charcoal ^{14}C dates from the digging sections we test the link between past climate change and human activities in the cave.

GLD1 stalagmite records reveal a dry event at ca 5700-5500yr BP and a drying trend toward extreme aridity, since ca 4700yr BP, peaking at ca 4200yr BP. These climatic deteriorations in N-Algeria, within dating errors, are synchronous with dry phases observed on speleothem records from central (Corchia Cave and Renella Cave, Italy) and eastern (Soreq Cave, Israel) Mediterranean. Specifically, climatic condition was harsher at ca 4200yr BP than at ca 5700-5500yr BP in central and W-Mediterranean; while it was harsher at ca 5700-5500yr BP in E-Mediterranean. The new ^{14}C dates relatively well anchor the age of sediment layers with the richest anthropogenic deposits (i.e. charcoal, bone and Neolithic pottery) to ca 4900-4400yr cal BP, coinciding with the wettest period inferred from the stalagmite records. Shortly following this period, archaeological remains were becoming very rare in the sediments, which might be the consequence of establishing extremely arid phase at ca 4200yr BP. This suggests a possible causal relationship between the cave abandonment and aridity. Similarly, a drought at ca 4200yr BP was inferred to cause the cultural collapse of the Uruk society in Mesopotamia and the Akkadian Empire in N-Africa. In the E-Mediterranean, although the early to late Bronze Age transition was coincident with the dry phase at that time, the major cultural transform from the Chalcolithic to the Bronze Age occurred at ca 5700-5500yr BP when the more severe drought was established. These observations suggest close links between past climate changes and ancient civilizations even though they might evolve independently at different sites.