



## **Holocene paleoclimate reconstruction based on stalagmite studies from the Levant region: Results from locations with contrasting altitudes across Mount-Lebanon**

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First, absolute-dated oxygen and carbon isotopic profiles from a Holocene stalagmite (11.9-1.1 ka) from the Jeita cave (coastal, central Lebanon) showed generally high  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$  values during the late-glacial (resp. -3.9 and -9.2 permil vpdb), low values during the early Holocene (resp. -6.5 and -11.0 permil vpdb), and again high values after 5.8 ka, suggesting a transition from wet conditions in the early Holocene towards drier conditions in the mid-Holocene. Additional work on a speleothem of the Jeita cave covering 0.9 to 0.4ka before 2012) indicates slightly decreased  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$  values; around resp. -5.5 and -10.7 permil vpd. Imprinted a return to generally slightly wetter conditions, important changes in  $\delta^{13}\text{C}$  at  $\sim 1280\text{AD}$  and  $\sim 1450\text{AD}$  suggest a change in vegetation cover which may be human induced.

The QaG-stm-1 stalagmite of 15cm long with an average diameter of  $\sim 3\text{cm}$  was retrieved from the Qadisha cave located at about 1750m above sea-level, in northern Lebanon. Samples having similar ages from different altitudes, yet relatively close locations from central and northern Lebanon are believed to reveal invaluable information on the Holocene paleoclimate in the Levant region and on the altitude influence. U-Th dating revealed the age of the sample between  $6482 \pm 32\text{a}$  and  $3247 \pm 127\text{a}$  (before 1950). Its  $\delta^{18}\text{O}$  isotopic composition indicates  $\sim 2.5$ permil lower values than for the Jeita cave calcite of similar age, related to the  $\sim 1600\text{m}$  higher altitude of the Qadisha Cave. With no clear hiatus, the rate of calcite deposition appears to be very slow (ca. 215a/cm) which contrast recent calcite deposition rate in the cave (ca. 30a/cm).

Cave water isotopic composition from both caves closely fits the local meteoric groundwater. The stable isotopic results on cave water and recently deposited calcite indicates evaporation processes going on in the Jeita cave and at a lesser extent in the Qadisha cave. The work carried out on the Jeita cave stalagmites (11.1 to 0.5ka) from coastal, central Mount Lebanon resulted in distinguishing four distinct periods covering the Holocene until almost present time. The wettest period in western central Lebanon occurred from 9.2 to 6.5 ka. A dry Mid- to Late Holocene until around 1.1 ka, with exception of a relatively wetter period between 4.0 and 3.0 ka. A return to more humid conditions in the last millennium is anticipated with the early results of JeG-stm-3.