

## Late Pleistocene climate variability in the eastern Mediterranean: Multi-proxy speleothem records from Dim Cave in SW Turkey

EZGI ÜNAL-İMER<sup>12\*</sup>, JAMES SHULMEISTER<sup>1</sup>,  
JIAN-XIN ZHAO<sup>3</sup> AND I. TONGUÇ UYSAL<sup>24</sup>

<sup>1</sup>Climate Research Group, School of Geography, Planning & Environmental Management, The University of Queensland, Brisbane, QLD 4072, Australia

<sup>2</sup>Queensland Geothermal Energy Centre of Excellence, The University of Queensland, Brisbane QLD 4072, Australia

<sup>3</sup>School of Earth Sciences, The University of Queensland, Brisbane QLD 4072, Australia

<sup>4</sup>Department of Geological Engineering, Hacettepe University, TR 06800, Turkey

Multiple climate-sensitive stable isotope (O and C) and trace element/Ca profiles derived from the Dim Cave (~36°N, 232m a.s.l.) speleothems provide continuous record of climatic changes and define the paleohydrological conditions for 90–10 kyr BP. MC-ICP-MS U-series dating of the speleothem Dim-E3 revealed step-wise growth pattern that spans between ~13 and ~90 kyr BP in the late Pleistocene, while fast-growth stalagmites Dim-E2 and Dim-E4 demonstrate growths collectively from ~10 to ~15 kyr BP. Changes in  $\delta^{18}\text{O}$  values (-3.3 to -6.6‰ VPDB) over glacial-interglacial timescales are interpreted as responses of Dim Cave to changes in the trajectories of winter westerly air masses, largely between northerly (European) track (less depleted) and southerly-shifted track along the North African coast (more depleted).  $\delta^{13}\text{C}$  (-0.21 to -12.5‰ VPDB) time series are interpreted to reflect variations in soil organic matter composition and/or thickness, which have been strongly depleted during interglacials, suggesting active carbonic acid production in the soil. In contrast, active carbonic acid production decreased during glacial times where  $\delta^{13}\text{C}$  values primarily reflect carbonate rock values. ICP-MS trace element/Ca ratios (e.g. Mg/Ca, Sr/Ca, and U/Ca) exhibit significant temporal covariations and correlations with  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$ . Chondrite-normalised REY plots of the selected speleothem sub-samples revealed typical seawater origin for the meteoric waters precipitated, which is also supported by elevated Y/Ho ratios averaging around 68. Depending specifically on Y/Ca (and Zr/Ca) and growth rates of speleothem Dim-E3, it can be argued that at least three wet seasons (72–63 kyr, 51–40 kyr, and ~18–10 kyr) prevailed across coastal Turkish side of the Eastern Mediterranean. It is also notable that several Heinrich events are recorded in the Dim Cave and appear to indicate intensification of westerly wind flow (on northern track) during these cold spells.