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Holocene paleoclimate and environmental reconstruction from Urmia Lake sediments in southwest Asia

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Lake Urmia, in northwest Iran, is the largest saline lake in the Middle East with surface area of 5000 km^2. Despite its potential as an archive of paleoclimate and paleoenvironmental information for Southwest Asia there has been no molecular organic geochemical investigation or precise dating of these sediments, especially for the Holocene. This study used multi-proxy analysis combining sedimentological, bulk and stable organic geochemical and compound specific stable isotopes along with high-resolution radiocarbon dating on organic and carbonate material to understand the Holocene climate and environmental variability in SW Asia.

The age model based on sixty calibrated radiocarbon dates shows variation of sedimentation rates between early and middle Holocene and a sudden increase in late Holocene. The most prominent change, at 4.3 Ka, closely corresponds to the well-documented 4.2 ka event (Medieval Optimum) in the Mediterranean and Middle East.

We used compound-specific hydrogen isotope ratios (δD) in long chain n-alkanes and n-alkonic acids as paleohydrological proxy. The fact that Urmia Lake is large and little affected by in-situ production of iso-GDGTs from methanogenic Euryarchaeota makes the measured TEX86 proxy reliable. Therefore, we used this proxy to reconstruct the Holocene paleotemprature. The analyzed record reveals multi-decadal to centennial pacing of paleoclimate and paleoenviromental changes, with most prominent events recorded at 8.1, 4.3 and 2.5 ka BP.