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Biomarker signatures in sediment cores of Lake Urmia (NW Iran): Potential implications for paleo-climate and paleo-environment reconstruction

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Lake Urmia, in northwest Iran, is the largest saline lake in the Middle East with a surface area of $\sim$ 5000km2. Historical documents indicate its existence since at least 2000 years BC, and palynological investigation of a 100 m-long core suggest it contains a sedimentary record spanning the last 200 ka. Despite this potential as an archive of paleo-climate and paleo-environmental information, to date there has been no molecular organic geochemical investigation or precise dating of these sediments. As part of an exploratory study, we have analyzed material from 3 recently collected 8 m-long cores from the eastern, western and middle part of the lake, with the aim of gaining insight in to past depositional and environmental conditions from biomarker signatures preserved in Lake Urmia sediments.

The main objectives are to 1) constrain major source(s) of organic matter and gain insights into carbon cycle and depositional processes from bulk isotopic (δ13Corg, [U+F044]14Corg) and molecular information, 2) determine the applicability of molecular proxies (TEX86 index derived from glyceroldialkylglycerol tetraethers, GDGTs, and unsaturation index UK37 based on long chain alkenones) for paleo-temperature reconstruction and 3) reconstruct the paleo- vegetation and hydrology from compound-specific stable isotopes (δ13C and δD of n-alkanes).

In select samples examined from the three cores, we find the hydrocarbon fractions are dominated by long-chain n-alkanes, with n-C29 and C31 as the dominant homologues in most of the samples. Based on the n-alkane distribution, we distinguish two main types; Type 1 mainly includes the samples deeper than ca 4 m (CPI= 10.2, ACL= 30), characteristic of a terrestrial higher plant source; Type 2 comprises mainly shallower samples (CPI =1.5, ACL = 27.3) which may suggest an increased contribution of aquatic plants. Preliminary GDGT analyses indicate low BIT values for most samples, which suggest little input of soil-derived branched-GDGTs. The fact that Urmia Lake is big and little affected by in situ production of iso-GDGTs from methanogenic Euryarchaeota makes the measured TEX86 proxy reliable. The potential for Uk37 index-based temperature reconstruction also appears feasible since the alkenone concentrations in most of the samples are sufficient. We will present these preliminary data together, compound-specific stable isotope with initial 14C results on bulk sediments.