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Major and trace elements documented paleoenvironmental and provenance signatures as inferred from the lacustrine sequence of Orog Nuur, southern Mongolia

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In arid realm, due to scarce of continuous terrestrial archives, lacustrine sequences were more often employed as the paleoenvironmental repository. However, there exist numerous spatial and temporal heterogeneities concerning existing studied sites. In the Gobi Desert of southern Mongolia, only two records i.e. Bayan Tohomin Nuur and Ulaan Nuur, were previously reported, neither of them, however, provided records older than ∼15 ka. A record that spans longer time period is therefore indispensable to better understand the thermal and hydrologic pattern and their driving mechanisms.

Among the suite of the multidisciplinary studies on lacustrine archive, geochemistry appears most likely the promising tool to decipher the interplay between the environmental change, source lithotype and sediment bulk-composition. Considering the late Quaternary lacustrine sediments, the bulk-geochemistry may be controlled by source terranes, authigenic or allothigenic input, which can be altered by the past environment conditions. Knowledge of the bulk-geochemistry downcore variance along with the field investigation and carefully examined geologic mapping will thereby allow us to gain a better understanding of the climate-induced provenance changes throughout the deposition process. On the other hand, surveys considering the bulk-geochemistry and corresponding environmental interpretations in the pelagic realm have been systematically conducted and reviewed, while their counterpart explanations in the lacustrine sediments still need more investigations.

Two parallel cores (ONW I, 6.00 m; ONW II, 13.36 m) was retrieved from Orog Nuur, Gobi Desert of southern Mongolia. A suite of high resolution element abundances were examined based on core ONW II in an attempt to gain a better understanding of the paleoenvironment and provenance history of the catchment system over the last ∼50 ka. Due to the predominant clay or silty-clay fractions in the lacustrine sediments, Al and Si display broadly identical pattern. Ca behaviors may be ascribed to the authigenic calcite abundance. Mn and Co act as good indicator for the redox condition. Owing to the short burial time and weak diagenetic influence, Fe is not an indicator to the diagenetic processes. Likewise, Zr may be associated to fluvial clastic in relation to the lithotypes but not necessarily linked to the aeolian inputs as in the pelagic realm. Furthermore, S in lake sediments may denote the redox condition and K is more likely linked to the K-feldspar which is associated with the allogenic fluvial inputs. As inferred from the biplot between CaO and $Al2O_3/SiO_2$, disparate source lithotypes may exist before and after the Termination I. The Holocene appears to be a distinctive alkaline environment relative to the late Pleistocene. This may be ascribed to either enhanced hydrodynamic strength of the riverine inflows and/or intensified source rocks erosion in the upper catchments of Orog Nuur. Furthermore, in exceptionally arid realm e.g., Gobi Desert, sands may exert a considerable influence on the bulk-geochemistry of the lake sediments. Normalization with the sand abundance for major and minor elements seems like a viable technique in attempts to better discriminate the possible provenance signatures.