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Four warm and humid climatic events since the Pliocene inferred from the identification of sedimentary greigite (Fe₃S₄) in Lake Qinghai, China

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Qinghai Lake, located on the northeastern margin of the Qinghai-Tibet Plateau, is China's largest extant closed-basin lake, and is of considerable interest in the context of research on Asian climate and environment evolution and the recent uplift history of the Tibetan Plateau. A 626 m long core has been drilled in the southern basin of Lake Qinghai and which reveals a generally continuous sedimentary record consisting of aeolian silt at the base, overlain by lake sediments. Magnetostratigraphy dates the base of the sequence to about 5.1 Ma. The magnetic susceptibility record reveals the presence of four distinct peaks at depths of 431.99 – 419.24 m, 410.28 - 396.40 m, 47.43 - 43.89 m, and 17.23 - 16.41 m, and from which samples were chosen for detailed rock magnetic analysis, including thermomagnetic and hysteresis properties. The results indicate the presence of the authigenic ferrimagnetic sulphide greigite (Fe₃S₄) of stable single domain or pseudo-single-domain grain size and which we conclude is responsible for the enhanced magnetic susceptibility. Sedimentary greigite is most frequently found in rapidly deposited marine sediments, but it can also form in freshwater environments with a high organic loading (SNOWBALL & TORII, 1999). From the presence of the greigite, together with the results of sediment grain size and geochemical analyses, we infer that the four intervals represent episodes of relatively warm and humid climate. Based the magnetostratigraphic-based age model they are dated as follows: 3.802 - 3.726 Ma, 3.620 - 3.592 Ma, 0.613 - 0.597 Ma and 0.174 - 0.168 Ma B.P.

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References

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