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Deep Drilling Campaign in the Western Qaidam Basin, NE Tibetan Plateau and their Revealed Global Temperature Forcing of Salt Formation in the Late Miocene-Quaternary

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The Qaidam Basin in the NE Tibetan Plateau has contributed the largest amount of potash in China. However, how the potash was formed has long been a subject of debate. Here we carried out a deep drilling campaign in the western Qaidam Basin to unravel the relationship between climatic change, Tibet uplift and salt resource formation. With the international cooperation between China and Germany, up to now, four boreholes have been drilled, with an average recovery rate of above 93% and accumulated cores ~2400 m. The drillings reveal a sequence of upward increasing paleosanility and salt occurrence alternating with mostly mudstones and siltstones. Magnetostratigraphic, OSL and U/Th dating of the cores yield an age range between about 7.3 Ma and 0.1 Ma (Zhang et al., 2012a, 2014; Cai et al., 2012; Han et al., 2013). Detailed lithofacies analysis and various proxies (minerals, carbon and oxygen isotopes, salt ions, elements, pollen and spores, grain size, rock magnetism) demonstrate that the long-term evolution of the salt formation was controlled by the global cooling since the late Miocene, and that repeated salt layers were formed in cold or glacial periods modulated by orbital forcing (Li et al., 2010, 2013; Wang et al., 2012; Zhang et al., 2013b; Herb et al., 2013). Tibet uplift might have also influenced this evolution (Zhang et al., 2013b; Han et al., 2014). They also show that the climate experienced a long- term stepwise drying with significant drying events that occurred at about 3.6 Ma, 2.5 Ma, 2.2 Ma, 1.6 Ma, 1.2 Ma, 0.9 Ma, 0.6 Ma and 0.1 Ma, during which the paleo-Qaidam lake evolved from a late Miocene fresh water lake, via a brackish lake, to a playa salt lake (Wang et al., 2012; Yang et al., 2013a,b; Han et al., 2014).

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