Origin of the Red Earthy Deposit (RED) at the Northeastern Tibetan Plateau (China) and its implication to regional desiccation since the middle Miocene

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In this work, the Red Earthy Deposit (RED) at Xining, the Northeastern Tibetan Plateau (China), was investigated on soil micro-structure, grain size, major- and trace-chemistry elements, and magneto-stratigraphy. These evidences indicate a wind-blown origin of the RED.

The magnetostratigraphy investigation shows that the RED began to deposit about 11.4 Ma BP. Miocene aeolian sequence at Qin’an, northwest of China was reported (Guo et al., 2002), but its’ distribution is still unknown. Our result indicates that the Miocene aeolian deposits had extended to northeastern Tibetan Plateau at least since the middle Miocene. Existence of the RED proves aridity of interior of the Tibetan Plateau and the Asia began at least since the middle Miocene time. Change of the proxy index such as grain-size indicates two important desiccation process took place at 9.61-9.91 Ma BP and 7.8 Ma BP, respectively.

Trend of the proxy index sharply is varied from high-frequency and high-amplitude pattern to low-frequency and low-amplitude pattern at around 10.4 Ma BP, which may indicate there was a geological events with change of climatic pattern at that time. Other records have showed intensity of Indian monsoon has an increase, and δ 18O of foraminiferal oxygen isotope has an increase as well, and sea level have a sharp decline at around 10Ma BP. Thus, this event occurred in the Northeastern Tibetan Plateau at 10.4 Ma BP may be a reflection of a global event.

In this study, the Red Earthy Deposit (RED) at Xining, one of river terraces, consists 25 visually definable fulvous weakly-developed soils interbedded with reddish strongly-developed soils, which have similar structure with the typical Red Clay in Chinese Loess.

There is a good agreement of both major and trace chemistry element compositions between loess-soil units and the RED. The REE distribution of them are similar in shape with enriched LREE and fairly flat HREE profiles, and clear negative Eu anomaly, identical to those of upper continental crust.

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