Variations in the Provenance of the Late Neogene Red Clay in Northern China

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In northern China, late Neogene wind-blown sediments are comprised of two units: the Quaternary loess and the underlying late Miocene-Pliocene Red Clay deposits. Knowledge on the provenance of these sediments is fundamental in reconstructing wind patterns and the aridification history of Asian interior during the late Miocene and Pliocene. Notable progress has been made in understanding the origin and depostion of Quaternary loess. However the underlying Mio-Pliocene Red Clay sequence is lithologically more diverse system and no consensus has been reached on its provenance.

In this study, a combination of end member modelling on the bulk grain size distributions and U-Pb dating of single grain detrital zircons, together with the newly developed dust trajectory modelling, allows us to investigate the spatial-temperol variation in the provenance of Red Clay at the three Red Clay sequences in the Chinese Loess Plateau (CLP). Our results show that while the majority of the detritus of the Red Clay in the CLP was mainly derived from the northern Tibetan Plateau, Red Clay in the northern CLP shows signutures of increased sources from the Central Asian Orogeny Belt. This spatial pattern is supported by the results from the back-trace trajectory modelling of the dominant dust transport pathways in the CLP for the late Miocene. It is also noted that around 3.6 Ma, Red Clay from the northern CLP shows increased contribution from the western China, possibly indicating an intensified aridity of NTP and Taklimakan desert due to the uplift of Tibetan Plateau in the late Pliocene. The Red Clay deposits in the two sites of southern CLP show analogous provenance but divergent end member grain size components, highlighting the significance of local pedogenic processes in altering the sediment composition.