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Asian dust provenance changes during the last 2.6 Mys at Lingtai section, the Chinese Loess Plateau and this implication to East Asian monsoon evolution

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Eolian dust deposited in the Chinese Loess Plateau [CLP] is considered as having been derived from the dry and semi-dry areas of the western to central China and Mongolia-western Siberia. These eolian sediments are called loess-paleosol sequence, which is composed of loess deposited under cold-dry climate (glacials) and the paleosol formed under relatively warm-wet climate (interglacials), and its deposition started from about 2.6 Ma (Sun et al., 1998). In recent years, the loess-paleosol sequence attracts increasing attention as a recorder of the East Asian monsoon [EAM].

It is considered that the estimation of loess and paleosol provenance is crucial to understand the condition and variation of EAM through reconstruction of desertification of inner Asia and transport wind system of eolian dust. However, the method to examine eolian dust provenance is not well established and its potential link to evolution of EAM, uplift of Tibet, and glacial-interglacial cycles remain unclear. According to previous studies that analyzed the grain size distribution of loess and paleosol in CLP, it was demonstrated that loess and paleosol are composed of two grain size populations whose grain size and relative ratio vary both spatially and temporally (Sun et al., 2004). They suggest that the coarse population was derived from northwest deserts (by winter monsoonal wind), whereas the fine population was derived from western deserts (by westerly wind), based on spatial variation pattern of the grain size which varied in association with glacial-interglacial cycles. However, they did not examine

the provenance of coarse and fine populations directly.

We analyzed 35 loess and 33 paleosol samples, which were separated into fine (0—30μm) and coarse ($>$30μm) fractions. We examined provenance of loess-paleosol sequence in Lingtai section of the CLP since 2.6 Ma, using Electron Spin Resonance [ESR] signal intensity of quartz, which reflects its formation age (Toyoda, 1992), and crystallinity index [CI] of quartz, which reflects its formation temperature and crystallization speed (Murata and Norman, 1976). With these two parameters, we identified the provenance of quartz in fine and coarse fractions of loess and paleosol samples by comparing with present desert deposits in East Asia (Sun et al., 2007 submitted). The results suggest that fine and coarse fractions in the same samples were derived from difference sources, and provenance changes in both fractions occurred approximately at the same time at 2.2, 1.1, and 0.3Ma. In the following discussion we will focus on fine fraction and reconstruct its provenance changes.

During 2.6—2.2Ma, the fine fraction was derived from northwest China with gradual increase in the contribution from Mongolia. During 2.2—1.1Ma, the fine fraction was derived mainly from northwest China and Mongolia with strongest contribution from Mongolia at 1.6Ma. Then, during 1.1—0.3Ma, contribution from Taklamakan desert increased with strongest contribution from Taklamalan at 0.8Ma, and contribution from northwest China gradually increase during 0.8—0.3Ma. Finally, the fine fraction was derived mainly from northwest China (Tengger desert) during 0.3—0Ma. Although loess and paleosol samples show more or less similar trend of provenance changes, contribution from each deserts to loess and paleosol are different. We believe that these provenance changes will provide important clues to resolve the evolution of EAM, desertification of inner Asia and/or uplift and erosion of Tibet, Tien Shan, and Altai mountains.