

Three large shifts in East Asian monsoon circulation indicated by loess–paleosol sequences in China and late Cenozoic deposits in Japan

¹XIAO, J.L. and ²AN, Z.S. ¹Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China; ²State Key Laboratory of Loess and Quaternary Geology, Chinese Academy of Sciences, Xi'an 710054, China.

Correlations between loess–paleosol sequences in China and late Cenozoic deposits in Japan suggest that East Asian monsoon circulation experienced three large shifts during the late Cenozoic. About 2.5 Ma ago, the onset of loess accumulation in north-central China accompanied by a dramatic increase in eolian dust flux to the Sea of Japan marked a pronounced development of the East Asian winter monsoon winds. Since ca. 1.2 to 1.1 Ma ago, the obvious alternation of loess and paleosols in the Chinese loess sequence with increased coarse grain-size fraction in the loess units and higher-than-average magnetic susceptibility values in the paleosols, and the repeated occurrence of interstratified marine clay layers in the Osaka Group of central Japan, indicate that the East Asian monsoon circulation strengthened and the contrast between the summer and winter monsoons increased. The paleosols of the Chinese loess sequence were more strongly developed from ca. 550 ka ago, and loess started to accumulate in areas of the mid-lower reaches of the Yangtze River and in Lake Biwa of central Japan from ca. 450 ka ago, reflecting more vigorous summer and winter monsoon circulations since ca. 550 to 450 ka ago. These large changes in East Asian monsoon circulation were not only related to the changing solar radiation, global glacial/interglacial cycles and the changing configuration of land and sea but were also directly controlled by the uplift of the Tibetan Plateau.