Mineralogical evidences of a warm and dry summer monsoon for the late Tertiary red clay formation, China

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In the past decade, field observations and geochemical and sedimentological studies have demonstrated that the late Tertiary red clay formation underlying the Pleistocene loess-paleosol sequence on the Chinese Loess Plateau are also wind-blown in origin, thus providing a good opportunity to reconstruct monsoon changes over the late Tertiary. In this study, we examined the classic Lingtai loess-plaeosol sequence and red clay formation on the Chinese Loess Plateau with a diffuse reflectance spectrophotometer. From the reflectance data we calculated sample redness, a reasonable proxy for iron oxide minerals which are responsible for the color changes in the eolian sequence. Sample redness of the red clay varies from about 31.1% to 36.6%, higher than the overlain loess and paleosol samples (29.1~35.1%) as expected (Fig. 1). Changes of iron oxide minerals were identified by analyzing the reflectance spectra. Both hematite and goethite are present in the red clay formation, but hematite content and the ratio of hematite to goethite are much higher than the overlain loess and paleosol. Based on this comparison, the early Pliocene red clay formation is characterized by conditions that are warmer and drier than the Pleistocene paleosols.

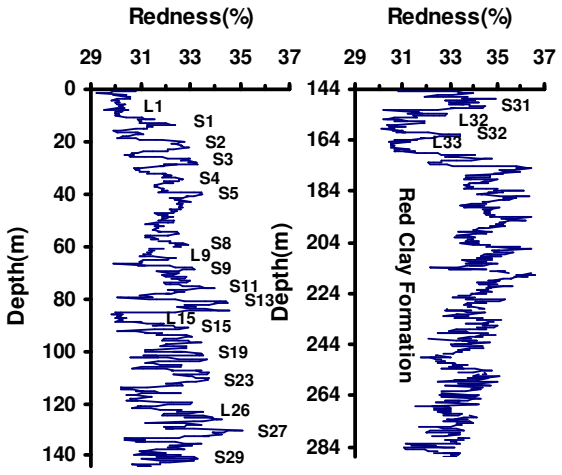

Fig. 1 Redness record of the Lingtai loess-redclay section

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