

Prominent half-precessional signal of East Asian Winter Monsoon in Chinese Loess Sequence

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The history of East Asian Winter Monsoon (EAWM) was reconstructed based on geochemical record from the loess deposit at the Weinan section in the southeastern Loess Plateau. The section contains 26 m of loess-paleosol sequences with base age of around 250 ka and can be divided into seven sub-layers downwards, which correspond to the seven marine oxygen isotopic stages (MIS1-7) of the last two glacial-interglacial cycles. Multi-paleoclimate proxies, such as magnetic susceptibility (MS), Zr/Rb ratio and grain size, were determined. The Zr/Rb ratio pattern shows two features. Firstly, similar to the variation of MS and mean grain size (MGS), the Zr/Rb ratio generally correlates well with stratigraphic marker and shows very strong 100kyr cycles. Samples from the loess layers deposited in the glacial periods are characterized by a high Zr/Rb ratio, whereas for samples taken from the paleosol layers deposited in the interglacial periods usually displayed a low Zr/Rb ratio. Secondly, different from the MS and GMS record, Zr/Rb ratio shows remarkable half-precessional cycles in the Weinan section. For example, there are significant six, four and six cycles in the Zr/Rb record during MIS 5 (S1), MIS 6 (L2) and MIS 7 (S2) respectively. Although the precise time control point is absent, the temporal pattern of reconstructed EAWM suggests an obvious presence of half-precessional (around 11kyr) climate variability in the Loess Plateau during the last 250 ka, especially during the period between 60 ka and 250 ka. Because the half -precessional cycle is peculiarly appeared in the tropical region, our result suggests a low latitude influence on the EAWM regime over the past 250 ka.

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Sedimentary and geochemical evidence for methane seep from a dolomite chemoherm in the Nantuo (Marinoan) glacial deposit, Zunyi area, SW China

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A dolomite chemoherm, 1.6 m high and 3.6 m wide, occurs in the upper part of the Nantuo Formation, and outcrops along the roadside near Jinhe village, south of Songlin town, Guizhou Province, SW China. The massive dolomite of chemoherm mainly consists of microcrystalline dolomite with minor pyrite, and detrital quartz and feldspar. The upper part of chemoherm contains an ice-rafting igneous gravel. Botryoidal structure, oolitic structure, pyrite framboid, and barite crystal fans occurred in the chemoherm, that are frequently observed in modern seep sediments.

In the lower part (from 0 cm to 122 cm) of the chemoherm section, the $\delta^{13}\text{C}$ values are from -4.65‰ to -3.94‰ , the Ce/Ce* ratios are from 0.61 to 0.98, and the Ba contents are from 307 ppm to 10, 529 ppm. The $\delta^{13}\text{C}$, Ce/Ce* and Ba contents show a synchronous variation. The $\delta^{13}\text{C}$ decreases to -4.65‰ at 41 cm height and the Ce/Ce* and the Ba increases to a peak value, and then drops to a normal level.

The $\delta^{13}\text{C}$ values are from -6.36‰ to -5.51‰ in the upper part (123-160 cm), lower than that of the lower part of the chemoherm. The Ce/Ce* ratio increases from 0.86 at the 131 cm height to 1.82 at the 158 cm height. Ba contents all are higher in the upper part, and there are two extremely high values, 2.63×10^4 ppm at the 131 cm and 2.93×10^4 ppm at the 149 cm height, where barites occurred.

These sharply and significantly negative $\delta^{13}\text{C}$ excursions, positive Ce anomalies, extremely high Ba contents in the dolomite chemoherm, all are similar to seep carbonates, suggested that the late Neoproterozoic deglaciation might be related to methane release.

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