

## Paleoprecipitation changes over the 60 ka in semi-arid region of China from the geochemical evidence of loess-paleosol sequences

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<http://www.sci.metro-u.ac.jp/geog/himal/index.html>

In this study, I clarified the distribution patterns of paleo-precipitation since the last glacial period on the basis of the extent of pedogenesis in loess - paleosols of China. Also, these precipitation changes were caused by time series changes of regional and global atmospheric circulation patterns.

In the terrestrial sediments, it is generally difficult to transfer a lithologic sequence into time-series changes of the lithology. At first, I proposed new criteria for identification of loess and paleosols by using geochemical analyses of loess - paleosols. And then, based on new criteria for their identification, I clarified the formation mechanism of loess - paleosols. I proposed as the result that sequential changes of sedimentological features within the loess-paleosols of the western part of the Chinese Loess Plateau could be directly transferred those thickness into time-series, because small precipitation didn't cause the dissolution of clastic materials such as aeolian carbonates and the cementation below paleosol/loess lithologic boundaries. Also, it is clear that the formation of paleosol horizon in the semi-arid area caused by decreasing of aeolian dusts which the Westerlies transported. Then, it is possible that the loess - paleosols were formed by precipitation changes due to the East Asian summer monsoon activities and changes of aeolian supplies due to the intensity of the Westerlies.

Based on above-mentioned fundamental investigations on the loess - paleosols, I got new information and the hypothesis on the paleoclimatology since the last glacial period.

I could reconstruct high-resolucional variations of paleo-precipitation since the last glacial period from such three investigating sediments in details as follows; 1. Qitingshan loess section, Liaoning Province, China, 2. Tienshan loess section, Inner Mongolia, China and 3. Dajatai loess section, Gansu Province, China.

The time series changes of paleo-precipitation since the last glacial period have similar patterns each other. The variation of paleo-precipitation since the last glacial period have the instability oscillations with centurial- to millennial-scale. These high-frequent variations are linkage with Bond cycles and sometimes D-O cycles in the North Atlantic climatic records.

An et al. (2000) revealed the Asian summer monsoon activities since 15,000 cal yr B.P. in China and suggested that there are not millennial-scale climate changes in the Holocene. However, my results indicate the existence of millennial-scale variations of paleo-precipitation in East Asia since the last glacial period. I suggested that this millennial-scale changes caused by the intensity changes of the Westerlies, delivered the North Atlantic climate changes.

In MIS 3 (23 - 58 ka), the variation of paleo-precipitation in China was gradually decreasing as a long-term trend with having two eventual humid pulse at around 55 and 35 ka. I suggested that this long-term patterns of it during MIS 3 indicate the variations of the regional Asian summer monsoon activities, caused by the insolation changes in low latitudes by a earth's orbital precessional cycle.

The conclusion is that the variations of paleo-precipitation in semi-arid region of China since the last glacial period due to the Asian summer monsoon activities and the Westerlies were controlled by the both factors of global effects that the East Asian summer monsoon activities were caused by the variation of the Westerlies, driven the millennial-scale global climate changes, and regional effects that the East Asian summer monsoon activities were caused by an earth's external forcing.