4.5.P07

Wind sorting and chemical weathering effect on element concentrations in the Chinese loess and its implications for paleoclimate change

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In order to examine the elements behavior during wind sorting and weathering after dust deposition, major and trace element analyses for the Luochuan loess-paleosol sequence in China were performed. Chemical analysis of five grain size fractions (i.e. >45 μ m, 28-45 μ m, 8-28 μ m, 2-8 μ m and <2 μ m) show that some elements, such as Al, Fe, K, Mg and Rb, are concentrated in finer fractions both in loess and paleosol samples, while the others, such as Na, Sr, Si and Zr, are enriched in coarser fractions due to the effect of wind sorting. After dust deposited, some elements, such as Al, Fe, K, Rb, Zr and Si, are enriched in paleosols, while the others, such as Na, Mg and Sr, are depleted in paleosols due to weathering and pedogenesis. Because these elements have different behavior during wind sorting and pedogenesis, we can combine them to trace the two different processes.

Four geochemical parameters display a regular variation and record the alternations of loess and paleosols, not only in Luochuan loess and paleosol sequence during the past 1.2 Ma, but also in L1 and S1 of Luochuan, Xifeng and Huanxian sections in Chinese Loess Platerau. The elements ratios, such as Si/Al and Zr/Rb, can eliminate the effect of weathering and pedogenesis and serve as the proxies on the winter monsoon variation. The elements ratios, such as Fe/Mg and Si/Na can eliminate the effect of wind sorting and serve as the proxies on summer monsoon variation.

4.5.P08

Average chemical denudation flux of sodium and magnesium from the continent: An approach from the Chinese Loess study

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Interest in chemical weathering rates of continental silicates was kindled by the hypothesis of Raymo and Ruddiman (1992)[1] that tectonic uplift could drive global climate change. It was assumed that the tectonic uplift increased the chemical weathering rates of silicates, resulted in a reducd atmospheric CO₂ levels, and thereby cooled climate. But many variables, geologic, climatic or topographic, may potentially control the chemical denudation of the continent. The search for causal links between weathering rates and morphometric or climatic variables is complicated by the strong statistical associations between variables[2]. In general, the chemical composition of the Chinese Loess represents the average chemical composition of the exposed upper crust. The chemical denudation rate of the Chinese Loess could be considered as the average chemical denudation rate of the continent under certain climates. Sodium and magnesium are mainly associated with silicate minerals in the Chinese loess and susceptible to chemical denudation during the silicate weathering. In this work chemical data of sodium and magnesium, obtained from two loess sections (Luochuan and Xifeng) for the last glacial and interglacial cycle, were used to determine their chemical denudation flux. The average chemical denudation flux of sodium from the Chinese Loess Plateau during last interglacial period is 1.69 t/km²/yr at Luochuan and 1.72 t/km²/yr at Xifeng. The average chemical denudation flux of magnesium at both sites is 0.842 t/km²/yr and 0.722 t/km²/yr, respectively. The striking similarity of this study with other approaches is an excellent starting point for estimating the average chemical denudation flux of the continent from the Chinese loess.

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References

- [1] Raymo, M.E., and Ruddiman, W.F. (1992) *Nature*, **359**, 117-122
- [2] Gaillardet, J., Dupre, B., Louvat, P., and Allegre, C.J. (1999) *Chemical Geology*, **159**, 3-30