Distribution of mineral potassium in the Luochuan loess section, China

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Mineral potassium (K) is the dominant part of potassium in the loess and paleosols, mainly residing in feldspar and mica. We report here variation in mineral potassium contents of the Luochuan loess section during the past 130ka (Table 1).

Table 1: Mineral K content and magnetic susceptibility (MS)

Strat.(the number of samples)	Mineral K (%)		MS (SI)	
	Range	Mean	Range	Mean
S_0(10)	1.42-1.67	1.55	67.6-155.6	102.2
L_1LL_1(21)	1.43-1.72	1.59	52.2-91.2	70
L_1SS_1(29)	1.51-1.69	1.61	97.5-142.5	118.2
L_1LL_2(24)	1.46-1.65	1.55	49.1-117.6	72.2
S_1(11)	1.45-1.72	1.65	53.6-233.3	180.3

Mineral potassium content varies within the range of 1.42-1.72% with the average of 1.59% in the Luochuan section during the last 130ka, and is slightly higher in the paleosol S_1 than in the loess L_1. In addition, the distribution curve of mineral potassium in the Malan Loess section (L_1) exhibits three small fluctuations between low and high values. Mineral potassium is low in the loess L_1LL_1, high in the weak pedogenic loess L_1SS_1, and then low in the loess L_1LL_2.

S_0 and S_1 were developed during the post-glacial period and the last interglacial period, respectively. L_1 formed during the last glacial period, composed of three parts (L_1LL_1, L_1SS_1 and L_1LL_2). L_1LL_1 formed during the last stade of the last glacial period, L_1SS_1 were developed during the interstade of the last glacial period and L_1LL_2 formed during the early stade of the last glacial period. So, mineral potassium content oscillates regularly with climate change. Climate change probably resulted in leaching of diffluent elements (Ca and Na), but relative enrichment of mineral potassium of the Luochuan loess section.

Moreover, the fluctuation of mineral potassium is similar to that of magnetic susceptibility in the Luochuan loess section during the past 130ka. Both have also a good correlation (r=0.81). MS has been considered to be a classical proxy indicator of variations in the summer monsoon strength [1]. Therefore, variation in mineral potassium contents can also reflect the East Asian summer monsoon evolution.

Reference

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Biogeochemistry of the volcanic acidic waters at the Andean Volcan Copahue (Argentina)

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The naturally acidic water system near the active Volcan Copahue consists of the Copahue Crater Lake, the Upper Rio Agrio which flows into Lake Caviahue, and the Lower Rio Agrio below Lake Caviahue. The crater lake and most of the Upper Rio Agrio are extremely acidic (pH ≈0-1.6) with oxidizing conditions and poor colonization, mostly by well-known acidophilic bacteria and algae. In the lower part of the system before inflow into Lake Caviahue, microbial biomass, oxygen penetration and oxygen consumption in the sediments were similar to non-extreme aquatic habitats [1]. Lake Caviahue has a pH similar to acidic pit lakes (pH 2.2 – 2.7), but lower iron and higher phosphorus concentrations [2]. Sedimentation of algae is higher than in acidic pit lakes due to different algal communities and volcanic ash input. This results in better degradable organic carbon compounds in the sediments compared to pit lakes. Microbial sulfate reduction proceeds in Lake Caviahue sediments at pH<3 [3], and methanogenesis occurs in deeper layers below 25 cm. Below Lake Caviahue, the Lower Rio Agrio is gradually diluted and neutralized by tributaries, thereby shifting from a chemotrophic system dominated by Fe-S-Al biogeochemistry to an organotrophic system dominated by heterotrophic processes. Epilithic biofilms are an important habitat throughout, and we assumed that respiration would increase with increasing pH. In contrast to this, we obtained a minimum curve for biomass, respiration and photosynthesis with lowest values at a site with massive mineral precipitations. This indicates that physical stress is a more important regulatory factor for the biocoenosis than pH. We also observed considerable interannual variations in physicochemical conditions and high diurnal fluctuations of temperature and discharge in this part of the river. These fluctuations may represent a stronger stress for the biota than more acidic but stable conditions.

References

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