Biogeochemistry of Se in Hexi Corridor, Northwestern China

SHUXUN SHAO[1,2] AND BAOSHAN ZHENG[1]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, China (ssx651117@yahoo.com.cn)
[2]Graduate School, Chinese Academy of Sciences, China

In order to clarify the historic academic problem of whether livestock poisoning recorded by Marco Polo in 1295, which had happened in ancient Suzhou of northwestern China (the present Hixi Corridor Area), is selenosis or not, the present study researched the biogeochemistry of Selenium in the Hexi Corridor.

It was found through investigations that the poisonous plants to cause farm animals in Hexi corridor intoxication which symptoms are similar to those of selenium toxicity are *Oxytropis.glab*and *Oxytropis.ochrocephala*, which are two species of *Oxytropic DC*. Therefore, we think that the toxic grasses to cause intoxication in livestock, recorded by Marco Polo in 1295, probably was *Oxytropic DC*.

The average Se concentrations in above two species of plants are 0.112±0.038 mg/kg for the root of *Oxytropis.glaba*; 0.102±0.027 mg/kg for the stem and leaf of *Oxytropis glaba*; and 0.066±0.009 mg/kg for *Oxytropis. ochrocephala*, respectively. Their average soil selenium concentrations are 0.205±0.127 mg/kg on grassland producing *Oxytropis glaba*; 0.152±0.024 mg/kg on grassland producing *Oxytropis ochrocephala*, respectively.

The selenium concentrations in soils and *Oxytropic DC* in Hexi Corridor are far less than the thresholds to cause selenium toxicity in livestock. As a result, the present study concludes that poisoning in livestock, which happened in ancient Suzhou, western China, recorded by Marco.Polo in 1295, might not be selenosis.

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A Palaeozoic nitrogen isotope record

E.C. SUCHI AND C. OSTERTAG-HENNING

Geologisch Paläontologisches Institut, Westfälische Wilhelms-Universität, Corrensstraße 24, 48149 Münster, Germany (suchie@uni-muenster.de)

Motivation

During the last decade a number of researchers put forward the hypothesis that land plant evolution during the Devonian and Carboniferous had enhanced nutrient fluxes to the marine realm and hence ultimately caused many of the extinction events concurrent with widespread marine anoxia. There was no continuous proxy record, which would point to enhanced availability of limiting elements like nitrogen or phosphorus for the Late Palaeozoic.

Results and Discussion

For the Palaeozoic period a series of 295 total rock samples, 41 extracted total porphyrin samples, 7 nickel-porphyrin samples, and 6 vanadyl-porphyrin samples of the Devonian up to the Permian were analysed with regard to their nitrogen isotopic composition.

There is a clear shift to higher nitrogen isotope values during the Palaeozoic with a significant increase in the Carboniferous at about 310 Ma. The primary nature of the preserved $\delta^{15}N$ signal of the total rocks is corroborated by the nitrogen isotopic analysis of isolated porphyrin fractions.

It is assumed that the enhanced phosphorus delivering caused by chemical weathering fuels the phytoplankton productivity. Consequently this would lead to a higher rate of nitrogen utilization which could explain the elevated $\delta^{15}N$ values during the Palaeozoic. Denitrification could be a further explanation for the observed positive shift in $\delta^{15}N$. Denitrification will lead to an increase in $\delta^{15}N$ only if the rate of nitrate replenishment is greater than the rate of denitrification (Zahn et al., 1987).

Conclusions

Enhanced riverine nutrient inputs could not have been responsible for the extinction events for example at the Frasnian/Fammennian boundary, but on the long term may have moved the ecosystem to a more vulnarable state – until its communities had adapted to the new nutrient fluxes.

Reference

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