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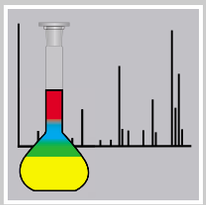

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Using Multiple Geochemical Techniques to Investigate Rainfall as a Potential Source of Selenium to Soils

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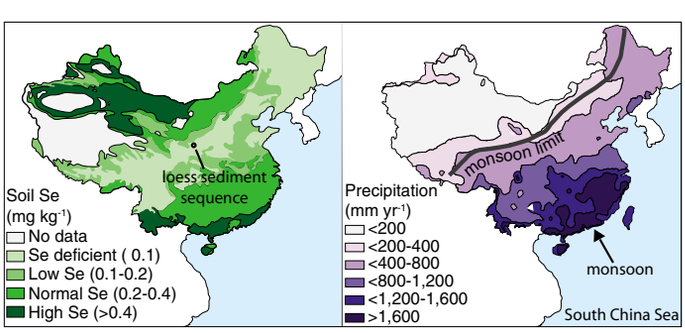
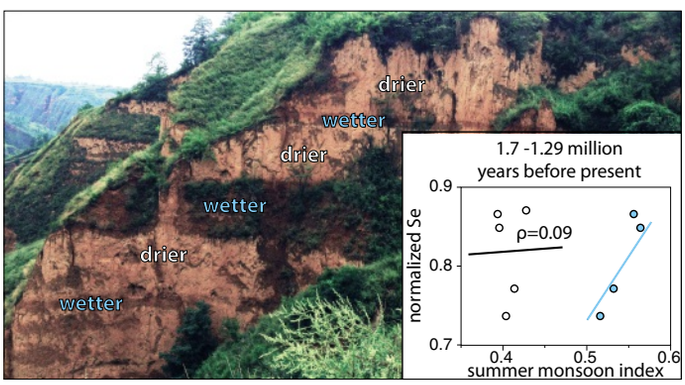
The trace element selenium (Se) is a micronutrient required by humans for important biological functions. Despite its importance for human health, the sources and processes that control the large-scale spatial distribution of Se in the environment remain unclear. Similar patterns of rainfall and soil Se concentrations, *e.g.* in Southern China, suggest that rainfall may be an important source of Se to soils.

With the goal of exploring rainfall as a source of Se to soils, we examined climatic and geochemical variables in a sediment sequence from the Loess Plateau of Central China. We used multiple analytical methods to investigate Se concentrations and speciation, which is a main factor controlling environmental Se mobility.

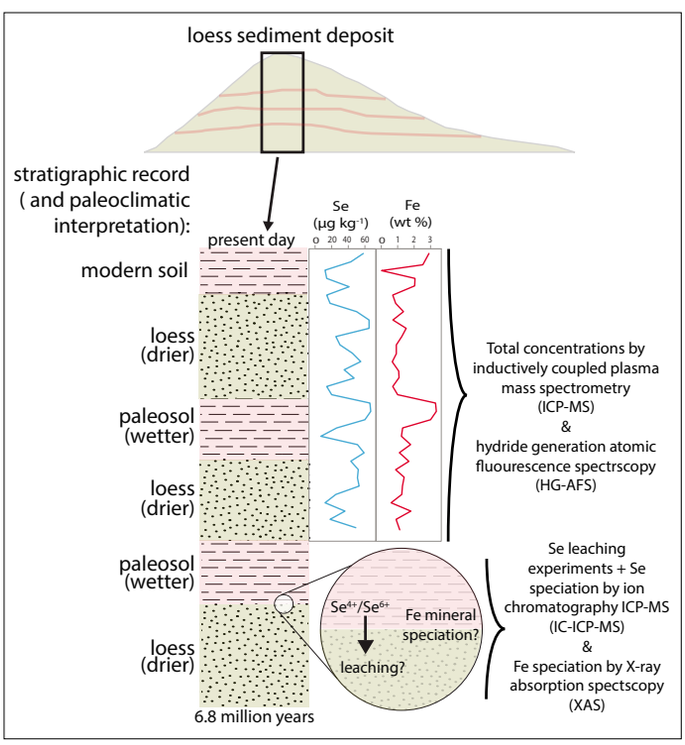
Speciation of Se could not be directly measured due to the low concentrations (< 70 mg Se per kg sediment). However by carrying out batch leaching experiments, followed by ion chromatography-inductively coupled plasma mass spectrometry analysis, we could quantify the maximum concentrations of Se species that could have been removed from these sediments by natural leaching processes. This amount was low, indicating that these sediments are a suitable environmental archive. Furthermore, speciation of iron was analyzed using X-ray absorption spectroscopy, since different iron minerals can have different binding capacities for Se, which influences the mobility of Se. Comparisons between results from geochemical analyses and climate variables



Distribution of Se in soils and rainfall in China. Also shown is the location of the studied sediment section, and the monsoon limit (present-day northern extent of the monsoon) (modified from Blazina *et al.*, **2014**).



A sediment sequence in the Chinese Loess Plateau. Inlay shows relationship of Se to the monsoon index (a proxy for precipitation) in wetter/drier times.



Schematic of loess section (modified from *http://gec.cr.usgs.gov/archive/eolian/images/11a.gif*) and overview of geochemical analyses and techniques employed in this study.

showed that in wetter time periods there was a relationship between Se and the strength of the monsoon, which was less pronounced in drier time periods.

By combining multiple geochemical techniques we could identify rainfall as a likely source of Se to soils. This finding is important in future efforts to predict the distribution of this vital trace element in soils.

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Reference

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