Impact of suspended inorganic particles on phosphorus cycling in the Yellow (Huanghe) River

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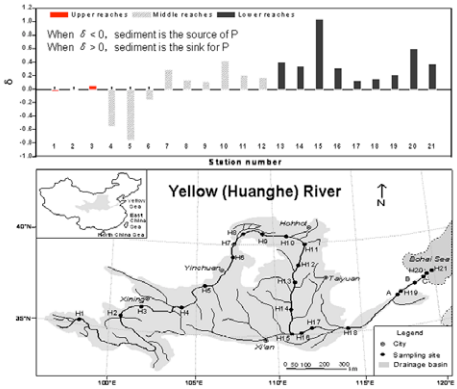
While the importance of phosphorus (P) as a limiting nutrient is well established, the understanding of global scale control on P cycling in continents and how these affect riverine P fluxes is still incomplete. P in water and sediment in the Huanghe was measured for 21 stations from the source to the Bohai Sea. The average total particulate matter (TPM) increased from 40 mg/L (upper reaches) to 520 mg/L (middle reaches) and 950 mg/L in lower reaches of the river. Although there was considerable nutrient pollution, the dissolved PO4 concentration remained low (0.32-0.58 μmol/L) due to adsorption on particles. The P removed was mainly due to the high TPM rather than the surface activity of the particles since they had low labile Fe and low affinity for P. The sediment was a major sink for P in the middle to lower reaches but not in the initial upper to middle reaches. TPM has been reduced by more than 10-fold due to artificial dams over the last decades. Experimental modeling revealed that TPM of 1 g/L was a critical threshold for Huanghe below which most of the P input to the river can no longer be removed by the particles where eutrophication may occur. These findings provide realistic representations of particle control on riverine P fluxes which can be used in coupled land-ocean modeling in global biogeochemical P cycling.



Nd-Sr Isotopic Constraints on the Source of the Hexi Corridor Loess

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Analysis and Comparison

The loessial soil is very important for habitants in the Hexi Corridor, North China. However, knowledge on the loess source of this region is uncertain till now. In order to answer this question, Sr-Nd isotopic comparisons between the loess of the Hexi Corridor and surface sediments of surrounding areas are conducted in this study.

River sediments from the Qilian mountian are collected for isotopic analysis of their fine-grained fractions in this study. The measured $\varepsilon_{Nd}(0)$ values vary from -11.84 to -11.95 with $^{87}Sr/^{86}Sr$ ratios from 0.7196 to 0.7388 □As listed in Table 1□.

According to topographical and meteorologic data, the Badain Jaran desert, the Qaidam desert, the Taklimakan desert, the Gurbantunggut desert and Rivers of the Qilian mountains might be potential sources to supply fine-grained fractions for the loess formation in the Hexi Corridor. $\varepsilon_{Nd}(0)$ values and $^{87}Sr/^{86}Sr$ ratios of fine-grained fractions vary from -7.4 to -10.2 and from 0.7132 to 0.7174 for the Badain Jaran Desert, from -10.0 to -10.5 and from 0.7166 to 0.7187 for the Qaidam Desert, from -9.5 to -11.7 and from 0.7136 to 0.7171 for the Taklimakan Desert, from -1.2 to -3.3 and from 0.7113 to 0.7136 in the Gurbantunggut Desert, respectively [2].

Results and Conclusion

Isotopic compositions of the Hexi Corridor loess are distinctly different from those of the Badain Jaran Desert, the Qaidam Desert and the Gurbantunggut Desert, but are roughly similar to the Taklimakan Desert and river sediments of the Qilian mountian. Due to the stability of Sr-Nd isotopes in the surficial process [3], the geochemical similarity of the loess in the Hexi Corridor with the fine-grained fractions of the Taklimakan Desert and river sediments of the Qilian mountian indicates the two areas might be main sources of the Hexi Corrdior loess.

Region	Type	Grain size	$\varepsilon_{Nd}(0)$	$^{87}Sr/^{86}Sr$
Qilian Mts.	River sediment	<75μm	-11.84	0.7335
			-12.95	0.7338
			-12.15	0.7196
			-11.96	0.7222

Table 1 Isotopic features of river sediments of the Qilian mountian

[1] Nakano *et al* (2004) *Atmospheric Environment* **38**, 3061-3067. [2] Chen *et al* (2007) *Geochimica et Cosmochimica Acta* **71**, *3904-3914*. [3] Rao *et al* (2011) *Geomorpholoy* **132**, 123-138.

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