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Arsenic and copper in arid and semiarid Andean rivers: controls of suspended particle size distribution by aluminum and iron geochemistry

PABLO A PASTEN[1,2], MAURICIO MONTECINOS[2,3], JOSÉ ANTONIO DÍAZ[2,3], ANA MACARENA TURRI[2,3], ALEJANDRO E BRISO[2,3] AND ALEJANDRA SOLEDAD VEGA[2,3]

[1]Pontificia Universidad Católica de Chile, CEDEUS
[2]Pontificia Universidad Católica de Chile
[3]Centro de Desarrollo Urbano Sustentable (CEDEUS)

Presenting Author: ppasten@ing.puc.cl

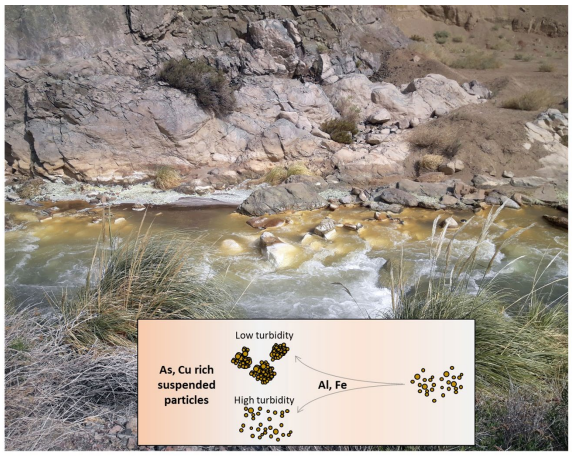

Figure 1. Al, Fe-controlled PSDs determine the physical fate of As, Cu in arid and semi-arid rivers.

Metal enrichment from natural and human origin (e.g. mining, urban metabolism) pose serious risks to water supply and ecosystems in arid and semiarid Andean rivers [1]. While the geochemical controls of metal partition have received much attention, the size distribution of metal-rich suspended solids has remained overlooked. The interaction between geochemical, hydrodynamic, and hydrological processes control the particle size distribution (PSD) of suspended solids. PSDs convey critical information for assessing pollutant fate and ecological impact: dominant particle size modes and volumes yield information on the settling potentials (related to the formation of metal repositories), while water turbidity is controlled by small modes [2-5]. This presentation will discuss results from natural and laboratory models that explored the connection between PSDs measured in-situ, metal partition, and turbidity, for a range of geochemical settings and stressors, including acid drainage and the release of metal-rich particle assemblages to surface waters. Notably, the interplay between Al, Fe and water chemistry determines PSDs and the binding capacity of suspended solids towards toxic metal(loid)s, controlling the physical and chemical fate of As and Cu. This knowledge is needed to feed public policy related to water infrastructure planning and environmental impact assessment in a context of climate change, as well as to develop effective wastewater discharge regulations for rivers in arid and semiarid regions.

References

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