

Trace-metal contamination in the glacierized Rio Santa watershed, Peru

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Abstract

The objective of this research is to characterize the variability of trace metals in the Rio Santa watershed based on synoptic sampling applied at a large scale. To that end, we propose a combination of methods based on the collection of water, suspended sediments, and riverbed sediments at different points of the watershed within a very limited period. Forty points within the Rio Santa watershed were sampled between June 21 and July 8, 2013. Forty water samples, 36 suspended sediments, and 34 riverbed sediments were analyzed for seven trace metals. The results, which were normalized using the USEPA guideline for water and sediments, show that the Rio Santa water exhibits Mn concentrations higher than the guideline at more than 50% of the sampling points. As is the second highest contaminating element in the water, with approximately 10% of the samples containing concentrations above the guideline. Sediments collected in the Rio Santa riverbed were heavily contaminated by at least four of the tested elements at nearly 85% of the sample points, with As presenting the highest normalized concentration, at more than ten times the guideline. As, Cd, Fe, Pb, and Zn present similar concentration trends in the sediment all along the Rio Santa.

The findings indicate that care should be taken in using the Rio Santa water and sediments for purposes that could affect the health of humans or the ecosystem. The situation is worse in some tributaries in the southern part of the watershed that host both active and abandoned mines and ore-processing plants.