

Content and distribution of arsenic in surficial sediments in Atacama Desert, northern Chile.

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In this contribution we study the first-order factors that control the content and distribution of arsenic in surficial sediments in an area of approximately 41,000 km² located between 18 - 21° S of the Atacama Desert.

The analyzed data was recently generated by SERNAGEOMIN (Geological and Mining Survey of Chile) as part of its national geochemical program. It includes whole rock concentrations (ICP-MS) for the <180 μm fraction of 2,167 surficial sediment samples.

In particular, the As content of the samples ranges between 2 and 2,886 ppm. The data presents 3 outlier samples with very high As concentrations linked to both natural (hydrothermal alteration zones; 1870 and 1793 ppm) and anthropogenic sources (mining; 2886 ppm). However, the high As contents for a number of other 50 samples could be also influenced by anthropogenic sources (mostly mining), as suggested by their geographical location and field observations.

After excluding the outlier and anthropogenic influenced samples, an interpolation map was generated in order to study the spatial distribution of As concentrations, as a result of natural conditions. It shows that most of the As-rich detritus are sourced from hydrothermal alteration zones and cenozoic volcanic-sedimentary sequences, located in the highlands. From these areas, As-rich detritus are transported downstream to the Pacific Ocean. However, numerous endorheic streams, transport this material to the central valley during relatively short periods of intense rainfall in the summer season ("Altiplanic winter"). Concordantly, the central valley coincides with a regional-scale As anomaly of 6,000 km², with mean concentrations of 59 ppm and maximum values of 843 ppm.

Therefore, the distribution of As in the study area, is controlled by both climatic (hyperaridity and Altiplanic winter) and geomorphological (strong topographic contrasts and the presence of an extended endorheic drainage basin).