

# Location and characterisation of pollution sites by principal component analysis of trace contaminants in a slightly polluted seasonal river: A case study of the Arenales River (Salta, Argentina)

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## Abstract

Principal component analysis (PCA) was used to deduce the common origin of trace contaminants in a slightly contaminated, strongly seasonal river of low-average discharge, aiming to ascertain the type of the pollution. Splitting of data into categories according to specific conductance was essential to reach conclusions. Dry-season data allowed the pinpointing of polluting sites by means of the biplots resulting from the representation of the scores on the components. Concentrations corresponding to the wet seasons yielded no useful results probably due to the high percentage of data below detection limits for 2 of the 6 variables. The Arenales River in North-West Argentina was monitored by means of 19 sampling campaigns between 2003 and 2005 comprising two hydrological cycles, at seven locations along a 25 km section of the river course across the city of Salta. Pollution of the river was not severe, overall mean values in  $\mu\text{g}/\ell$  being: As 1.2; B 490; Cu 4; Fe 92; Pb 13; Zn 83. Simple correlation analysis revealed no significant correlation between these elements. The high positive loadings of variables B and As concentrations on the first principal component and the biplots indicate that their main common point sources are boron mineral deposits still existing in the urban area. Interpretation of the biplots shows that Cu, Fe and Zn contamination also originated at point sources, the contribution of the sewage treatment plant being negligible.

**Keywords:** trace element contamination, water quality, principal component analysis, Arenales River, Salta, Argentina