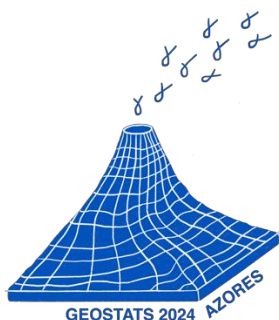


Hydrogeology



Relations between river sediments and dissolved matter

Juan Jose Egozcue¹; Vera Pawlowsky-Glahn²; Rita Fonseca³; Maria Teresa Albuquerque⁴

¹Universitat Politècnica de Catalunya, Spain; ²Universitat de Girona, Spain; ³Universidade de Évora, Laboratório AmbiTerra, Portugal; ⁴Instituto Politécnico de Castelo Branco, Portugal

A typical but actually unsolved problem is relating dissolved ions in water and the chemical composition of the corresponding sediments. Our first assumption is that both ion concentrations and the sediments are compositional in nature. Data from the 2022 and 2023 campaigns in the Trimpancho river (Mining System) (Huelva, Spain) are used to illustrate the possibilities and the challenges of such an analysis. The data consists of 23 sampling points recording both 14 dissolved ions (mg/L) and 10 elements (mg/kg) from the sediment. A first analysis of association using the proportionality index of parts (PIP) reveals that binary relations are weak, while the Aitchison-distance correlation indicates that there is some moderate correlation between dissolved ions and sediments. The relation was also examined using compositional canonical correlation. A surprising result was that up to three canonical functions exhibited very high correlations. A deeper evaluation suggested that these high correlations are due to overparametrization given the small sample size. Finally, after simplification of the canonical correlation model, some balances within dissolved ions and within sediments evidenced moderate correlations in accordance with the previous results.

Results show that the main relations involve several elements and single element relations are irrelevant. For instance, the ion balance of Ca, Cu, Fe, Zn over Mg, Mn, Ni has a 0.7 Pearson correlation with the sediment balance Al, Mn over Cr.

Correspondence to

Juan Jose Egozcue
juan.jose.egozcue@upc.edu

Open Access

Copyright © 2024 Egozcue *et al.*. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.