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Geochemical characterization and magnetic susceptibility of stream sediments from the Ombrone Grossetano River Basin (OGRB, Italy)

FRANCESCA GIANNETTI[1,2], DR. CATERINA GOZZI, PHD[1,2], GERD RANTITSCH[3], STEFANIA VENTURI[1,2,4,5], RICCARDO AVANZINELLI[1], ROBERT SCHOLGER[3], CLAUDIO NATALI[1,6], GIOVANNI ORAZIO LEPORE[1], MARTA MORANA[1], VALENTINA RIMONDI[1,2] AND ANTONELLA BUCCIANTI[1,2,4,7]

[1]University of Florence
[2]National Biodiversity Future Center (NBFC)
[3]Montanuniversität Leoben
[4]CNR-IGG Institute of Geosciences and Earth Resources
[5]Istituto Nazionale di Geofisica e Vulcanologia (INGV), Palermo Unit
[6]CNR-IGAG Institute of Environmental Geology and Geoengineering
[7]National Centre for HPC, Big Data and Quantum Computing

Geochemical composition of river sediments reflects the overall makeup of a drainage basin [1], making stream sediment surveys essential for environmental assessments. This is crucial as river ecosystems face increasing threats from pollution, land use modifications, and climate change.

This study focuses on the Ombrone Grossetano River Basin (OGRB, Italy), a major river ecosystem in Tuscany. Its lithological heterogeneity and the co-presence of protected areas and abandoned mining sites make it an ideal subject for in-depth environmental assessments.

33 samples were collected from the Ombrone river and its major tributaries. Each sample was divided in two aliquots (sieved at 2mm and 180µm) to explore geochemical and mineralogical variations in relation to grain size. Major, minor, and trace elements were measured via XRF analysis on both aliquots. Magnetic susceptibility was tested as a potential quick proxy for heavy metal contamination in these sediments [2].

Robust PCA was performed within the framework of compositional data analysis to explore data variability and identify multi-element trends. Results show that most samples' geochemical features are influenced by the siliceous-carbonate and clayey-sandy sequences that constitute the majority of the lithologies of the area. Phyllites, quartzites and ophiolitic sequences affect sediments on the basin's eastern side. Statistical tests indicate that grain size mainly controls the contents of Al_2O_3, TiO_2, P_2O_5, Zr, V and Rb, due to the presence of clays. Samples from right bank tributaries exhibit the highest magnetic susceptibility values, especially in the finer fraction, with magnetic minerals in both aliquots showing morphologies compatible with a natural origin. The spatial distribution of elements and sediment morphology seem to reflect both the basin's natural characteristics and the ore exploitation impacts.

This preliminary characterization provides the basis for further environmental assessments of the OGRB ecosystem.

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