

## **Methodology to quantify the role of the factors controlling the variation of rivers' total dissolved solids in Jiu Catchment (Romania)**

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The total dissolved solids (TDS) is a river water quality parameter reflecting its concentration in solute ions. It is sensitive to many physical and anthropogenic features of the watershed. In this context, the objective of this work is to analyze the spatial variation of the TDS and to identify the role of the main controlling factors (e.g. geology, soils, land use) in Jiu River and some of its main tributaries, by using a methodology based on GIS and multivariate analysis. The Jiu watershed (10,000 km<sup>2</sup>) is located in south-western Romania and it has a high diversity of physical and anthropogenic features influencing the water flow and its quality.

The study is based on TDS measurements performed in August, 2016, during low flow conditions in the Jiu River and its tributaries. To measure in situ the TDS (ppm), an EC/TDS/Temperature Hand-held Tester was used in the 12 measuring points on Jiu River and in another 7 points on some of its tributaries. Across the hydrographic basin, the recorded TDS values ranged from 31 ppm to 607 ppm, while in the case of Jiu River, the TDS varied between 38 ppm at Lonea station (upper Jiu River) and 314 ppm at Ișalnița (in the lower course). For each catchment corresponding to the sampling points, the influence of some contiguous features was defined on the basis of the lithology (marls, limestones, erodible bedrocks) and soils (clay textures), as well as the land cover/use influencing the solubility and solid content. This assessment was carried out in GIS through a set of spatial statistics analysis by calculating the percentages of the catchment coverage area for each determinant. In order to identify the contributions of different catchment features on the TDS variability, principal components analysis (PCA) was then applied.

The results revealed the major role of the marls and clayey soils in the increase of TDS (on the Amaradia and Gilort rivers and some sections in the middle course of the Jiu River). In contrast, turbidity did not play a significant role in the variation of TDS. The presence and extent of agricultural and industrial areas also have some influence, indicated by its positive correlation with TDS, at 95% confidence level. Thus, the main contributory variables in the increase of TDS are the geological substrate and soil texture across watersheds, followed by the anthropogenic disturbances (reflected by agricultural and industrial activities).

Keywords: total dissolved solids, Jiu River, PCA, GIS