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Potash mining mountain waste and its contribution to river water salinisation: the case of the Llobregat River, Catalonia, Spain

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It is well known that mining activities have negative effects on fluvial ecosystems. Such activities alter the water quality by introducing heavy metals and associated pollutants and alter the sediment regime by creating a point source sediment that may affect the entire basin.

In the Llobregat River, a medium Mediterranean river basin (ca. 5000 km^2), potash salt mining activities have been undertaken for several decades. Salinisation of surface river water has become an environmental issue of great concern for the water administrators given that the water of this river supplies half of the population of the metropolitan area of Barcelona (ca. 2,500,000 inhabitants) and it is also used for irrigation in the lowermost part of the river and its delta.

This study aims to describe the magnitude of the dissolved solids inputs that are detected in the river surface water after rainfall events by means of continuous electrical conductivity monitoring. Electrical conductivity records (EC) were obtained from an automatic water quality monitoring station set by the Water Catalan Authorities and located 3 km downstream from the potash mountain waste. The study also tries to predict the EC peak according to different hydrometeorological parameters selected from the episodes recorded.

Data analysed was continuously recorded at 15-minute interval between January 1st, 2018 and September 30th, 2020 and a total of 74 EC episodes were considered. Mean EC of the episodes recorded was 3,488 µS/cm, with a standard deviation of 3,638 µS/cm, and a coefficient of variation of 104.3%. The median was 2,390 µS/cm. Data obtained show that after rainfall events a peak of electrical conductivity in the river is detected. However, it exhibits a high variability in its magnitude, ranging from 939 µS/cm up to 26,900 µS/cm. Despite this, the coefficients of determination of the regression lines between the meteorological variables, such as rainfall intensity or total rainfall amount, and the peak EC exhibit poor correlations (R^2=0.355 and R^2=0.229, respectively), although they are significant.

Results indicate that washload processes in the salt mountain waste take place and reach the river producing extremely high EC peak values during a short period of time. Such values can have harmful effects on the river ecosystem and affect the lowerland river area, where water is diverted for potabilization and irrigation purposes. However, the low correlation between rainfall and EC

peak indicates that additional variables intervene in the rainfall-runoff processes and further research is required to fully understand the connectivity and transmission of the salt moutain waste into the river. Understanding such processes and analyasing the consequences on the fluvial system, will probably be the way to tackle the restoration of this enormous impact on this river ecosystem.