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Sediment quality in Rivers and their estuaries of an olive oil production area, Messinia, Greece.

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Sediment analysis at four major rivers (Pamisos, Aris, Velikas and Nedon) and their estuaries towards heavy metals took place in the Prefecture of Messinia, Greece, during two sampling campaigns in 2008 and 2011. The main industrial activity in the region is the operation of 250 olive oil industries and the main problem concerning pollution derives from the vast quantities of olive mill waste waters that are being generated annually most of which is currently discharged in nearby streams. Chemical parameters such as phenols, total organic carbon and certain heavy metals were found to be strongly correlated with the wastes from the olive oil industries.
Major and minor elements (heavy metals) were measured in riverine and estuarine sediments. In parallel heavy metals were determined in the olive waste from a local industry, using atomic absorption spectrometry, in order to correlate the results with the sediment analysis. Major and Minor elements were recorded based upon the total percentage of the sediment samples and in order to eliminate the grain size effect, the concentrations were normalized towards Al. A pollution indice, the sediment enrichment factor, was also calculated, the high values of which towards Cr are of particular interest. Additionally organic carbon and total phenolic compounds were determined in rivers and their estuaries. High concentrations of Chromium were recorded in River Aris sediment, which seems to be the most polluted. Relatively high concentrations of zinc were encountered at rivers Aris and Pamisos while the chromium load seems to be higher near the estuaries of the rivers. The olive mill waste water analysis confirmed the existence of chromium in the waste and extremely elevated values were also found at a nearby station where these wastes tend to accumulate for decades. In contrast the results from the Nedon River indicated that it is not affected, since the low values found remained constant from the source of the river until its outfall in the Messinian Gulf. A significant enrichment in phenolic content of sediments as well in organic carbon was observed in 2011 when compared to 2008, in most of the cases, indicating degradation of the study aquatic ecosystems of Messinia Prefecture.