



Contamination of sediments and water of a wet dune slack (SW Portugal)

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Lagoa da Sancha (LS), located in the Portuguese SW coast, is a small (0.12km²) wet dune slack with a shallow (<1m) open-water body, which occasionally dries out in summer. This environment is part of a Natural Reserve since 2000. It collects inputs from a 35km² watershed essentially draining Cenozoic sandy materials. The main anthropogenic activities in the catchment area are related to agriculture and hog raising; however, an industrial waste disposal located proximal to LS, infilling an abandoned quarry, has been recently discovered.

Field surveys have been conducted in March 2014 in order to collect sediment and water samples in LS as well as in the industrial waste disposal (TW3); riverine water and sediments and underground water have also been collected. Sedimentological (texture, pH, calcium carbonate and organic matter content) and geochemical (major elements, metals and organic compounds) analysis have been performed.

Results show that riverine and groundwater have neutral pH and low to medium mineralization of NaCl to CaHCO₃ types. The only metal found in high concentrations is iron, with a maximum value of 1200 ug/L. The texture and composition of alluvial sediments are compatible with the geologic background.

LS bottom sediments are CaCO₃-free organic muds, hyperacid and low organic; they present high contents of heavy metals, organic compounds (101 to 102 mg/kg) and S (2700 mg/kg). Also, the LS hydrosome presents pH values < 3, electric conductivity up to ≈ 8 mS/cm and very high concentrations of dissolved metals (iron attains 20000 ug/L and the heavy metals content is up to 3 orders of magnitude higher than in both the surface and groundwater). Dissolved hydrocarbon species (fraction C4-C10) reach 11 ug/L and bromoform 17 ug/L.

Chemical analysis to TW3 revealed the presence of a large diversity of organic compounds in concentrations of up to 105 mg/kg.

Hydrocarbon species and very high S content were only found in the soil and water of the waste disposal and in Sancha water and sediments, indicating that the lowland contamination probably originates by groundwater transport. In order to identify the hydrocarbon and S contamination plume, groundwater flowlines were drawn using the Modflow software and the particle tracking method. Results show that the Sancha lagoon is in the pathway of groundwater infiltrated in the hydrocarbon contaminated waste disposal area.