

Geochemistry of sediments contaminated by agricultural practices in the Laguna Honda wetland (Jaén province, Spain)

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The composition of sediments in saline wetlands is the result of detrital and anthropic inputs and their interactions with water table and communities of organisms in the ecosystem. Many of the saline wetlands at the eastern end of the Guadalquivir Basin are receptors of pollutants coming from agricultural practices of olive cultivation. A set of 130 samples in a sampling network of 47 points in the Laguna Honda saline wetland was geochemically analyzed. The relationship between detrital inputs, carbonaceous matter content, authigenic crystallization of minerals and trace element fixation processes was evaluated by statistical factor analysis. Four factors related to possible processes occurring in the lake were obtained explaining 87.28% of the system variance. The first factor (41.77% of variance) explains revealed two associations of elements. K, Fe, Al, Si and Ti have high positive weights in the factor and were associated to a detrital source from the surrounding materials. Ca and LOI show negative weights in the first factor, which can be associated with a process of calcium carbonate precipitation in the sediments. In the second factor, Mg, Cu, organic matter content and S have positive weights. This grouping is negatively correlated in the factor with depth and Zr content. Second factor can be associated to the formation of floating algal mats that provide a high content of organic matter in the shallowest sediments where the formation of epsomite and halite crusts is favoured. High organic matter concentration favours Cu adsorption from agricultural treatments and its transformation into copper sulphides through the action of sulphate-reducing bacteria. The third factor reveals the existence of a relationship between the accumulation of Au and REE, suggesting a mechanical transport process of Au nanoparticles coming from agricultural treatments. The fourth factor is characterised by significant weights of Hg and S which can be related to the fixation of Hg through the precipitation of sulphides mediated by sulphate-reducing bacteria.

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