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Functioning of an alluvial wetland zone deduced from a geochemical multi-component analysis of their waters, using "mixing diagrams"

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With the objective to identify and quantify the various processes taking place in a wetland alluvial zone (the alluvial wetland zone of Monbequi located along the Garonne river (SW France)), an end member multicomponent analysis using mixing type diagrams was developed. Several important features concerning the functioning of this wetland zone could be deduced:

a) Identification of water masses : using "conservative elements" (18O/16O, Cl, Na , and Ca) three water masses constituting end members in the mixing diagrams were identified : the Garonne river, and two distinct types of groundwaters, a first one corresponding to an interaction with the molassic substratum , and the second Ca^{2+}, Mg^{2+} enriched water mass, corresponding to an interaction with a shell rich alluvial zone boarding the Garonne River.

b) Identification of distinct biologically active zones: the mixing diagram analysis allowed to identify and quantify the excesses and deficits relatively to the simple mixing trends relying the three water masses compositions, of unconservative compounds (COD, NO3, O2, Mn, Fe) interpreted as taking part to bio-geochemical and physico-chemical processes. The analysis of the spatial repartition of these excesses or deficits of identified compounds allowed identification of two major biologically active zones (i) a first one extending along the contact zone between the Garonne river and the

alluvial groundwater characterized by COD, NO_3^-, O_2 deficits and Fe, Mn excesses. This zone corresponds to the oxidation of the organic matter brought by the Garonne river by a set of oxidants including the nitrates from the wetland aquifer (denitrification process) (j) the second one extending upon the riparian area, at the outlet of the groundwaters flows within the Garonne river, characterized on the opposite way by NO_3^-, COD excesses (nitrification process) , but also O2 deficits; It is interpreted as corresponding to the mineralization and further oxidation of the organic matter abundantly produced within this zone.

© Identification and quantification through their identified oxidized products (nitrates , carbonates in excess) of the fluxes of organic matter from distinct origins. This analysis lead to estimate the flux of organic matter formed locally and oxidized to be ten times higher than the flux of organic matter brought by the Garonne river, which is indicative of the high production rate of organic matter within the wetland zone.

Finally the conclusions reached lead to advance a conceptual model for the functioning of this wetland zone.