Short-term Oxidation-Reduction Processes within a Hypoxic Estuary, using an In Situ Mass Spectrometer

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The Oiartzun river estuary (Basque Coast, Northern Spain) holds the second commercial harbor of the region. The special morphology of the estuary (like a small fjord) is strongly modified for navigation purposes. The corresponding catchment and river flow are very small, whereas the estuarine volume is relatively high. The estuary is mesotidal, with high residence times of the water masses, especially for some inner locations. The water clean-up has experienced important improvements in recent years; however, high organic mater loads (mainly from domestic wastes) are still discharged into the inner locations. This produces strong and relatively fast oxygen consumption, enhanced by organic mater rich, heavily reduced sediments. This leading frequently to hypoxia events (measured), denitrification (observed, measured) and sulphatereduction (empirical sulphide smell).
The aims of this contribution are:

- To determine if the concentrations of the molecular species (non ionic forms in the dissociation or hydrolysis equilibria), associated to the abovementioned processes, are high enough to be detected

- To determine these patterns in quantitative or qualitative ways

The study was undertaken by means of an In-Spectr 200-200 Underwater Mass Spectrometer (UMS), manufactured by Applied Microsystems, based in the model developed in the University of South Florida. The UMS was used to analyze surface and bottom samples, along a tidal cycle, together with CTD sampling (temperature, salinity, dissolved oxygen, pH, light transmission, and chlorophyll) and Niskin bottles (to analyze ammonium, nitrite, nitrate, phosphate, silicate, sulphide, TOC…).

Hence, this contribution couples classical marine monitoring data (CTD continuous profiles), with discrete depth water samples (Niskin bottles), and continuous in-situ UMS measurements. The results are used for calibration/quantification of UMS data and a monitoring improvement, with better spatial and temporal resolution.