Water and ecological quality in the Aljezur coastal stream (Portugal)

ABSTRACT:

Authors: Marta Rodrigues, Anabela Oliveira, Martha Guerreiro, André B. Fortunato, Henrique Queiroga

Water and ecological quality in coastal areas is a matter of issue in Europe and worldwide, as stated by some European Directives (e.g European Water Framework Directive, Bathing water Directive). Therefore, integrated tools that allow the evaluation of the water and ecological quality of surface water bodies are useful to support their sustainable management. This study aims at validating the extension of a water quality and ecological model (ECO-SELFE, Rodrigues et al., 2009), focusing in different water quality parameters and taking advantage of the recent detailed field campaigns in the Aljezur coastal stream (southwest coast of Portugal) that included measurements of physical, chemical and biological quantities.

ECO-SELFE is a coupled 3D hydrodynamic and ecological model which targets river to ocean scales. Previous versions of ECO-SELFE include the simulation of the carbon, nitrogen, phosphorous, silica and iron cycles for several variables (zooplankton, phytoplankton, dissolved organic and inorganic matter, inorganic nutrients and dissolved inorganic carbon), but the oxygen cycle was not explicitly solved by the model. Thus, the first extension of the model regarded the oxygen cycle, since dissolved oxygen is one of the main indicators for the evaluation of the quality of water bodies. To allow the simulation of this cycle, two new state variables - dissolved oxygen and chemical oxygen demand - were added in the model. The processes considered in the oxygen cycle are: the gross primary production, the respiration of the community (zooplankton, phytoplankton and bacterioplankton), the pelagic chemical reactions and the reaeration. Due to the nature of the study area, which is used for bathing purposes, fecal contamination is another matter of interest in the study of the water quality of the stream. Therefore, the second extension of the model regarded the inclusion of a new module for the fecal contamination simulation, which can ran together or independently of the ecological module. For the simulation of the fecal contamination two new state variables were added *Escherichia coli* and enterococcus.

The extended ECO-SELFE was validated in the Aljezur coastal stream using different measurement periods (September and May), which allowed the evaluation of different environmental and seasonal conditions. The evaluation of the spatial dynamics was also possible since data were measured at several stations located along the stream, from freshwater to marine conditions.

References:

Rodrigues, M., Oliveira, A., Queiroga, H., Fortunato, A.B. and Zhang, Y.J. (2009). Three-dimensional modeling of the lower trophic levels in the Ria de Aveiro (Portugal), *Ecological Modelling*, 220 (9-10), 1274-1290.