IX Congresso sobre Planeamento e Gestão das Zonas Costeiras dos Países de Expressão Portuguesa
Instituto Superior Técnico | 14 a 16 de Maio de 2019 LISBOA2019

ASSESSMENT OF ESTUARINE PLUME IN A COASTAL AREA USING HIGH-RESOLUTION MODEL. THE TAGUS MOUTH CASE.

de Pablo, Hilda *; Sobrinho, João *; Garcia, Mariangel *; Brito, David **; Campuzano, Francisco*; Neves Ramiro *

✉: hildadepablo@tecnico.ulisboa.pt

* Maretec, Instituto Superior Técnico, Universidade de Lisboa. Av. Rovisco Pais, 1049-001 Lisboa, Portugal

**Bentley Systems, Edificio Mar do Oriente nº63 Escritório 3 1Lisboa, Alameda dos Oceanos, Lisboa

RESUMO

In coastal areas, the time and spatial scales of flow are determined by the tide, being of the order of hours. These time and space scales are important for navigation or fishing but are too small for managing nutrient loads, i.e. eutrophication. Residual circulation gives some insight on the preferential transport but does not allow its quantitative characterization because does not account for diffusion due to transient advection. In this work, it is proposed to compute long-term transport using integration control volumes. This calculation provides information about time variability of properties inside the control volume and the net fluxes of any property across its boundaries. Using several adjacent boxes this integration allows for the calculation of the effect of region inside a control volume over its neighboring regions. Using piles of control volumes one can quantify vertical fluxes - very important in upwelling areas - and compare them with horizontal transport. This is particularly important at the mouth of estuaries like the Tagus Estuary.

This strategy was used in the Tagus estuary, one of the largest estuaries in Western Europe, and adjacent coastal area. In this region, the long sea Guia submarine outfall discharges the waste water from the Costa do Estoril region with about 800 000 equivalent inhabitants. Through a downscaling approach, the three-dimensional (3D) MOHID model was run to simulate tide-generated flow, density currents, atmospheric forcing, and biogeochemical processes controlled, mainly, by vertical transport and the Tagus Estuary discharge.

The hydrodynamic model was validated using tide gauge data collected at both mouths and inside the estuary. The results of the biogeochemical model were validated using data and monitoring programs carried out in the study area. The fluxes were integrated into time and space (vertically and horizontally) using the boxes methodology implemented in the domain. The results are presented for five different river flow classes, determined from the ten-year analysis of the Tagus river flow.

Results show that the extension of the estuarine plume is determined by the river discharge and that the tidal flow associated with the estuary flood/ebb dynamics dominates the horizontal transport in the Tagus mouth vicinity. However, the vertical transport forced by the wind generated important vertical transport of nutrients from the deeper layers.

Using the integration methodology, it was easy to compare the relative importance of vertical and horizontal transport for the biogeochemical distributions at the mouth of the estuary and to compare them with the loads from the submarine outfall for different seasons, driven by the variability of the river discharge and of the upwelling regime. It was also possible to show that the submarine outfall loads are of secondary importance when compared with upwelling and river discharge.