Numerical simulation of the river and urban discharges into the Sea: Application to the Catalan Coast.

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Introduction

The coastal oceans are the recipient of freshwater and land/drained materials that are primarily brought in through river and urban discharge [Kourafalou et al., 1996]. Freshwater discharge from rivers and urban outflows to the ocean water has profound effects on the physical, chemical, and biological processes in coastal waters. It induces circulation patterns and modifies mixing processes [Milliman and Farnsworth, 2011]. Due to their ecological and dynamical importance, a good understanding of the mixing and transport processes in river plumes is required for the maintenance of coastal ecosystems and their resources.

In this paper will discuss the results of the land boundary fluxes implementation into the coastal circulation model. As a demonstration part of the Catalan coast has been chosen. The combination of local topography with torrential rainfall can produce considerable local runoff on a short time with a large impact on the receiving coastal waters.

Methodology and aim

For the coastal circulation model, version 3.0 of the Regional Ocean Modeling System [ROMS, Shchepetkin and McWilliams, 2005] has been implemented for small portion of the Catalan coast. ROMS uses sigma coordinates and solves the 3-D Reynolds-Averaged Navier-Stokes equations. The code design is modular, so that different choices for advection and mixing, for example, may be applied by simply modifying preprocessor flags. Nested increasing-resolution models have been implemented in order to reproduce with enough resolution the coastal circulation and the river plume evolution. The boundary conditions are obtained from the MyOcean products.

River and urban run-off are estimated based on rainfall (predictions) form the contributing catchments areas. Conceptual models based on a reservoir-type schematization of the river and sewer network have been set up to allow the fast prediction of the different point source boundary conditions [Keupers et al., 2011].

Model output for selected events will be compared to data from dedicated campaigns during the Field_AC Project and to data from operational buoys in the Catalan coastal area.

References

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