Modeling and observation of freshwater and sediment plumes at the Catalan Coast.

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Coastal ocean regions are dynamic and complex environments that are driven by an intricate interaction between atmospheric, oceanographic, estuarine/riverine and land–sea processes [Smith et al., 2010]. Specifically, 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]. In addition, the coastal plume formed by the buoyant inflow is a highly dynamic region with significant salinity gradients and constitutes an important dynamical component of the coastal circulation [Morris et al., 1981]. 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. The combination of satellite ocean data, in situ coastal ocean measurements and use of numerical models offer exciting opportunities to improve our knowledge of the ocean dynamics, in coastal areas.

In this paper results from a coastal circulation model for the Catalan coast (will be compared with data from dedicated campaigns and satellite observations. The simulation incorporate river and urban discharges into the sea. The combination of local topography with torrential rain fall can produce considerable local run-off on a short time with a large impact on the receiving coastal waters. This can be captured by satellite data (Figure 1) and campaign data.

Methodology and aim

For the coastal circulation model, version 3.0 of the Regional Ocean Modeling System (ROMS, Details on [Haidvogel et al., 2000]) has been implemented for a 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 domains have been used in order to reproduce with enough resolution the coastal circulation. The boundary conditions are obtained from the MyOcean project [http://www.myocean.eu.org/].

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 satellite data from My-Ocean project [http://www.myocean.eu.org/], to data from dedicated campaigns during the Field_AC project [http://lim050.upc.es/field_ac/index.html] and to data from operational buoys in the Catalan coastal area.

References