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Spatial wind heterogeneity in coastal areas and its effects on water circulation (The Alfacs Bay case, Ebre Delta)

Pablo Cerralbo, Manel Grifoll, and Manuel Espino
Maritime Engineering Laboratory (LIM), Universitat Politècnica de Catalunya, Barcelona, Spain (pablo.cerralbo@upc.edu)

Two semi-enclosed bays closes the Ebre Delta on north (Fangar) and south (Alfacs). Both bays receives direct freshwater input from drain channels of rice fields 9-10 months a year. Southern bay, Alfacs, is about 16km long by 4km wide with an average depth of about 3.1 m (maximum of 6.5 m in the middle). The mouth is about 2.5 km wide.
Wind observations revealed relevant spatial – and temporal- heterogeneity on both intensity and direction. In particular, noticeable effects were detected on sea breezes and north-westerly winds. On both cases, the effects of topography -mountains around are 700m high- were evident. The importance of the wind on the water circulation and hydrography of the bay has been studied in the past, however homogeneous wind conditions were assumed. In this work we present the spatial variability observed in wind conditions and its effect on water circulation. The analysis of the effects on hydrodynamic and hydrography were carried out through the implementation of several numerical tests using the circulation model ROMS (Regional Oceanic Modelling System). From the simulations we conclude that the spatial variability in wind conditions affects the circulation pattern and the exchange between the open sea and the inner bay.