



Coastal oceanographic tools for coastal lagoons. The Alfacs bay in the Spanish Mediterranean

Agustín Sánchez-Arcilla (1), Pablo Cerralbo (1), Marc Mestres (1), Marta Fernández-Pedrerera (1), Manuel Espino (1), Margarita Fernández (2), Sergi Tudela (3), and Eduard J. Chifré (3)

(1) Universitat Politècnica de Catalunya (BarcelonaTech), Laboratori d'Enginyeria Marítima, Barcelona, Spain, (2) IRTA, Carretera Poble Nou km 5.5, Sant Carles de la Ràpita, Tarragona, Spain, (3) Direcció General de Pesca i Afers Marítims – Generalitat de Catalunya, Barcelona, Spain

Coastal lagoons are highly productive areas (for instance regarding aquaculture) and subject to multiple pressures. The challenge for oceanographic predictions is compounded by significant land discharges, in some cases coexisting with a micro-tidal range. The resulting problem can be illustrated by the Alfacs bay in the Ebro Delta of the Spanish Mediterranean coast where there is, for most of the year, a persistent structure with a salt wedge layer and fresh water from land discharges floating above it. Such fresh water discharge, coming from rice field irrigation, contains nutrients and pesticides and therefore affects in multiple ways the productivity and water quality of the bay, where residence times can be large depending on prevailing met-ocean conditions. The application of a nested oceanographic suite, forecasting circulation and surface waves within the bay, provides objective information to solve water quality problems that are becoming more acute due to temperature and concentration peaks during the summer period, where sea water may exceed 28°C with high rates of mortality and therefore a significant impact on the local economy.

In this paper we explore the suitability of land boundary conditions and the controlling effect of the bay mouth on the resulting 3D circulation patterns, looking at renovation times, bed and free surface friction and the level of turbulence in the water column. We shall also discuss the implications of opening a connection between the sea and the bay domain through the outer beach and how it affects water temperature and concentrations. A set of 3D ROMS simulations spanning one year (2014), with outer boundary conditions from IBI MFC, will be compared to intensive field campaigns and discussed in terms of water renovation and quality as a function of met-ocean conditions. The implications of a connection to the outer sea will also be analysed, as a natural and sustainable type of intervention that can be assessed with the proposed shallow water oceanographic suite. From here a set of conclusions on the models' performance and on the effectiveness of such a sustainable intervention will be discussed.