

Hydrodynamic response in a microtidal and shallow bay under wind and seiche events

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In this contribution we investigate the hydrodynamic response in Alfacs Bay (semi-enclosed bay in The Ebro Delta, NW Mediterranean Sea). The bay is micro-tidal, with a mixed tidal regime and a persistent hydrographic structure during most of the year (salty layer in the bottom and freshwater layer on top due to freshwater input from rice fields). Short-term response to energetic wind events was identified in the T/S and water velocity observations, sometimes inverting the estuarine circulation or developing one-layered flow. In comparison to previous investigations in Alfacs Bay, we observed that water current variability, and also maximum velocities, were directly related to the development of surface standing waves (i.e. seiches). Mixing mechanisms versus buoyancy sources are studied through adimensional numbers, potential energy anomaly equation and numerical model (ROMS), proving the leading freshwater contribution to stratification, enhanced by heat fluxes in summer. On the other hand, mixing is directly related to winds, mainly in winter and early spring when both buoyancy forces are lower. Seiche induced mixing is suggested as an eventual mechanism that may break the stratification within the Bay under special circumstances. Finally, the role of freshwater contribution to the estuarine circulation is analyzed as a possible mechanism influencing the water residence time in the bay and the different ecological problems associated.