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Flow in the Ebro Delta shelf, Numerical models and laboratory simulations

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This work presents the results of two laboratory and numerical experiments. The characteristic induced structures by stationer typical conditions from spring, summer, fall and winter. Laboratory experiences were developed on a five meters turntable (SINTEF facilities) obeys the Froude-Rossby similarities. While, the meso-escale numerical model was developed in the LSEET laboratory. This work evidences complementary results from the vortex sort characteristic by radius from both experimental and model methods. Additionally numerical model has a better representation from the conditions in the first 15km and the laboratory model represent the resolution between the large and the meso scale boundary.

Physical variables that describe mixing are compared with experimental laboratory results from a large number of studies of mixing dynamics in environmental fluids to find habitat regimes for primary production. The work relates physical and biological variables, and emphasises the utility of laboratory studies. Several laboratory experiments that focused on turbulent mixing dynamics in stratified shear flows are used to describe (a) mixing in the estuary and (b) induced circulation in the river plume. Mixing descriptors as entrainment, Richardson number and Reynolds number and field

data were employed, and advanced techniques of laboratory simulations, image processing and numerical modelling were used to match (a) to (b). Four kinds of experiments were used to describe the dynamics in the whole estuary.

Mixing turbulence across a density interface generated by an oscillating grid inside a mixing-box. The horizontal advance of a turbulent front in a stratified system with a lateral current, inside a 1 m x 1 m square box. Induced circulation in the delta del Ebro slope and shelf that were performed with an experimental model in a 2 m x 4 m rectangular tank on a 5-m diameter turntable. Dispersion simulations in the river plume with the OCK3D code.

Experiments were performed in the UPC applied physics laboratories in Barcelona and in the SINTEF laboratories in Trondheim. The estuary under study (delta of the Ebro), where a stable saline wedge is present the greater part of the year, driven by the river flow changes, was seen to behave acording to the experiments even for the transient flows.