Geophysical Research Abstracts
Vol. 17, EGU2015-5736-1, 2015
EGU General Assembly 2015
© Author(s) 2015. CC Attribution 3.0 License.

Rip currents in three-dimensions with a fully-coupled model: application to the sediment transport

Anne-Claire Bennis (1), Franck Dumas (2), and Fabrice Ardhuin (3)

(1) M2C, UMR CNRS 6143 - University of Caen, 24 rue des Tilleuls, 14000 Caen, France, (2) Dyneco/Physed, Ifremer, Technopole Pointe du Diable, 29280 Plouzané, France, (3) LPO, CNRS/IRD/Université de Bretagne Occidentale/Ifremer, Technopole Pointe du Diable, 29280 Plouzané, France

The mechanics of rip currents are complex, involving interactions between waves, currents, water levels and the bathymetry, that present particular challenges for numerical models. The pioneer work of Yu and Slinn (2003) shows the reduction of the offshore extension of the rip system due to the currents effects on the waves (CEW). Weir et al. (2011) have quantified the impact of CEW in terms of bottom friction. They also highlighted the modification of the breaking acceleration by CEW. First, we redo their experiment in three-dimensions, that differs from these previous studies. Similar results are obtained: the offshore reduction of the rip system, the change of sign in the perturbation of the alongshore group velocity, the change in wave breaking acceleration... We also observe that the wave-current interactions are strongly modulated by the intensity and the shape of the horizontal mixing, with a significant impact over the water column. According to the parametrization of the wave breaking dissipation, some changes are noticed in the vertical profiles of the rip currents. The cross-shore pattern is modified over the water column. Three parameterizations are tested. They take the effects of an opposite current and of the steepness of waves into account. Second, sediments are added in our configuration. As mentioned by Uchiyama et al. (2014) for the same bi-dimensional case, we find that CEW affects the elongation of the rip channel. Three-dimensional simulations also show that the concentration of suspended sediment is weaker within the water column with CEW than without CEW. That is due to a weakest flow with CEW.