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Numerical simulation of wave-current interaction under strong wind conditions

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Although ocean surface waves are known to play an important role in the momentum and other scalar transfer between the atmosphere and the ocean, most operational numerical models do not explicitly include the terms of wave-current interaction. In this work, a numerical analysis about the relative importance of the processes associated with the wave-current interaction under strong off-shore wind conditions in Gulf of Tehuantepec (the southern Mexican Pacific) was carried out. The numerical system includes the spectral wave model WAM and the 3D hydrodynamic model POLCOMS, with the vertical turbulent mixing parametrized by the kappa-epsilon closure model. The coupling methodology is based on the vortex-force formalism. The hydrodynamic model was forced at the open boundaries using the HYCOM database and the wave model was forced at the open boundaries by remote waves from the southern Pacific. The atmospheric forcing for both models was provided by a local implementation of the WRF model, forced at the open boundaries using the CFSR database. The preliminary analysis of the model results indicates an effect of currents on the propagation of the swell throughout the study area. The Stokes-Coriolis term have an impact on the transient Ekman transport by modifying the Ekman spiral, while the Stokes drift has an effect on the momentum advection and the production of TKE, where the later induces a deepening of the mixing layer. This study is carried out in the framework of the project CONACYT CB-2015-01 255377 and RugDiSMar Project (CONACYT 155793).