Wave Forced Nearshore and Shelf Circulation

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Several theories for the wave-forced mean flow are compared, including the works of Mellor (2003), McWilliams et al. (2004) and Groeneweg (1999). These theories include three-dimensional radiation stresses, wave-current refraction and vortex force with conservative and non conservative processes.

Using the Generalized Lagrangian Mean, a set of equations is proposed that includes most of these effects. Then emphasis is laid on the implementation in the three dimensional oceanographic model Regional Ocean Modeling System (ROMS) and on applications to nearshore and shelf circulations. The impact of the Earth's rotation on the wave-induced set-up, on the wave-induced mass transport and on the return flow are discussed at the scale of the inner-shelf.

Impacts of swell and wind sea are separated. The undertow in the surf zone is also described using this formalism.