Wave-current interactions in three dimension: from the shelf to the surf zone

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The interactions of waves and currents are considered at coastal and littoral scales using a combination of numerical modelling, and remote sensing. A new theoretical framework for wave-current interactions based on the Generalized Lagrangian Mean (Ardhuin et al., Ocean Modelling 2008) is presented together with some first results obtained in academic situations with the primitive equations ROMS model forced by a simple wave model (Thornton and Guza, J. Geophys. Res. 1983). The different forces appearing in the 3D balance are discussed, together with a possible parameterization of strong wave nonlinearity. The feedback of surface currents on ocean waves is considered with some evaluation of ocean current quality based on wave model hindcasts and new observation techniques using SAR-derived Doppler velocities (Chapron et al., J. Geophys. Res. 2005). Perspectives are finally given on a fully coupled current-wave system and its use of remote sensing data.