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A24B-2576: Topographic effects on low-frequency variability in three-dimensional transient littoral currents

ABSTRACT

Tuesday, February 23, 2016
04:00 PM - 06:00 PM
Ernest N. Morial Convention Center - Poster Hall

Shear instability in wave-driven littoral currents leads to two distinctive transient processes that are responsible for very low frequency (VLF) variability around surf zones. One is so-called *shear wave* associated with cross-shore shear in longshore currents driven by obliquely incident waves. The other is offshore erupting coherent eddies (*surf eddies*) induced by alongshore shear in rip currents under near-normal incident wave conditions. We analyze both the processes with the ROMS-WEC model (Uchiyama *et al*., 2010), a coupled phase-averaged wave-current interaction circulation model based on an Eulerian-averaged vortex force formalism of McWilliams *et al*. (2004). The model successfully reproduces 3-D shear waves observed during the SandyDuck field measurement, with reduced variability due to topographic irregularity in the alongshore direction. Rip current-induced surf eddies are generated ubiquitously on a surveyed beach topography, showing significant depth-dependency that results in faster decay of enstrophy and kinetic energy than depth-independent 2-D surf eddies. These VLF motions are excited with a steady wave forcing either with the 3-D or 2-D models. The feedback mechanism of current effects on wave (CEW) is found to be essential to impel the VLF-EKE (eddy kinetic energy) shoreward. Alongshore irregularity in the beach topography is found to be crucial to enhance the shore-confined VLF-EKE substantially.

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