Geophysical Research Abstracts
Vol. 17, EGU2015-4293, 2015
EGU General Assembly 2015

Hydrodynamic instability mechanism for rip currents

Jie Yu

Civil Engineering Program, Department of Mechanical Engineering, and School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, New York 11794, United States (Jie.Yu.1@stonybrook.edu)

On re-examining the hydrodynamic instability, Yu (*J. Fluid Mech.*, vol. 549, 2006, pp. 403–428) showed that when the fully dynamical interactions are duly accounted for, and proper mathematical analysis is carried out, the positive feedback between the wave and evolving current can initiate and sustain rip current circulations with scales comparable to field observations on alongshore uniform beaches. In this study, we extend that analysis to consider non-planar beaches, and to include a *new* branch of unstable modes that correspond to alongshore propagating horizontal circulations with the magnitudes of the flow growing in time. This latter has not previously been studied. These propagating unstable modes have typical time periods of tens of minutes and alongshore propagation speeds of a few cm/sec. The physical implications of their spatial and slow time oscillations are discussed, as of relevance to occurrence and recurrence of transient rips, alongshore migration of rip currents and very low frequency pulsations in surf zone eddy circulations.