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Stochastic Breaking Progressive Waves

Juan Restrepo (1), Jorge Ramirez (2), Luc Deike (3), and Ken Melville (4)

(1) Oregon State University, Mathematics, Corvallis, OR, United States (restrepo@math.oregonstate.edu), (2) Universidad Nacional de Colombia, Mathematics, Medellin Colombia, (3) Princeton University, Aerospace and Mechanical Engineering, Princeton NJ USA, (4) Scripps Institute of Oceanography, University of Calfornia, San Diego, San Diego CA USA

Wave breaking transfers momentum between waves to currents. In doing so it dissipates wave energy and affects long-term dispersion and transport of tracers, Wave breaking also affects the transfer of wind stresses to the ocean and is a major player in ocean acoustics, the dynamics of near-surface gas exchanges and the dynamics of phytoplankton and buoyant pollutants.

Progressive waves were generated numerically using a numerical Navier Stokes solver. The velocity field was then used to estimate Lagrangian parcel dynamics in the neighborhood of the breaking event. The transport generated by the breaking events is shown to be significant, when compared to the wave-generated residual flow, as captured by the Stokes drift.

We formulate a parametrization of the breaking velocity based upon an analysis of the Largrangian dynamics of fluid parcels. Further, we describe how the breaking velocity is incorporated in the {\it vortex force} formulation of wave current interactions.