Wave Breaking Dissipation in a Fetch-Limited Sea

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Abstract

Coupled remote sensing and *in situ* measurements of strongly-forced, fetch-limited waves are applied to assess the role of breaking in an evolving wavefield. Wave growth follows accepted fetch-limited relations, and estimated terms in the Radiative Transfer Equation are in quasi-equilibrium. Remote sensing measurements of the Phillips breaking distribution, $\Lambda(c)$, using stabilized shipboard video recordings are unimodal and qualitatively consistent with several recent studies. *In situ* measurements of turbulent energy dissipation from wave-following "SWIFT" drifters and a tethered Dopbeam system are consistent with the wave evolution and wind input (as estimated using the Radiative Transfer Equation). The breaking strength parameter, b, is calculated by comparisons of the fifth moment of $\Lambda(c)$ with the measured dissipation rates and varies over nearly three orders of magnitude. Breaking strength is shown to negatively correlate with average wave saturation and steepness, in contrast to recent laboratory results by Drazen et al. (2008). An explanation for this difference is proposed based on the energy ratio between the peak waves and the equilibrium range. Recently, similar measurements of breaking dissipation were made in unlimited fetch conditions which underscore the importance of equilibrium breaking in the wind-wave energy balance.