

# **Field Observations of Wave Breaking**

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Field observations of wave breaking provide essential information to make progress in understanding the underlying processes. We present observations of wave breaking across deep, intermediate, and shallow conditions, including in the presence of sheared currents and partial ice cover. Using shipboard stereo measurements, we show that wave breaking is controlled by the local crest steepness and crest speed, which are distinct from both the bulk parameters of the wave field and the parameters of the carrier wave. The stereo results are superior to buoy results, because buoys must use dispersion to infer steepness (rather than measuring wave geometry directly). Still, wave buoy measurements are useful for the kinematics of individual breaking waves, as well as the relation of breaking statistics to bulk and spectral wave parameters. The accelerations of wave buoys during breaking events far exceed the motions predicted by weakly nonlinear wave theories, and these motions provide a proxy for wave breaking severity. Wave breaking statistics are highly correlated with bulk wave steepness, with important adjustments to the steepness associated with finite depth and sheared currents. In the presence of partial sea ice cover, wave steepness is reduced and wave breaking is suppressed. These observations of wave breaking are related to observations of the turbulent dissipation rate in the ocean surface layer.