Aeration and bubble measurements of coastal breaking waves

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Abstract

The air entrainment process of surf zone waves is studied experimentally to understand as a first step of twophase characteristics of surf zone breaking waves. A set of laboratory experiments of free surface elevation, water velocity, void fraction and bubble distribution is conducted simultaneously for regular gravity wave breaking on a plane slope. The in situ data are collected by using a measurement array of wave gages, a dual-tip resistivity void fraction probe and an acoustic Doppler velocimeter. Two-dimensional projected bubble size measurements are conducted by the high speed camera with imaging technique. The experimental data show a linear relationship between the void fraction and turbulent intensity. In addition, the bubble size distributions are proportional to the bubble size to the power of \(-1\) and \(-3.4\) independent of the distance from breaking point and water depth. The length scale separating two power laws is the Hinzec scale which corresponds to the wave energy dissipation scale. This result will be important for modeling and implication for the study of surf zone dynamics.

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