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Lagrangian observations of acceleration and bubble dynamics in plunging breakers MIGUEL CANALS, ANDRE AMADOR, University of Puerto Rico at Mayaguez — Understanding the three-dimensional structure of plunging waves is one of the most difficult problems in fundamental fluid dynamics. In this presentation we provide an analysis of field data collected in breaking waves using novel Lagrangian drifters with a diameter of 5-10 cm and equipped with miniature HD cameras and inertial measurement units. These drifters were deployed, using a personal watercraft, into the breaking region of waves ranging from 1-5 meters in height. We analyze in detail the time series of particle acceleration and rotation and how these quantities relate to the imagery captured by the camera aboard the drifters. This data represents the first dedicated study of the three-dimensional particle dynamics of plunging breakers. Going beyond the basic statistical analysis of the acceleration data, we make an attempt at characterizing the intensity of the wave breaking process using the bubble size and characteristics obtained from the HD video images. We also attempt to relate the spectral statistics of acceleration and particle rotation to existing Lagrangian turbulence models in the hopes of obtaining estimates of the kinetic energy dissipation in breaking waves, while taking into account the unsteady and heterogeneous nature of the turbulent flow.

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