THE SHOALING WAVES EXPERIMENT

The Shoaling Waves Experiment (SHOWEX) was a 5-yr field-oriented departmental research initiative (DRI) by the Office of Naval Research to improve the scientific understanding of the properties and evolution of surface gravity waves in intermediate- and shallow-water depths (typical of inner-continental shelves up to the edge of the surf zone). The focus for this research was driven by a range of U.S. Navy needs including improving wave forecasts, understanding the interactions between waves and acoustical and optical processes, air–sea interaction, remote sensing, forces on vessels and structures, and sediment transport issues. Two complementary field experiments, one off the North Carolina coast at Duck and the other in Lake George (Australia), were carried out to test critical hypotheses concerning processes such as nonlinear interactions, wind input, whitecapping and depth-induced breaking, interactions with complex shelf topography, and bottom boundary layer phenomena. In addition, theoretical and numerical studies were conducted to explore certain aspects of the mechanics of shoaling, wind-driven waves.

This section is meant to provide an assessment and lasting documentation of the present knowledge and understanding of the dynamics of surface gravity waves in shoaling waters. The eight manuscripts in this section represent the first results from the SHOWEX program using new and/or innovative technical approaches and methodologies to examine wave dynamics in finite water depth. Two of the manuscripts (Donelan, Babanin, Young, Banner, and McCormick; and Young et al.) describe new insights in the source terms in finite water depth from the experiment in Lake George, Australia. The remaining six manuscripts employ remote sensing (Plant et al., Wyatt et al., Mahrt and D. Vickers, and Sun et al.) and modeling techniques (Ardhuin and Herbers) to observe the evolution of the directional wave spectrum in shoaling water and how it relates to the overlying wind conditions and changes in the bottom topography. In particular, one manuscript (Donelan, Dobson, Graber, Madsen, and McCormick) utilizes a SWATH ship to measure the momentum input by the wind into the waves. Such measurements have been elusive due to the diffuculty in carrying them out while following a wavy surface. These manuscripts will provide new data and a foundation to answer the scientific questions posed by the SHOWEX program.

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