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Statistics of deep-water wave kinematics

A. Toffoli (1), E. M. Bitner-Gregersen (2), and M. Onorato (3)

(1) Centre for Ocean Engineering, Science and Technology, Swinburne University of Technology, Hawthorn, Australia (toffoli.alessandro@gmail.com), (2) Det Norske Veritas, Veritasveien 1, 1322 Hoevik, Norway, (3) Dipartimento Fisica Generale, Universia' di Torino, Via P. Giuria 1, 10125 Torino, Italy

A direct numerical simulation method is used to monitor the evolution of nonlinear random directional wave fields. The aim is to investigate the combined effect of high order nonlinearity and directional energy distribution on the statistics of wave orbital velocity. Results show that the development of modulational wave instability and the concurrent formation of large amplitude waves lead to a substantial departure of the statistics of the horizontal velocity from the Normal probability density function when the wave field is long crested. As short crestedness increases, departure from Normality gradually diminishes and eventually vanishes for sufficiently broad directional spreading.