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Numerical investigation of a novel wave-action transfer model for near-resonant water waves

Ruslan Puscasu (1), Alexander Babanin (1), and Michael Stiassnie (2)

(1) Faculty of Engineering and Industrial Sciences, Swinburne University of Technology, Melbourne 3122, Australia, (2) Faculty of Civil and Environmental Engineering, Technion, Haifa 3200, Israel

We present preliminary numerical results of an improved wave-action transfer model that incorporates Stokes corrections for four near-resonant water waves. The results confirm the expectations that near-resonant interactions, rather than the exact resonance, dominate the temporal nonlinear evolution of homogeneous near-Gaussian wave fields [1]. The wave-action transfer model consists of a system of integro-differential equations, but simplifies to a single ordinary differential equation of second order for nearly-resonating quartets [2] and allows a closed analytic solution. These solutions were used to examine the evolution parameters of our deterministic four-wave system for different initial conditions. The results compare more favorably with the Monte-Carlo results of Stiassnie and Shemmer [3] and those from the kinetic equation [4-6]. Though only sets of four water waves have been investigated the model can be numerically generalized for a higher-order interactions that is the subject of further studies. It is our expectation that the discrepancy between the above-mentioned approaches would reduce as the number of interacting modes in the system is increased.

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