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Three-wave interactions in a gravity-capillary range of wind waves

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The effects of three-wave interactions on forming of short wind waves spectrum are investigated. Wavenumber spectrum in gravity-capillary and capillary range is found as a result of evolution of initial arbitrary spectrum under the influence of assigned sources of kinetic equation. Three-wave interactions are taken into account using exact collision integral without any additional assumptions simplifying a problem. Model validity is proved by reproducing Zaharov & Filonenko (1967) theoretical spectra describing the “energy equipartition” and “inertial interval” cases. Numerical calculations show that the main role of three-wave interactions consists in energy transfer from short gravity waves to waves of smaller lengths. The prominent feature of most of resulting spectra is a dip on curvature spectrum in the vicinity of phase speed minimum. Wind forcing, viscous dissipation and mechanism of generation of parasitic capillaries are considered in a number of calculations using parameterization for corresponding sources by Kudryavtsev, Makin, Chapron, 1999. The necessity of additional nonlinear dissipation terms in kinetic equation for short gravity and capillary waves is revealed. The results of calculation with this realistic parameterization of kinetic equation sources show that, when accounted, nonlinear dissipation and parasitic capillaries terms play much more significant part in capillary range than wave-wave interactions. The latter are important only in phase speed minimum area where the typical dip remains at the same wavenumber in all numerical experiments.

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