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Wind effect on the evolution of two obliquely interacting random wave trains in deep water.

(English) [Zbl 07222034]

Wave Motion 89, 14-27 (2019).

Summary: A pair of coupled nonlinear evolution equations for the spectral functions are derived in a situation of crossing sea states characterized by two narrowband Gaussian random surface wave systems in the presence of uniform wind flow. These two equations are employed to perform stability analysis of two initially homogeneous wave spectra subject to infinitesimal perturbations. It is found that the results of the stability analysis remain qualitatively similar with the corresponding deterministic situation. The notable difference is that the growth rate of instability reduces slightly due to the effect of randomness. But, it is much higher than the growth rate of a single wave system. As the spectral bandwidth increases the growth rate of instability decreases.

MSC:
76 Fluid mechanics
37 Dynamical systems and ergodic theory

Keywords:
crossing seas; instability; randomness; spectral transport equation; wind effect

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References: