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Numerical and Experimental Simulations of Wind Effect on Rogue Waves

J. Touboul (1), J.P. Giovanangeli (1), C. Kharif (1), E. Pelinovsky (2)

(1) Institut de Recherche sur les Phénomènes Hors Equilibre, Laboratoire Intéraction Océan Atmosphère, Marseille, France, (2) Institute of Applied Physics. Laboratory of Hydrophysics and Nonlinear Acoustics, Nizhny Novgorod, Russia.

Rogue wave generation can be explained on the basis of spatio-temporal focusing concept. The paper reports on a series of numerical simulations based on a BIEM method and their comparison with experiments. The modulated wave trains are numerically generated by a paddle and the wind effect is described by the introduction of wind-induced current. The time-variable frequency of the paddle is chosen to produce a rogue wave (due to spatio-temporal focusing) at a given fetch. Numerical simulations are performed for different values of wind-drift current ($u_s = 0, 20, 25, 30, 40, 50 cm.s^{-1}$), corresponding to the experimental values of wind speed ($U = 0, 4, 5, 6, 8, 10 m.s^{-1}$). It is shown that the shift of the focusing point increases as u_s^2, as predicted theoretically (Pelinovsky & Kharif, 2005). A spreading of the focusing area and a weak decrease of the rogue wave amplification are observed as the wind speed increases. Experiments showed that the amplification increases as the wind speed increases (Giovanangeli & al., 2004). This disagreement suggests that the amplification of the rogue wave may be due the direct effect of the wind on the free surface which is not taken into account in the numerical model.