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Numerical Simulations of Rogue Waves Applied to their Remote Sensing

J. Touboul, T. Elfouhaily, C. Kharif (1)

(1) Institut de Recherche sur les Phénomènes Hors Equilibre, 49 rue Joliot Curie, BP 146, 13384 Marseille Cedex 13

Rogue wave generation can be explained, among others technics, by modulational instability. The paper reports on a series of numerical simulations based on a pseudo-spectral method. A Stokes wave train, modulated to the maximum Benjamin-Feir instability value, is propagated. The wind wave spectrum is represented by addition of a noise on the initial condition. This initial condition is propagated until the rogue wave arises. The free surfaces of the initial condition and extreme wave event (rogue wave) are coupled with a second order scattering model based on local curvature approximation (Elfouhaily *et al*, 2003). This scattering model is sensitive to surface curvature, and its asymptotic behavior can follow both Kirchhoff model, corresponding to the tangent plane approximation, or Bragg model, corresponding to the small slope approximation. It is shown that the short wind waves disappear when the freak wave occur. The presence of the wind waves enforces the second order scattering model to behave as the Bragg model while their vanishing imposes a Kirchhoff like behavior. Thus this second order model is expected to be very suitable for detection of extreme wave events.