Distribution function of the narrow-band shallow-water waves

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M. Tayfun in his paper (Tayfun, 1980) has approximated the wind waves in the open sea by the two harmonics of the Stokes wave with random amplitude and phase. As a result, he found the probability density function of the water level displacement, wave crests, and wave heights. This idea applies here to the narrow-band shallow-water waves. Theoretical model is based on the Korteweg-de Vries equation, which is fully integrable. It describes the weakly nonlinear long surface and internal waves in the coastal zone. It is actively used here for description of random wave field including the soliton turbulence (Pelinovsky and Kokorina, 2006; Pelinovsky and Shurgalina, 2017). In the case of the small Ursell number, the wave spectrum remains narrow enough (Talipova et al, 1999; Kit et al, 2000; Pelinovsky and Kokorina, 2006). In the first approximation, we approximated the wave field by the two harmonics of the cnoidal wave with random amplitude and phase. It allows calculating analytically the statistical moments of the wave field. In particular, the skewness is positive and growth with increase of wave intensity conforming obtained early numerical results (Pelinovsky and Kokorina, 2006).

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