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Evaluating the kurtosis of surface elevations of a random wave field propagating on a linear shear current.

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Here the effects of third order nonlinearities on statistical properties of random waves in deep water are discussed by analyzing the kurtosis and skewness of surface elevations of wave fields with and without vorticity.
The simulated wave fields are restricted to one-dimensional direction of propagation with constant vorticity and without dissipation. Numerical simulations of nonlinear surface waves on a linear shear current are performed using the vor-HOSM which is an extension of the well-known high-order spectral method (HOSM).
An adjustment procedure for initializing the nonlinear free surface simulations with linear solutions is used to study the nonlinear evolution of a sea wave obtained from dressing a JONSWAP spectrum.
The comparative analysis suggests that the interaction between nonlinear surface gravity waves on a linear shear current with constant vorticity tends to enhance instability. This instability becomes slightly evident when the value of vorticity is increased.