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Effect of sampling variability on the skewness and kurtosis of nonlinear waves

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Sampling variability, the statistical uncertainty due to limited number of observations, may have significant impact on sea surface description. Field wave records have restricted duration, usually 20 or 30 minutes, therefore estimated from them wave statistics will be affected by sampling variability. Quantification of this uncertainty is important for design and marine operations as well as for forecasting of extreme and rogue waves. The study shows by use of numerical simulations effects of sampling variability on the measures of wave field nonlinearity such as the skewness and kurtosis coefficients of sea surface elevation as well as on the maximum wave crest and evolution of a wave train. Wave data are simulated by the nonlinear wave model HOSM (Higher Order Spectral Method). The nonlinear order M in the HOSM simulations is set to M=3, which includes the leading order nonlinear dynamical effects, including the effect of modulational instability. Sea states where rogue waves were registered in nature are used as input to the numerical simulations. The Pierson-Moskowitz and the JONSWAP spectrum with different gamma parameters and different directional energy spreading functions are applied in the analysis and their effect on sampling variability estimates is demonstrated. The spatial and temporal wave characteristics are considered in the study.