Rogue waves, non-Gaussian statistics and proximity to homoclinic data

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In this paper we provide a statistical interpretation of rogue wave data obtained from numerical simulations of the NLS equation and of the modified Dysthe equation. The sea states investigated are characterized by JONSWAP spectra with random phases. To test for non-Gaussianity we examine the kurtosis as a function of δ, the proximity of the sea state to homoclinic or unstable data, as determined by the inverse spectral theory of the NLS equation. Our results indicate that the wave strength and the kurtosis depend strongly on the proximity to instabilities. The modulational instability is a significant source of non-Gaussianity in the water wave statistics.