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Extreme events in Faraday waves

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Observations of extreme wave events in the ocean are rare due to their low statistical probability. In the laboratory however, the evolution of extreme wave events can be studied in great detail with high spatial and temporal resolution. The reported surface wave experiments in the short wavelength gravity-capillary range aim to contribute to the understanding of some of the underlying mechanisms for rogue wave generation.
In this talk, we report on extreme wave events in parametrically excited Faraday waves. Faraday waves appear if a fluid is accelerated (normal to the fluid surface) above a critical threshold. A variety of novel tools have been deployed to characterize the 2D surface elevation. The results presented show spatio-temporal and statistical data on the surface wave conditions leading up to extreme wave events. The peak in wave amplitude during such an event is shown to exceed six times the standard deviation of the average wave field with significantly increased statistical probability compared to the background wave field [1]. The experiments also show that parametrically excited waves can be viewed as assembles of oscillons [2] (or oscillating solitons) where modulation instability seems to play a crucial role in their formation. More detailed studies on the oscillon dynamics reveal that the onset of an increased probability of extreme wave events correlates with the increase in the oscillons mobility and merger [3].

Reference:
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