

Extreme Ocean Gravity Waves: Understanding and Predicting Breathers with Wave Breaking and in Coastal Waters (extension)

Initiative: Modellierung und Simulation komplexer Systeme (beendet)

Ausschreibung: Extremereignisse: Modellierung, Analyse und Vorhersage

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Extreme ocean waves are mysterious phenomena of giant waves in the open ocean and near the coasts. They tend to appear seemingly from nowhere and disappear without a trace. Their existence is now a well established fact but present understanding is still comparatively poor and there are a number of fundamental mechanisms under debate. One promising theory is based on breather solutions of nonlinear wave equations. Generation of breathers and their combinations can be a reason for the formation of extreme waves. In the past project the group has gathered observational, experimental and modelling based evidence for this hypothesis. In a next step, the studies are extended to finite water depth, i.e. the coastal zone, and include wave breaking as well as the role of irregularity of the natural sea state. The general approach is modeling based. Laboratory experiments are conducted to investigate the phenomena and to generate a validation base for mathematical modeling. The results contribute to an improved understanding of the nature of the phenomenon, also with respect to coastal waters. Furthermore, tools to identify, anticipate and mitigate rogue waves approaching ships, offshore structures, or coasts and beaches will be developed.

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