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On the modelling of freak waves

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Freak waves are probably the most dangerous type of extreme waves. Their very strong deviation from the average sea state makes them unique phenomena on the free ocean surface. Eye witnesses, reporting on individual extreme waves in coastal or deep water, mention either single very high waves or several successive extreme waves. Freak waves are dangerous not only for swimmers, fishermen or yachtsmen, but are also capable of seriously damaging large vessels. Within the past 20 years at least 200 supercarriers have been lost, each more than 200 meters long. In majority of these cases the cause of the accident is believed to be freak waves. The consequences of the attack of freak waves are usually very tragic. Many accidents occurred in the Mediterranean Sea.
The problem is that the mechanism of the formation of freak waves is still unknown. Neither the occurrence of these waves nor their physical structure is well understood by conventional wave science. According to some hypothesis freak waves are the results of the nonlinear interaction of waves in a wave train. Theoretical models and experimental data are applied to predict the formation of freak waves. Conducted investigations comprise cases characteristic for the Mediterranean Sea. The studies and results are part of a widely-recognized EU MaxWave project.