

FREAK WAVES: MYTHS AND FACTS

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It is more and more believed that a considerable amount of severe damage cases to ships and to offshore structures might be due to freak waves, which are individual waves of exceptional wave height or abnormal shape. Once believed to be a sailor's myth, their existence has been demonstrated by theoretical and experimental studies. Moreover single waves exceeding levels unexpected by current statistical theory have been recorded in situ. The 1995 New Year's wave recorded at Draupner oil field had a crest height of 18.5 m (crest to trough wave height of 26 m) in a background sea-state with a significant wave height (H_s) of 11.92 m. The return period to encounter such a sea-state was estimated at 1-5 years. However, the return period to encounter such a crest height was estimated at approximately 10000 years (Jenkins *et al.*, 2002). Description of freak waves is not only important for design work but also for operational purposes it would be of tremendous benefit if warnings could be given to mariners. Meteo centers now provide wave forecasts, usually in terms of significant wave height, wave period, and wave direction both for wind sea and swell conditions. These forecasts are based on spectral wave models. Although a spectrum only gives some average description of the sea-state, and therefore no details about the instantaneous position of the sea surface, it might contain additional information that points at an increased risk for the occurrence of exceptional waves. It is one of the objectives of the EU project MaxWave to promote the use of sea-state related parameters and in particular to introduce new warning criteria for extreme and dangerous waves in marine weather forecast. To this end numerical model results supported by existing measurements – including global satellite radar surveillance by the new European Remote Sensing Satellites (ERS-1/2 and ENVISAT) – are used to better understand the shape and impact of extreme waves in relation with shipping incidents reported as being due to bad weather. The study of shipping casualties in heavy seas can help to identify the ocean areas more prone to bad weather conditions in general and to abnormal waves in particular as well as to derive parameters for seasonal and regional risk for the occurrence of potentially dangerous sea-states for marine operations.

References

Jenkins A.D., A.K. Magnusson, A. Niedermeier, Ø. Hagen, E. Bitner-Gregersen, J. Monbaliu and K. Trulsen. 2002. Rogue Waves and Extreme Events in Measured Time-Series. Met.no research report 138. Norwegian Meteorological Institute.