



Changes of wave steepness and consequences for generation of rogue waves

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Average wave steepness represents an important characteristic for describing the sea state and for design and operation of marine structures. Although its growth is limited by wave breaking, it is now well established that wave steepness is one of the parameter responsible for generation of abnormal waves called also freak or rogue waves. Sea states characterised by high steepness and narrow directional distribution are more prone to the quasi-resonant mechanics such as modulational instability and hence to the formation of rogue waves. Recent investigations carried out by Gulev and Grigorieva, (2013) have shown that the average wave steepness is increasing and the observed climate changes seem to be responsible for it. These conclusions have been drawn based on visual observations of wave climate collected from ships in normal service all over the world. The present study is investigating changes in wave steepness in the North Atlantic wave climate used today for design of ship structures. Wave hindcast data, NORA10 and ERA-Interim, are applied in the analysis. A long-term distribution for wave steepness as well as a joint distribution for wave steepness and significant wave height are established. Consequences for generation of rogue waves are demonstrated and discussed.