



Potential changes of wave steepness and occurrence of rogue waves

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Wave steepness is an important characteristic of a sea state. It is also well established that wave steepness is one of the parameter responsible for generation of abnormal waves called also freak or rogue waves. The study investigates changes of wave steepness in the past and future wave climate in the North Atlantic. The fifth assessment report IPCC (2013) uses four scenarios for future greenhouse gas concentrations in the atmosphere called Representative Concentration Pathways (RCP). Two of these scenarios RCP 4.5 and RCP 8.5 have been selected to project future wave conditions in the North Atlantic. RCP 4.5 is believed to achieve the political target of a maximum global mean temperature increase of 2° C while RCP 8.5 is close to “business as usual” and expected to give a temperature increase of 4° C or more. The analysis includes total sea, wind sea and swell. Potential changes of wave steepness for these wave systems are shown and compared with wave steepness derived from historical data. Three historical data sets with different wave model resolutions are used. The investigations show also changes in the mean wind direction as well as in the relative direction between wind sea and swell. Consequences of wave steepness changes for statistics of surface elevation and generation of rogue waves are demonstrated. Uncertainties associated with wave steepness projections are discussed.