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Probability distribution pf surface waves during crossing seas from a second order model

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Two different types of waves usually characterize the sea surface: wind seas and swells. Whereas the first refers to waves still influenced by the wind, the latter refers to waves that have moved out the generating area or are no longer affected by the wind. During heavy seas, ships usually travel perpendicularly to the crests. However, they may be in trouble when they have to face two (or more) wave trains coming from different directions. Under this condition, the entire hull would be exposed to wave impact with increasing risk of being damaged. Some ship incidents related to sea states characterized by wind sea and swell along perpendicular directions, i.e. crossing seas, were documented within the framework of the E.U. project MaxWave by analysing ship accidents reported as being due to bad weather. With the present study, we aim at investigating the influence that crossing sea states have on the statistical distribution of surface waves, and in particular whether crossing seas enhance the chance to have extreme wave phenomena (i.e. extreme heights, crests, and troughs). To this end, both deep and shallow water waves are generated by a second order sea-surface model and using two dimensional spectra as input. The probability distributions of wave heights, crests, and troughs in the case of both crossing and unidirectional seas are consequently compared.