A method to predict freak waves

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Recently, many freak waves events have been reported as the main cause of ship acci-
dents. Though a few of them could be explained otherwise, there are enough evidences
to consider the presence of freak waves beyond any reasonable doubt .Therefore , to
predict the appearance of freak waves is one objective looked for by researchers.

On the open sea freak waves are linked to modulation instability and a so-called
Benjamin-Feir Index (BFI) was proposed (Janssen) to predict them. In the past the
"peakness" factor of Goda was another attempt to reach similar results.

Our approach to the problem is different: Assuming the same mechanism of instabil-
ity, we part of the result (Dingemans and Otta) that the evolution of the wave train
envelope can be described as a Duffing's equation. The well known limits of stability
of this equation(in the sense of Lyapunov) are computed using the equation

and the method of Hill. Through this procedure we can predict how far or how near

a wave train is likely to generate freak waves, even in the case of atmospheric distur-
bances moving on the surface of the ocean (Pelinovsky)