



## Abstract View

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# The Interaction of Wind-Generated Sea Waves with Tidal Currents

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### ABSTRACT

The interaction between wind-generated surface waves and tidal currents can be described in terms either of the energy balance of the system or of the conservation of wave action, assuming that the tidal currents are weak. Analytical solutions for the variation in surface wave amplitude and wavenumber are shown for the case where the surface waves are in deep water and are propagating parallel to the direction of tidal wave propagation, using the energy balance approach.

Wave analysis from two adjacent sites in the southern North Sea show that wave heights during two 16-day periods were modulated at a period of 12–13 h and that higher waves were occurring when the waves were propagating in the same direction as the tidal current. A simplified model for the tidal regime in this area was used to compute the theoretical modulation of the wave amplitude from the energy balance equations and these were compared with the observed wave heights. Very good correspondence was found between the phases of the modulations, but the observed wave height variations exceeded those predicted by over 50%. The limitations of this analysis and some possible causes of this underestimation are discussed.

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