



Gravity wave amplification and phase crest re-organization over a shoal

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Surface gravity wave propagation above a shoal or any submerged structure has drawn of great interest for decades for both oceanographers and coastal engineers. Indeed, the experimental study of wave focusing above such a topography is useful for testing the accuracy of wave propagation models for steep two-dimensional sloping bottoms. In the context of the maritime navigation hazards, it may also explain the occurrence of localized huge waves and steep surface slopes.

Experiments have been carried out in the wave basin at University of Toulon, France. The shoal consisted of a half cylinder with half spheres at both ends. Various depths of immersion of the shoal were tested for regular wave conditions. The analysis is based on the measurements of the wave amplification above and around the shoal. Photographs were also used for the wave crests shape analyses.

A significant increase of the wave amplitude up to twice the incident amplitude can be observed experimentally above the mound. Due to the smaller wave celerity above the mound, a phase delay is observed for the wave down-wave the shoal compared to the wave on both sides. Two slightly divergent separation lines of zero wave amplitude are observed down-wave the mound, waves do not cross as also verified numerically through a refraction-diffraction model.