THE EFFECT OF THE WAVE-CURRENT INTERACTION ON THE WAVE CHARACTERISTICS IN THE BELGIAN COASTAL AREA

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In coastal areas, the propagation of wind waves is highly dependent on the bathymetry and the hydrodynamics. The presence of bottom enhances the frictional dissipation of wave energy, wave breaking, high harmonic generation, and wave refraction. The refraction induced by an irregular (and time varying) bathymetry may lead to a number of processes (e.g. convergence or divergence of energy, cross-wave conditions, etc.) and controls the spatial distribution of wave heights. Similarly, the bathymetry dominates the hydrodynamic evolution and shortens the time and spatial scales of variability of the flow. Like bottom gradients, the horizontal current shear may induce a refraction effect on the waves.

In the present study, a series of numerical results on the tide/surge/current effect on waves in the Belgian coastal area are presented. It is shown that the inclusion of an inhomogeneous and unsteady current field in the computation of waves modifies the spatial distribution of significant wave heights. Differences of significant wave height in the order of 10% are observed when current and time varying depth are included in the computation. Increasing from the standard 30 degree directional resolution to 10 degree directional resolution (which is considered to account for the complex bathymetry) has a similar impact on the energy distribution in the coastal area. At specific locations (Westhinder and Bol van Heist), qualitative and quantitative agreement is improved when the coupled system is used.