GENERATION OF IRREGULAR LONG AND SHORT CRESTED WAVES IN A NUMERICAL MODEL FOR WAVE PROPAGATION

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MildWAVE (Troch, 1998) is a numerical mild-slope wave propagation model which is able to generate linear water waves over a mildly varying bathymetry and to calculate instantaneous surface elevations throughout the domain. Wave transformation processes such as refraction, shoaling, reflection, transmission and diffraction are simulated intrinsically.

Characterising the wave climate in coastal regions using regular waves is mostly unsatisfactory. Irregular long crested waves are most often used to represent the real sea state. In reality the sea state is however short crested and the waves propagate in multiple directions. So, short crested wave generation is the best approach to model real waves. Both irregular long and short crested wave generation has been implemented in MildWAVE. In order to validate the numerical wave generation module, tests were run in a numerical wave flume and wave tank. The use of the so-called energy velocity appears to be a necessity when using the mild-slope equations.

The result of the thesis is a multifunctional numerical model that can be used for different applications, for example to estimate the risk of flooding in a harbour due to wave penetration and overtopping or to predict the influence of coastal engineering structures on the wave propagation. The possibilities of the new MildWAVE model were demonstrated with an extensive application for the Harbour of Ostend. The present situation and two future designs with breakwaters have been compared for both long and short crested waves and for different storm scenarios.

References

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Troch P. 1998. MildWAVE - A numerical model for propagation and transformation of linear water waves. Internal Report, Dept. of Civil Engineering, Ghent University.