Development of unstructured grids and associated numerical techniques for the spectral energy balance of SWAN

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Abstract

Numerical wave modelling in oceanic and coastal waters is usually based on a phase-averaged approach, i.e. the spectral energy balance. Well-known examples are WAM, WAVEWATCH-III and SWAN. All relevant proccesses of wave generation, propagation, dissipation and wave-wave interactions are generally well represented. Up to now, these models are often applied at structured grids whereas the energy balance equation is approximated by means of either finite differences or finite volumes. This common approach is adequate for most applications with fairly uniform and smooth grids.

Today, numerical wave and flood modelling is a topic of much interests. Flood modelling is based on the solution of the shallow water equations for which the dynamics are based on wind forcing, atmospheric pressure gradients, the Coriolis force and the bottom friction. Well-known examples are Delft3D-FLOW and ADCIRC. However, for computations of flooding and the effect of waves on flooding, large areas with a high variability in geographic resolution are often required. This implies the use of unstructured grids for both flood

and wave modelling. Moreover, both these models need to be coupled as well.

A PhD-project is started at Environmental Fluid Mechanics Section, Delft University of Technology for the development of an appropriate numerical technique for the spectral energy balance approach of SWAN to facilitate the use of unstructured grids. Some of the aspects of this project will be highlighted in this talk.