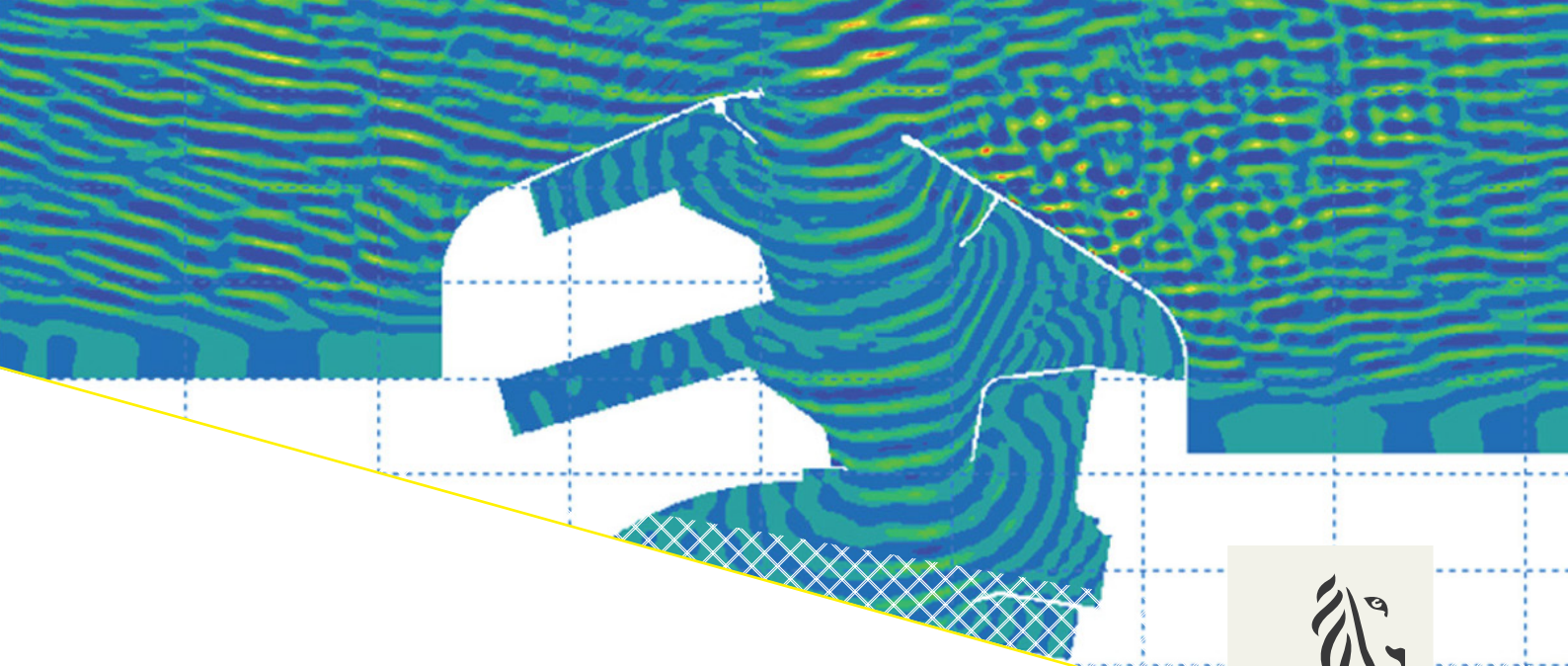




Modeling wave climate in coastal ports



Flanders
State of
the Art

For wave climate studies in the Belgian coastal ports (Nieuwpoort, Ostend, Blankenberge and Zeebrugge), Flanders Hydraulics has two types of port models at its disposal:

1. models for wave penetration through the harbor mouth, developed with Mike21-BW
2. models for wind waves generated within the port, developed with SWAN

Wave penetration

The Mike21-BW model solves the 2D depth-averaged Boussinesq equations in the time domain (phase solving), including the following physical processes in the model domain:

- generation of short-crossing wave spectra
- wave diffraction through the harbor mouth and at points in inner harbor
- refraction and shoaling of waves in shallow water
- (partial) wave reflection on quay walls and embankments in harbor, including standing waves
- wave refraction in shallow areas

Wind waves

The model SWAN solves the action-balance equations in the spectral domain (phase averaging), including the following physical processes in the model domain:

- short-cross wave generation by wind based on available string length
- wave diffraction (albeit in a less accurate approximation compared to Mike21-BW)
- (partial) wave reflection: wave reflection on quay walls and embankments in port, excluding standing waves
- wave refraction

Applications

- Boundary conditions for the study of wave overtopping, derived on the basis of a combination
- Based on a combination of M21-BW and SWAN wave spectra
- Wave conditions for determining loads on structures in the harbors
- Wave conditions for monitoring safe mooring of ships

