# HARES AND WAVEDIRECT

## WAVE PROPAGATION MODELLING (AND ANALYSIS)

**HARES ("HArbour RESonance")** is a two-dimensional numerical model for the determination of short wave propagation in near-shore domains, e.g. harbour basins. The model is based on the 2D Mild-Slope Equation and includes the physical phenomena of diffraction, refraction, shoaling, (partial) reflection, (partial) transmission, non-linear bottom friction, non-linear wave breaking, directional spreading and frequency spreading. HARES has been developed in-house by Svašek Hydraulics, and is one of the the fastest and most widely applicable Mild-Slope wave models currently available.

HARES is based on the Finite Element approach and applies a flexible mesh of linear triangles. This offers almost unlimited flexibility in grid generation. Special features, like complicated harbour and breakwater layouts can be accurately incorporated in the grid. HARES is highly parallelised for efficient calculations on our in-house computational HPC cluster. HARES offers large computational speed and can be applied interactively in port design processes.

HARES can deal with (partially) reflecting structures in a harbour as well as breakwaters which combine partial transmission and reflection properties. Comparison with measured wave conditions inside a harbour basin in laboratory tests (*Eikema et al., 2018*) confirm the accuracy of HARES results.

A recent improvement to the model (2018) is the addition of a very fast and efficient spectral treatment of bottom friction and wave breaking based on the entire wave spectrum, inspired after the spectral wave-energy model SWAN. HARES also offers the new post-processing tool **WAVEDIRECT** (2019), which enables the user to detect and analyze all local wave propagation directions within the HARES solution. In this way, it is also possible to construct detailed local 2D wave energy spectra.

Eikema, B.J.O., Attema, Y., Talstra, H., Bliek, A.J., De Wit, L. and Dusseljee, D.W. (2018). *Spectral modeling of wave propagation in coastal areas with a harbour navigation channel*. 34th PIANC World Congress 2018, Panama City, Panama.

DEVELOPER

Svašek Hydraulics

MAIN FEATURES

- wave propagation over topography,
- diffraction,
- refraction and shoaling,
- (partial) reflection and transmission,
- non-linear bottom friction,
- non-linear wave breaking (depth- or steepness-induced),
- monochromatic vs. spectral approach (frequency/directional spreading),
- Detecting wave directions and building 2D spectra (WAVEDIRECT).

MORE INFORMATION

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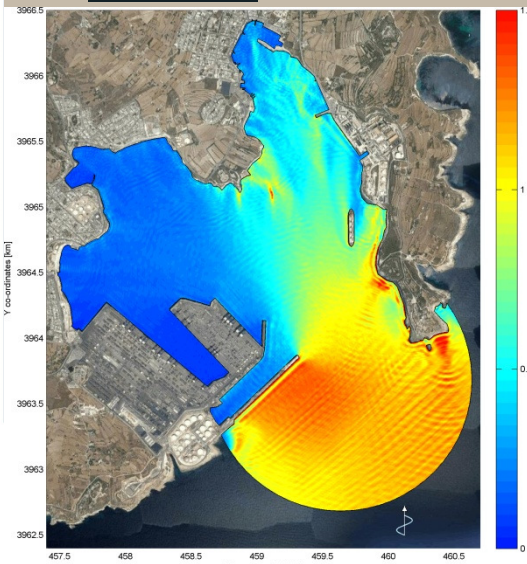


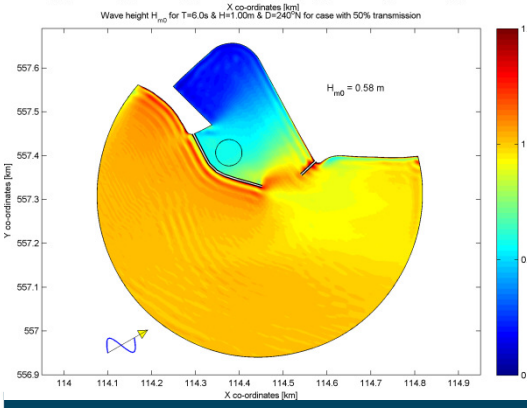


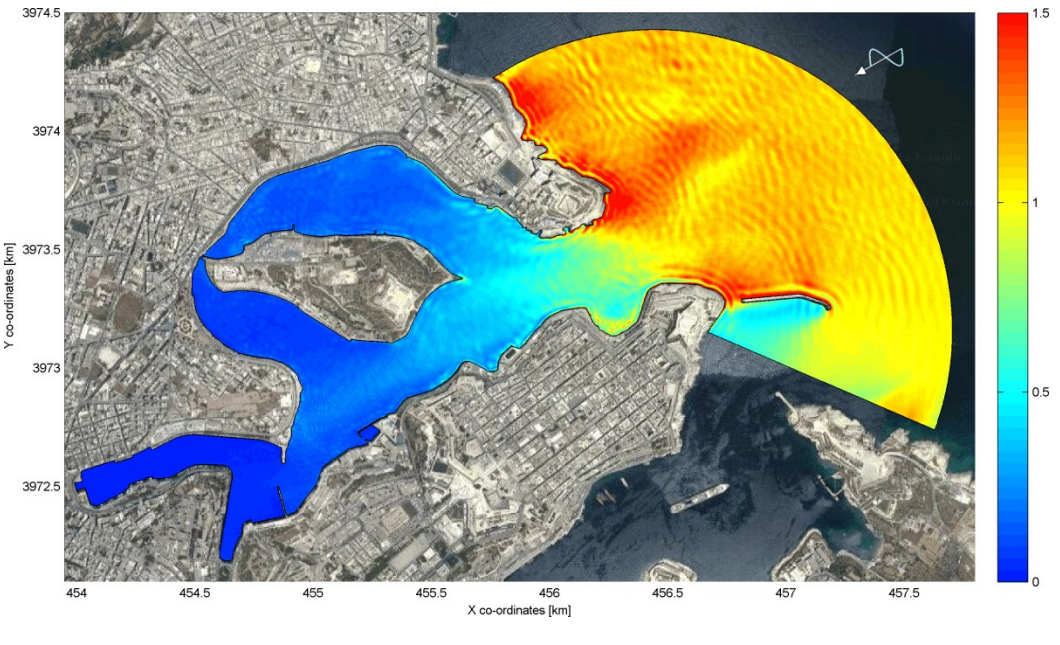


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