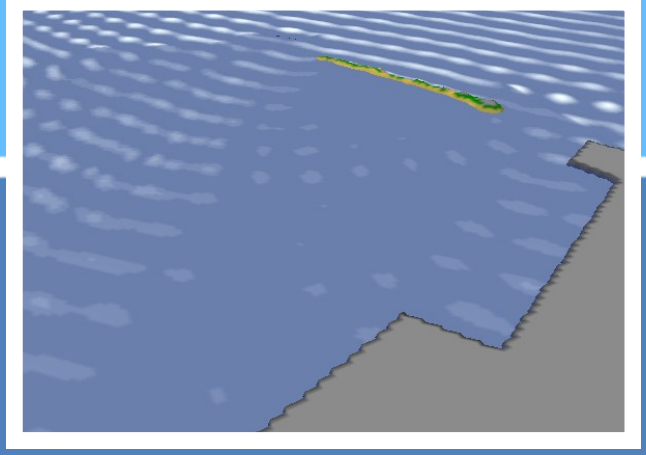
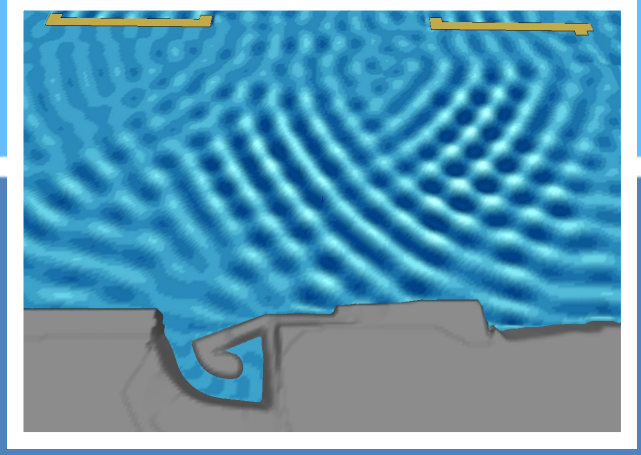
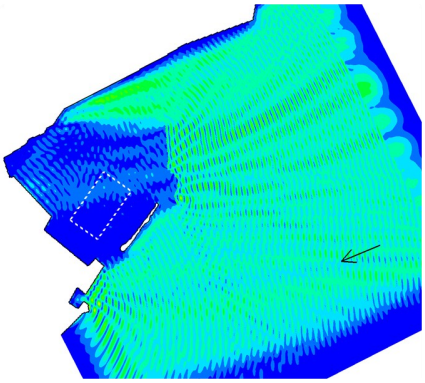
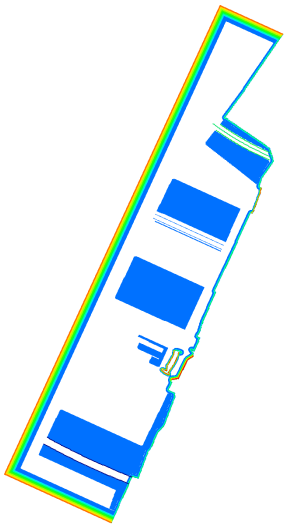






Simulation of waves behind fixed and floating breakwaters



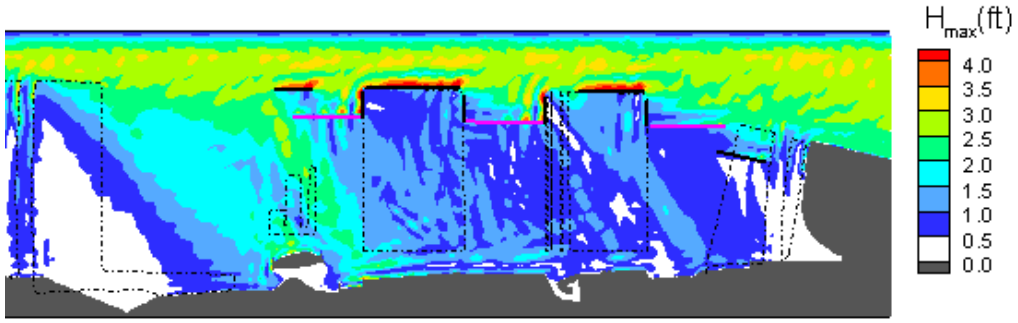
Internal wave generation and absorbing boundaries are used allow scattering of reflected wave energy

HYPER INTRA-PERIOD WAVE MODEL

Hyper is a state-of-the-art model for the simulation of combined refraction-diffraction in areas where reflection and interaction with floating and fixed structures is important. Written by Neil MacDonald of Coldwater Consulting, the Hyper model is especially well-suited to agitation studies in ports/marinas and to sizing and positioning floating breakwaters and wave fences.

The model is based on a hyperbolic approximation of the mild-slope equation and is solved using a finite-difference numerical scheme. The model can simulate the effects of refraction, diffraction, reflection and breaking. Internal wave generation is used in the model in conjunction with absorbing boundaries. This effectively allows reflected components to radiate freely from the domain. Reflective internal boundaries can be expressed as dissipative or conservative thus allowing full or partial reflection (e.g., marina walls and bulkheads), and full or partial transmission (e.g., floating breakwaters, wave fences, multiple piles).

The Hyper model can be used to model long-crested or short-crested monochromatic seas and, if required, the wave generation boundary conditions have also been extended to allow the generation of ship wakes. In these cases, the wake angle and period is determined theoretically from the speed of the vessel and the depth of the water.



Modelling wave height at a facility with wave fences, floating breakwaters, pile-supported piers

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