Numerical simulation of long ship waves

Tomas Torsvik

Bergen Center for Computational Science,
UNIFOB, University of Bergen

Center for Nonlinear Studies,
Institute of Cybernetics,
Tallinn University of Technology

The waves generated by high speed vessels are often seen as problematic in coastal waters, due to the unusually long wave period of these waves, and the large amplitudes attained as the waves approach the shore. Wave generation in shallow water is characterized in terms of the depth Froude number, which is the ratio of the ship speed $U$ to the celerity of the long wave component of the ship wake $\sqrt{gh}$, where $g$ is the acceleration of gravity and $h$ is the water depth. We study how the effective Froude number is altered when we consider not only the local depth at the location of the ship, but also depth variation near the shore. The study of waves generated by a ship in a channel with a variable cross channel bathymetry has revealed that the cross channel averaged Froude number may be a more appropriate parameter than the local Froude number at the location of the ship. Large wave amplitudes are attained at the channel walls, but may also occur in regions of shallow water due to interaction between two waves.