

SUMMARY

The Westerschelde estuary is located in The Netherlands and is a major shipping route connecting the North Sea to the Port of Antwerp (Belgium). Cross currents up to three knots occur at high water during extreme spring tides and are increasingly hampering navigation in the Westerschelde near Hansweert resulting in one major incident leaving a container vessel stranded on a nearby sand bank.

This study aimed at the simulation, prediction and assessment of a large eddy (stretching over the complete navigation channel) which produces these cross currents. A numerical model was set up and a detailed calibration of the hydrodynamic model was executed. A good agreement was obtained between model and measured data on the location of the eddy and the strength of the cross currents. Flow fields produced by the numerical

model subsequently have been implemented in a nautical simulator in which pilots are trained on sailing in these exceptional conditions.

Currently, a warning is sent out to Traffic Control whenever at least one of two parameters is being foreseen to pass a critical value according to forecasting models (high water level and water level gradient). This system has been proven to yield false negatives in some cases. The simulation results and analysis have clarified the conditions in which the eddy grows sufficiently (2 km across) to cause cross currents in the navigation channel. A new criterion for sending out a navigation warning is proposed. It shows a better correlation with the occurrence of cross currents, hence pilots will have a higher probability to be warned in case of cross currents.