

Using the Flood Early Warning System with Ocean Modeling Data

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What is Delft FEWS?

FEWS stands for 'Flood Early Warning System'. It is primarily used in operational river flow forecasting. For example, by the end of the year, it will provide operational flow forecasts at all National Weather Service River Forecast Centers in the United States. FEWS provides:

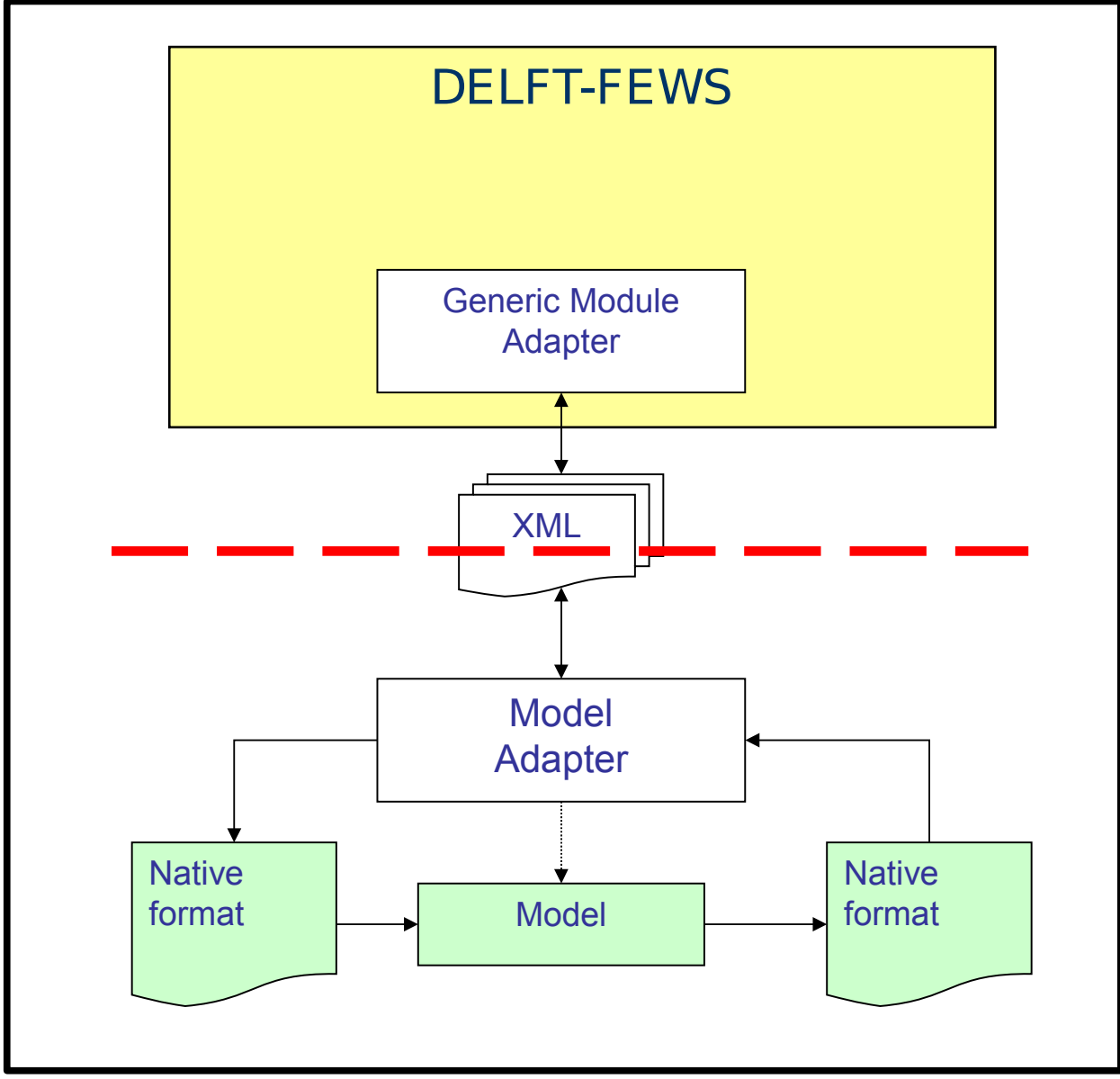
- Data importing and exporting (NETCDF, GRIB, ArcInfo ASCII, PIXML...)
- Data pre-processing and post-processing
- Support for a wide range of models (hydrodynamic, rainfall-runoff, snowmelt, glacier melt, routing...)

What are the major advantages of FEWS?

- FEWS was built with an open architecture, so new data types and models are relatively easy to add
- FEWS is user-configurable, so it can be used worldwide at a variety of scales.

Why use Delft FEWS in marine and coastal applications?

Although FEWS was originally designed for flood forecasting, the advantages noted above mean that it can be used in novel and unexpected ways. This poster highlights recent uses of FEWS with coastal and marine applications.



How an external module is incorporated into FEWS

EXAMPLES

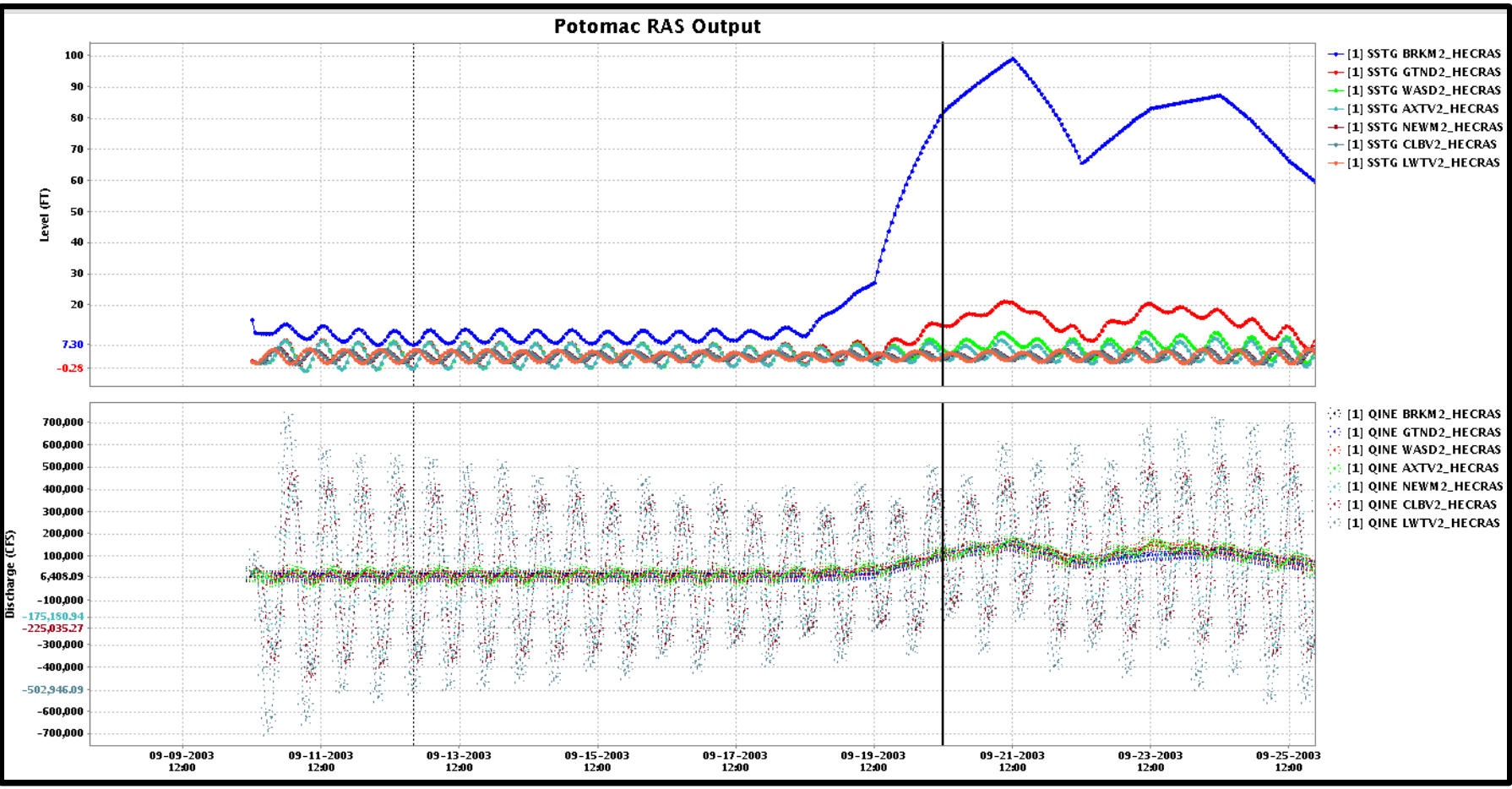
Storm surge in the Chesapeake Bay and Potomac River

Background

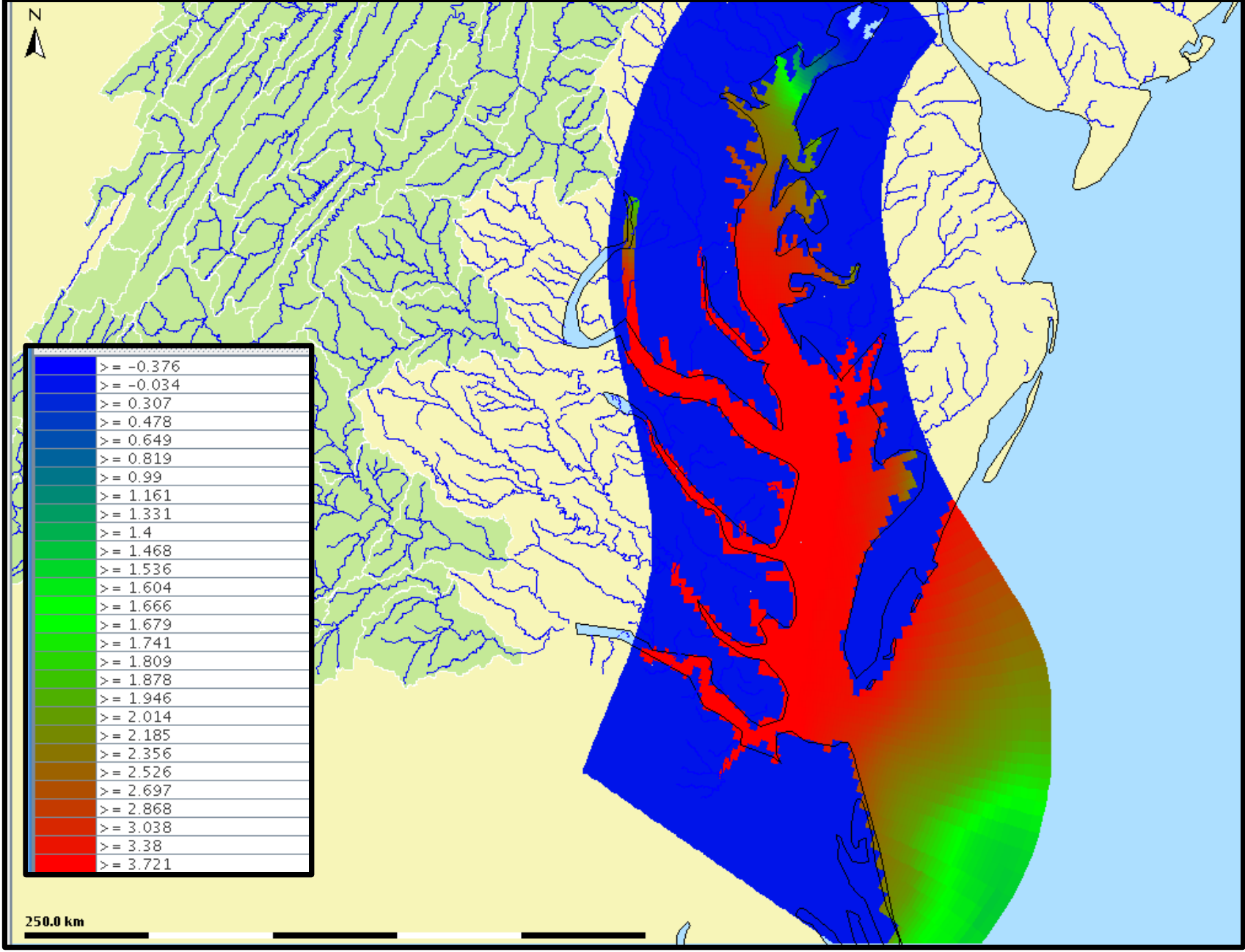
- Storm surges in the Potomac can cause coastal flooding in a highly populated area

What does it do?

- Inputs:
 - water height from the Integrated Ocean Observing System (IOOS) Chesapeake Bay Regional Ocean Modeling System (ChesROMS).
 - discharge data from Potomac River stations
- FEWS retrieves gridded ChesROMS data from an OpenDAP server, subsamples the grid, and manipulates input timeseries
- HEC-RAS is used to forecast water heights



Timeseries of river stage and tides



ChesROMS water height

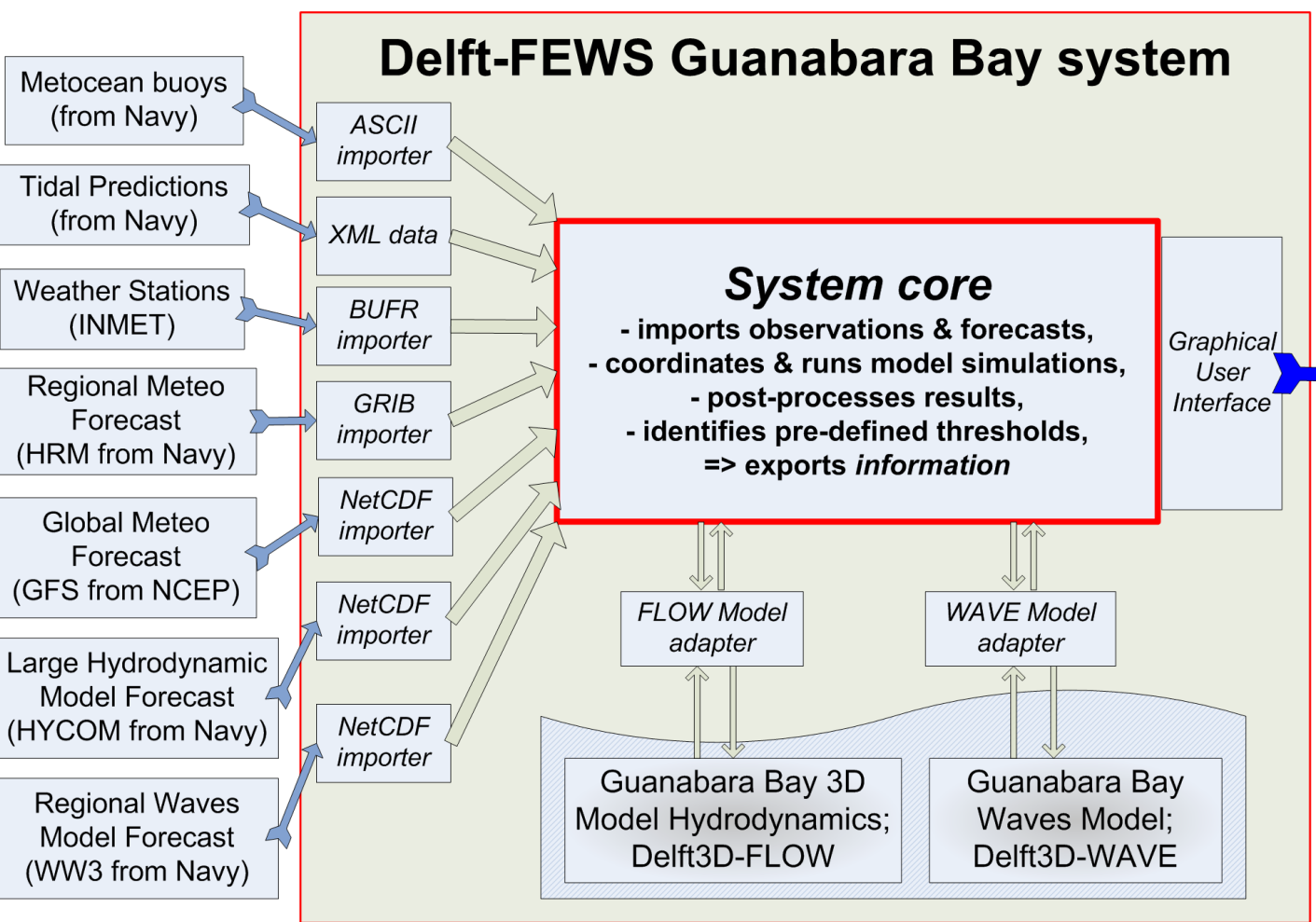
FEWS-Guanabara (Rio de Janeiro)

Background

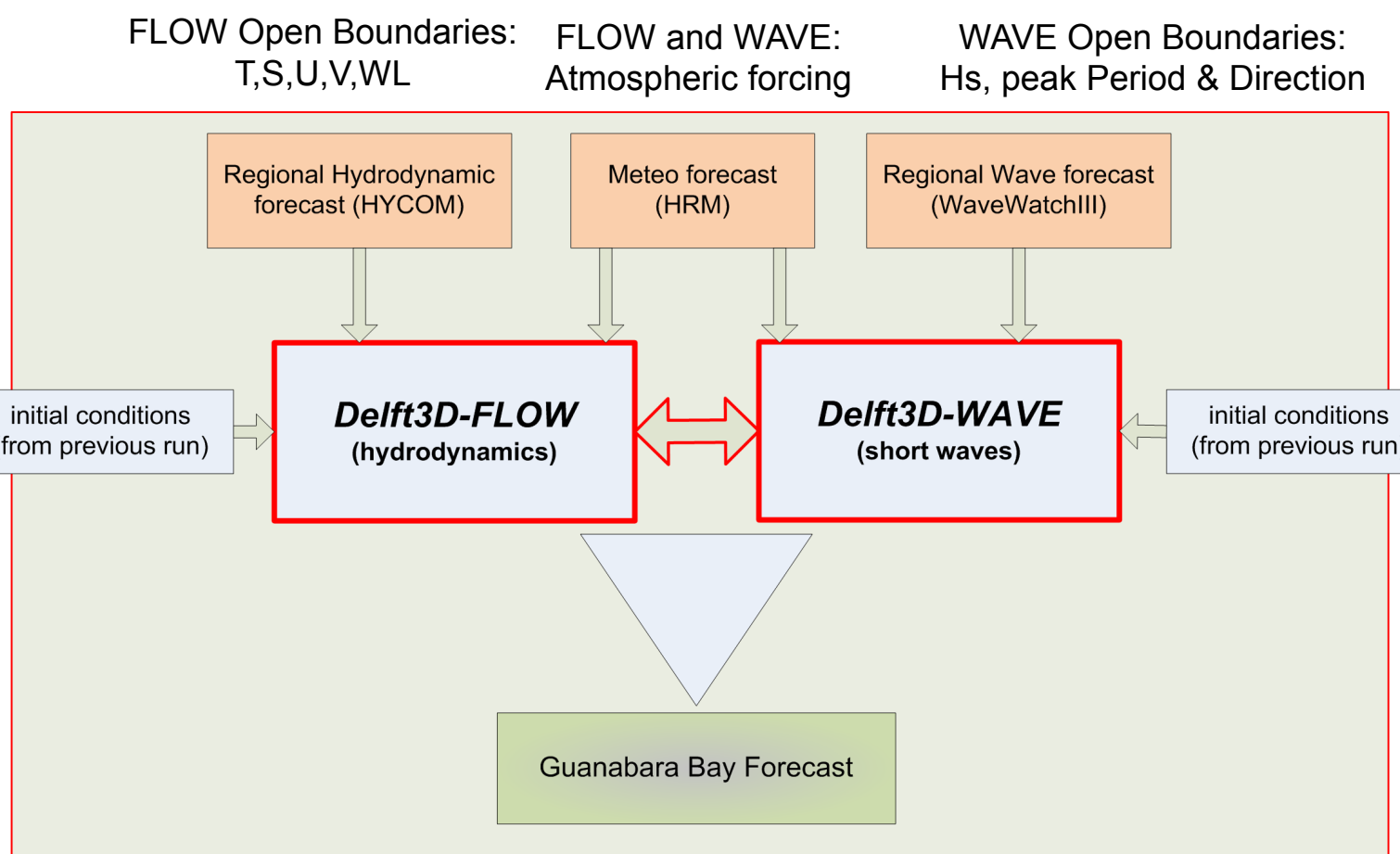
- Designed to provide the Brazilian Navy with a system to forecast waves in Guanabara Bay

What does it do?

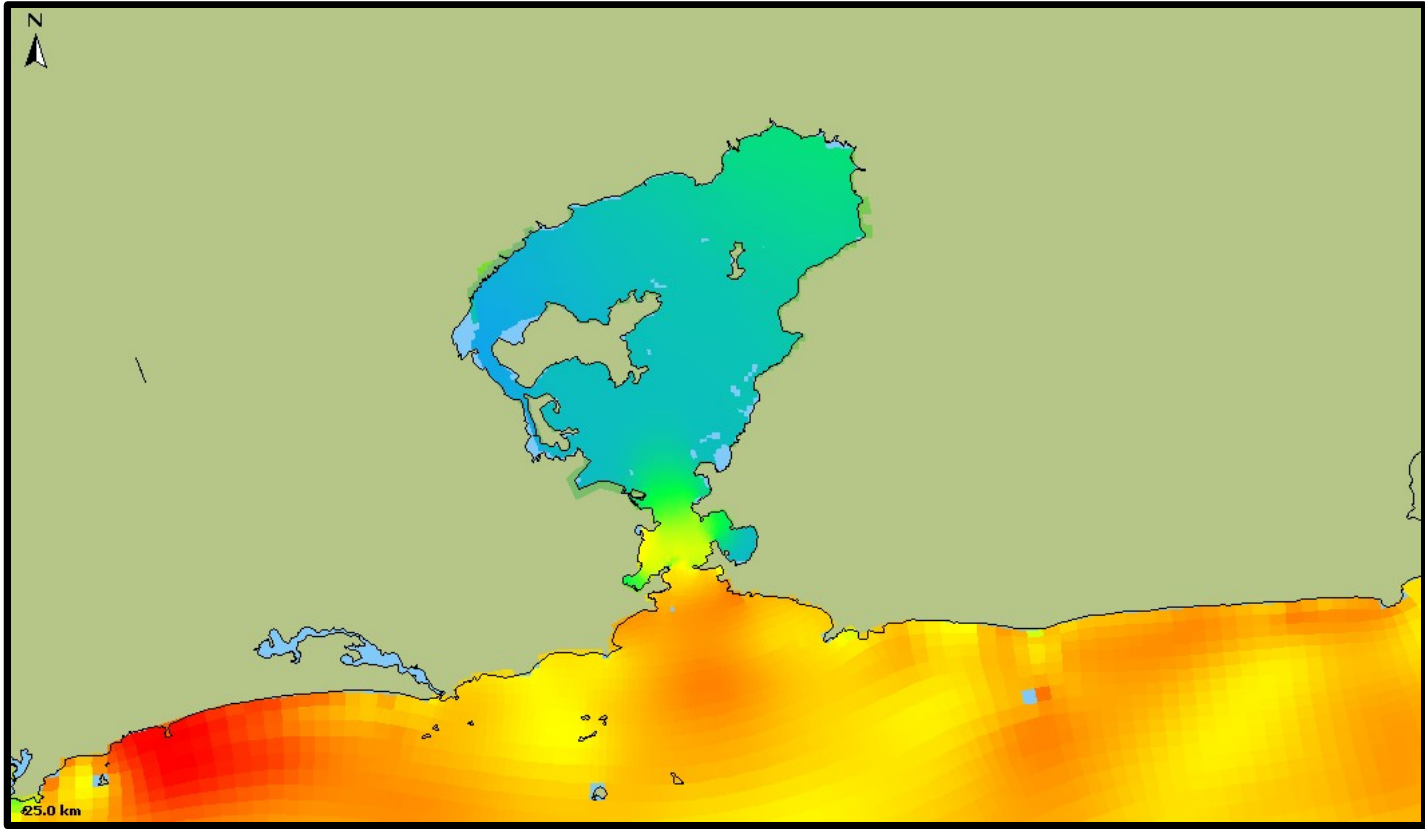
- Inputs: hydrometeorologic observations and model results
- Outputs:
 - Delft3D-FLOW: water level, currents, temperature, salinity
 - Delft3D-WAVE: height, period, direction



The system as a whole



Forecasting models



Example of output: wave height

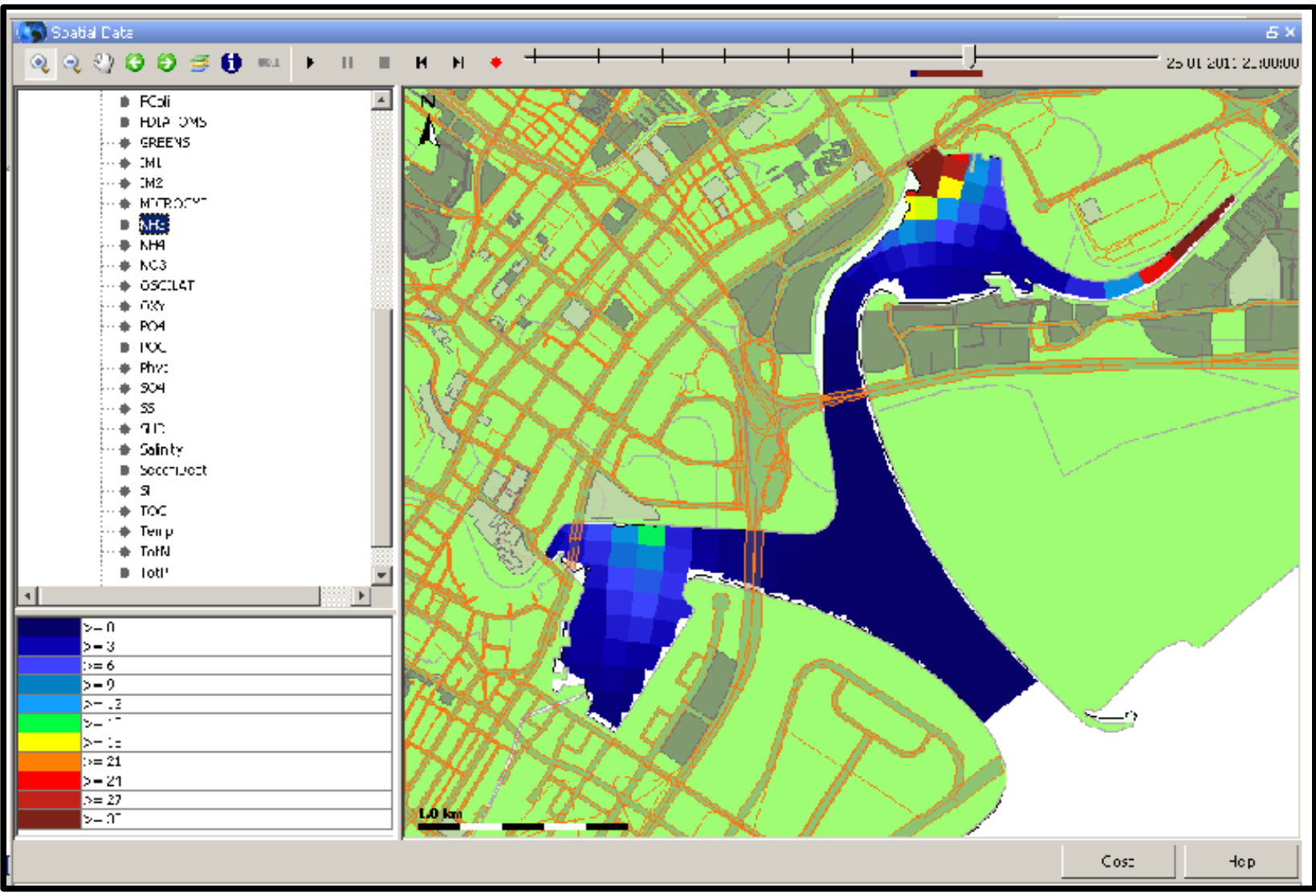
Singapore Operational Management System

Background

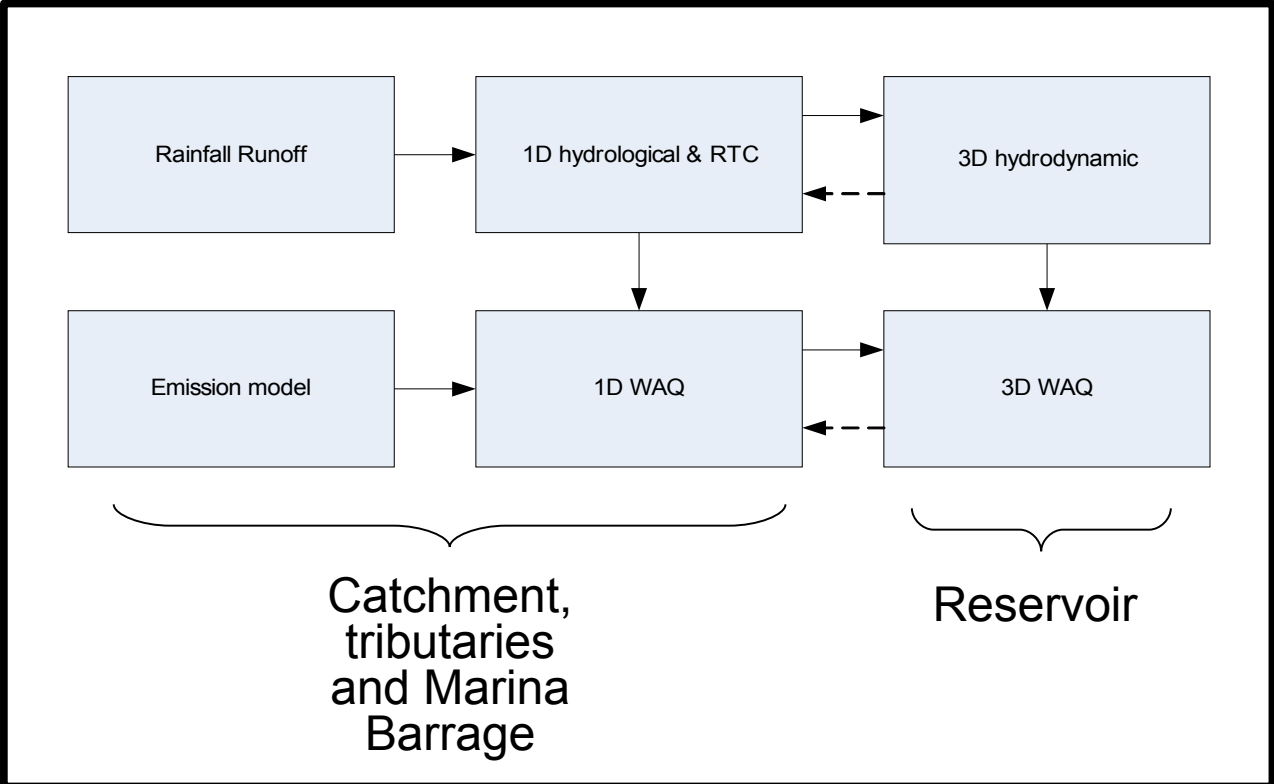
- Provides real-time water quality information and forecasting in Singapore, especially in reservoirs.
- Provides tools for rational evaluation of reservoir management

What does it do?

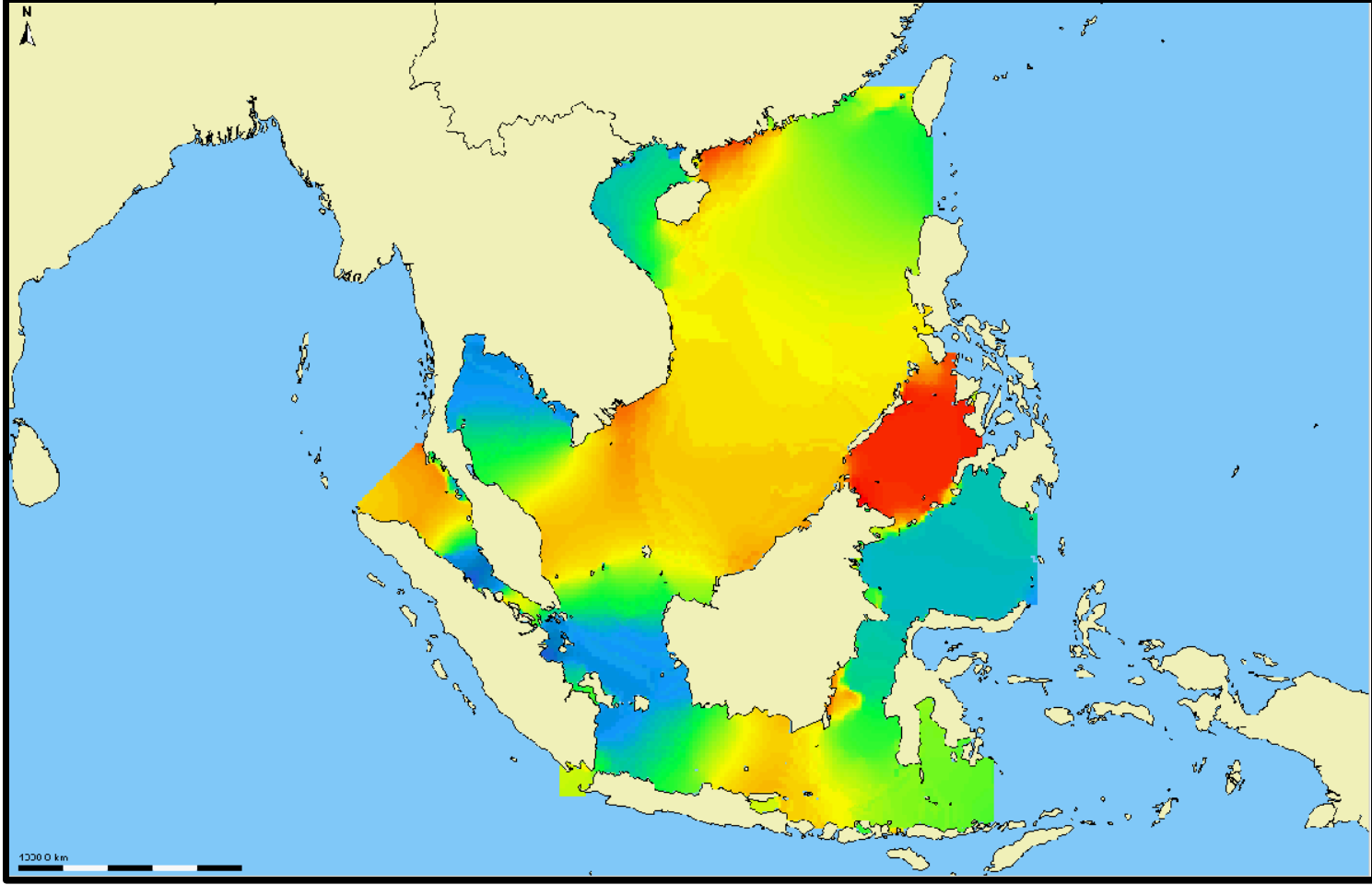
- Information and forecasts for nutrient loading, phytoplankton biomass, oxygen content, bacterial pollution, salinity, suspended load
- Includes a 1D catchment model (Sobek) coupled with a 3D reservoir model (Delft3D)



Delft3D modeled NH₃ in Marina Reservoir



Catchment and reservoir models



South China Sea water height

Conclusions

- FEWS is a useful tool for coupling timeseries and models, providing a large amount of flexibility. This flexibility has allowed FEWS to be used with oceanographic and coastal monitoring and forecasting systems, leading to:
- flexibility of data input and output
 - a wide variety of interfaced models
 - relative ease to configure to regions of interest at a variety of locations and scales