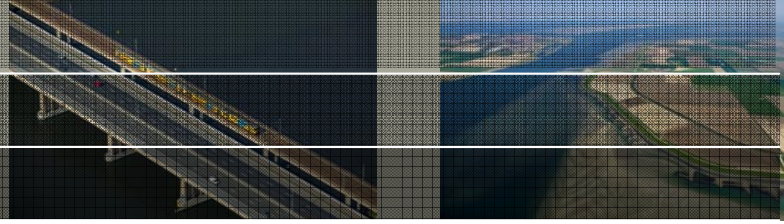
Introduction to FEWS

Hans van Duijne

WaterTech, Banff, April 2011

Email: hans.vanduijne@deltares.nl

Presentation Overview

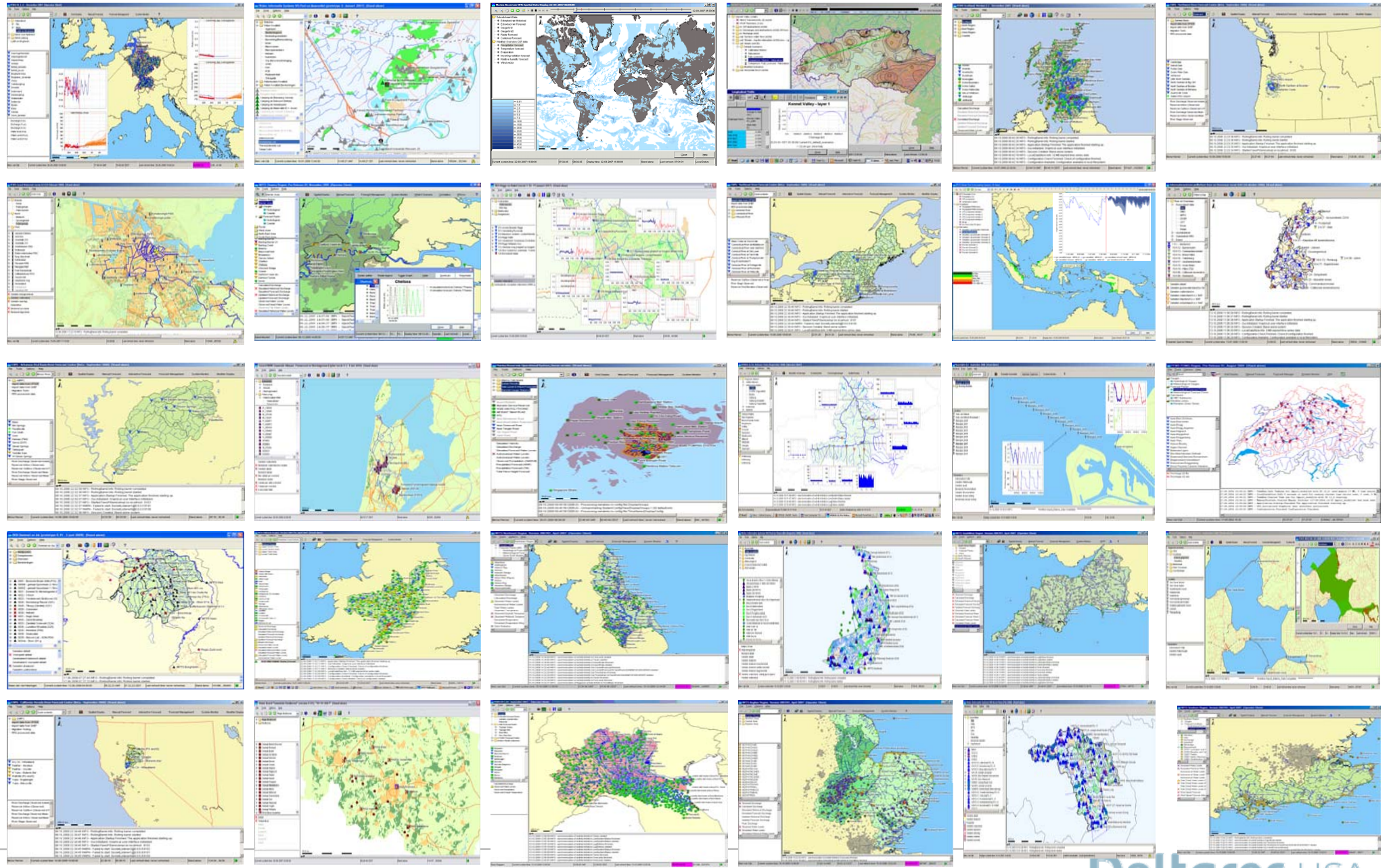


- Introduce FEWS
- Introduce several FEWS applications
- Introduce Deltares

Water Resources Warning System (FEWS)

Deltares

Delft FEWS User Community



Deltares USA

Elements of FEWS

Operator Client

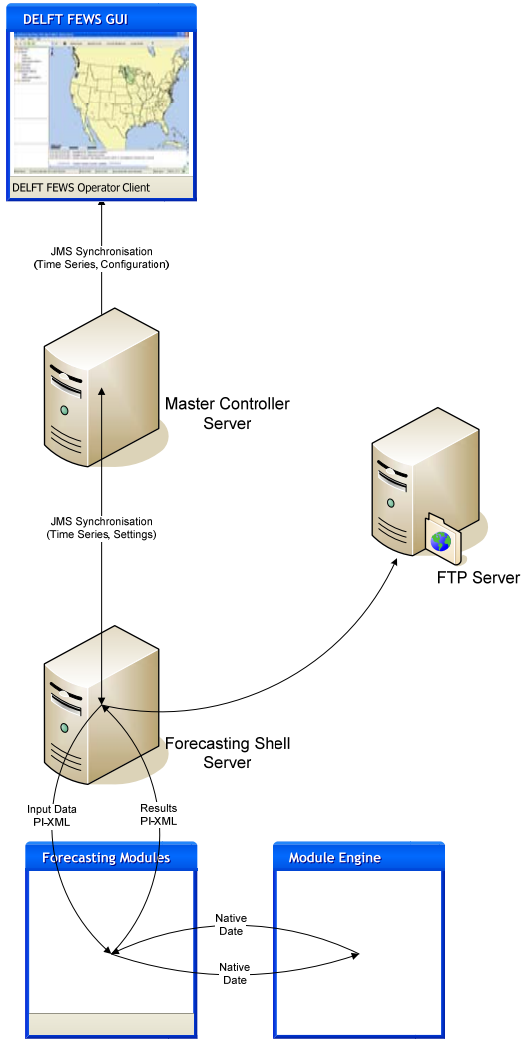
- Front end – identical to Stand Alone System
- Selected Tasks can be run locally

Master Controller

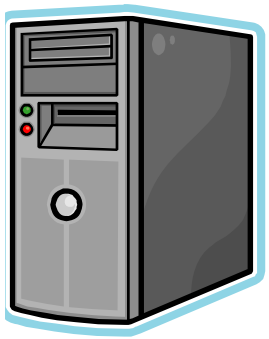
- Serverside – manages connections and run queues
- Serverside – Speaks to database (Oracle, SQL Server, POSTGRES)

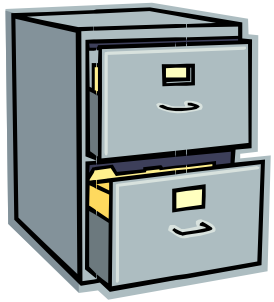
Forecasting Shell Server(s)

- Back end – processing units on which models are run
- Same application as front end (and stand alone)
- Speaks to external models



Using with FEWS





User

Conducts interactive forecast jobs at client application

Submits (modified) forecasts for approved run at server

Receives approved forecasts from server

Master Controller

Schedules and dispatches forecast requests

Synchronizes approved forecasts back to central database and clients

Central Database

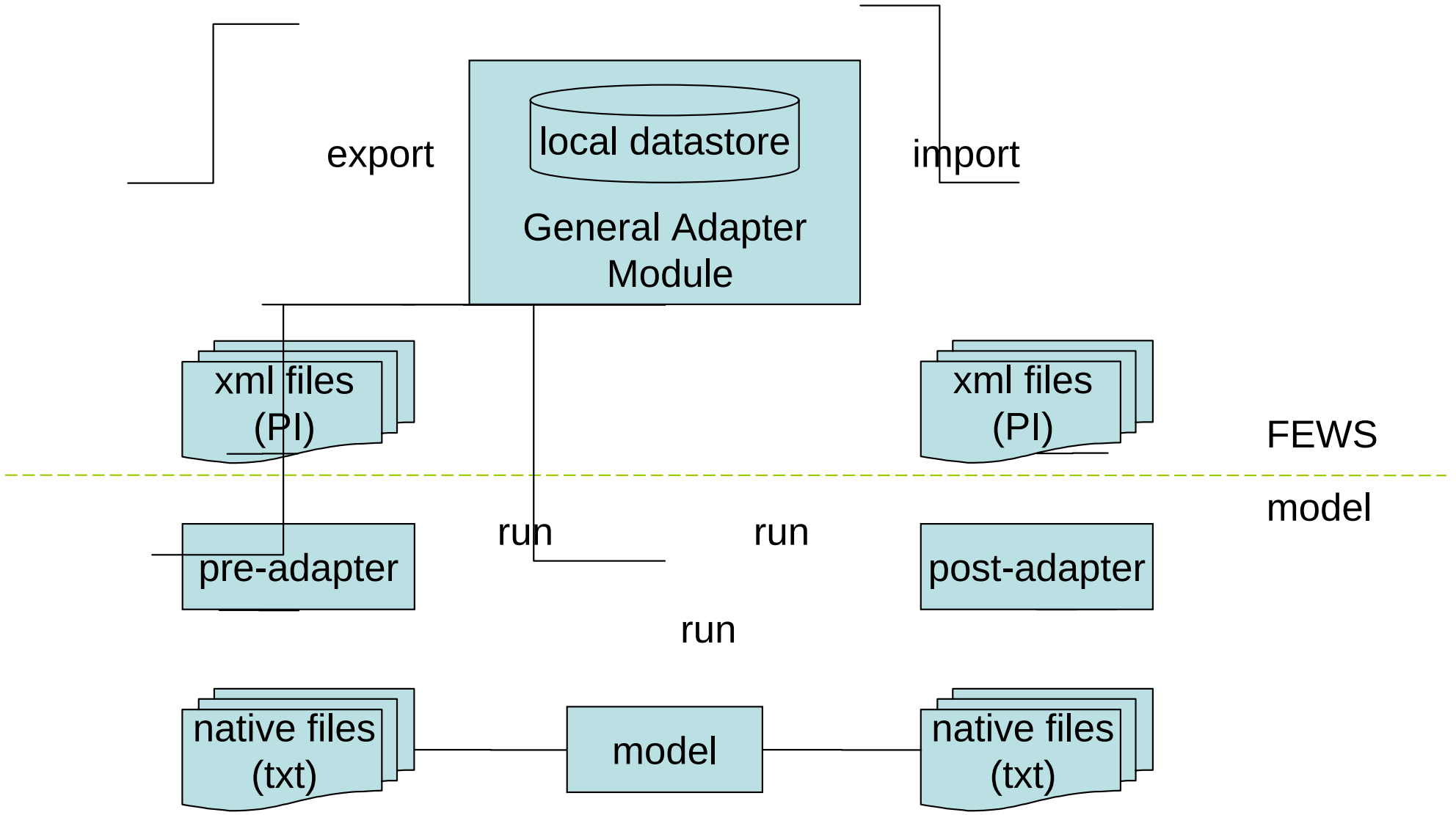
Storage of all (approved) data handled by server

(Postgres)

Shell servers

Executes approved forecasts

Running models – how does it work



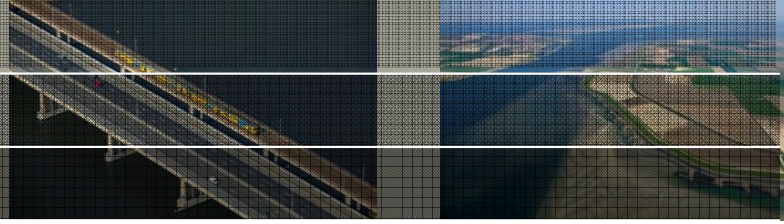
Delft FEWS

Open Shell Forecasting System

Model	Type	Supplier/Owner	Country
ISIS	Hydrodynamics	HR/Halcrow	UK
PDM			UK
TCM			UK
KW			UK
PACK			UK
ARMA			UK
PRTF			UK
TRITON			UK
STF			UK
DODO			UK
MCRM			UK
Modflow			Netherlands/UK
Mike11			Denmark
NAM			Denmark
LISFLOC			Italy
TOPKAP			Italy
HBV			Sweden
Vflo			USA
SWMM			USA
HEC-RA			USA
Snow17			USA
SACSM			USA
Unit-H			USA
PRMS			Germany
SynHP			Germany
SOBEK			Netherlands
SOBEK-			Netherlands
Sacrame			Netherlands
RIBASIM			Netherlands
REW	Distributed Rainfall-Runoff	Deltares	Netherlands
DELFT3D	2/3D Hydrodynamics/Water quality	Deltares	Netherlands
TWAM	2D Hydrodynamics	PlanB	UK

FEWS is an Open Modeling Framework

About FEWS

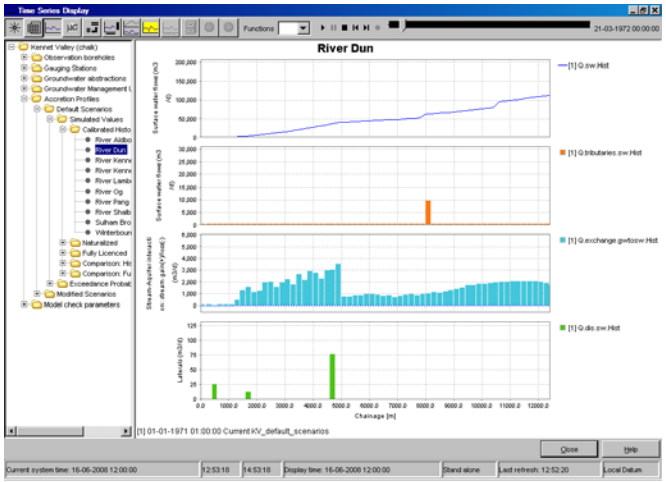


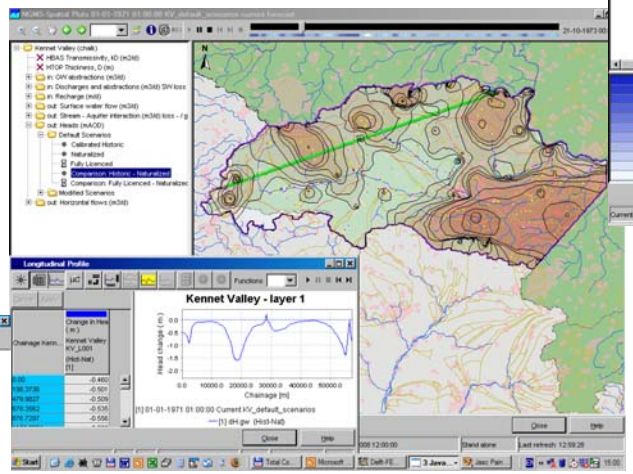
- The software is free
- The source code will be open source within a closed community
- Any model can be linked to FEWS without Deltares
  > Many examples of this
- New displays can be added without Deltares
  > This requires coding expertise
- New data can be added without Deltares
  >This requires coding expertise

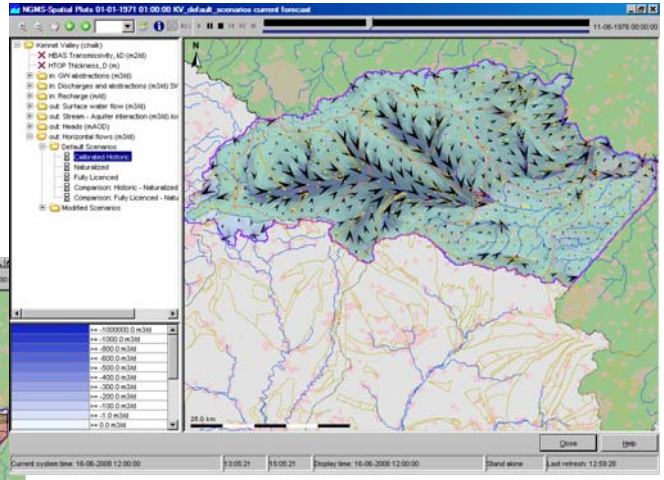
Example FEWS Applications

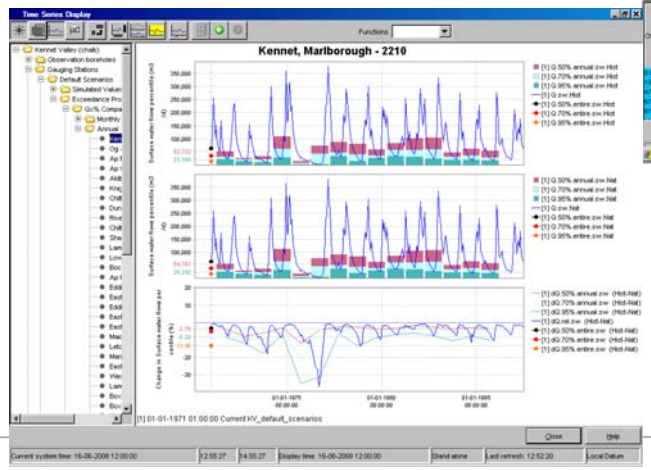
Deltares

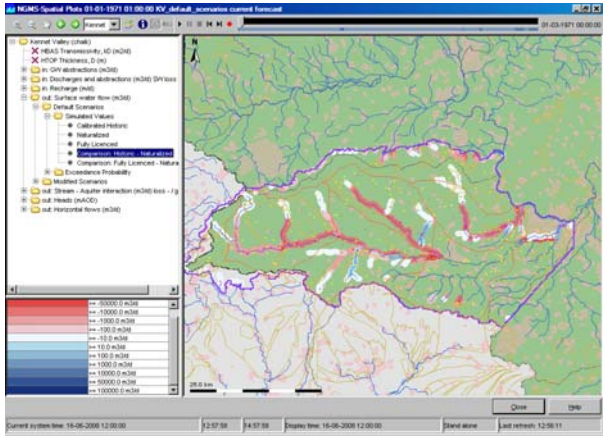
FEWS: Groundwater Modeling for the UK









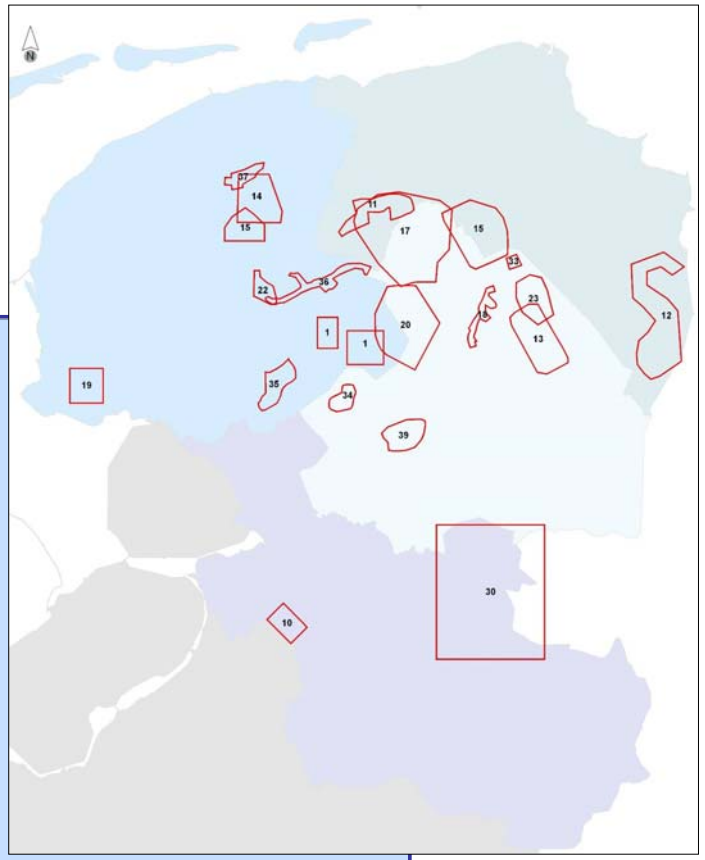


Deltares USA

Groundwater Interactive planning

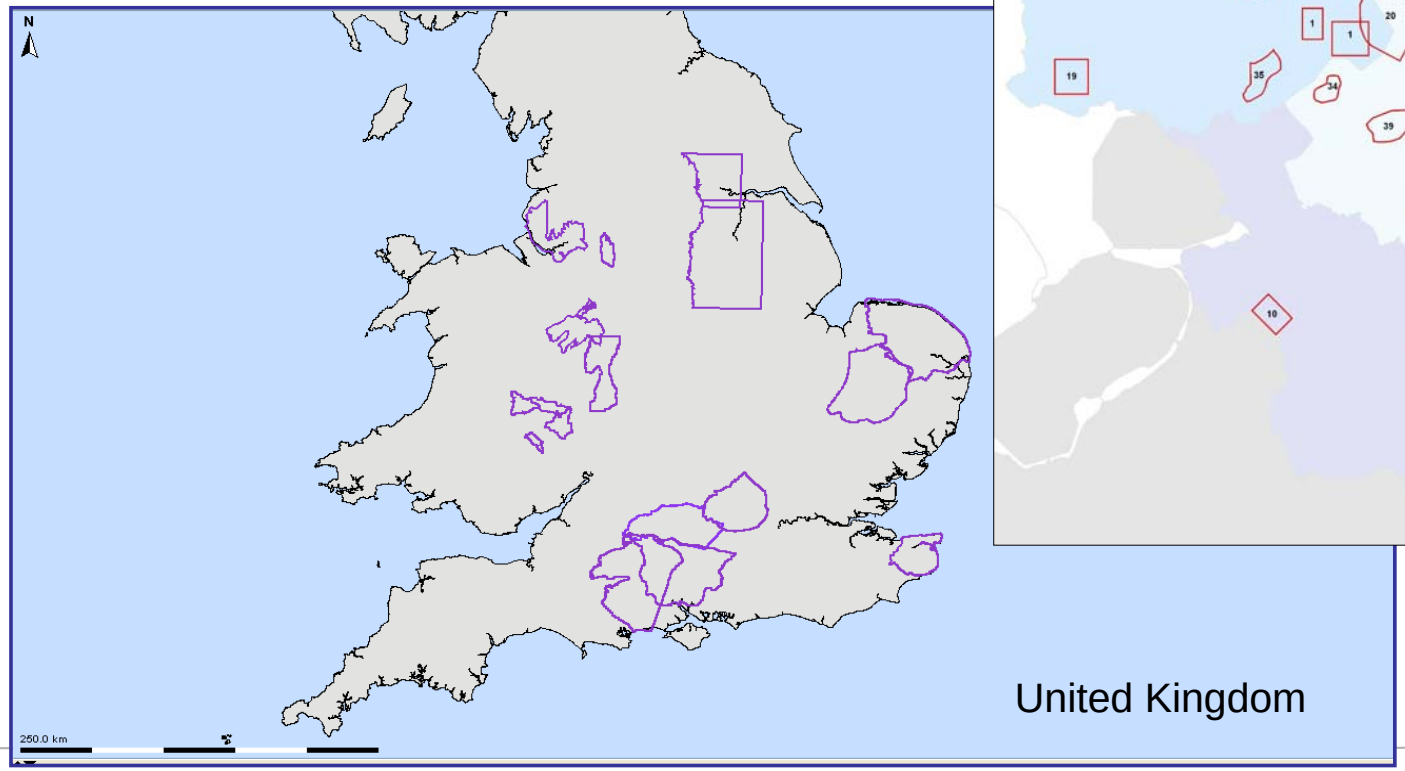
Methodology for Interactive Planning in WAter management, MIPWA

The Netherlands



Advantages:

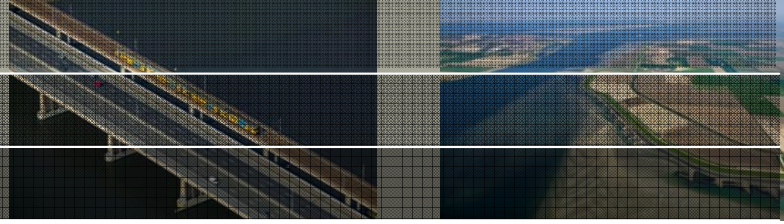
- Solve boundary problems
- Supports large models
- No inconsistencies



United Kingdom

Deltares USA

iMOD Demonstration



- Yare North Norfolk is used in the IMOD demonstration

1. Showing some inputfiles of the Yare North Norfolk. These files are automatically created the IMOD-inputfiles by use of the MODFLOW-IMOD adapter.

1. Model simulation of the entire Yare North Norfolk

1. Example of a sub model in Yare North Norfolk

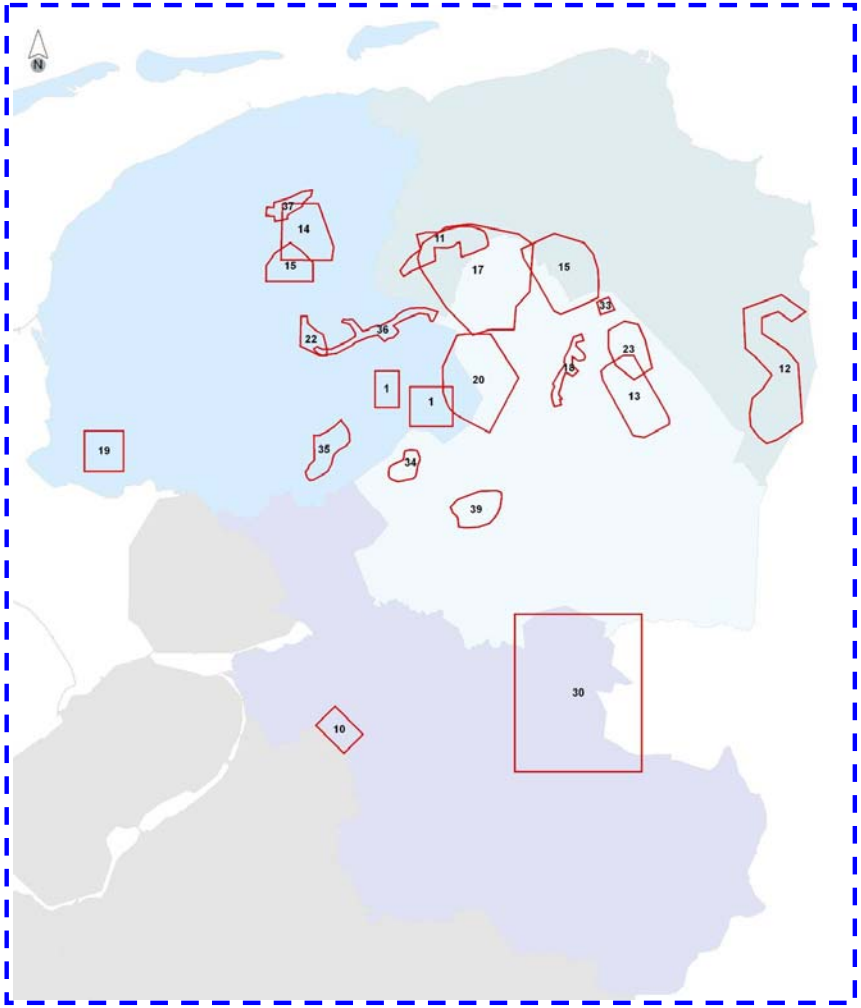
1. Showing the scenario editor for submodels

1. Extra: Making 2D profiles

MIPWA: an example

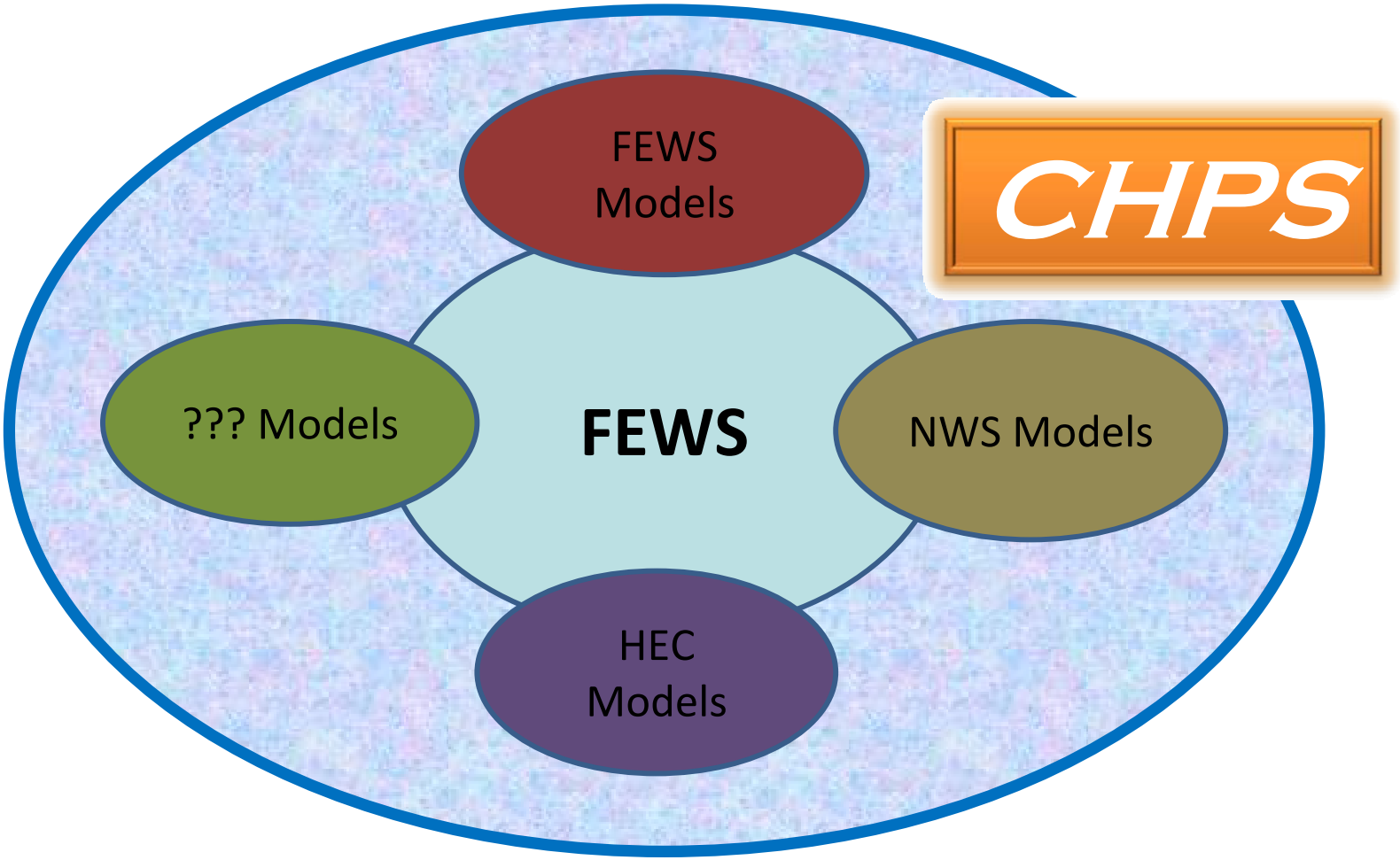
Methodology for Interactive Planning in Water management

- > 50 local models
- Inconsistencies
- Boundary problems

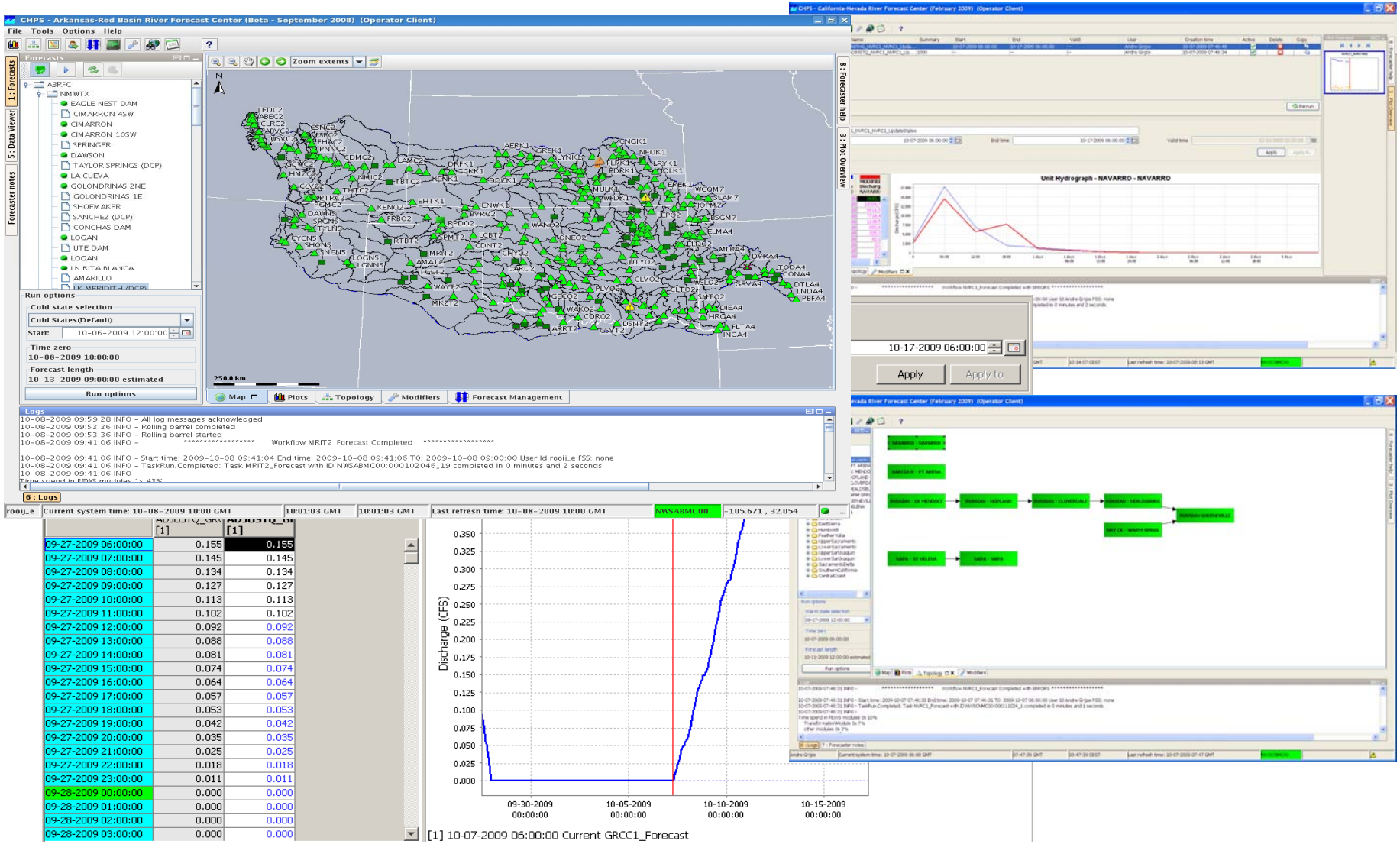


Deltares USA

CHPS = Community Hydrological Prediction System

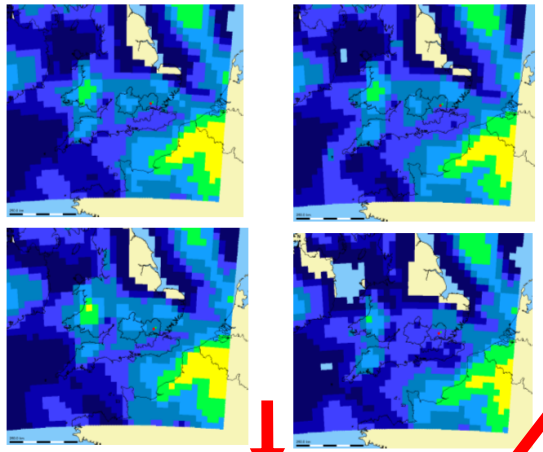


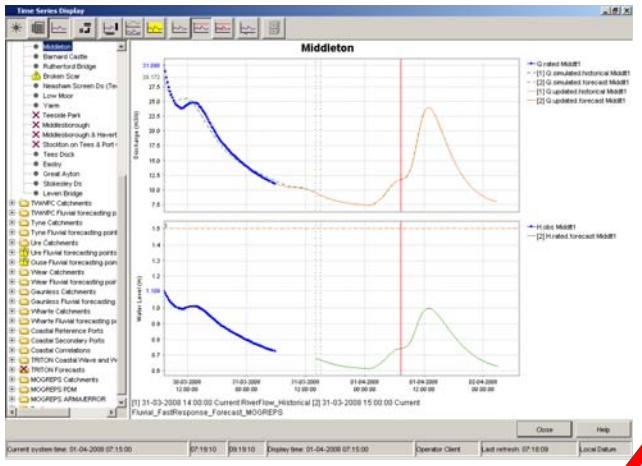
NWS Forecasting with CHPS

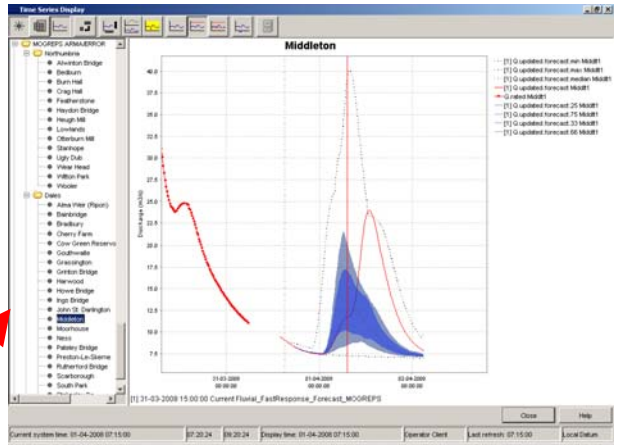


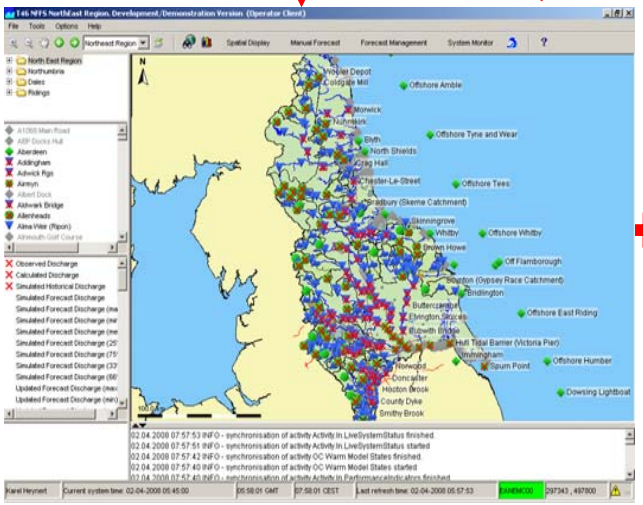
Deltares USA

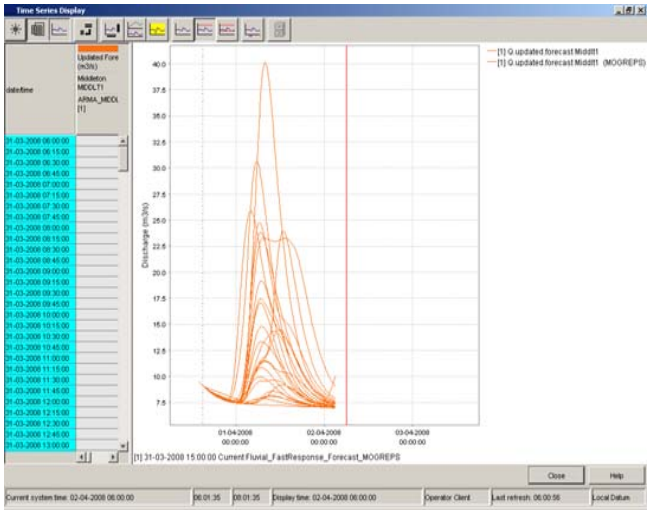
FEWS Supports Ensembles

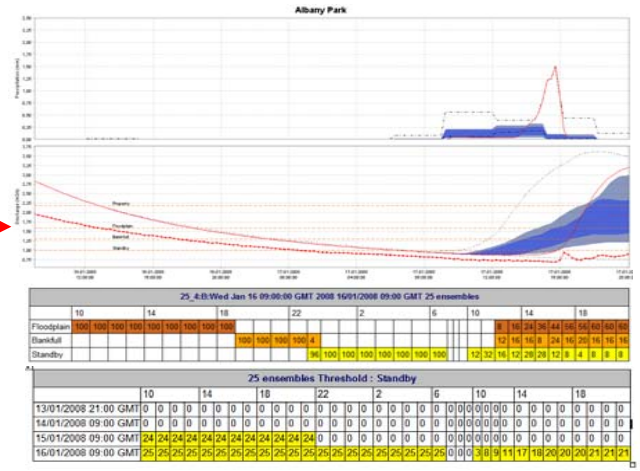






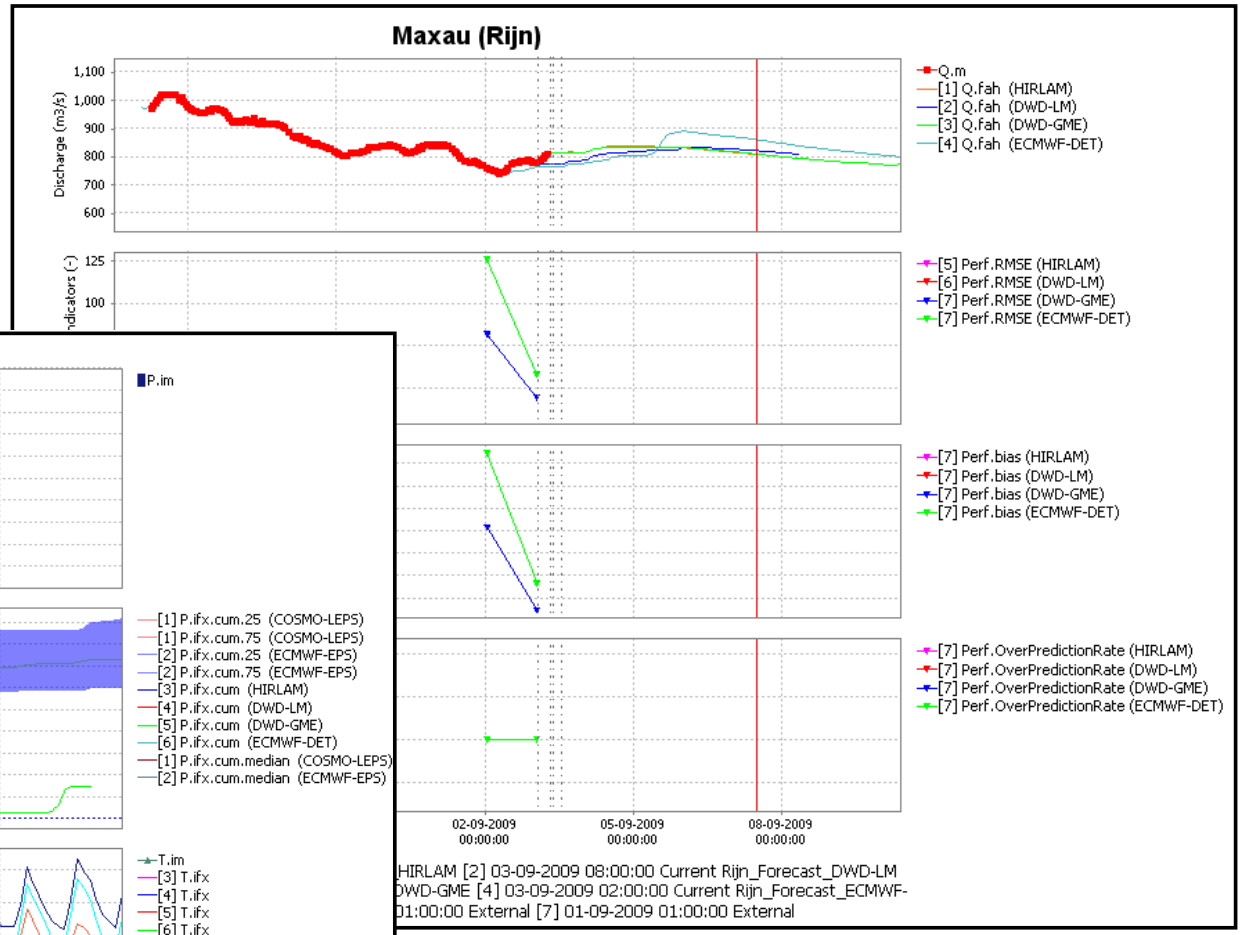


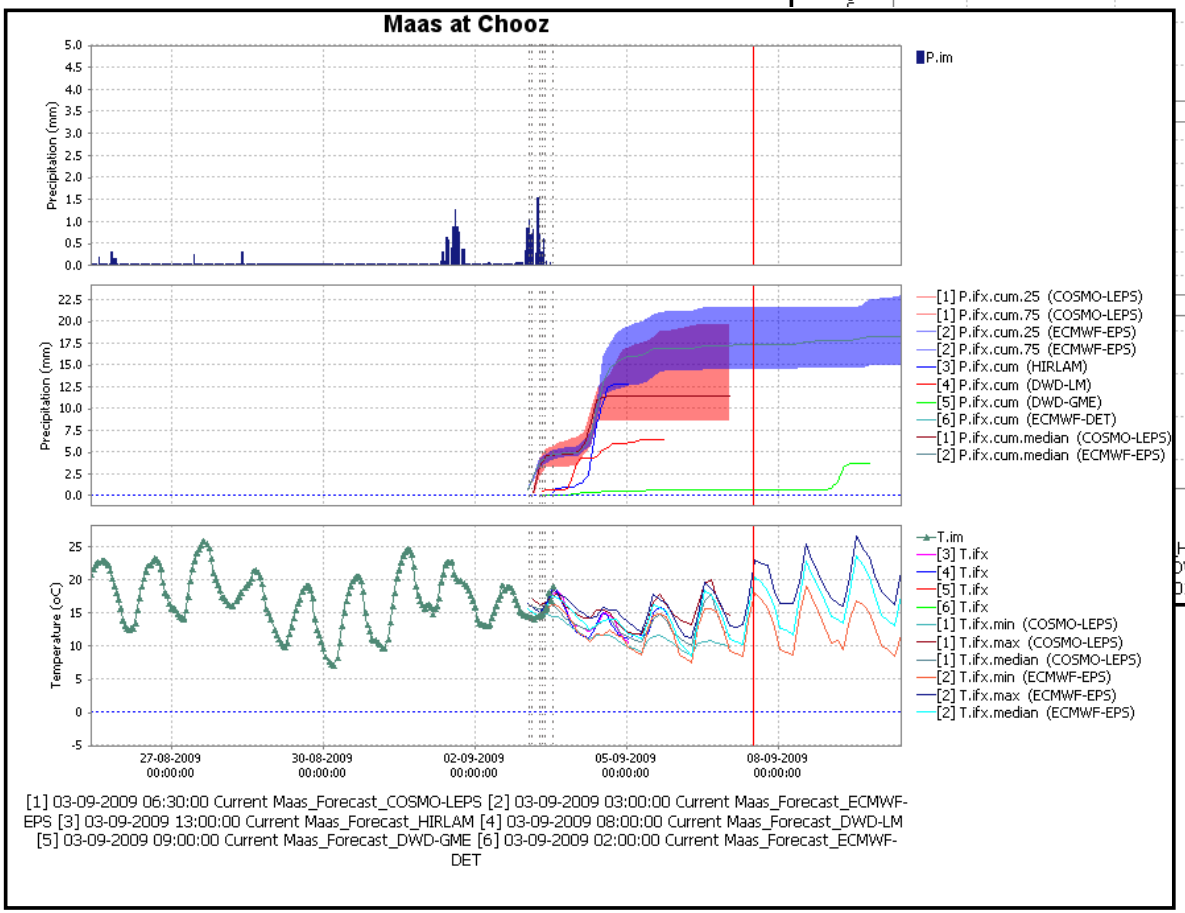




Deltares USA

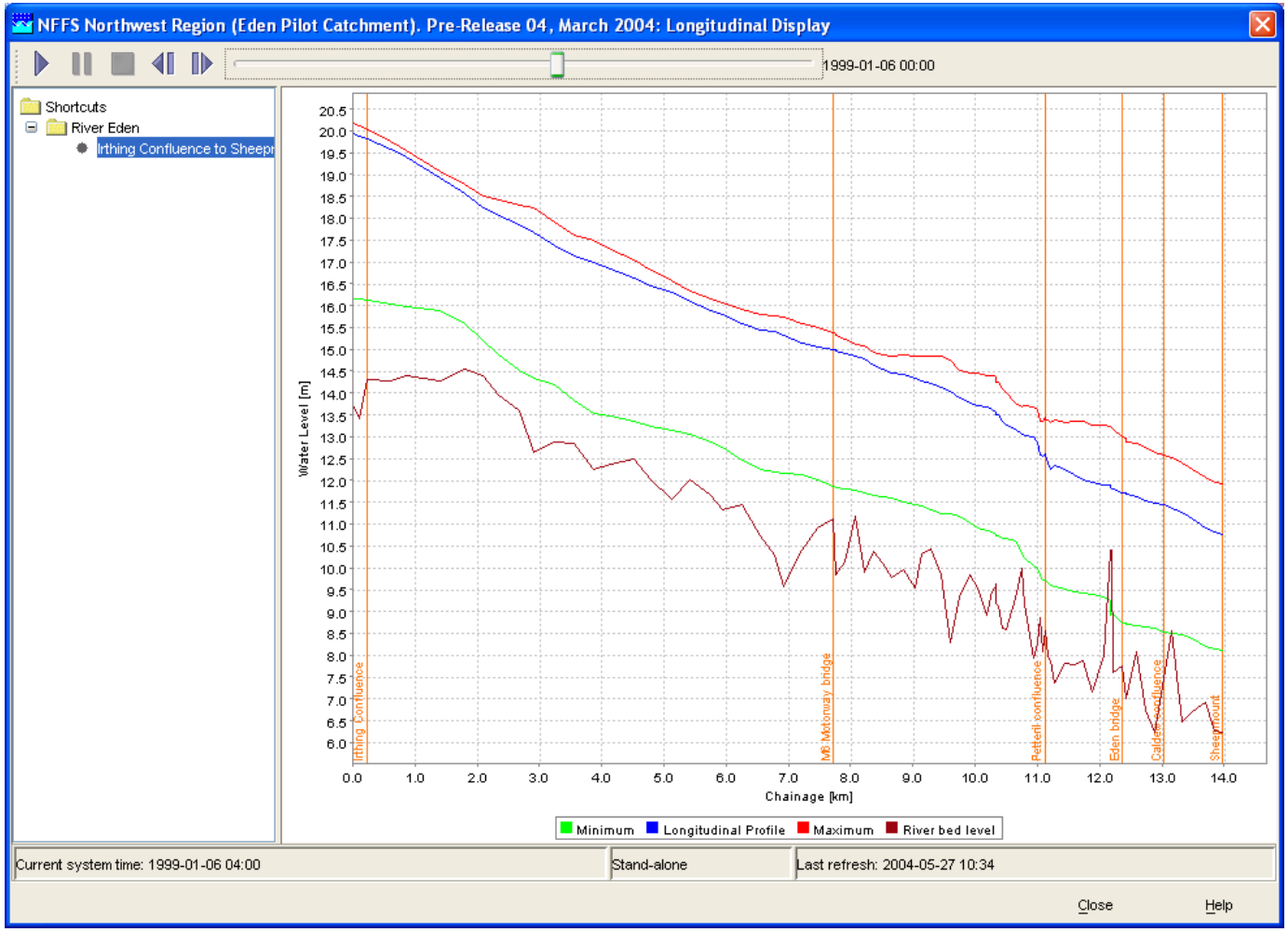
Uncertainty: Performance Indicators





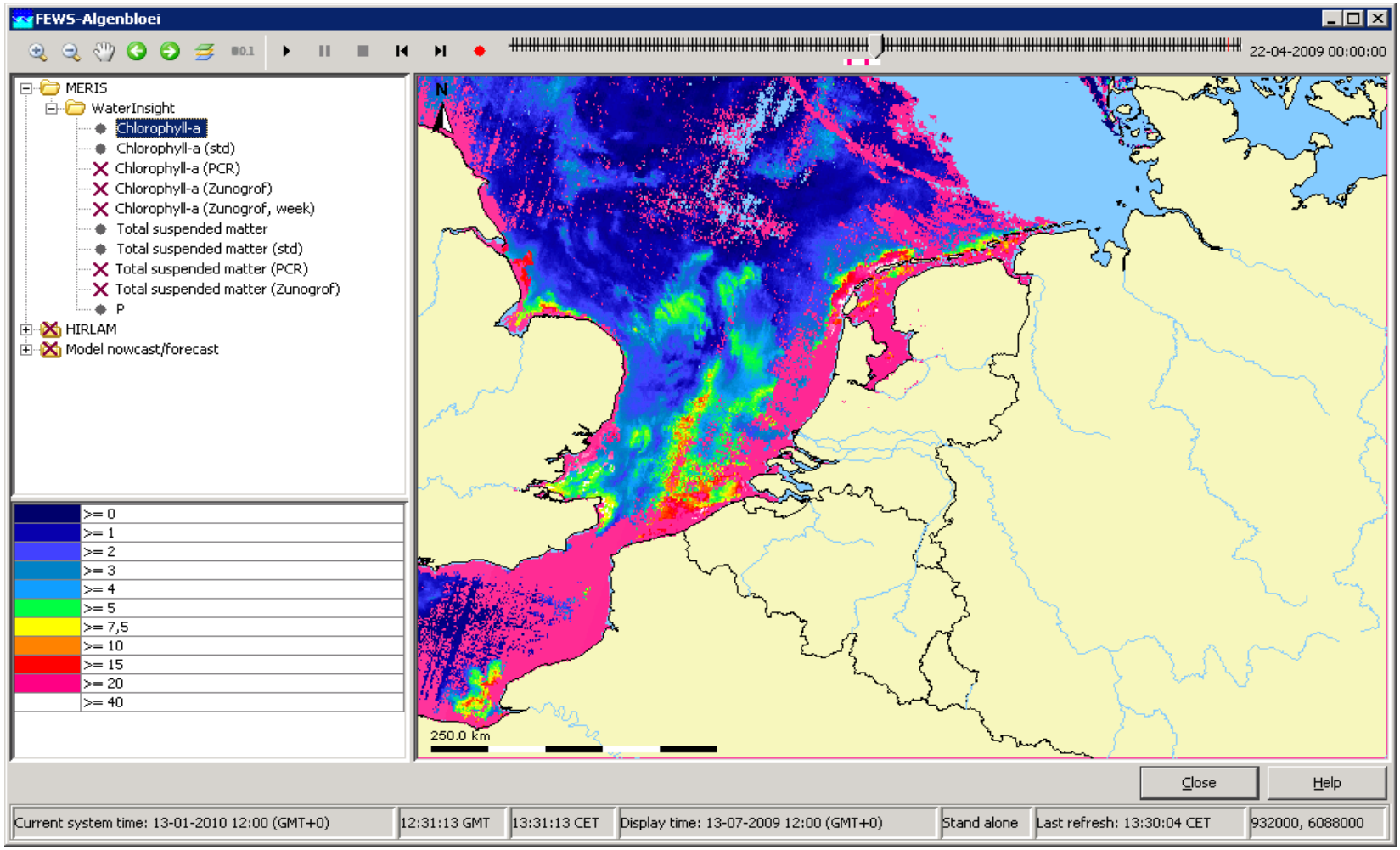
Deltares USA

FEWS: Longitudinal Display

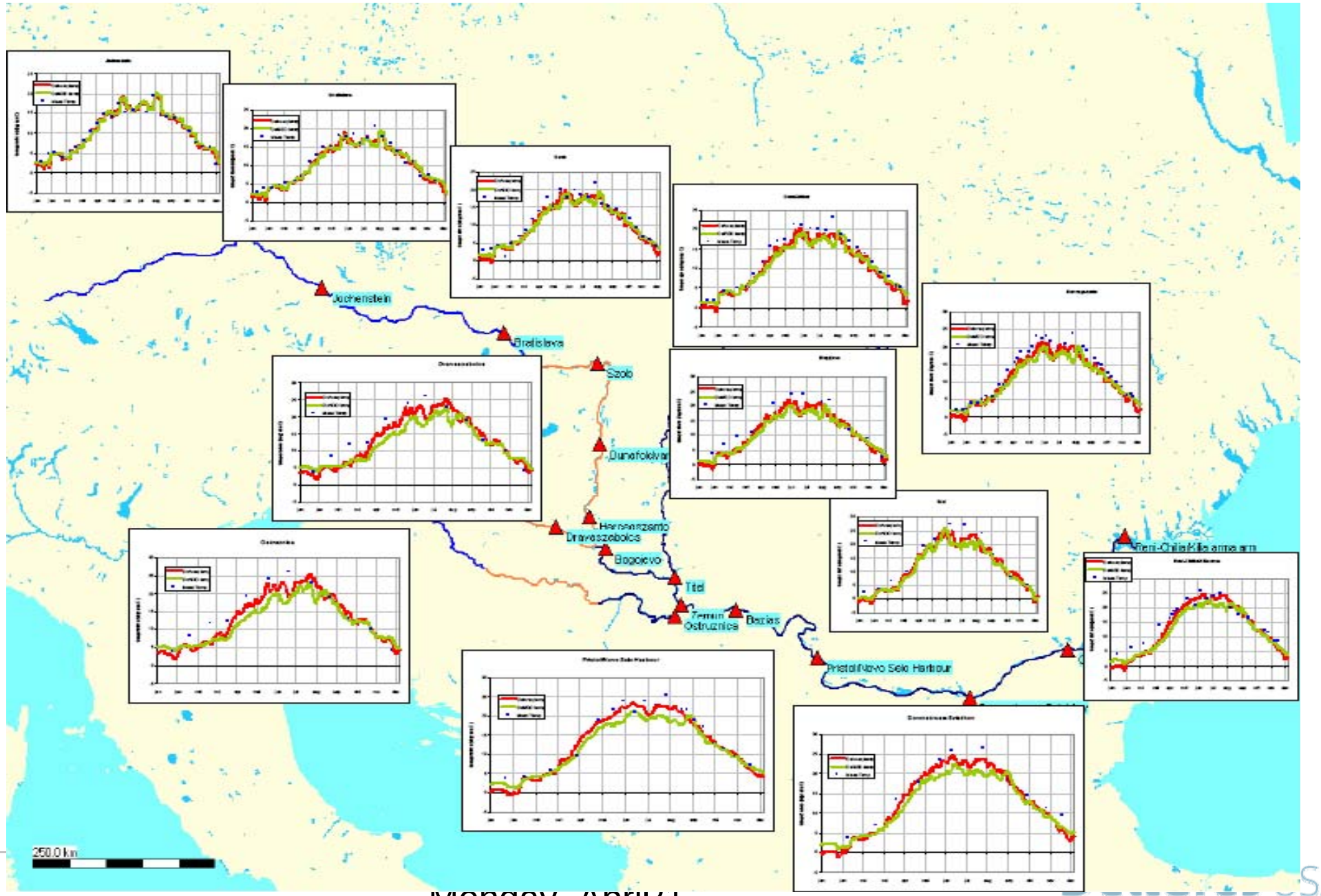


Deltares USA

FEWS: Algal Bloom Forecasts



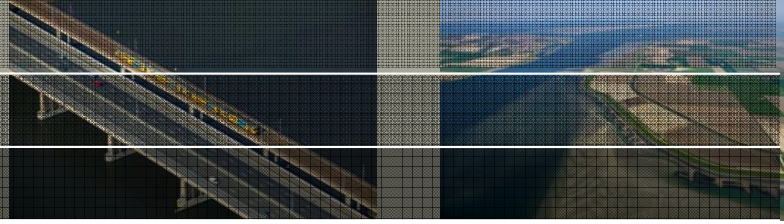
FEWS: Water Temperature Forecasts



Introduction to Deltares

Deltares

Deltares



- Deltares USA
  - US non-profit conducting hydrologic research and education
  - 3 staff
  - Tight collaboration with the Netherlands, but with the advantage of local presence

- Deltares (in the Netherlands)
  - Established in 1920's
  - Non-profit foundation under Dutch law
  - 900 staff
  - Topics…
    - surface water, groundwater & geotechnics
    - design, policy & management / operation
    - studies, software & hydraulic research
  - Overseas projects: 30%

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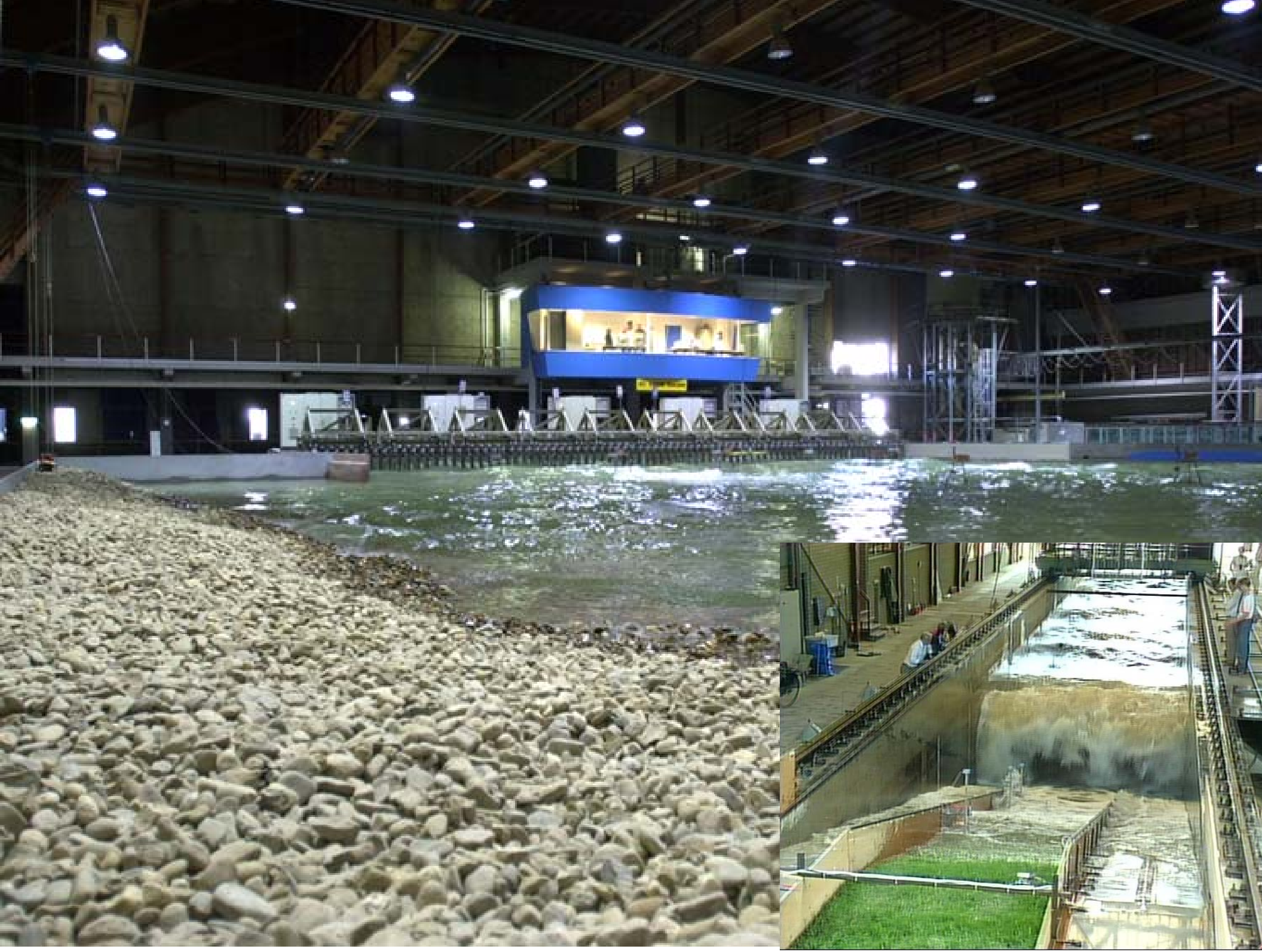
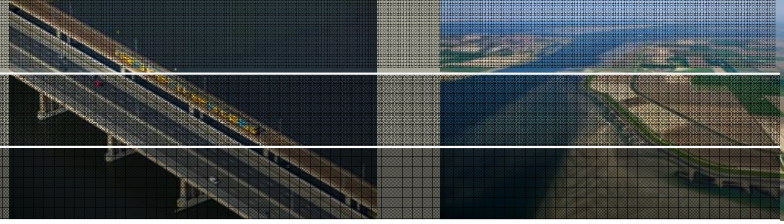


....And lots of software



hydraulic engineering

- Delft3D
- SOBEK
- Delft-CHESS
- Delft-WAVES
- WANDA

water management

- Delft3D
- SOBEK
- RIBASIM
- Delft-FEWS
- HYMOS
- Delft-CHESS

urban water cycle

- WANDA
- SOBEK

hydrodynamics

- Delft3D
- SOBEK
- Delft-CHESS
- Delft-WAVES
- WANDA
- WAQUA

hydrology

- HYMOS
- SOBEK
- Delft-FEWS

morphology

- Delft3D
- Delft-CHESS
- SOBEK

water quality

- Delft3D
- SOBEK
- MAMPEC
- Emission module

ecology

- Delft3D

offshore

- Delft-WAVES
- Delft-CHESS

coasts

- Delft3D
- Delft-CHESS

harbours

- Delft-WAVES
- Delft-CHESS

estuaries

- Delft3D
- SOBEK

rivers

- Delft3D
- SOBEK
- HYMOS
- Delft-FEWS

canals

- SOBEK

sewers

- SOBEK

Deltares