

Real-time flood forecasting model for the Demer basin (operational flood modelling)



Client : AMINAL, Afdeling Water

Date : 2001 - 2011

Budget : € 235 400 (share of Soresma)

Location : Belgium, Limburg & Vlaams-Brabant

Assignment :

Soresma nv (in association with IMDC and Wallingford Software) was selected by AMINAL, Afdeling Water for the development and implementation of a state-of-the-art real-time flood forecasting model for the Demer basin.

This on-line system will allow our client to:

- forecast flood events in the Demer river basin in the near future (one to two days in advance)
- to inform emergency services automatically on the present and future situation in the Demer basin even before critical situations occur
- to deploy a proper water management policy by e.g. adjusting control structures (such as weirs, inlets, pumps, ...) in order to reduce the damage.

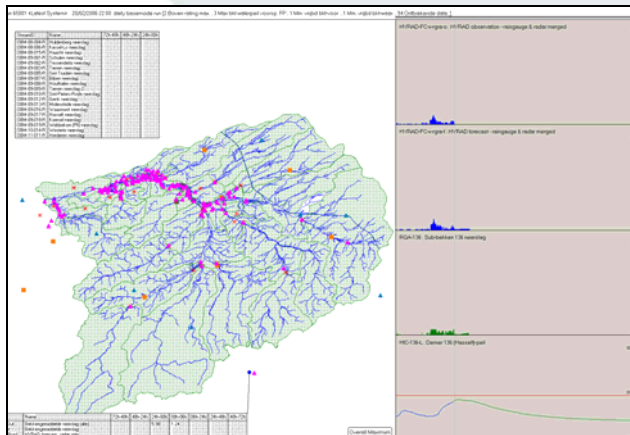
Technical Description :

Demer river basin

The Demer river basin is situated in the provinces Limburg and Vlaams-Brabant and has regularly been struck by heavy floods over the last decade. People in the neighbourhood still remember the violent floods in January 1995 and September 1998 that caused huge material losses in towns as Diest, Zichem and Aarschot, ... The Demer catchment is characterized by an extensive densely populated area that reaches up to the river banks and numerous water management constructions, each with their proper complicated operational features.



Flooding in Halen - September '98 (picture by AMINAL, Afdeling Water)



User Interface of the Flood Forecasting Model

Flood Forecasting Model

The real-time flood forecasting model for the Demer basin can be described as an advanced tool in management support, resulting in a synergy based on the most recent river basin and flooding management tools on the one hand and the latest trends in data-acquisition techniques and software development on the other.



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The real-time flood forecasting model for the Demer basin guarantees both an optimal control of the existing and planned water management infrastructure in the Demer basin and an appropriate critical management tool during flooding.

The tool functions fully automatically 24/24 and 7/7. Depending on the position it will systematically read measurement data from 19 pluviographs, 8 meteo stations and 25 limnigraphs of the field network. The tool further records 21 weir positions and 25 water level measurements every 15 minutes at selected water control structures e.g. at the retention basins of Schulensmeer and Webbekomsbroek.

Twice a day it receives the precipitation forecasts for the coming 36 hours, 48 hours and 10 days of a KMI weather forecasting model.

All recorded data are introduced in numerical models allowing the tool to forecast the following:

- precipitation in the entire basin area
- snow that may melt
- run off and water flow for 79 sub basins and its tributaries in the Demer river catchments
- water level on 3329 locations on the Demer river and its tributaries between Kermt and Werchter (144 kilometres of water course)
- flooded areas (and associated water levels) in the Demer valley.

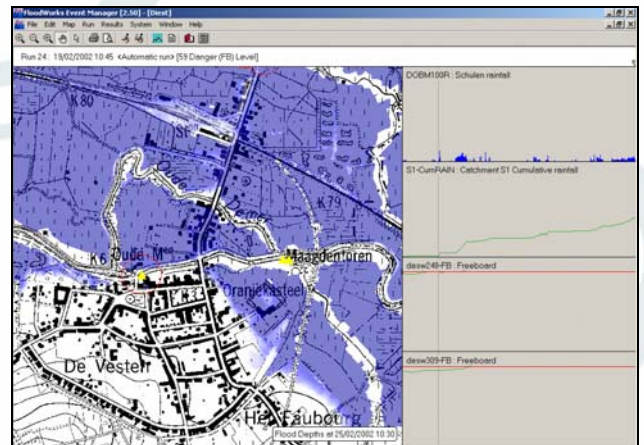
On top of that it is possible to simulate and evaluate in real-time a number of emergency scenarios such as breaches in dikes, defects on weirs and pumps, obstructions of bridges and tubes.

The simulated forecasts are automatically reported to the emergency services, local authorities, the press and other stakeholders. The generated flood maps that accompany the reports visualize neighbourhoods, streets and houses that are threatened by flooding in the forthcoming 6 to 48 hours.

Integrated system

The real-time flood forecasting model for the Demer basin includes four separated modules that are integrated in one central user interface:

- Observation module: collects, validates and visualizes hydrological data in real-time for about 10 field stations (climate stations, constructions, etc.) linked by means of telemetrics for hundreds of data flows (water levels, water flow, precipitation, weir positions, inlet control, ...)
- Forecasting module: predicts water levels, water flow and flooding areas, based on three numerical models. These are successively:
 - Rainfall-Runoff (PDM) - Hydrology
 - Hydrodynamic flow (IWRS) - Hydraulics
 - Flood mapping (IWRS) - Flooding
- Management supporting module: assists the operators in the evaluation of the uncertainty in the forecasts, the possible measures and the emergency scenarios that may occur
- Alerting module: allows a clear synthesis and interpretation of all information from the previous modules.



Forecasting of flood, water level and precipitation

Hardware

Two linked redundant servers form the central calculator of the integrated software tool. These servers are assisted by two interconnected clusters of four high quality processors in order to obtain enough calculating power for on-line scenario analyses.

A telemetric server links all remote stations in the field, assuring an optimal transfer and data acquisition towards the calculation module.



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