STEADY AND UNSTEADY INUNDATION MODELLING BASED ON HIGH RESOLUTION TOPOGRAPHIC DATA

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MODELS

HYDRAULIC MODELLING

WOLF modelling system:

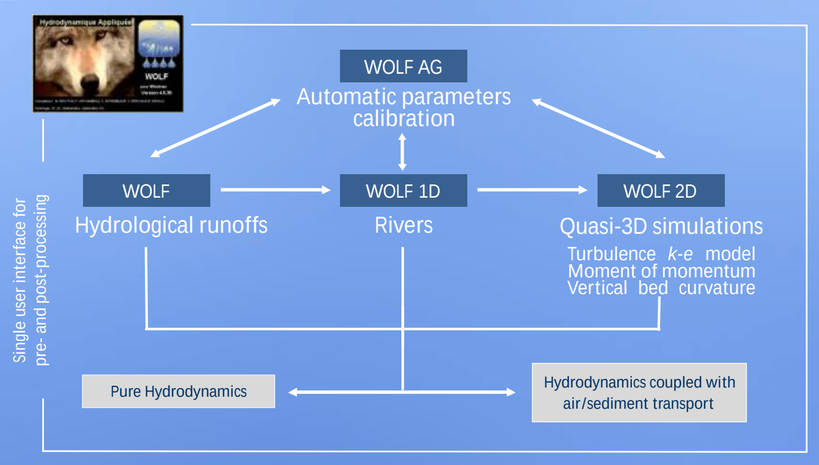
- The 1D and 2D models are used in this study
- 1D and 2D are fully dynamic
- Modules are included into a single user interface

Main characteristics of the 2D model :

- Velocity field in the floodplain
- Complex topography such as urban area

Main characteristics of the 1D model :

- Deal with exchange between flooplain and river bed



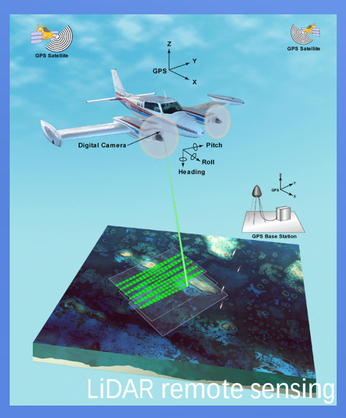
Summary

Inundation mapping (water heights and velocity field based on 2D flow simulations) is being performed in the whole Walloon Region as a basis for a flood risk analysis and mitigation program.
Only floods caused by overflow of rivers are considered at the present stage of the project.
Most accurate topography data (DEM) currently available are exploited to describe the floodplains (information resolution of 1 point/m^2 with an accuracy of 15 cm in elevation).
Moreover a 1D-2D coupled model is used to model the propogation of floods between Ampsin and Lixhe on the Meuse in the context of the European Project Interreg IVb AMICE.

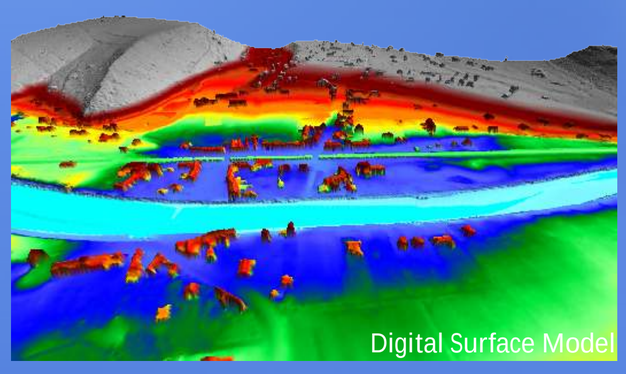
INPUTS FOR 2D MODELLING

Topographic Data : LiDAR DSM

LiDAR (Light Detection and Ranging) is a remote sensing technology. Like the similar radar technology, which uses radio waves instead of light, the distance to an object is determined by measuring the time delay between transmission of the pulse and detection of the reflected signal.



LiDAR remote sensing



Digital Surface Model

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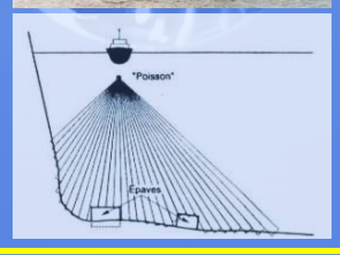
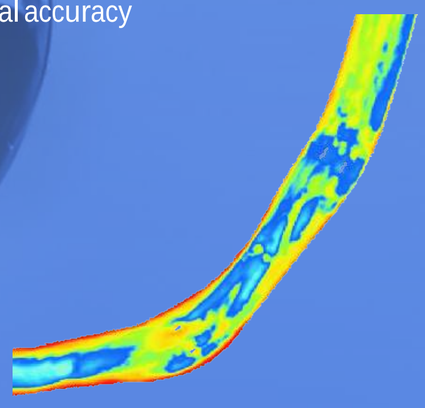
Topographic Data : SONAR

The SONAR technique contributes to measure the river bed topography since the LiDAR signal does not go through the free surface. The spatial resolution is the same than LiDAR i.e. 1 point/m² with 15 cm of vertical accuracy





Sonar river bed model

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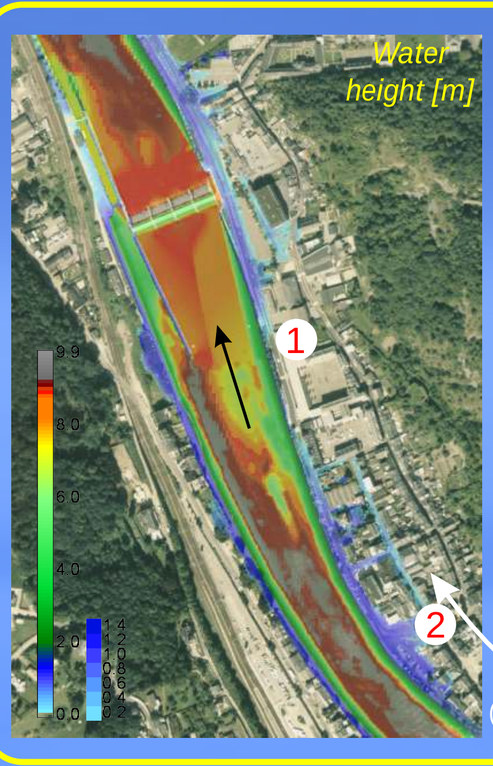
Topographic model for 2D modelling

LiDAR and SONAR combined with an aerial picture

2D FLOOD MODELLING

1995 historical flood event on the Meuse in Dinant. Comparison between (a), (b), (c) aerial pictures of the flood event (by courtesy of SPW) and (d), (e) predicted water heights. Hot spots are drawed with white circles



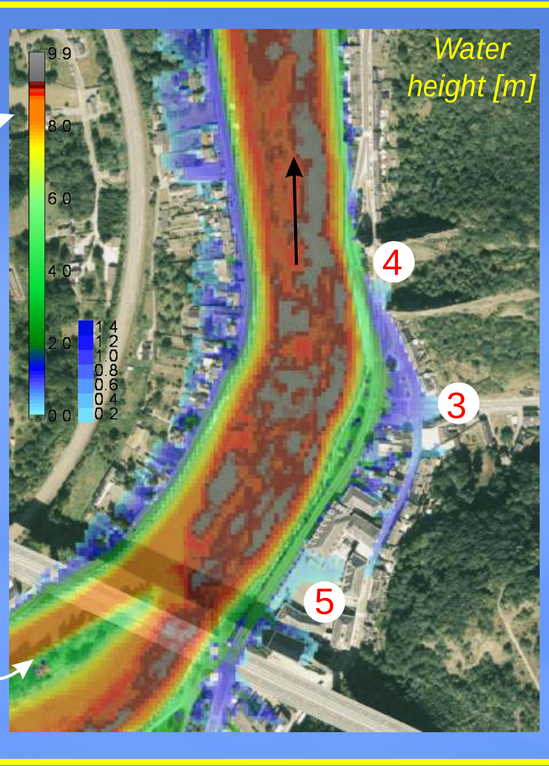
(a)

(d)

(b)

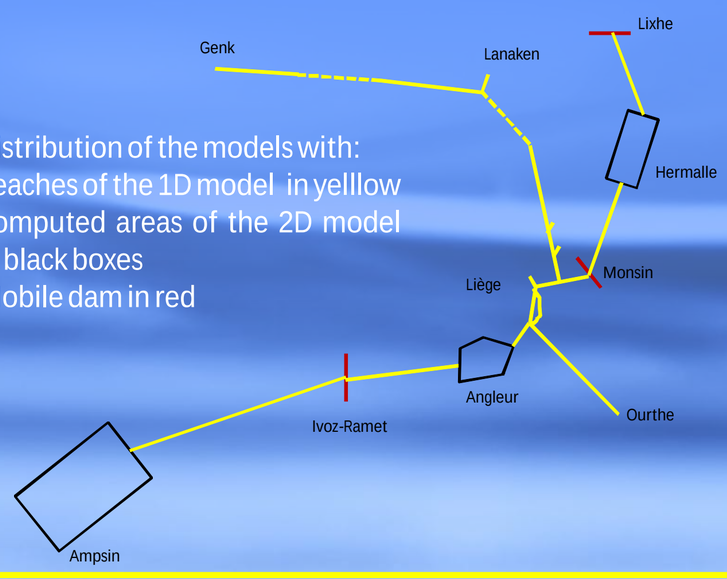
(c)

(e)



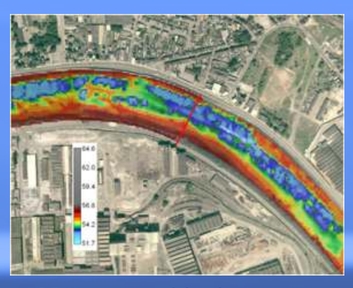
1D-2D COUPLED MODEL

In the framework of the European project Interreg IVb AMICE, a 1D-2D coupled model has been developed in order to study the flood propagation between Ampsin and Maaseik. 2D model is localized where inundations exist

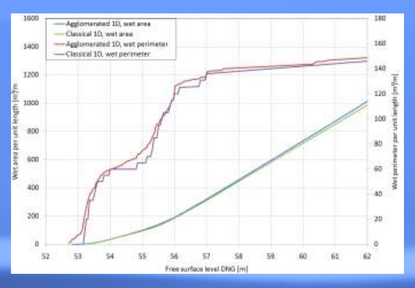


Distribution of the models with:
Reaches of the 1D model in yelllow
Computed areas of the 2D model in black boxes
Mobile dam in red

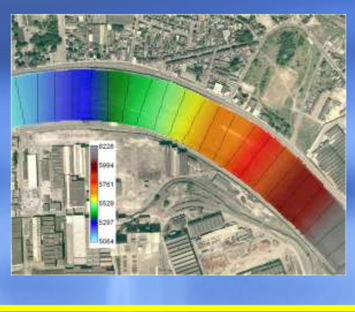
Topographic data (cross sections each 50 m) used in the 1D model are based on an agglomeration of the 2D data in order to improve « classical » cross sections



2D topographic data and line of a classical cross section

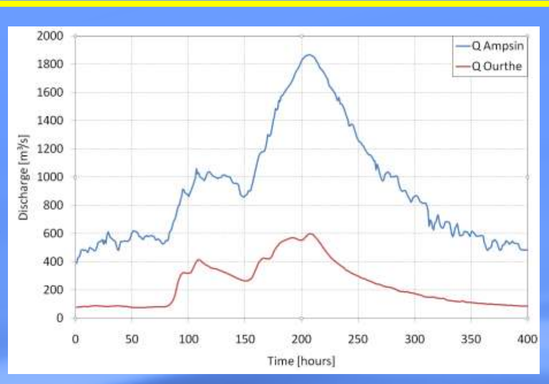


Comparison of wet area and perimeter



Areas of agglomeration for each cross section

Discharge input in river Ourthe and in Ampsin for the flood of january 2003. A water height boundary condition is prescribed in Lixhe



Comparison of the historical and modelled discharge in Lixhe

Hydrology, Applied Hydrodynamics and Hydraulic Constructions (HACH)
www.hach.ulg.ac.be

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