

Water
Research
Expertise

Integrated modelling

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R&D pole in water related science

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Who are we ?

The **Aquapôle** is a university R&D pole in water related science. Their expertise serves the water stakeholders (public and private institutions), at regional and international level.

Thanks to their know-how and their network of affiliated services (ULg, FUSAGx, CEBE-DEAU...), the **Aquapôle** federates multidisciplinary competences covering all the sections of the hydrologic cycle, natural or anthropic.



University of Liège, Campus Sart-Tilman
Avenue des chevreuils, 3
Building B53, Parking P52 or P32
4000 Liège - Belgium

Tél : +32 4 366 51 01
Fax : +32 4 366 51 02
Mail : aquapole@ulg.ac.be

www.aquapole.ulg.ac.be



University of Liège

www.aquapole.ulg.ac.be

Integrated modelling

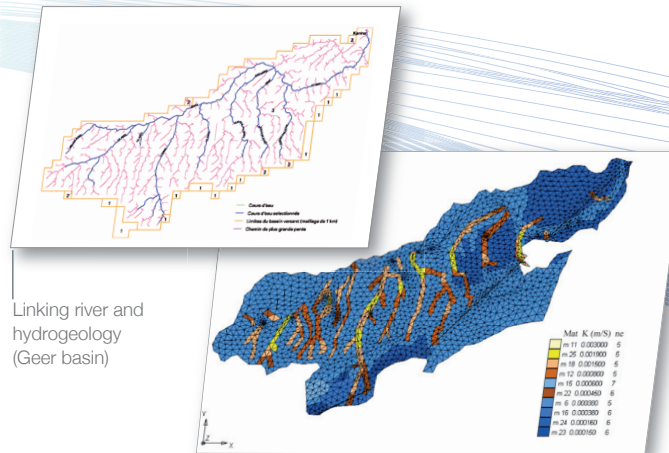
Purposes

- Developing deterministic models for the hydrologic cycle (rivers basin models, soil models, groundwater models)
- Integrating various existing calibrated and validated operational models, each dedicated to the accurate modelling of one compartment, in order to improve significantly the knowledge on the whole hydro-system (terrestrial hydrologic cycle)
- Developing water management tools dedicated to high and low flow conditions addressing quantity and quality issues
- Generating scenarios in order to simulate :
 - impact of climate changes
 - flood events
 - salinity and saltwater intrusions
 - water bodies biological quality
 - effect of the farming methods
 - socio-economic impacts

It leads to the construction of Integrated Models interfacing several codes for different compartments as : soil, surface water, groundwater, rivers, ecosystems, biology, ...

The use of numerical methodologies for integrating allows

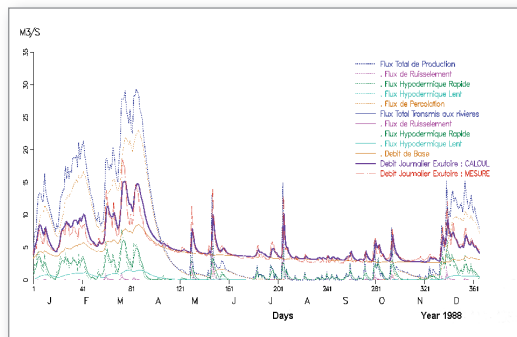
multi platform approach, synchronisation, parallelism, real Bi-Directional links for thousands of nodes



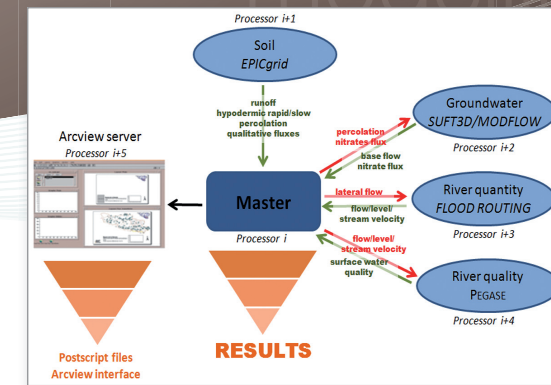
Linking river and hydrogeology (Geer basin)

The selected solutions lead to

- allow the link of compartmented models whatever their numerical schemes and discretisations
- develop an “integrating” module (Master)
- use multiprocessor machines with physically based parallelism
- use public libraries



Flow calculation, contribution from each compartment (Gette basin)



Existing integrated models for QUANTITY

MOHISE (1997-2001) → CLIMATE CHANGES
“Modèle Hydrologique Intégré Simulation cycle de l’Eau”
Linking soil + hydrogeology + river, on the Geer, the Gette, and the Ourthe (MPI)

MOHICAN (1996-2002) → FLOODING
“Modèle Hydrologique Intégré Crues et Niveaux d’eau”
Linking soil + hydrogeology + hydraulic (MPI)

Existing integrated models for QUANTITY+QUALITY

SALMON (1994-1998) → SALINITY, POLLUTION
Linking PEGASE (quality river model) + hydrogeology + estuary + ocean, on the Scheldt (PVM)

MOIRA (2000-2005) → STATE OF AQUATIC RESOURCES
(surface water and groundwater), “global” integrated model
“Modèle Intégré pour les Ressources Aquatiques”
Linking PEGASE + soil + hydrogeology from the PIRENE program (MPI)

Integrated models in development

Diffuse loads (2008)
Feasibility study, linking soil and PEGASE models to calculate diffuse loads

OpenMI-Life (2007-2009)
Linking PEGASE + hydraulic model, with a standard interface