LESSONS LEARNED: AQUAVAR DECISION SUPPORT SYSTEM FOR WATER RESOURCE MANAGEMENT FOR A MEDITERRANEAN WATERSHED

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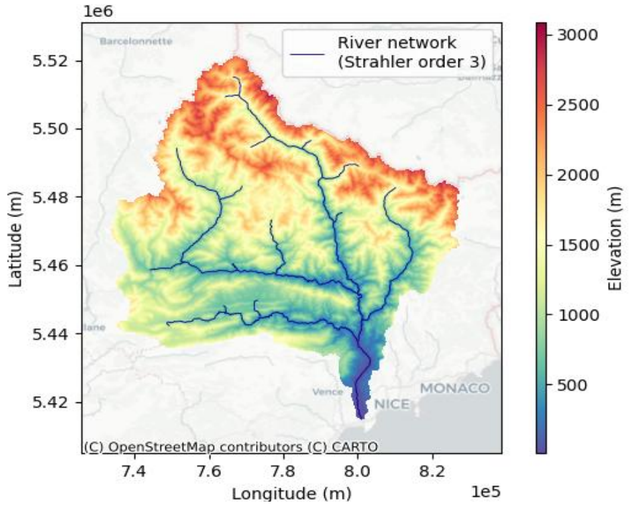
Overview

1. Nice Metropolitan area: the Var watershed
2. AquaVar: An initiative for the development and sustainable operation of a DSS
3. AquaVar : Interface and functionalities
4. DSS development through collaboration: feedback and perspectives

*Is the final **TRL** of a DSS a Moving Target?*

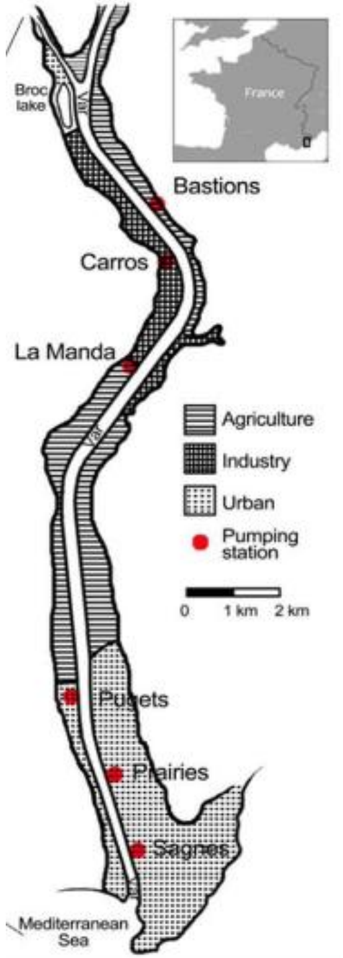
1- Nice Metropolitan area: the Var watershed



Sunshine, palm-trees, mountains …

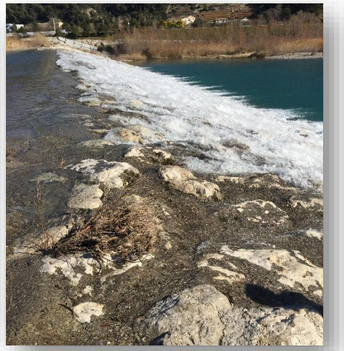
… a bit of human activity …

1- Nice Metropolitan area: the Var watershed



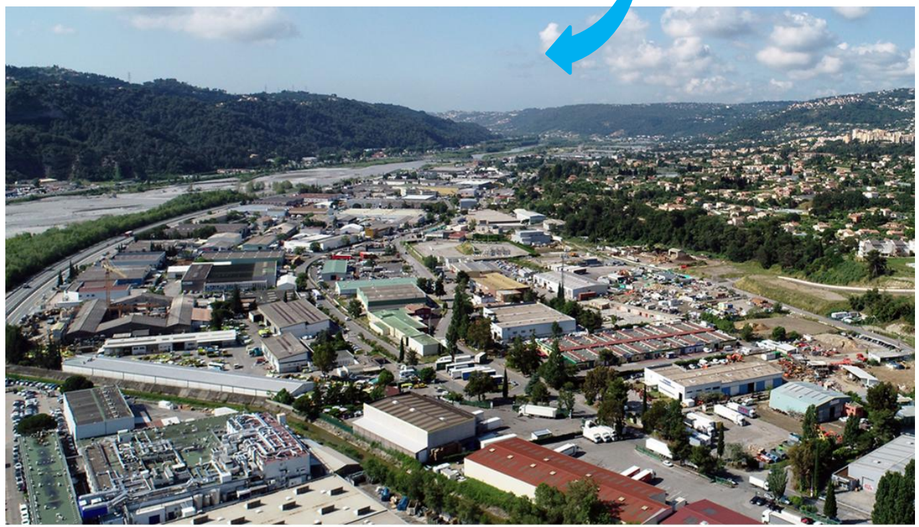
(Ma et al, 2020)

… in the river-bed …



Carros industrial area :

- ✓ 567 companies
- ✓ 11,750 jobs
- ✓ 188 hectares
- ✓ 2.4 billion EUR
- ✓ in annual turnover

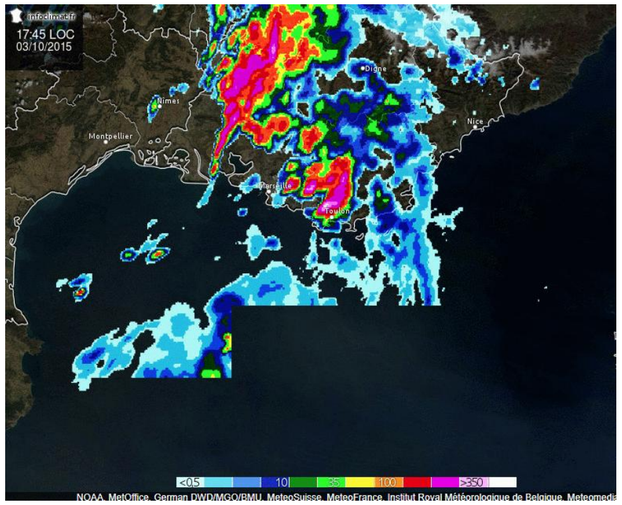


ALL THIS

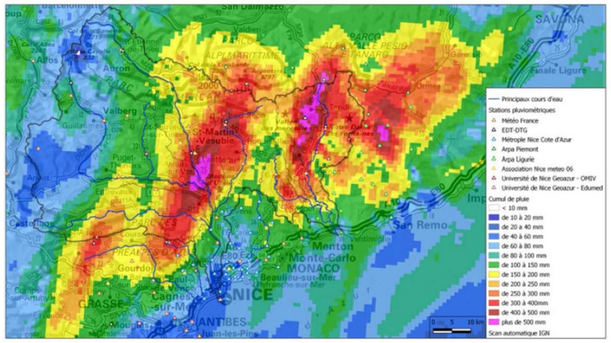
… is still growing

2- AquaVar: An initiative for the development and sustainable operation of a DSS for operators

2015 Oct.03 (Cannes)



2020 Oct.02 Alex Storm



Source: Meteo France

2022–2023 : Drought in France

Major water issues to manage:

✓*Competition among water uses and increase of the water demand*

✓*Growing **vulnerability regarding floods***

✓*Major droughts associated to high consumption periods*

✓*Major **droughts** repeated over several consecutive years*

✓*Vulnerability of resources regarding **accidental pollutions***

✓*Need **to anticipate** difficult situations and to establish strategy for a sustainable drinking water supply to users*

2- AquaVar: An initiative for the development and sustainable operation of a DSS for operators

A DSS to do what? How?

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- DEPG
- DPGR
- APE

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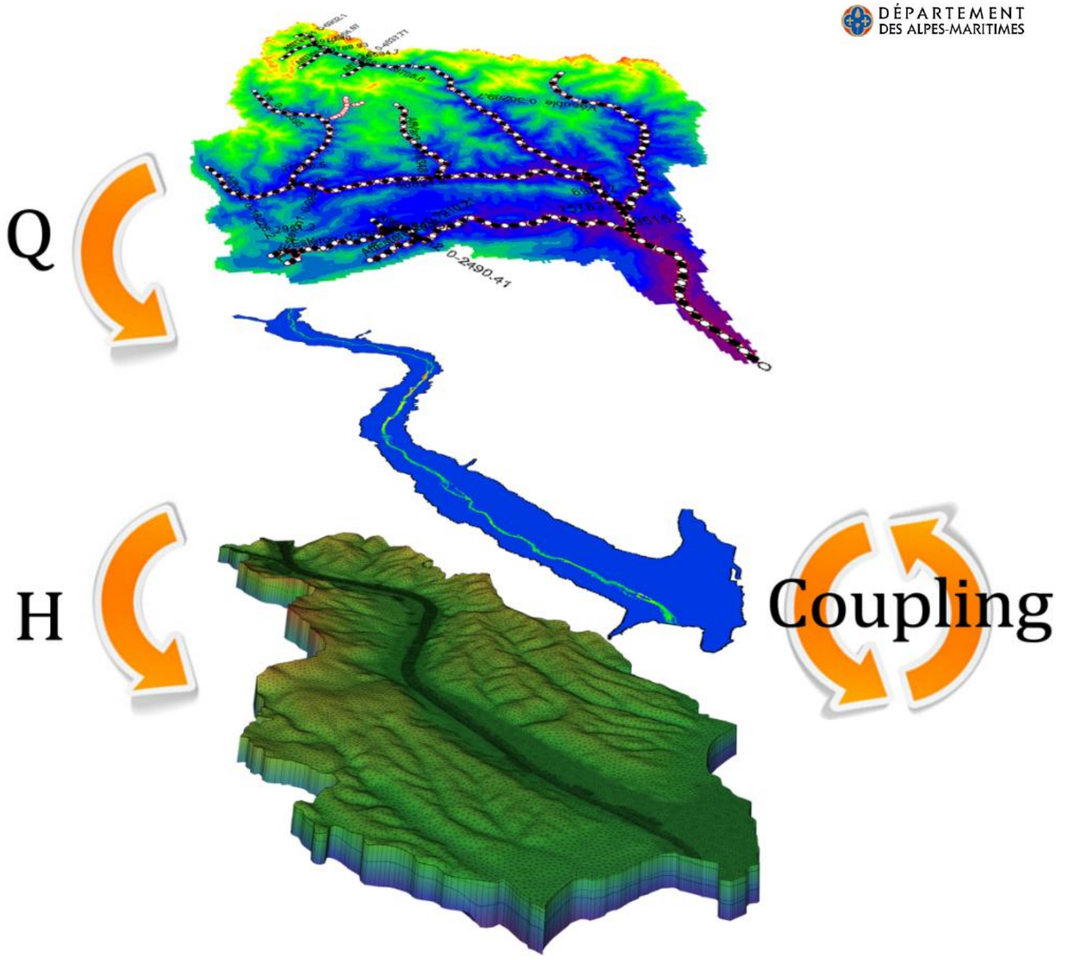


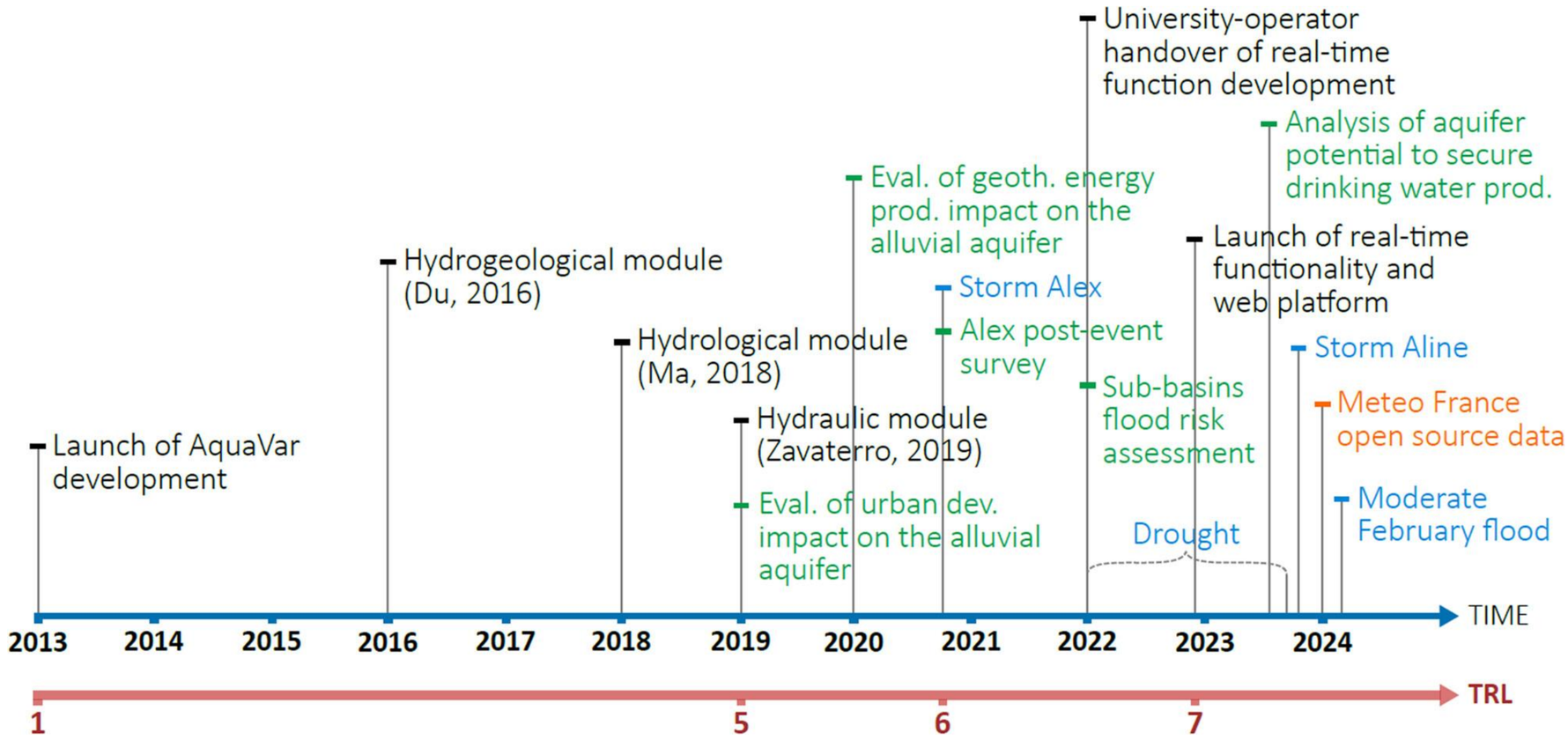
Develop a simulation tool to manage:

1. Integration of existing sensors for **real-time monitoring**
2. **Optimization of pumping** protocols and identification of new resources
3. **Saltwater Intrusion monitoring** and simulation
4. **Pollutant** Impact Assessment
5. Geothermal Impact Assessment
6. **Flood Extent**
7. Impact of New **Urban Developments**
8. Development of the tool and integration with the Nice Information System

2- AquaVar: An initiative for the development and sustainable operation of a DSS for operators

- **Development steps and launch of main features (2013-2019);**
- **Selection of one–off applications (2019-ongoing);**
- **Hydrological notable events (2021-ongoing);**
- **Change in access to DSS input data (2024-ongoing).**

AquaVar development and operation timeline:

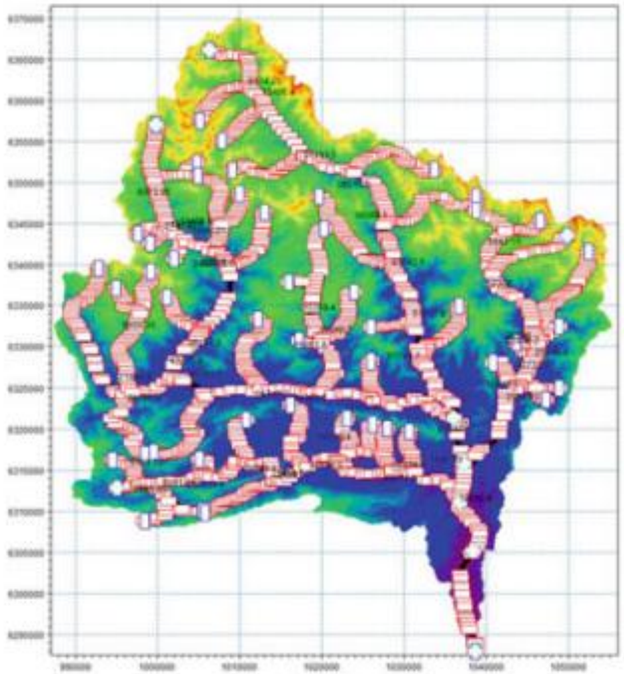


Picourlat, F. et al. (2025). AquaVar decision support system for water resource management: Lessons learned from the first five years of operation. *River*.

2- AquaVar: An initiative for the development and sustainable operation of a DSS for operators

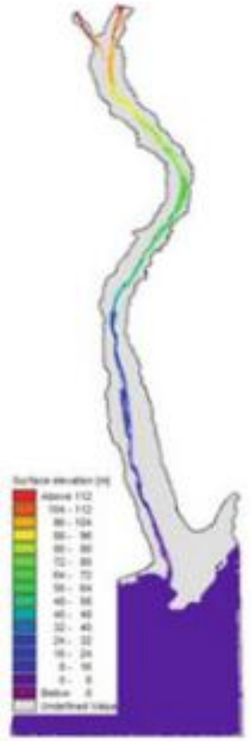
A DSS to do what? How?

2D **Hydrological** model + 2D **Hydraulic** model + 3D **Hydrogeological** model



MIKE SHE

- Full Var catchment (3,000 km^2)
- 100 m resolution
- Production of boundary conditions the 2 downstream models

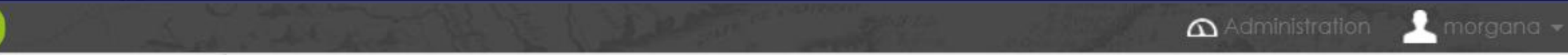


MIKE 21FM

- High resolution
- From 25 m to 5 m
- 25 km long
- Floodplain + all infrastructures

FeFlow

- High resolution
- From 75 m to 5 m
- 7 layers
- Up to 600 m deep



Plateforme AquaVar

Observations

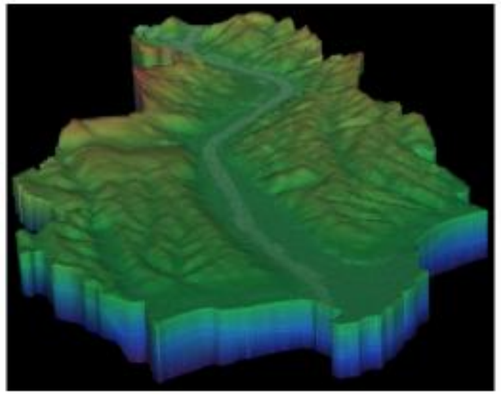
VOIR LA CARTE DESCRIPTION

Hydrologie

VOIR LA CARTE DESCRIPTION

Hydraulique

VOIR LA CARTE DESCRIPTION



Hydrogéologie (bientôt disponible)

DESCRIPTION

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Liz map

Administration morgana

Rechercher

Plateforr

Obser

VOIR LA CART

Liz map capteurs aquaVarMap

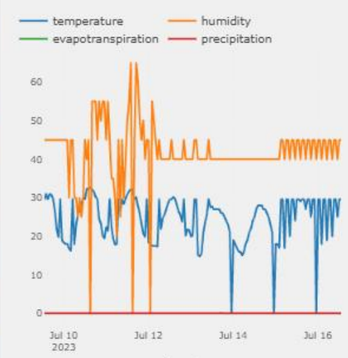
Administration langueyl

Popup

meteo

Field	Value
id	04115001
name	MEAILLES
latitude	6332442.91
longitude	990407.1841

Temperature, humidité, évapotranspiration, précipitation



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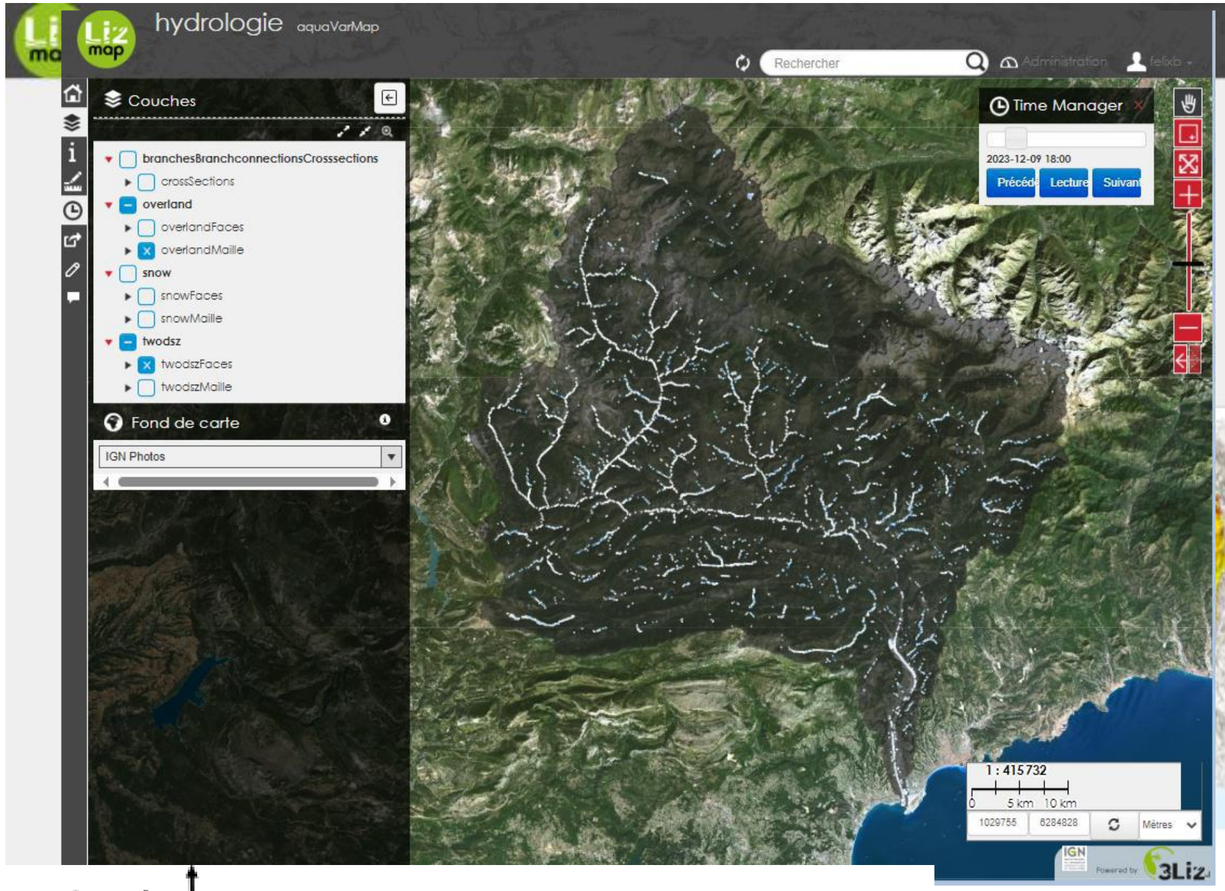

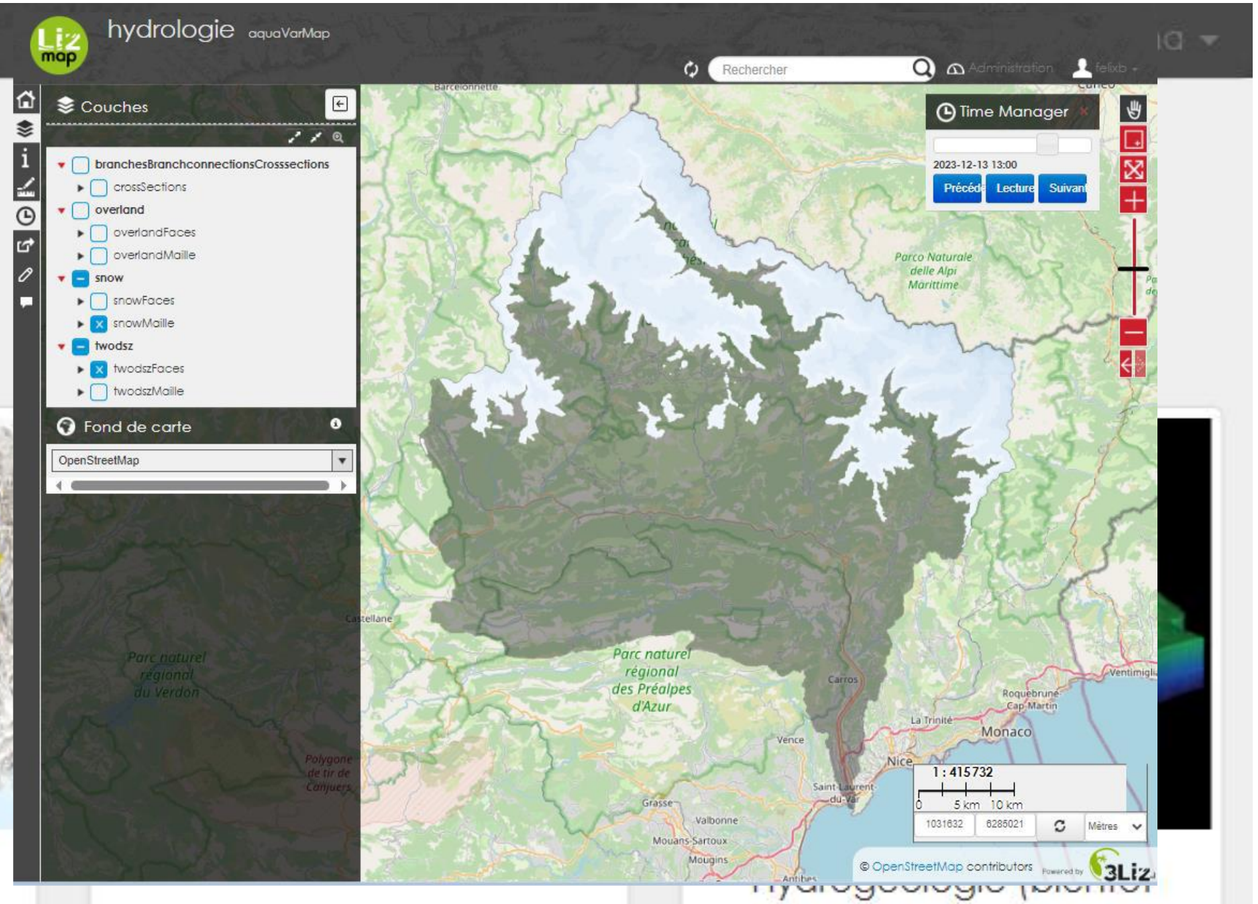

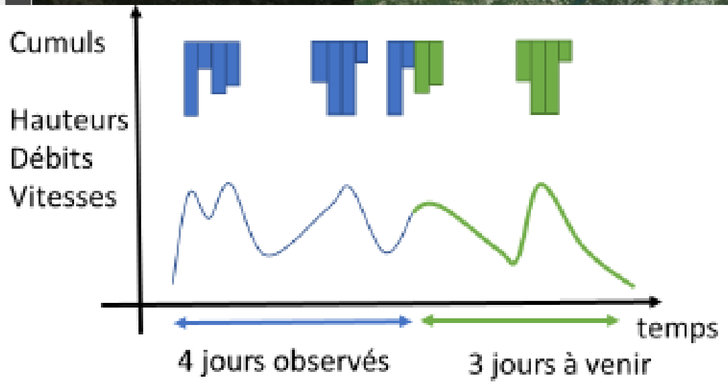

ydrologie

ARTE DESCRIPTION

Hydraulique

VOIR LA CARTE DESCRIPTION

disponible)

DESCRIPTION

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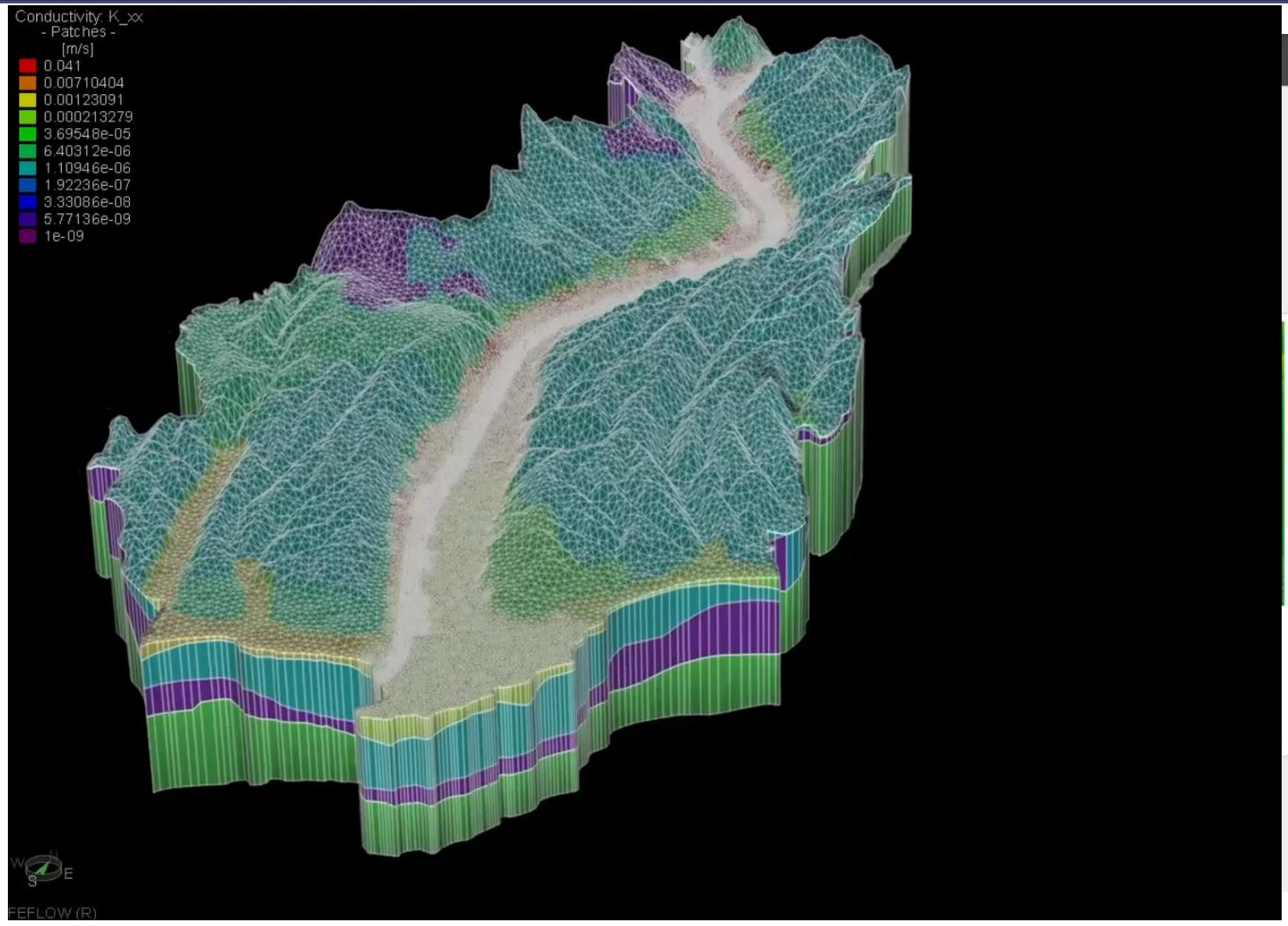
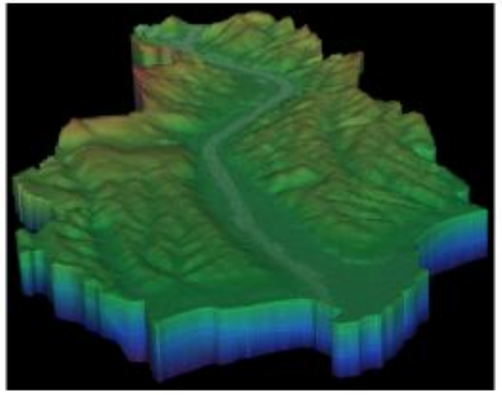
DONNÉES, MÉTHODES & SERVICES POUR LES TERRITOIRES DE MONTAGNE



Administration morgana



Hydrogéologie (bientôt disponible)

DESCRIPTION

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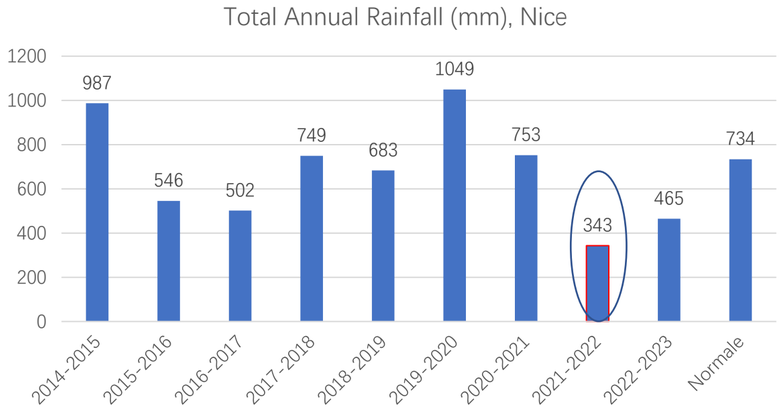
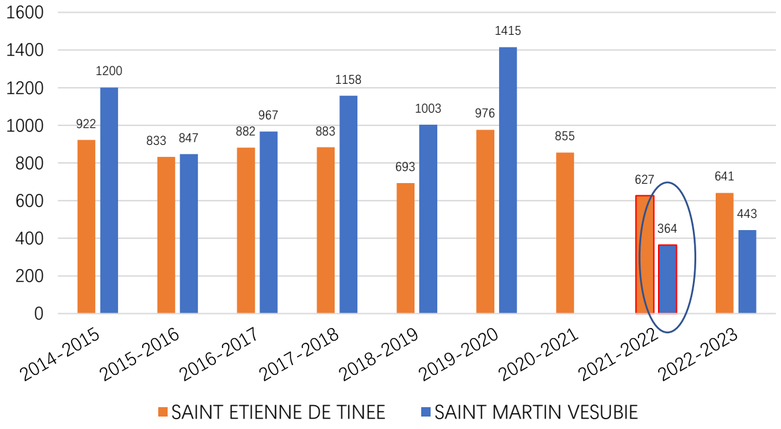
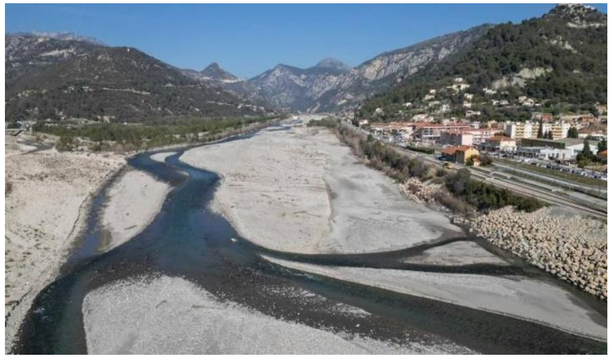
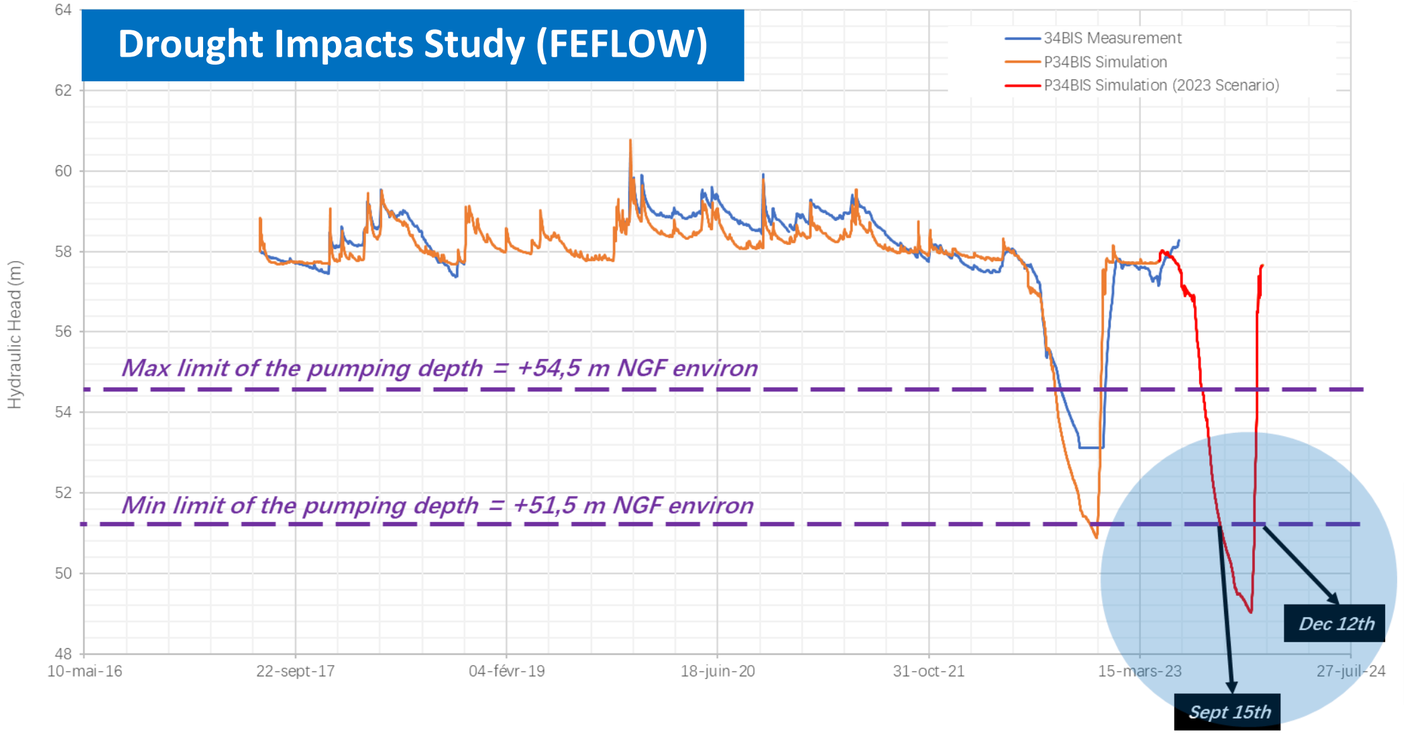
3- AquaVar : Application







Lake Broc (top) and the Var River (bottom) during the drought in 2022



There is risk of low water for pumping for 2 months (Sept 15th – Dec 12th)

Simulate scenarios of interest:
e.g. what if 2022 drought occurs a second time?

4- DSS development through collaboration: Feedback

The strengths of this DSS development and scheme

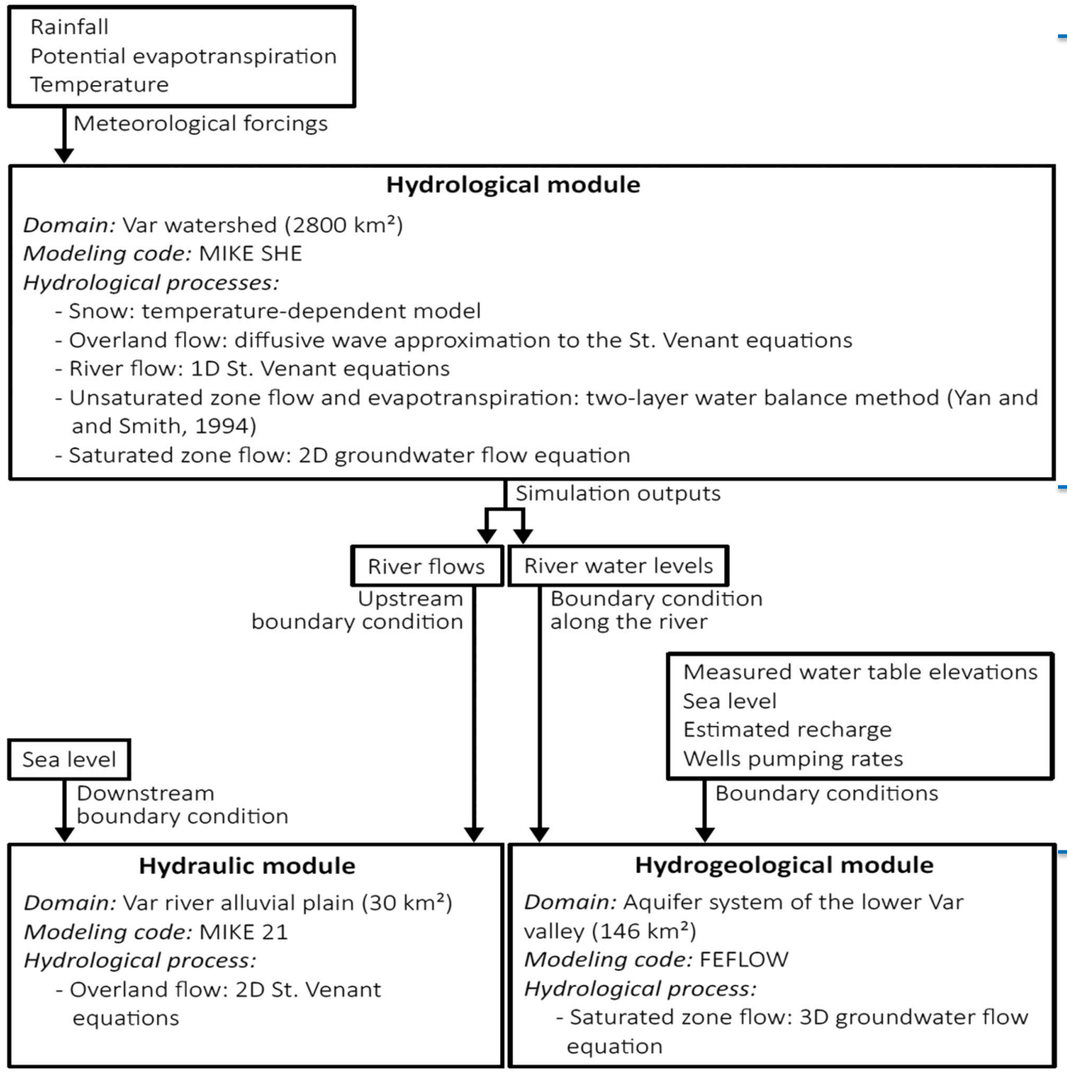
1. **Joint** research and development
2. **Unlocking** administrative boundaries
3. **Maximizing** the use of **public money**
4. Learning and **replication** of the solution (two **DSS in development**)
5. Collaboration resiliency
6. **Long-term investment** and **slow** development
7. Allows for **evolution and innovation** (new Post-doc and Thesis upcoming)

Challenges to overcome

1. Three different administrations: Failure to **act quickly**
2. Long-term investment and slow development: maintain the **commitment of the partners**
3. **Cost** of maintaining the SAD due to some functions

Final TRL of a DSS, in that configuration, is a Moving Target

4- DSS development through collaboration: Perspectives/Needs



AIO Project (Agir et Innover pour l'eau, 2025-2028)

Objective: AquaVar digital twin enhancement

✓ **Integrating Remote sensing data**

- **Rainfall/ET/SM products**
- **Snow cover maps**
- **DEMs (monthly/seasonal maps)**

✓ **River hydro-sedimentary assessment**
- **Hydro-morphological evolution of the Var valley**
- **Integration of debris-flow risk assessment**

✓ **River-Aquifer Interaction**
✓ **Hydrogeo-chemistry & Hydrogeo-physics**
✓ **REUT water and hydroinformatics (2PhDs)**

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xylem

MERCI …!

THANK YOU …!

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