

Aquazur : uses of a DSS tool and application to case studies

Félix Billaud



The Nice Metropolitan area, a region of contrasts

WES-BCA, Nice
2026-04-23



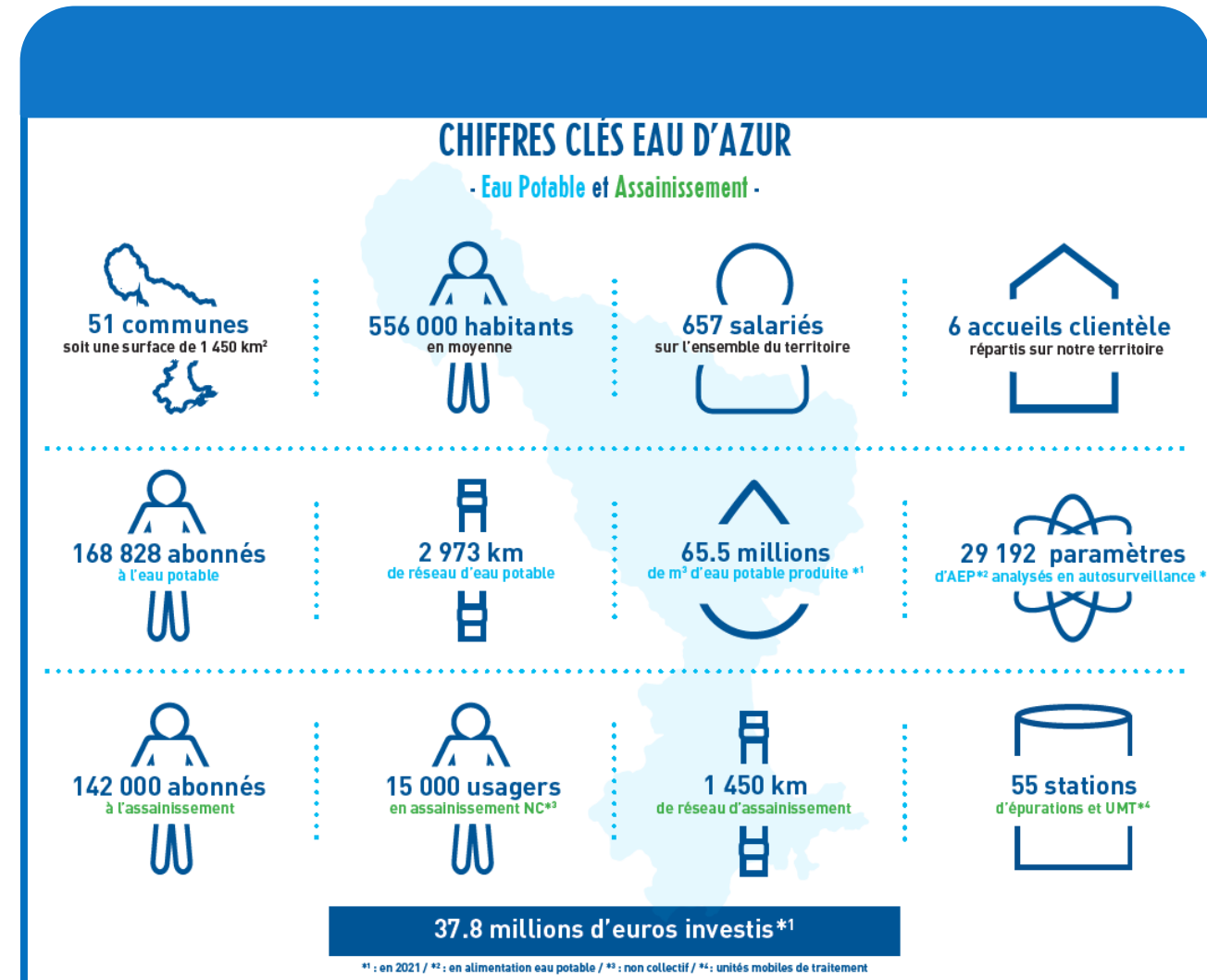
560 000 inhabitants, 1400 km², 51 municipalities

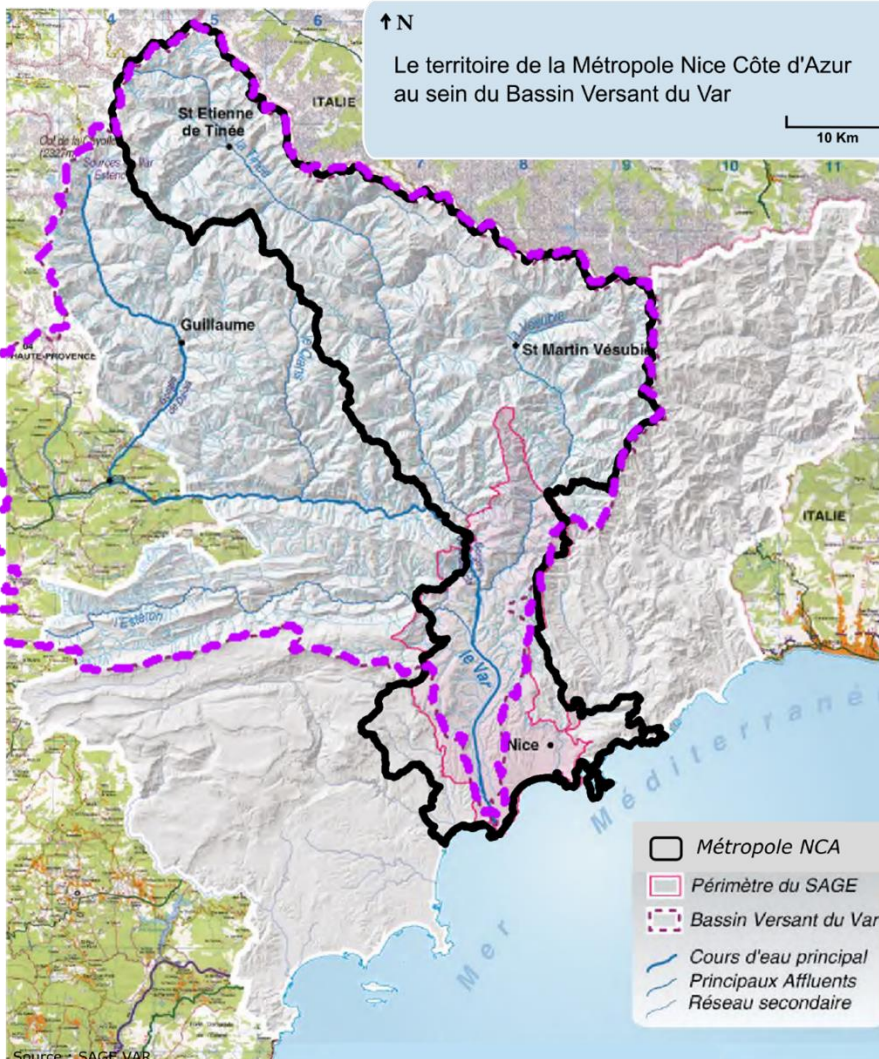
A contrasted territory between the seaside and the Alps mountains, located on one main river basin : the Var and its three tributaries (Tinée, Vésubie, Estéron)





- Nice Metropolis is the local public authority gathering the 51 municipalities in charge (among others)
 - Transport and infrastructure monitoring
 - Urbanism
 - Accommodation policy
 - Risk management (runoff, floods, landslides, earthquakes, tsunami, health, etc)
 - Ecological and environmental planification
- Eau d'azur, part of Nice Metropolis, is the water public authority in charge of
 - water resources management
 - water supply
 - wastewater collect and treatment





Major water resources issues to manage:

- ✓ Competition among water uses and increase of the water demand
- ✓ Growing hazard and 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 future situation situations

Uses and features in Nice

- ✓ Forecast and anticipate flash floods
- ✓ Identification of new water resources
- ✓ Monitoring and simulation of salt water intrusion
- ✓ Pollutant impact assessment
- ✓ Geothermic exploitation impact assessment
- ✓ Impact of new urban developments
- ✓ Integration of existing sensors for real time monitoring

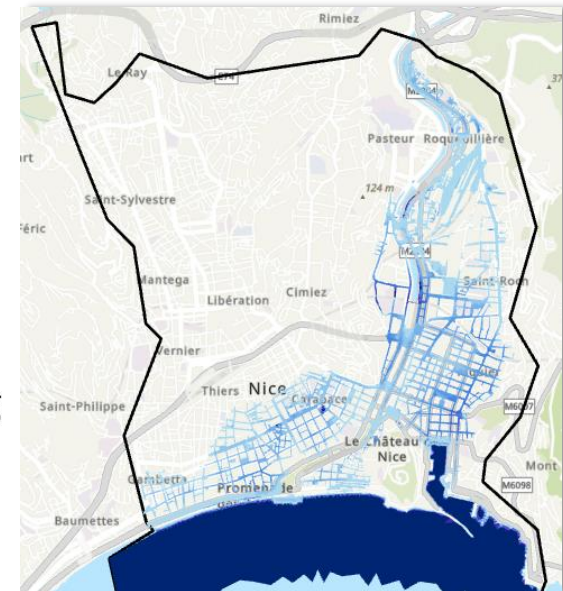
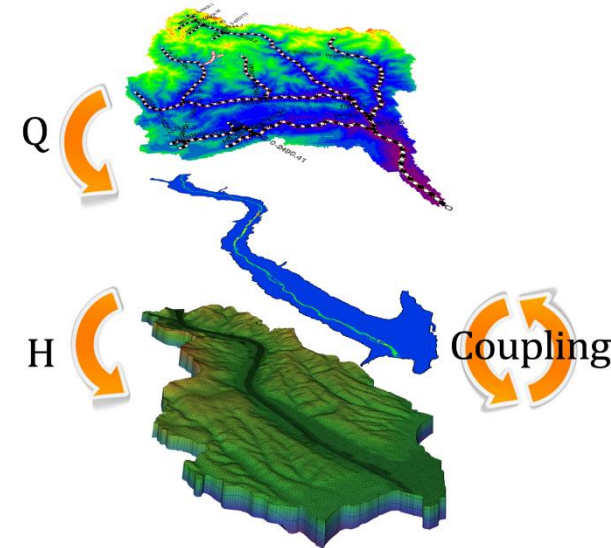
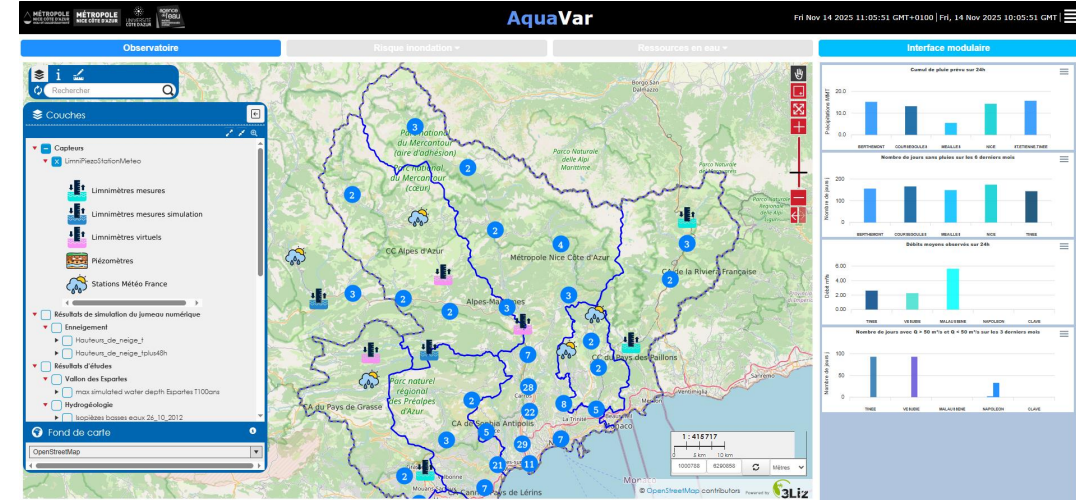
Users

- ✓ Metropolitan authorities
- ✓ Water company



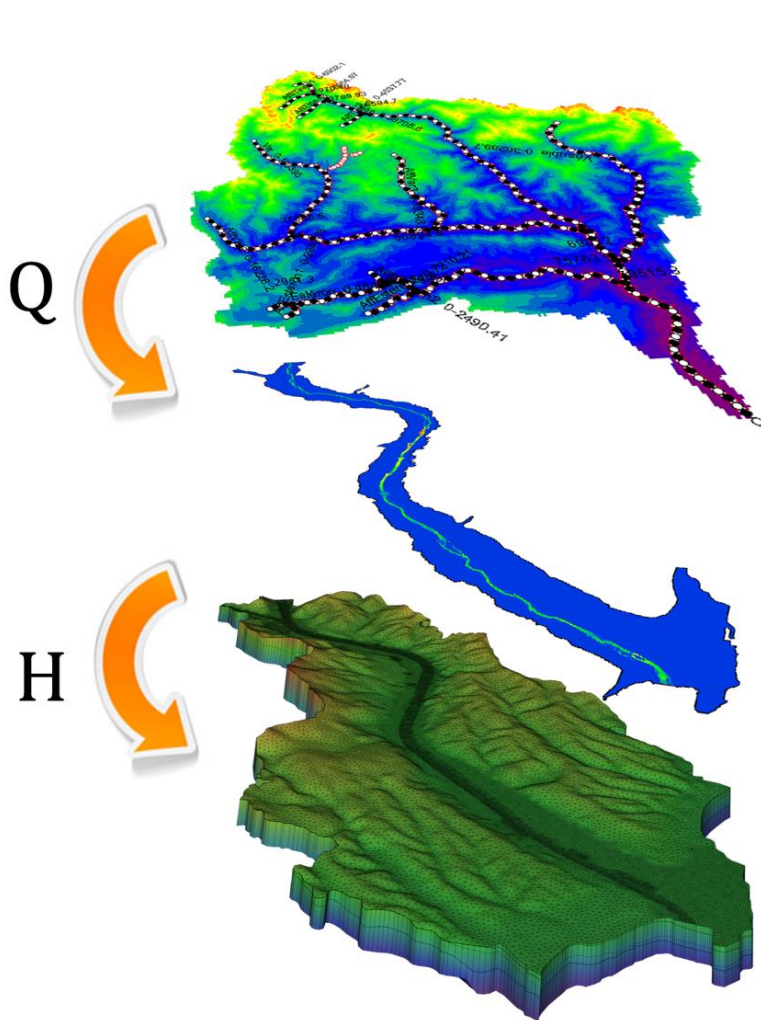


- **Project owners :**
 - Nice Metropolis
 - Eau d'Azur
 - Nice Côte d'Azur University
- **Development Duration: 4 years (2014 to 2018) and even more**
- **In use duration : from 2018**
- **Objectives:**
 - Design an operational Decision Support System (DSS)
 - Gather hydrological experts and create a numerical environment for the stakeholders (municipalities, water authority, etc) to study specific issues
- **Key figures**
 - 30 successful studies
 - More than 20 studies planned for the next 3 years
 - 1 operational DSS system in use





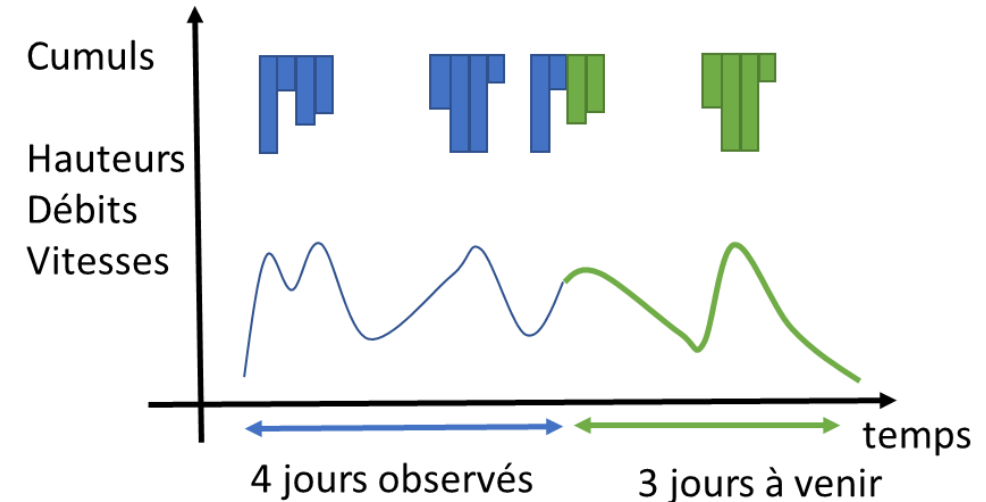
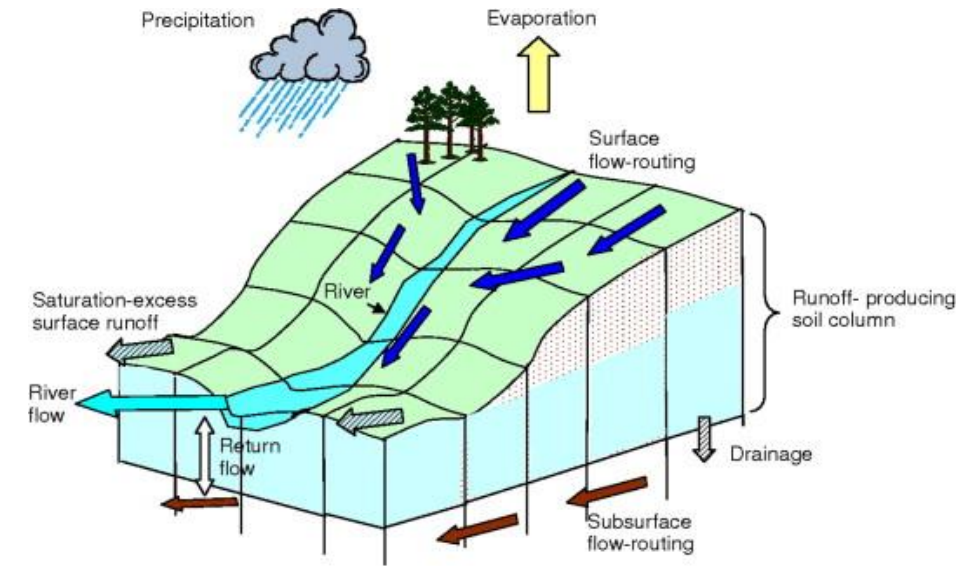
Aquavar : a powerfull DSS tool



- Utilisation de 3 modèles numériques
 - Modèle hydrologique
 - Modèle hydraulique 2D
 - Modèle hydrogéologique 3D
- Approche déterministe distribuée



- Modélisation temps réel ou hors ligne (études)





AquaVar DSS : how does it work

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Data sources +
data types



Data processing
and modelling



Platform
publication

Meteorological
French
Institute

Observed
and forecast
meteo data

HUBEAU
National
Public data
platform for
water issues

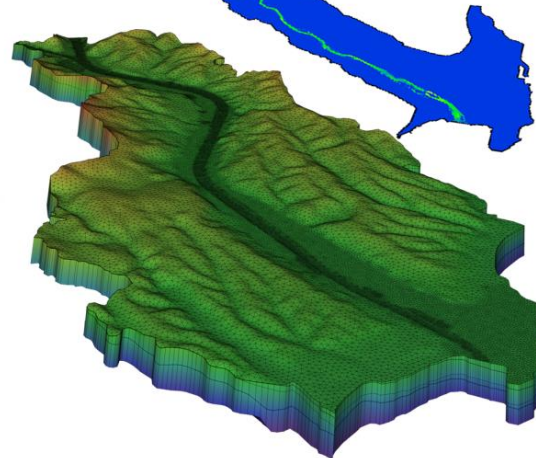
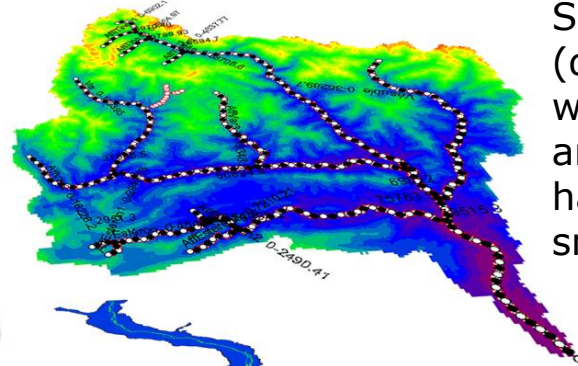
Water height
River discharges
Piezometric
head
Water quality

Eau d'azur
and NCA
databases

Observed
meteo data
Drinkable water
production
Demographic
and economical
data

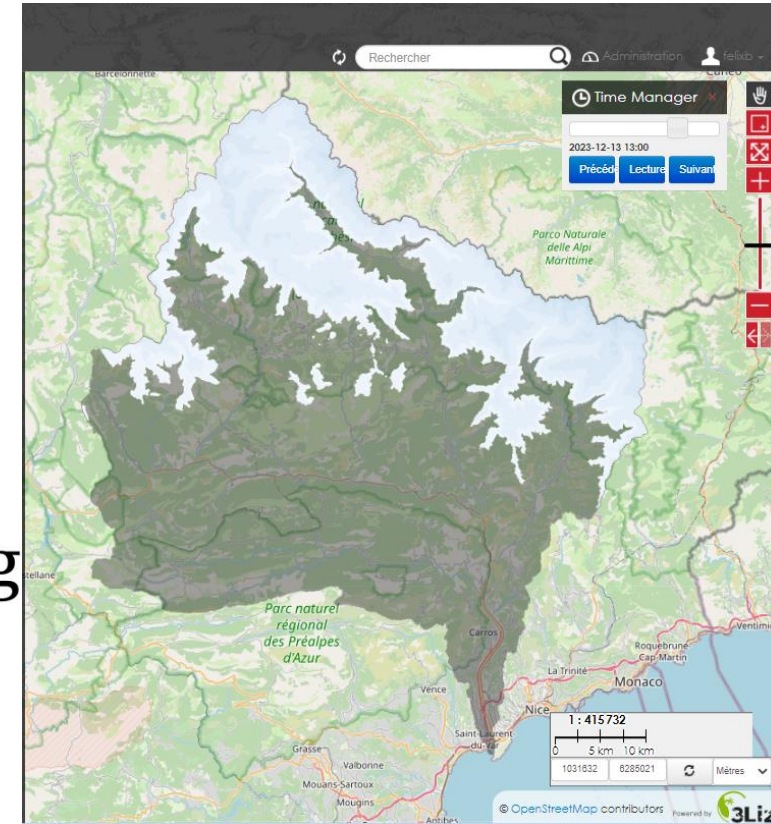
Q

H



Simulated data
(discharges,
water height
and speed,
hazard maps,
snowcover, etc)

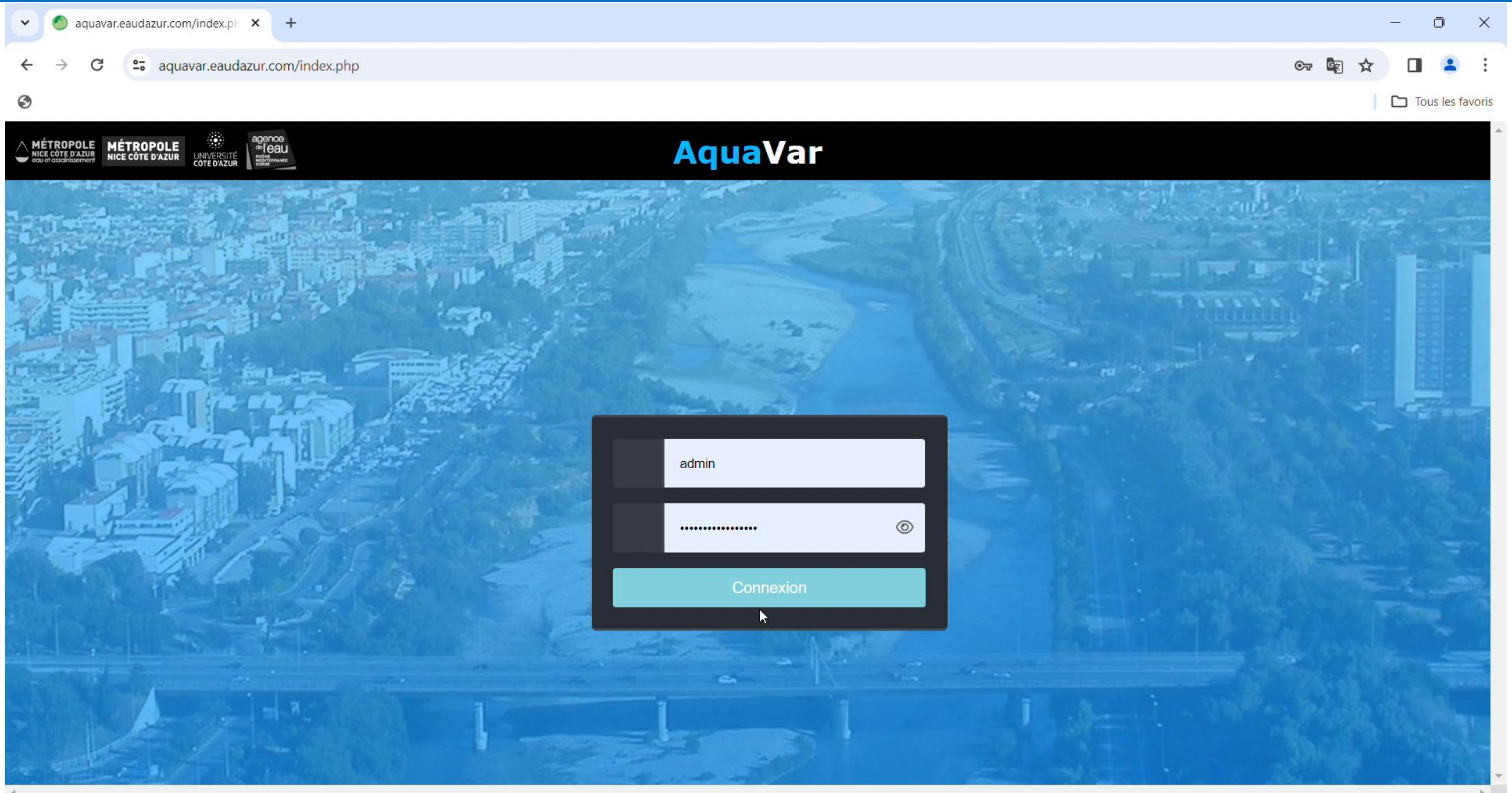
Coupling





AquaVar DSS : modular interface vs operational dashboard

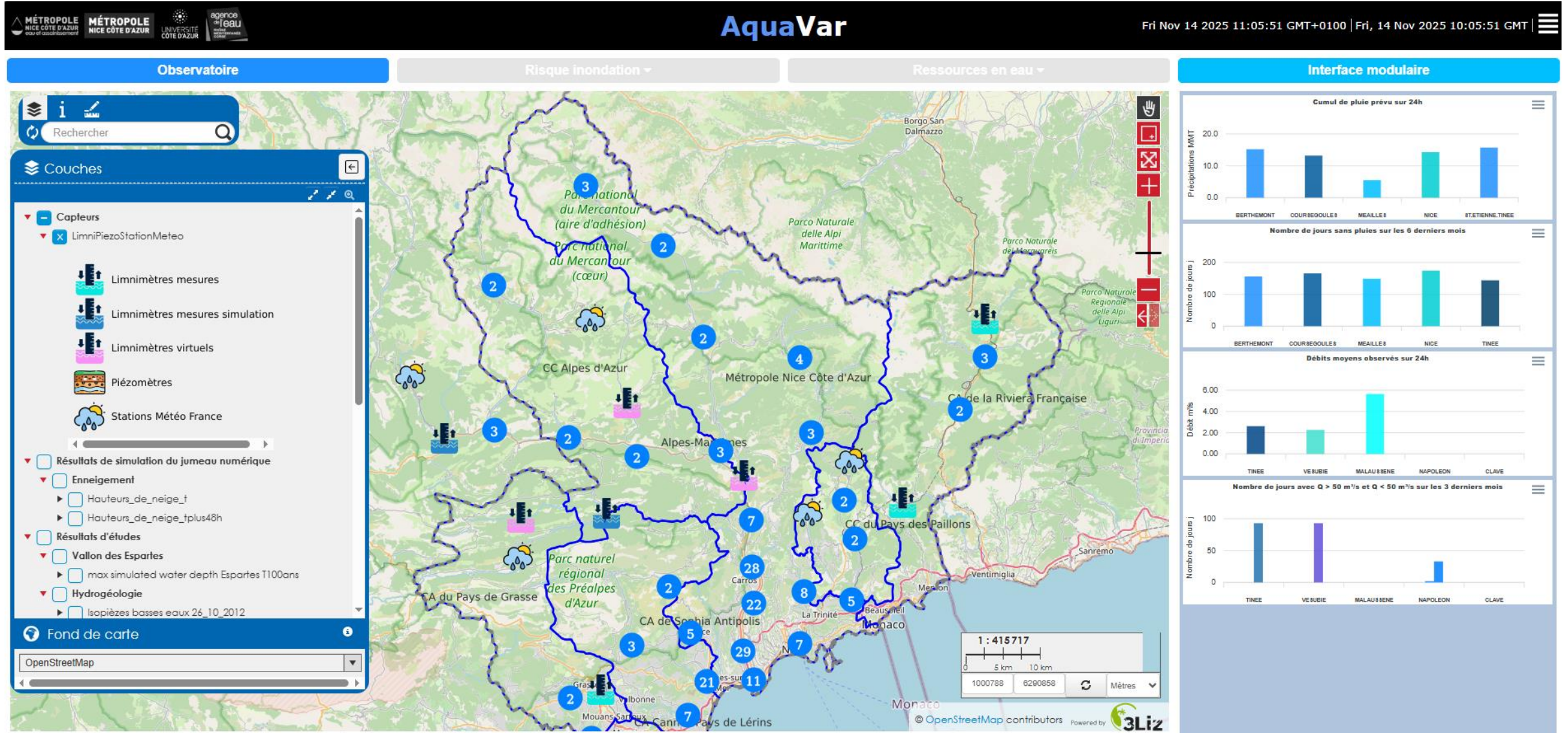
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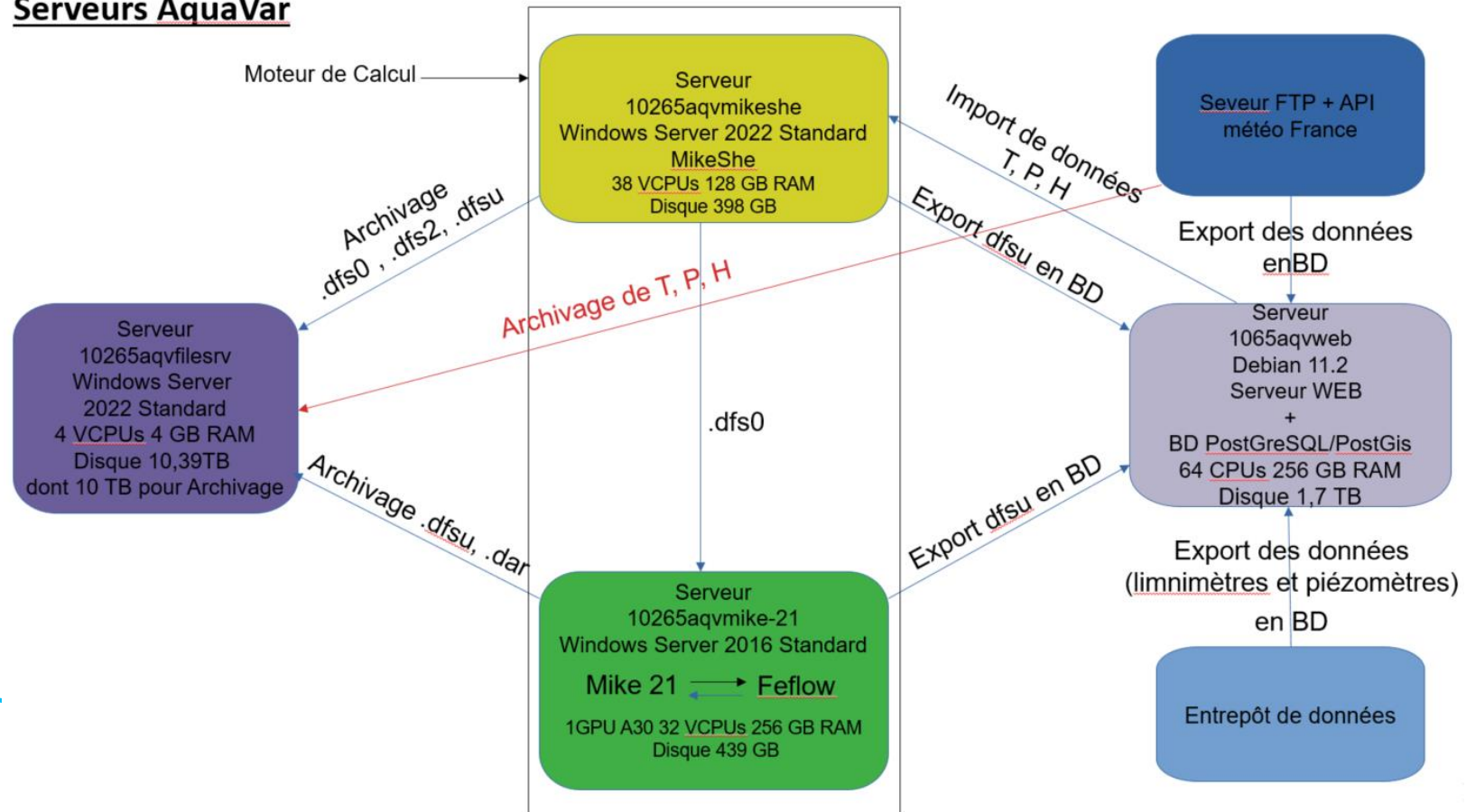
AquaVar DSS : presentation of the operational dashboard

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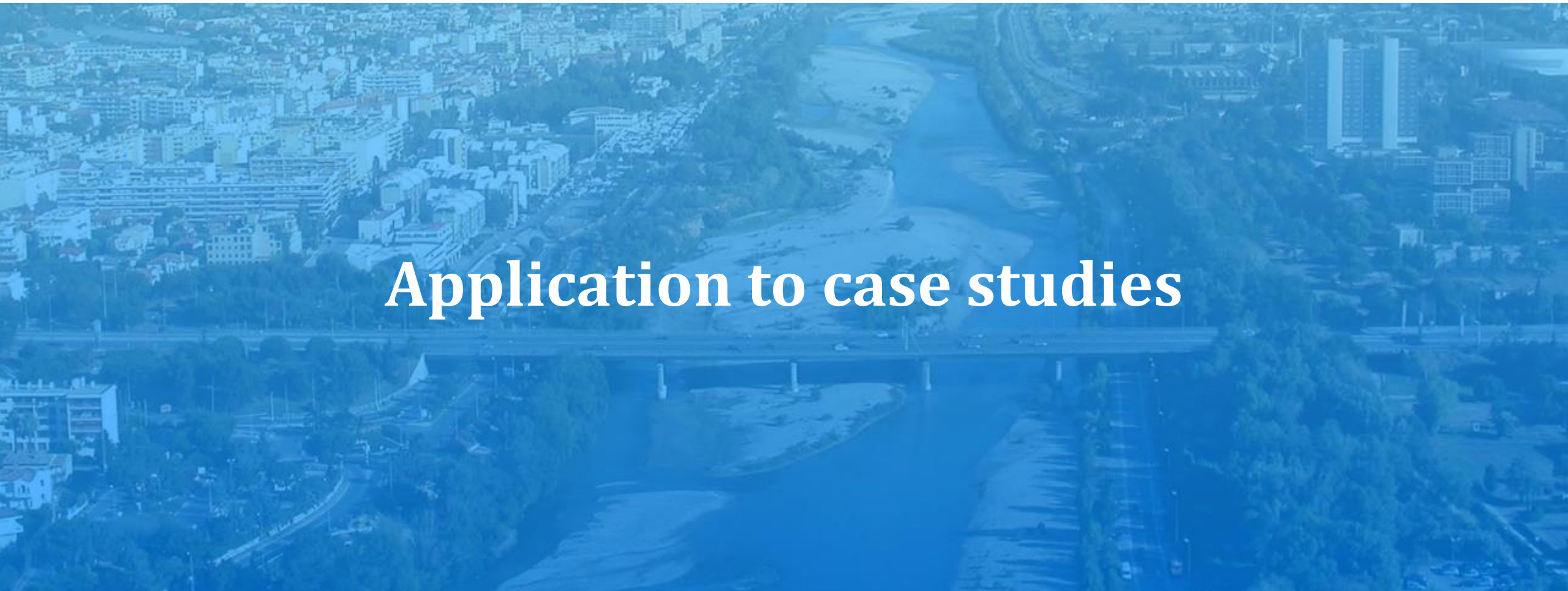


- 1 informatical expert (back end + front end)
- Several scientific or technical experts (UniCA + Eau d'Azur)
- 1 cloud service
- 3 softwares licences

Serveurs AquaVar



- Total cost : 180 000 € / yr



Application to case studies

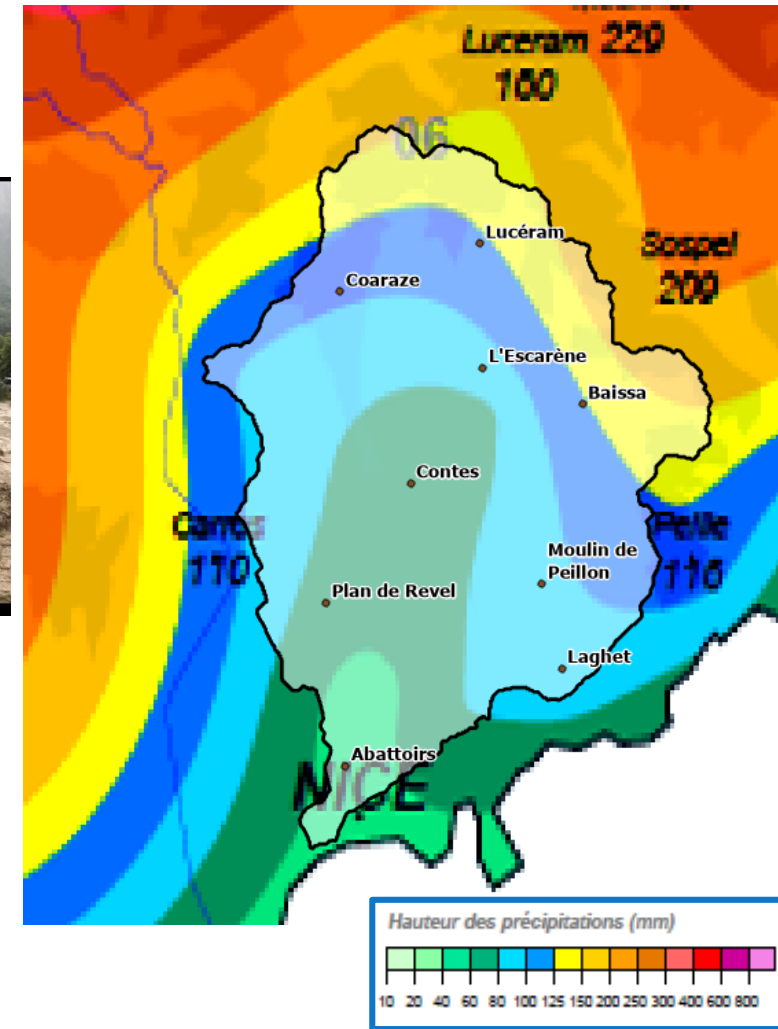
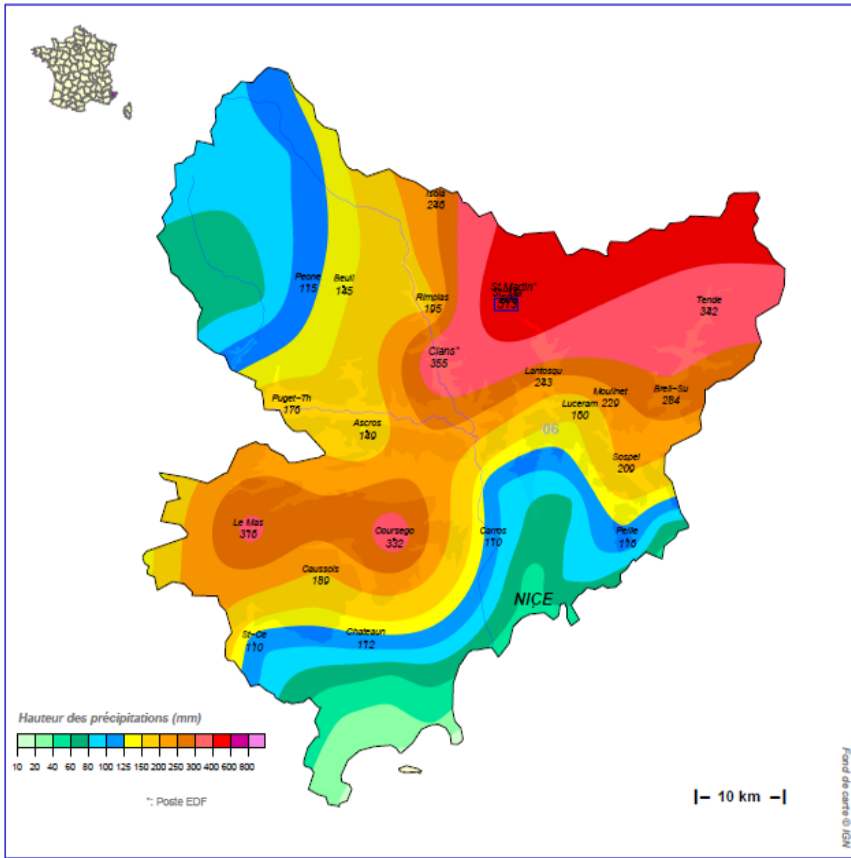
Alex storm : what if it happens on another basin ? Paillon exemple

Quantité de pluie (mm) en 1 jour

du 2 OCTOBRE 2020 à 6 h UTC au 3 OCTOBRE à 6 h UTC

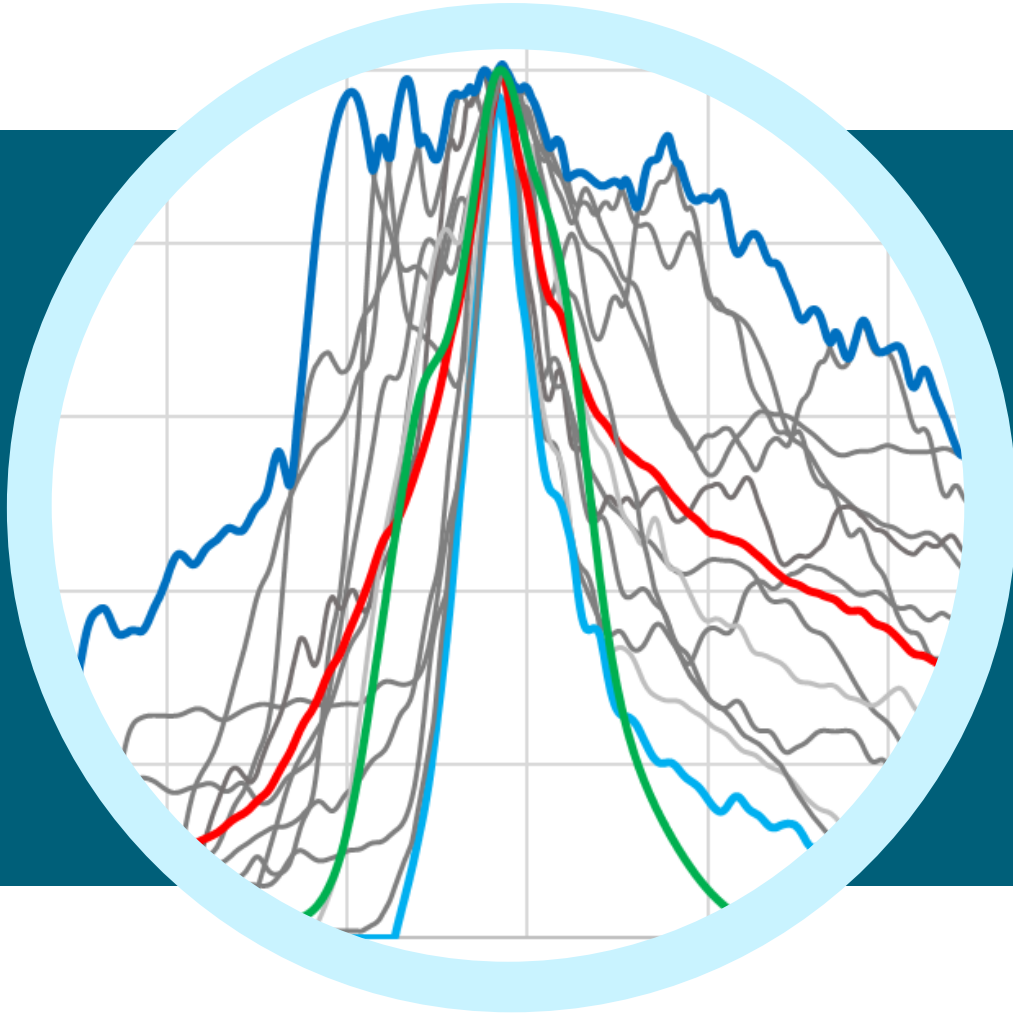
~600 mm

Cumulative rainfall at Saint
Martin Vésubie



eau d'azur

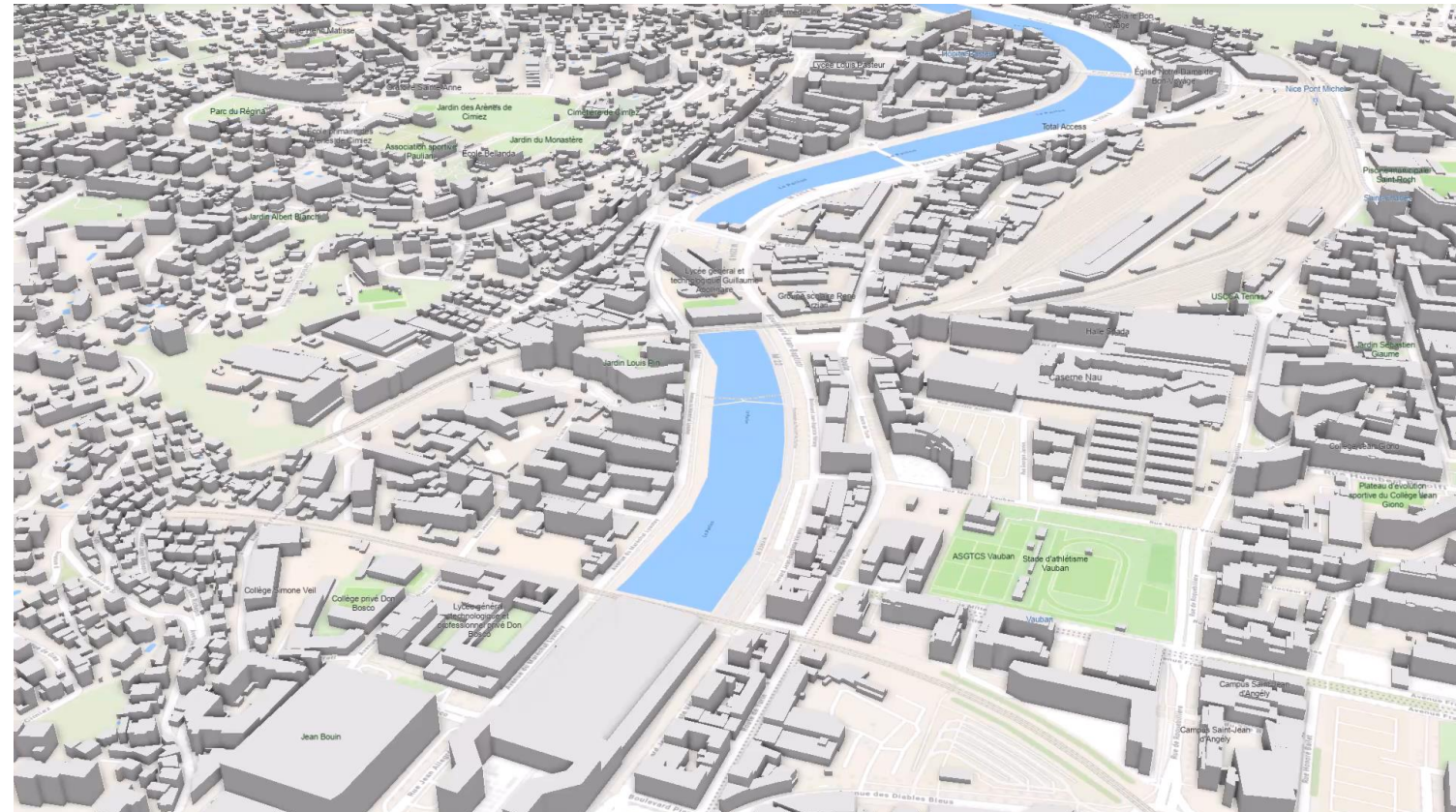
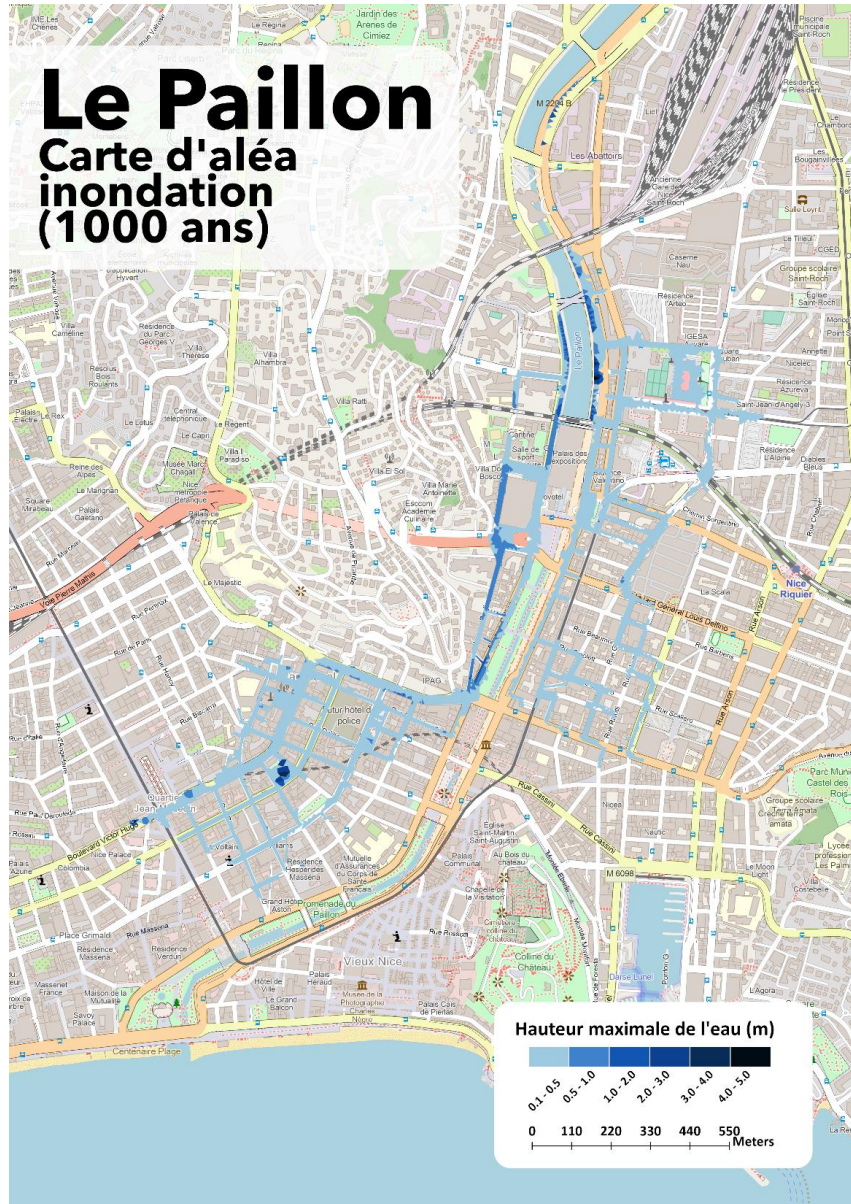
Extrapolation to get a 1000 years return period





Extreme event on Paillons : results exemples

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Those results are given for communication purposes, they are not the real ones

2nd case study : Impacts of climate change ?

Objectives : Understand and quantify the impacts of climate change on water resources (e.g., river flow, groundwater recharge, etc.) in the Vésubie + Var watershed

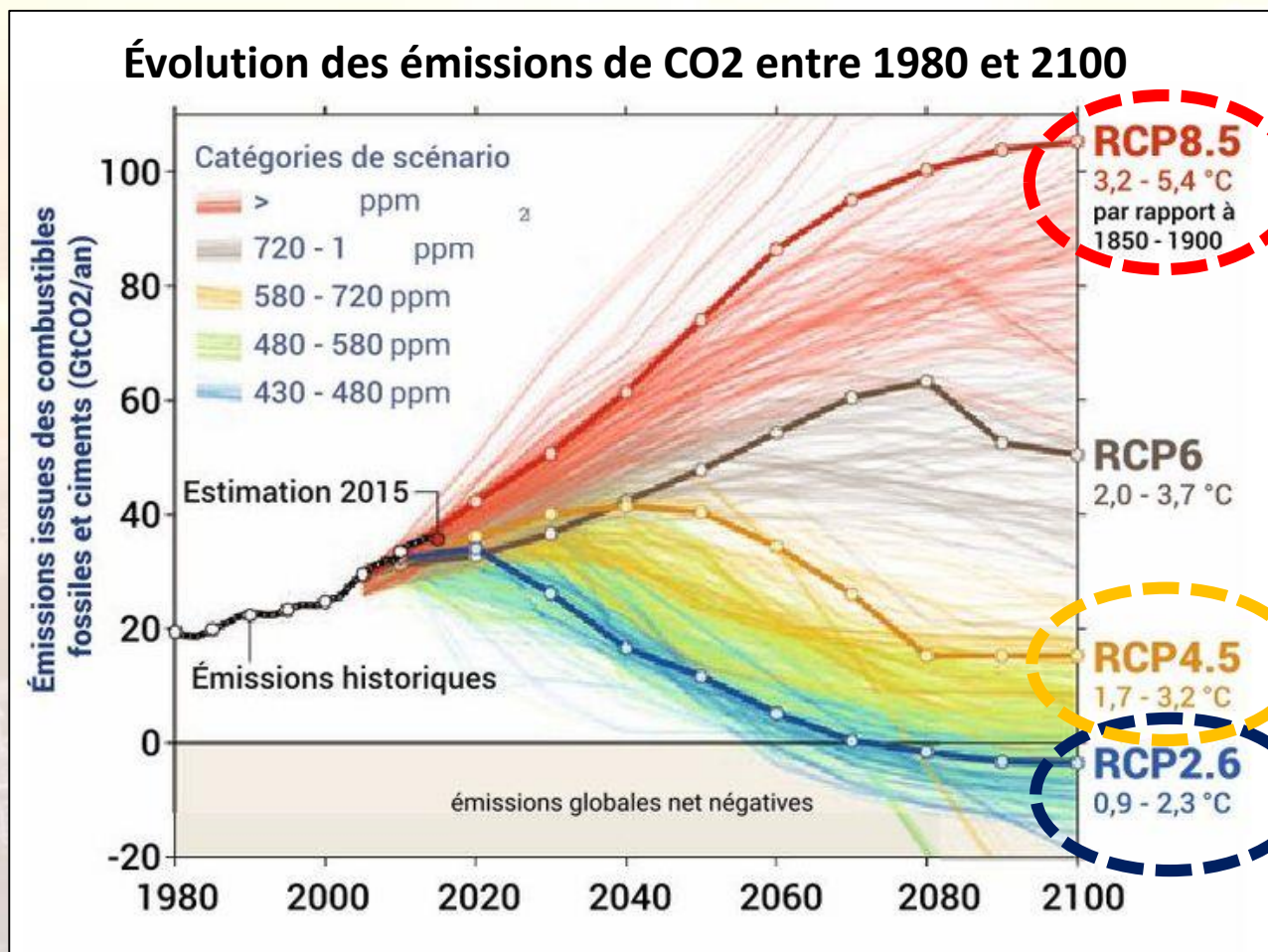


What future changes in the climate for
The different climate models
And their scenarios By 2100

What are the impacts
on the availability of the
water ressources



2nd case study : Impacts of climate change ?



Risques physiques

Il s'agit des dangers liés aux effets directs du changement climatique, tels que les phénomènes météorologiques extrêmes, l'élévation du niveau de la mer et d'autres perturbations environnementales.

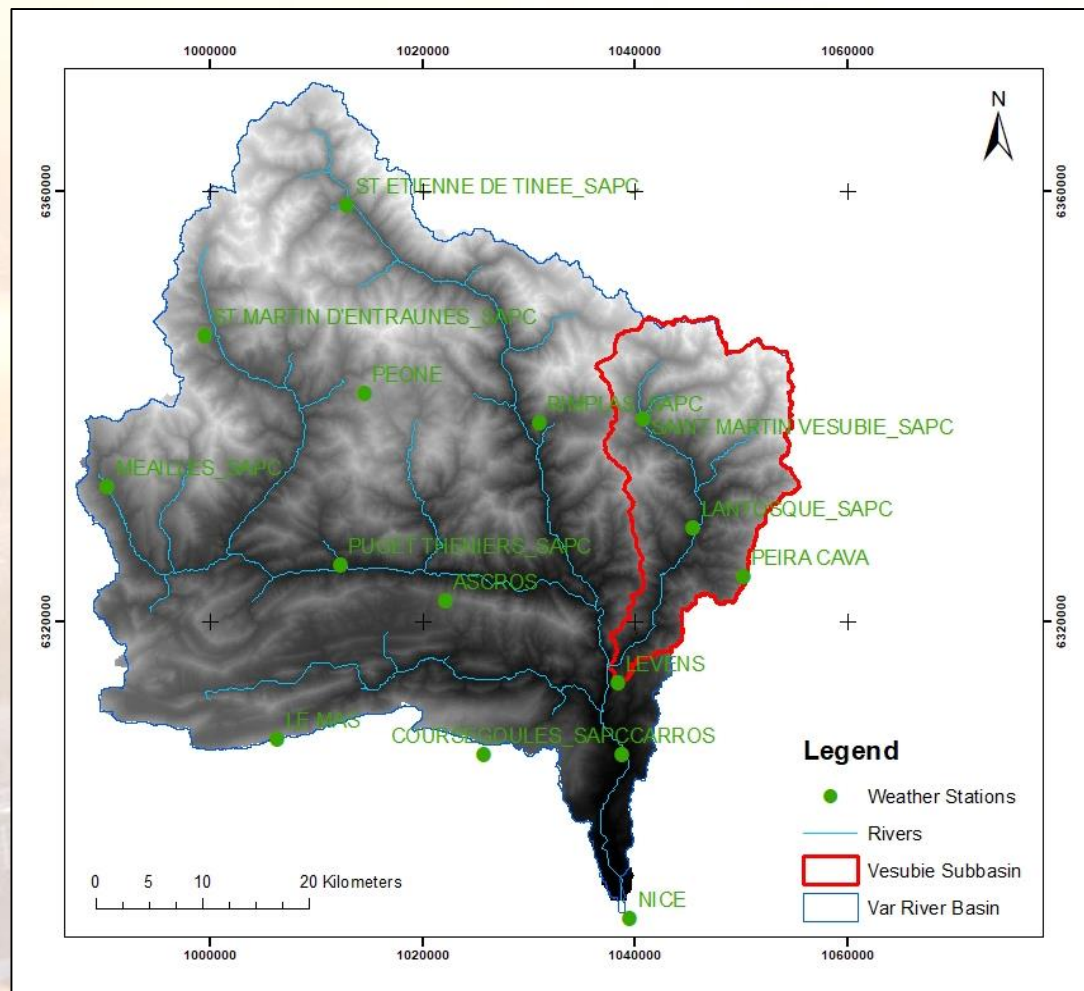
Définis par le GIEC pour son 5ème rapport :

- RCP 2.6 scénario d'émissions faibles
- RCP 4.5 scénario d'émissions modérées
- RCP 8.5 scénario d'émissions fortes

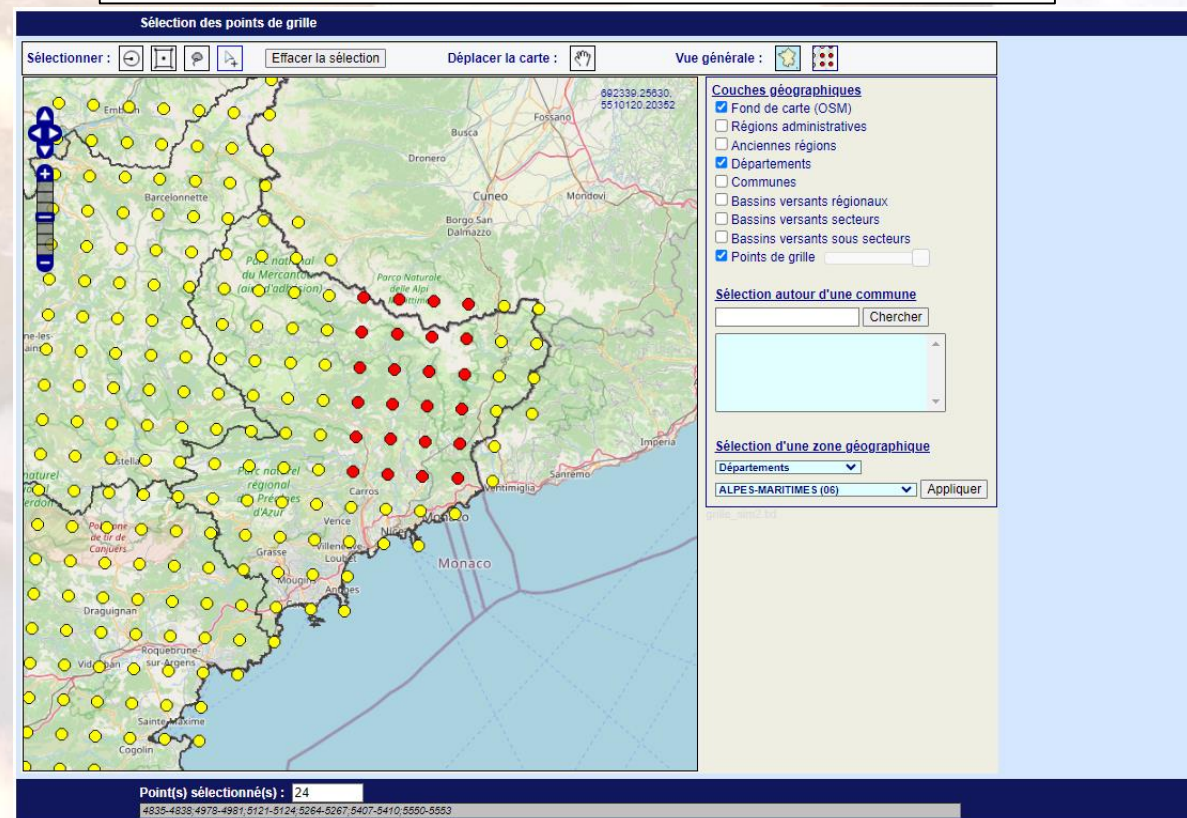
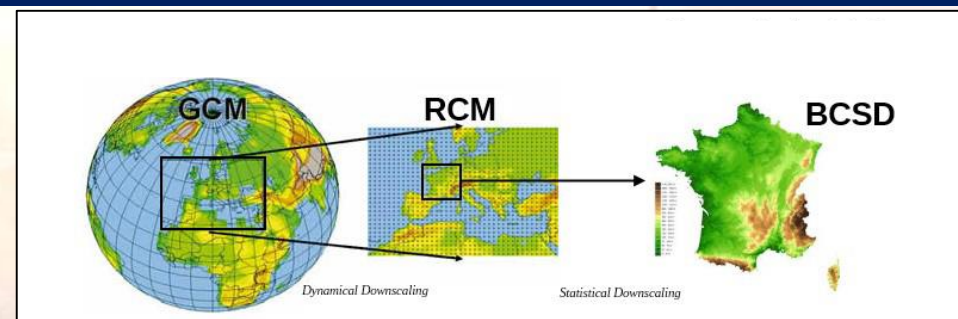
Risques de transition

Ces risques découlent de la transition vers une économie bas carbone, notamment des changements réglementaires, des transformations du marché et des défis économiques.

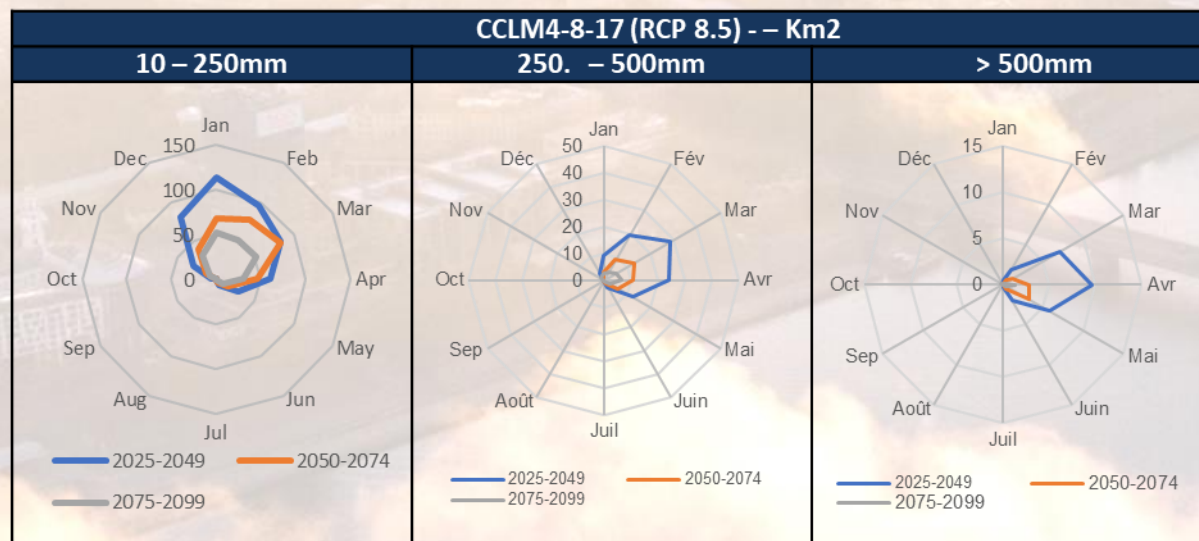
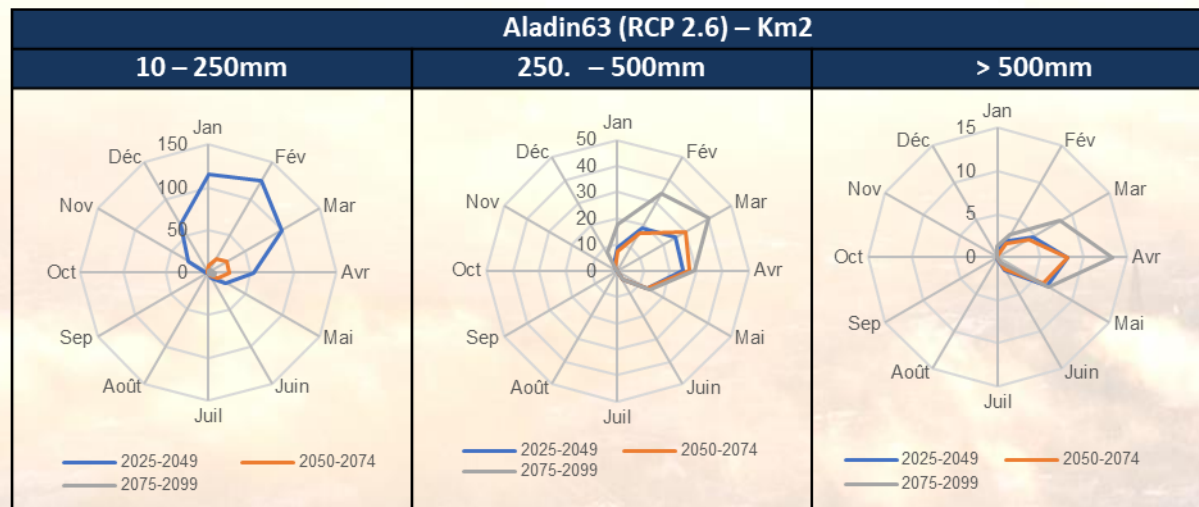
2nd case study : Impacts of climate change ?



Bassin de la Vésibue dans le bassin du Var



2nd case study : Impacts of climate change ?



Pour RCP2.6

profondeur de neige (moyenne mensuelle)	2025 [km2]	2050 [km2]	2100 [km2]
10-250mm	43.2	8.2 (-80%)	2.0 (-95%)
250-500mm	8.3	8.3 (+1%)	12.3 (+50%)
>500mm	2.0	1.8 (-10%)	2.8 (+38%)

L'altitude limite pluie neige augmente légèrement et modifie le périmètre enneigé

Pour RCP8.5

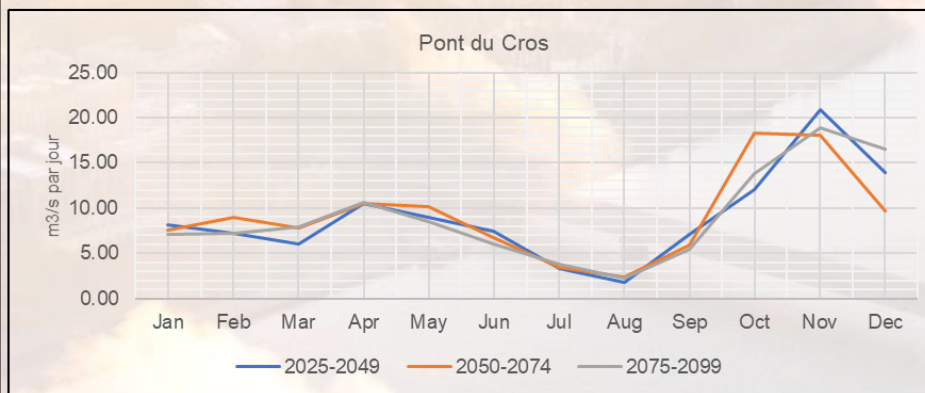
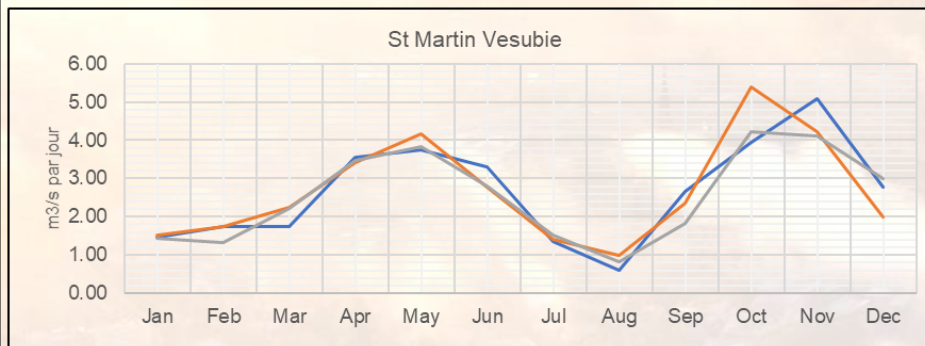
profondeur de neige (moyenne mensuelle)	2025 [km2]	2050 [km2]	2100 [km2]
10-250mm	42.2	28.8 (-30%)	19.3 (-55%)
250-500mm	8.4	3.6 (-55%)	1.9 (-75%)
>500mm	2.2	0.6 (-70%)	0.2 (-90%)

L'altitude limite pluie neige augmente considérablement et affecte la totalité du stock neigeux

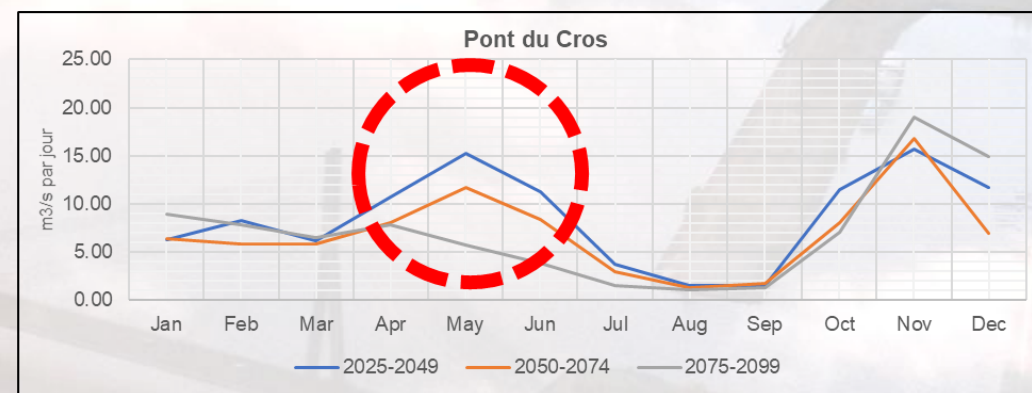
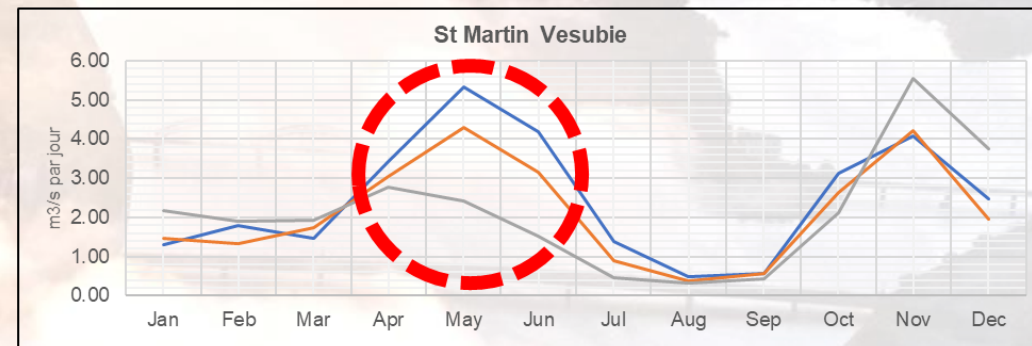
2nd case study : Impacts of climate change ?



RCP 2.6



RCP 8.5



Thank you for your attention !

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