ASGARD Project

Assimilation of Satellite data to GuArantee the early warning of Rain runoff and the associated Disaster

BlueMapping

IGNfab

PARIS SACLAY Communauté d'agglomération

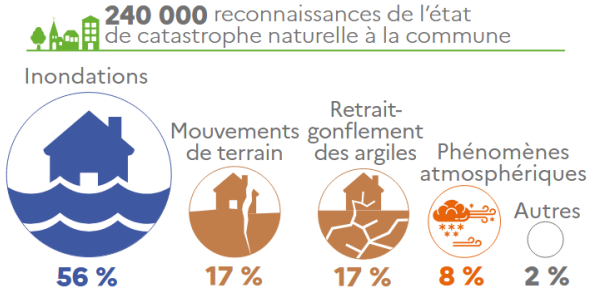
Géosciences pour une Terre durable brgm

predict Risques sous haute surveillance

Pluvial floods affect all EU regions

Floods = 1st natural risk

- Many forms of floods
  - Fluvial
  - **Pluvial**
  - Coastal
  - Groundwater



Source : SDES

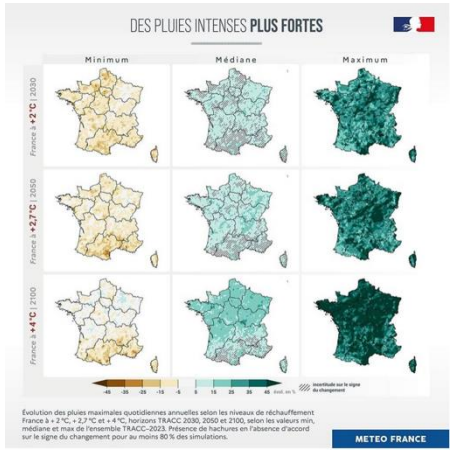
Pluvial floods = 1st flood risk

- **> 50%** of flood damages
- **> 70%** of French cities affected
- Occur **far from rivers**
- **Flood** & **Erosion** & **Pollution**

Source : IGN / CCR

Climate change impact

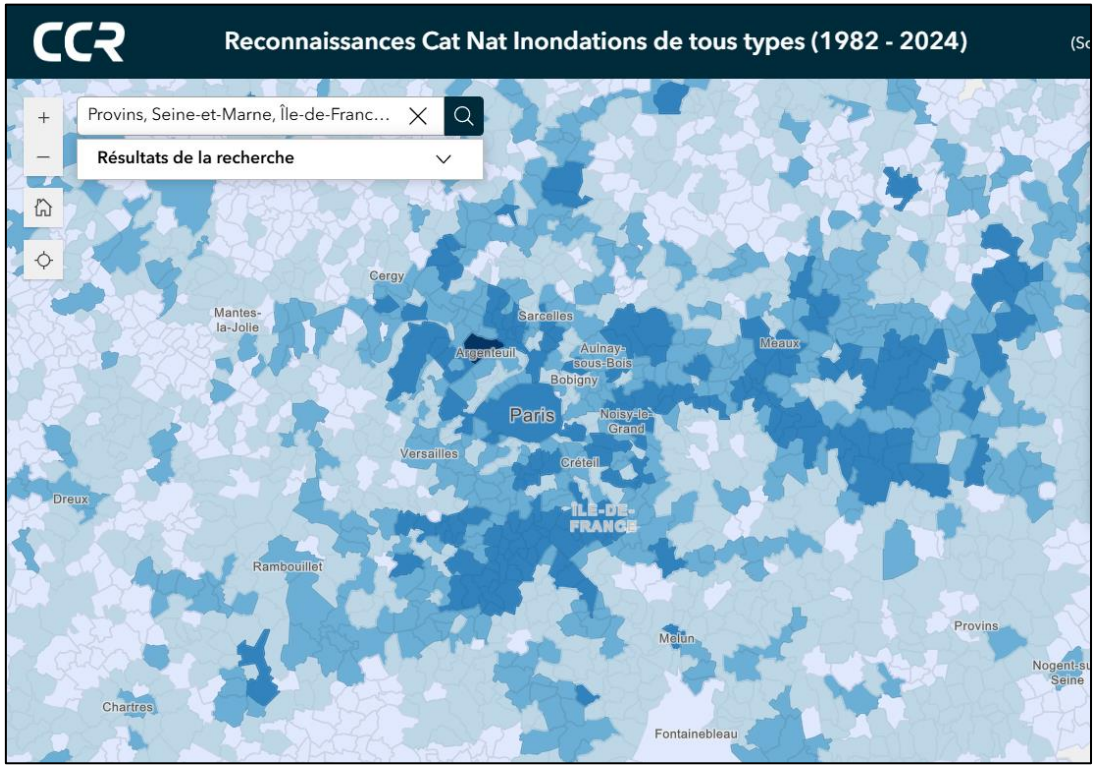
- **+20%** of rain intensities (scenario +4°C in 2100)
- **Soils less infiltrating** (too wet or too dry)



Source : Météo-France

Runoff and small river streams are a blind spot of risk knowledge

Knowledge historically on large rivers

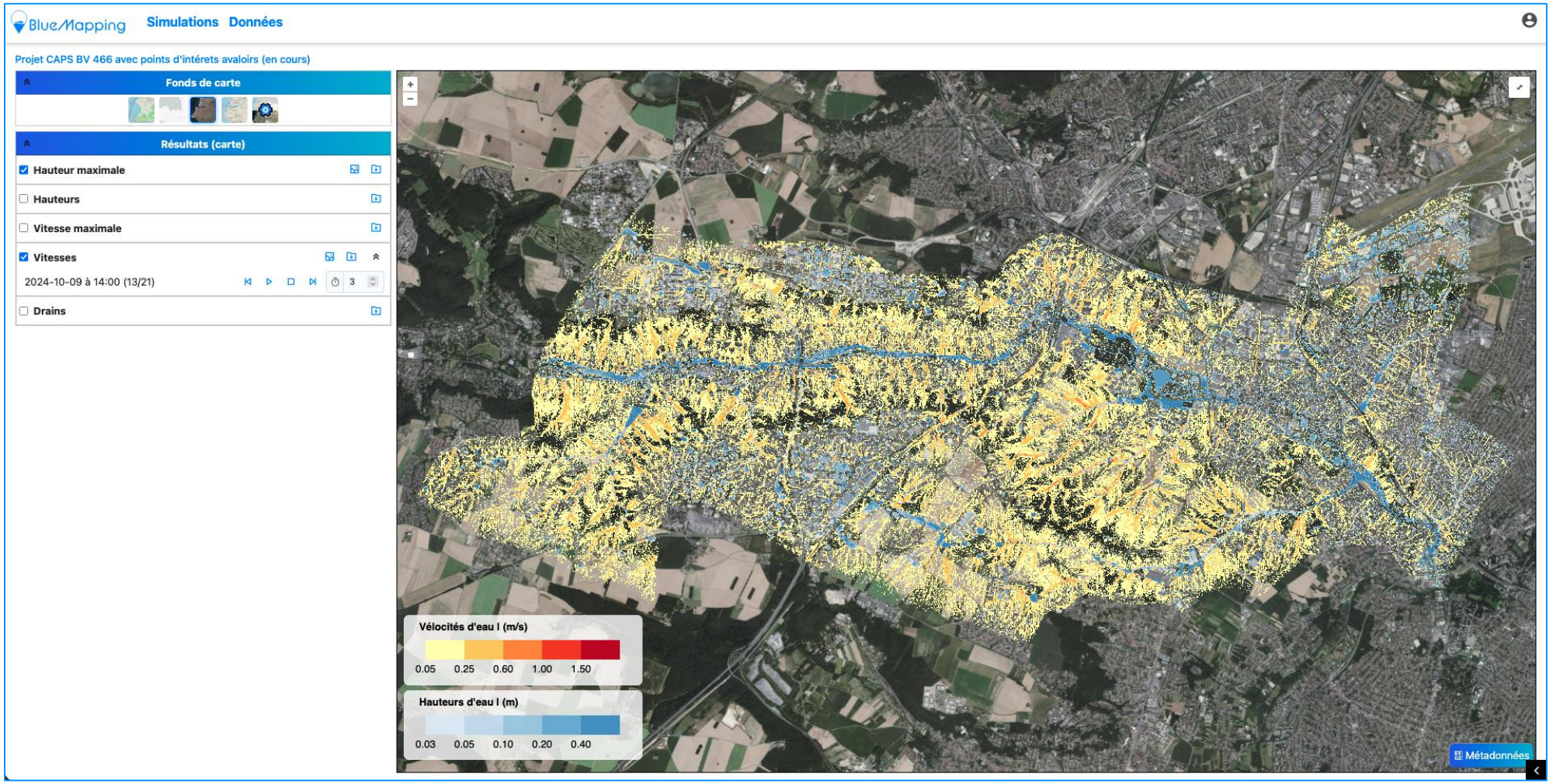


Flood damage by cities
as recognised « Natural Disasters» by the French State

Flood damage occur mainly far from large rivers.
The knowledge of risk is limited, and early warning systems are missing.

Source : https://cartoviz2.institutparisregion.fr, https://www.ccr.fr

Bluemapping is the first SaaS solution modelling diffuse water flows



Partners

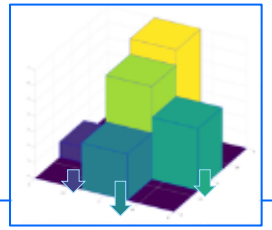
3 breakthrough technologies behind the Bluemapping solution

Digital Twin

Automated workflows
to process public data

IGN · brgm · cnes · METEO FRANCE · AIRBUS DEFENCE & SPACE · Copernicus · Land Monitoring Service

+



Physical model

High resolution water balance
& **Distribution by cellular automata**

+

Cloud Native

High performance, **scalable**
infrastructure

aws · NVIDIA.

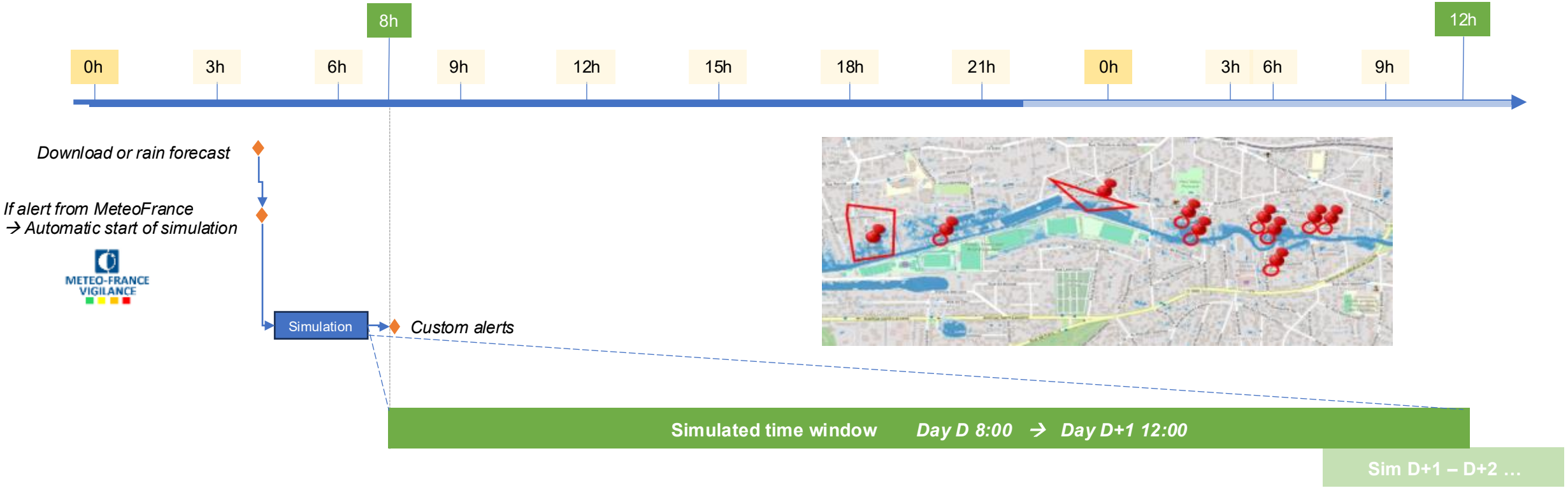
Simulations of diffuse water flows
Fast – Large scale – High resolution – Everywhere

5 mn - 2h	**100s – 10 000s km²**	**1-5 m**

Early warning system based on the fast simulation of rain forecasts

- Automatic system
  - Simulation on the next 28h
  - Custom alerts
  - Advanced calculation strategies possibles (radar, nowcasting, forecasting)

- Workflow



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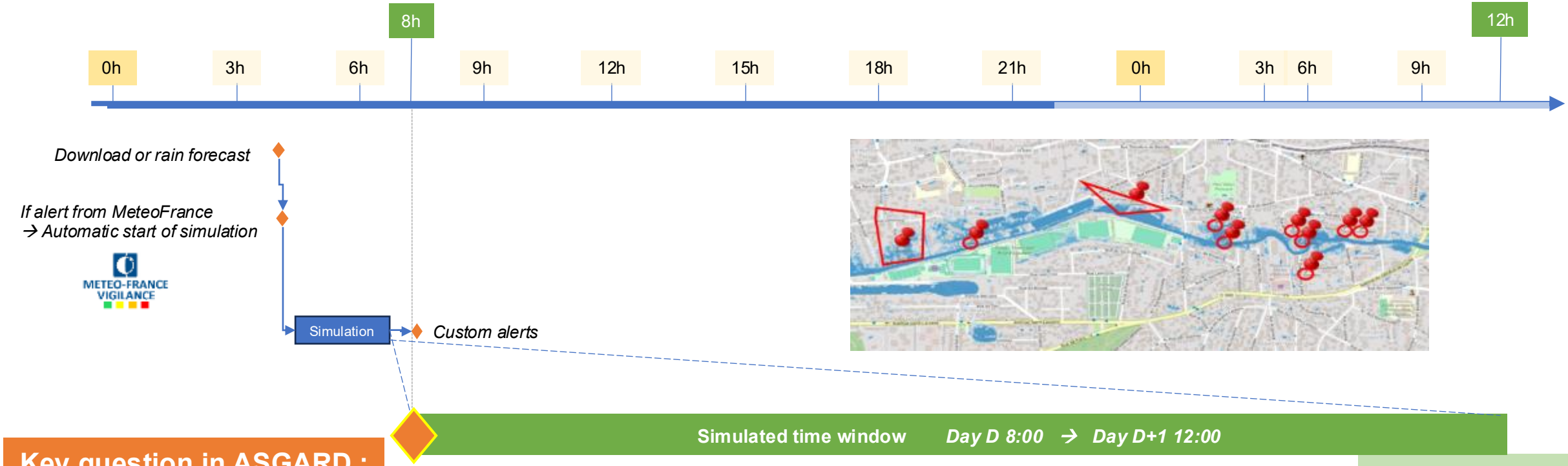


Key question in ASGARD : Get the latest land data and soil status in real time

ASGARD Project

- Consortium

Startup on pluvial flood simulation

National Lab on soils and groundwater

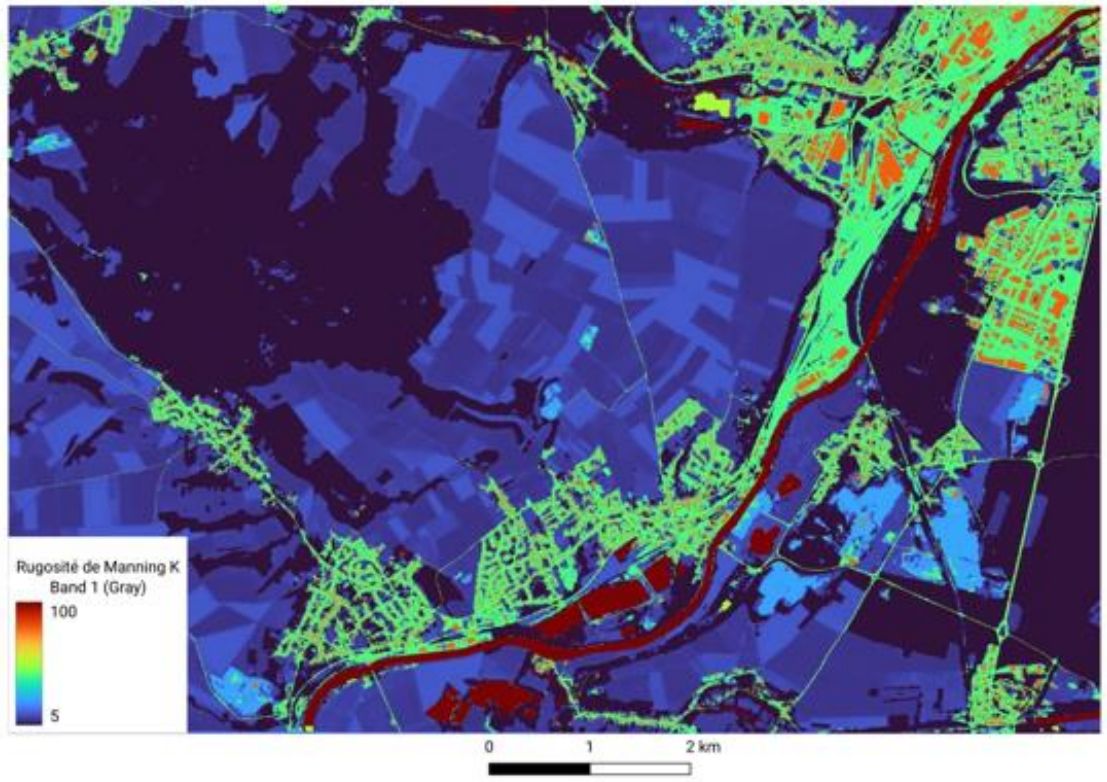
Climate risk prevention and management expert

- Project budget 315 000 €
- Duration 18 months

- Data to be updated by satellite imagery
  - Topography
  - Land cover
  - Roughness
  - Soil status for infiltration
  - Vegetation status
  - Initial soil moisture and water state

- Example on roughness
  - Roughness drives the speed of diffuse water flows → Flood dynamics
  - Depends on many parameters (Land cover, Vegetation, Agricultural practices..)
  - Spatialisation of roughness based on Sentinel 1 & 2

- Why it makes sense?
  - Capacity to apply fresh satellite data everywhere in the world and anytime

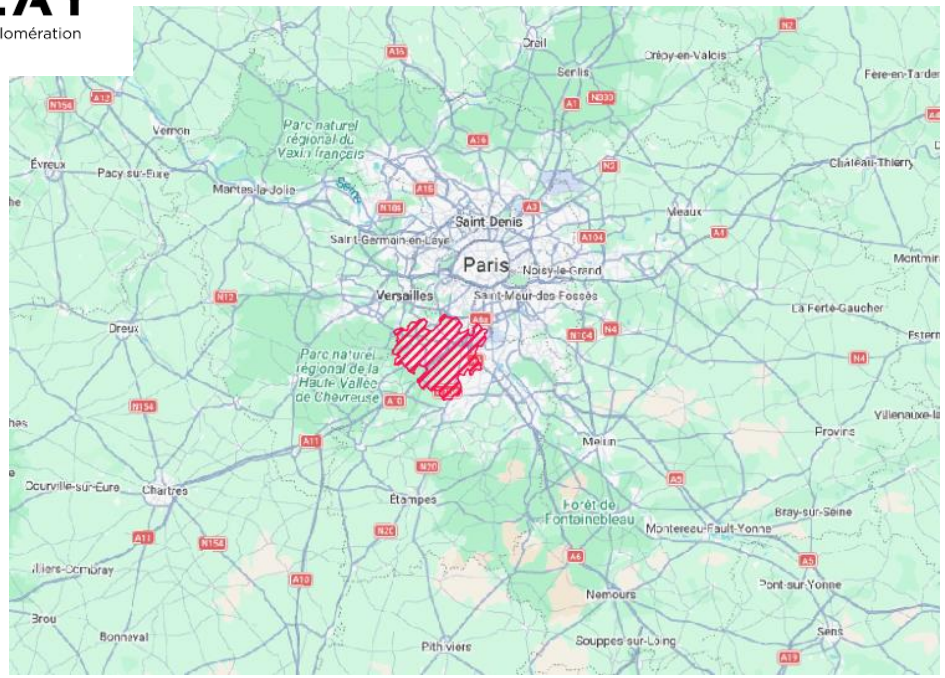


Example of Manning roughness calculation by satellite data assimilation

Demonstrators

Paris-Saclay innovation cluster

PARIS SACLAY
Communauté d'agglomération



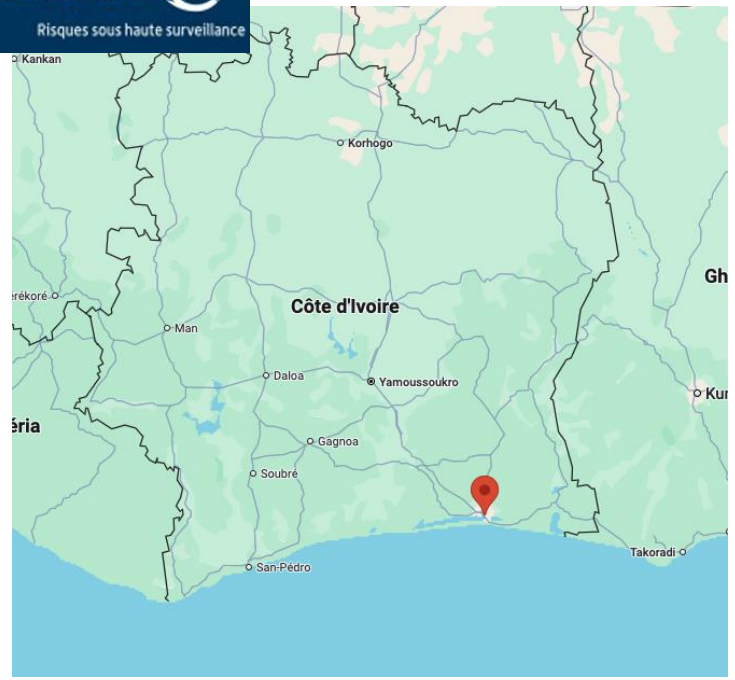
- Urban operation of national interest to create a world-class R&D cluster
- Innovative territory contributing to the national Digital Twin project
- Land development of historic rural areas exacerbates runoff
- Several important pluvial floods: Juin 2021, Oct 2024

➢ **Demonstrator to validate workflows**

Géosciences pour une Terre durable
brgm

Abidjan, Ivory Coast

predict
Risques sous haute surveillance

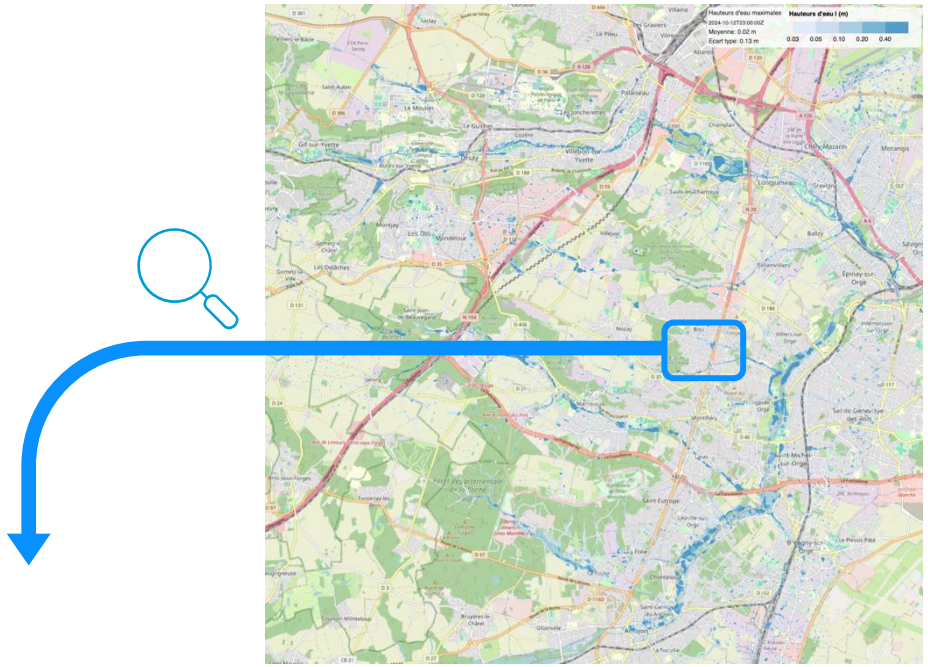


- Economy highly based on agriculture and mining
- PARU project on Great Abidjan / Vigiclimm Côte d'Ivoire
- Several important pluvial floods: 2018, 2020, 2021, 2022
- Many fatalities and impacts on infrastructure and lands
- Pollution of natural areas

➢ **Demonstrator to replicate workflows**

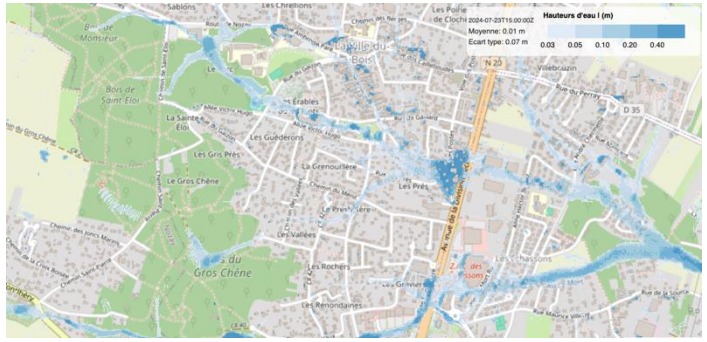
Applications for public authorities

- **Dynamic maps with yearly updates**
  - Defined for specific scenarios (e.g. rain 50 year on low-infiltrating soils)
  - Risk preparation & prevention
  - Review of building permit applications
  - Assessement of disconnecting stormwater drainage networks
  - Yearly updates with the latest urban development

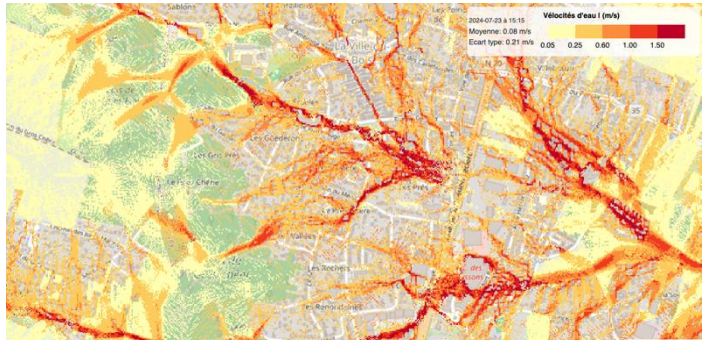


- **Forecast & Early warning system**

Height
(m)



Speed
(m/s)



Drain criticity
Max flow rate by drain (L/s)

BlueMapping

Ultimate goal: a fully replicable solution to increase flood resilience

- Satellite-based digital twin
  - Real-time status for forecast simulation
  - Applicable worldwide

- Countless applications: Rain falls everywhere !
  - Public authorities: rain management on surface and in networks, flood management, urban management
  - Infrastructures: all networks affected: energy, water, transport, telecoms…
  - Mines: Operational risks, production losses, pollutions
  - Airports: Security of airport operations, pollutions
  - Industries: Pollutions, Loss of production, insurability
  - Agriculture: Production losses, pollution
  - Insurances: Damage prevention and forecast
  - …

- User Group to be set up soon
  - Public and private organisations active in or concerned with pluvial floods

Thank you for your attention !

Questions ?

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