

# Team 01 Presentation 3

Presentation 3: Results of the 2nd week, climate changes



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# Var Catchment - Summary of week 1

## The Models

- HEC-HMS: hydrologic
- Telemac: 2D hydraulic
- MIKE-11: 1D hydraulic

Where should we build the WWTP that  
was previously destroyed?



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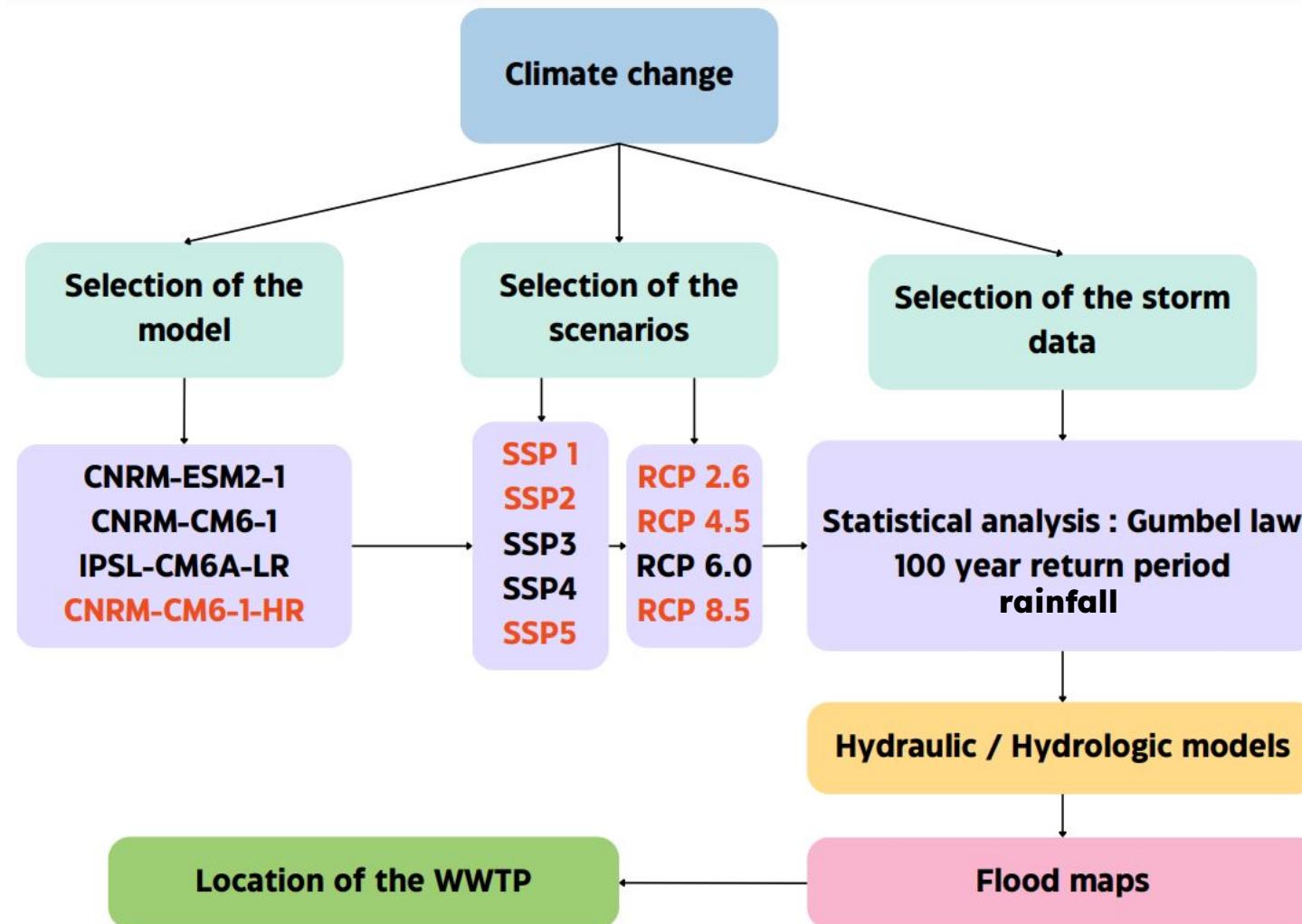


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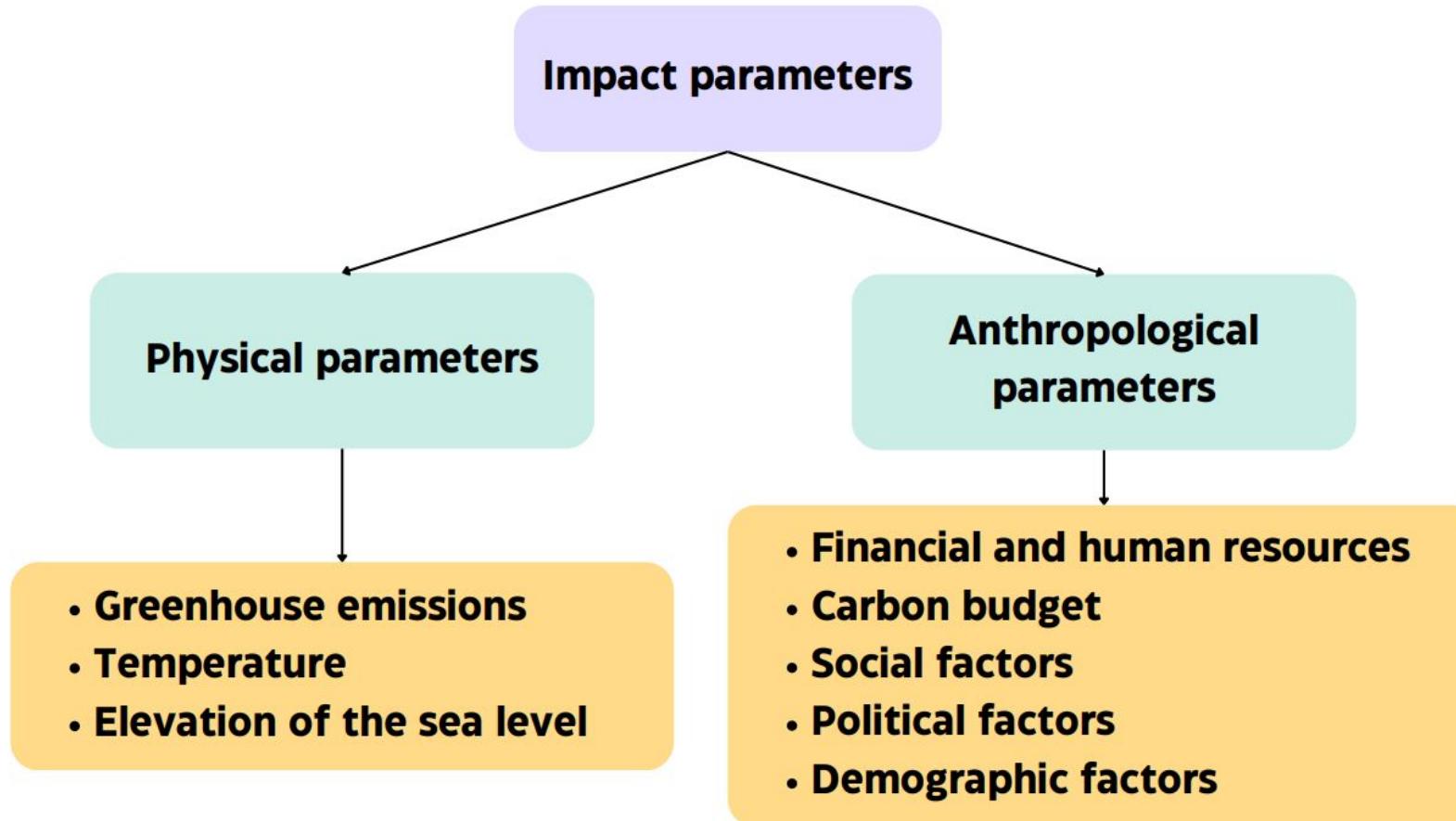


# Var Catchment - This week's workflow

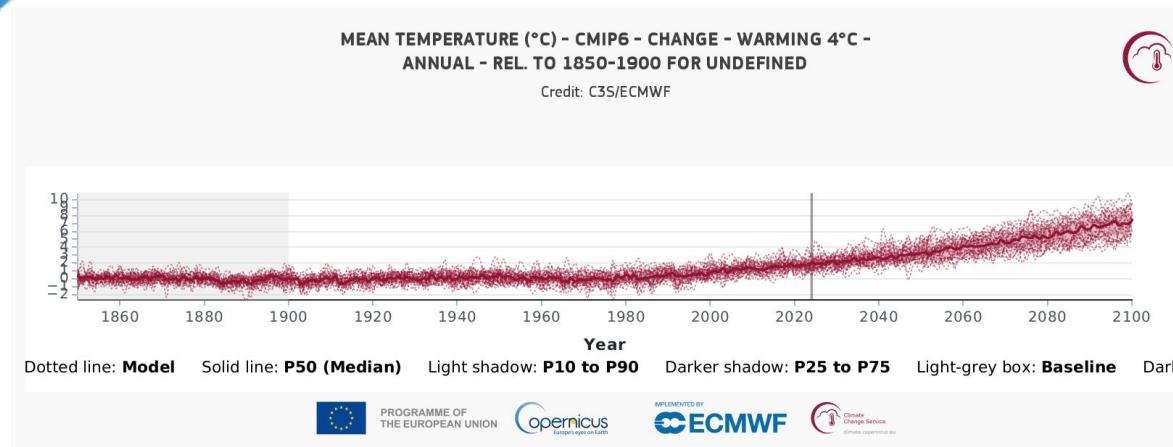




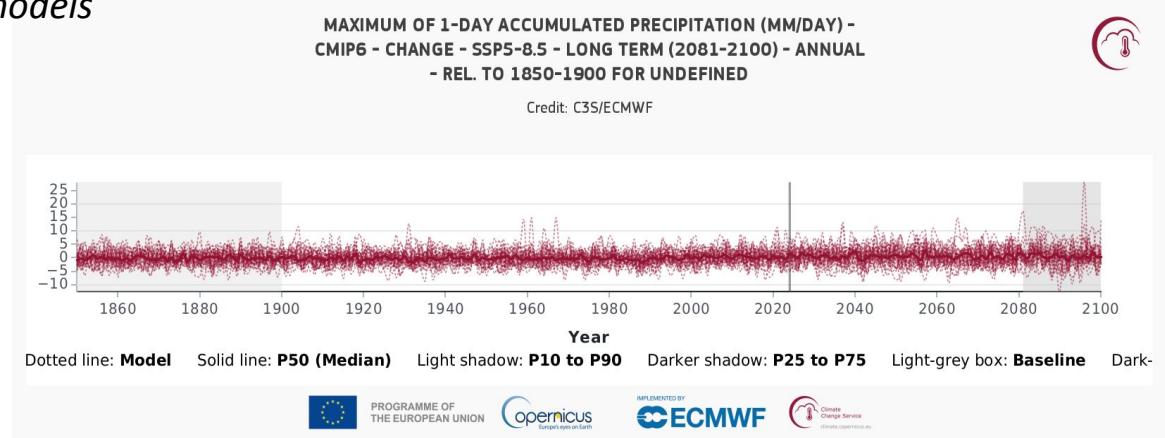
# Var Catchment - Affecting parameters



# Var Catchment - Impact of Climate Change



Projections of the annual temperature according to different models  
(Copernicus)



Projections of 1 day accumulated precipitations according to different models (Copernicus)



# Vésubie Catchment - Selection of the model

Model	Advantages	Disadvantages
CNRM-ESM2-1	Effective for modeling <b>terrestrial and oceanic processes</b> . Assessment of <b>long-term impacts</b> (biosphere-atmosphere interaction).	Less precise locally (CNRM-CM6-1-HR). <b>Less accurate for extreme events.</b> Underestimation of output parameters
IPSL-CM6A-LR	Effective for modeling <b>climatic processes</b> . Good performance for <b>overall precipitation and temperatures</b> . Suitable for <b>varied scenarios</b> .	Less precise locally (CNRM-CM6-1-HR). <b>Less accurate for clouds and extreme precipitation.</b> Overestimation of output parameters.
CNRM-CM6-1-HR	Effective for modeling <b>precipitation and extreme events</b> . High spatial resolution: <b>locally accurate</b> .	High computational cost. Underestimation of output parameters.
CNRM-CM6-1	Suitable for modeling a <b>wide range of climate variables</b> . <b>Good general balance</b> between performance and computational cost.	<b>Less precise locally</b> (CNRM-CM6-1-HR). May require downscaling for accurate local-scale analysis. Underestimation of output parameters.

**CNRM-CM6-1-HR**



- **Flash floods**
- **Extreme precipitations**
- **Resolution : locally accurate**

# Var Catchment - Selection of the scenarios



**SSP1(2.5)**

**SSP2(4.5)**

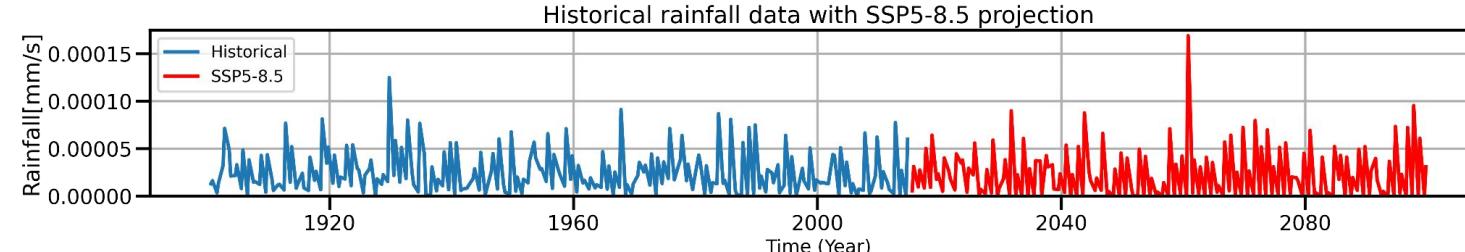
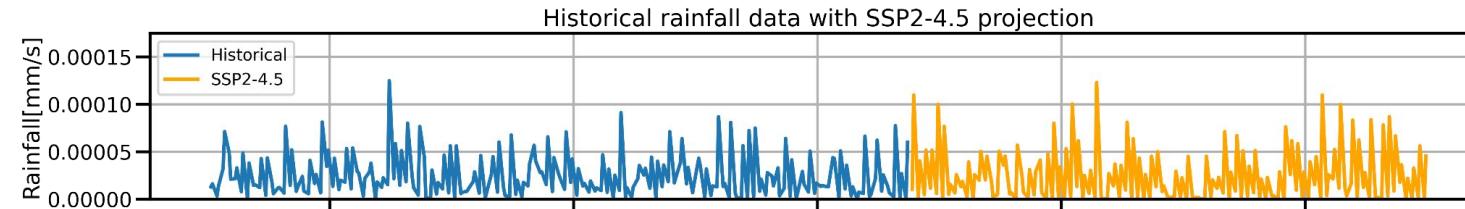
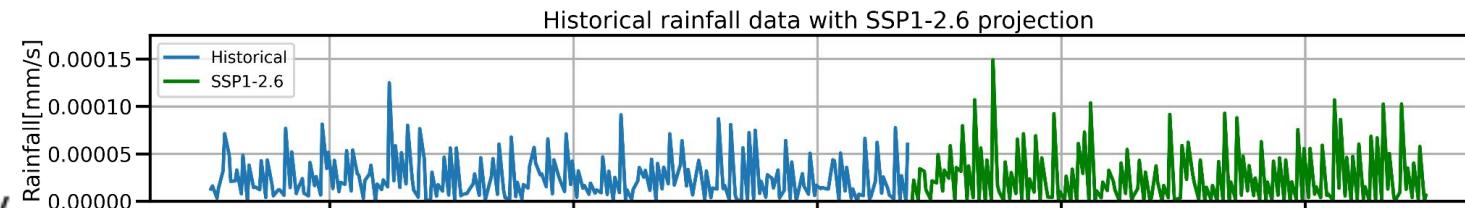
SSP3

SSP4

**SSP5(8.5)**

**Utopic**  
Mass sustainability  
effort and  
environment  
conservation

**Distopic**  
Fossil-fuel  
dependant society  
with limited  
sustainability efforts

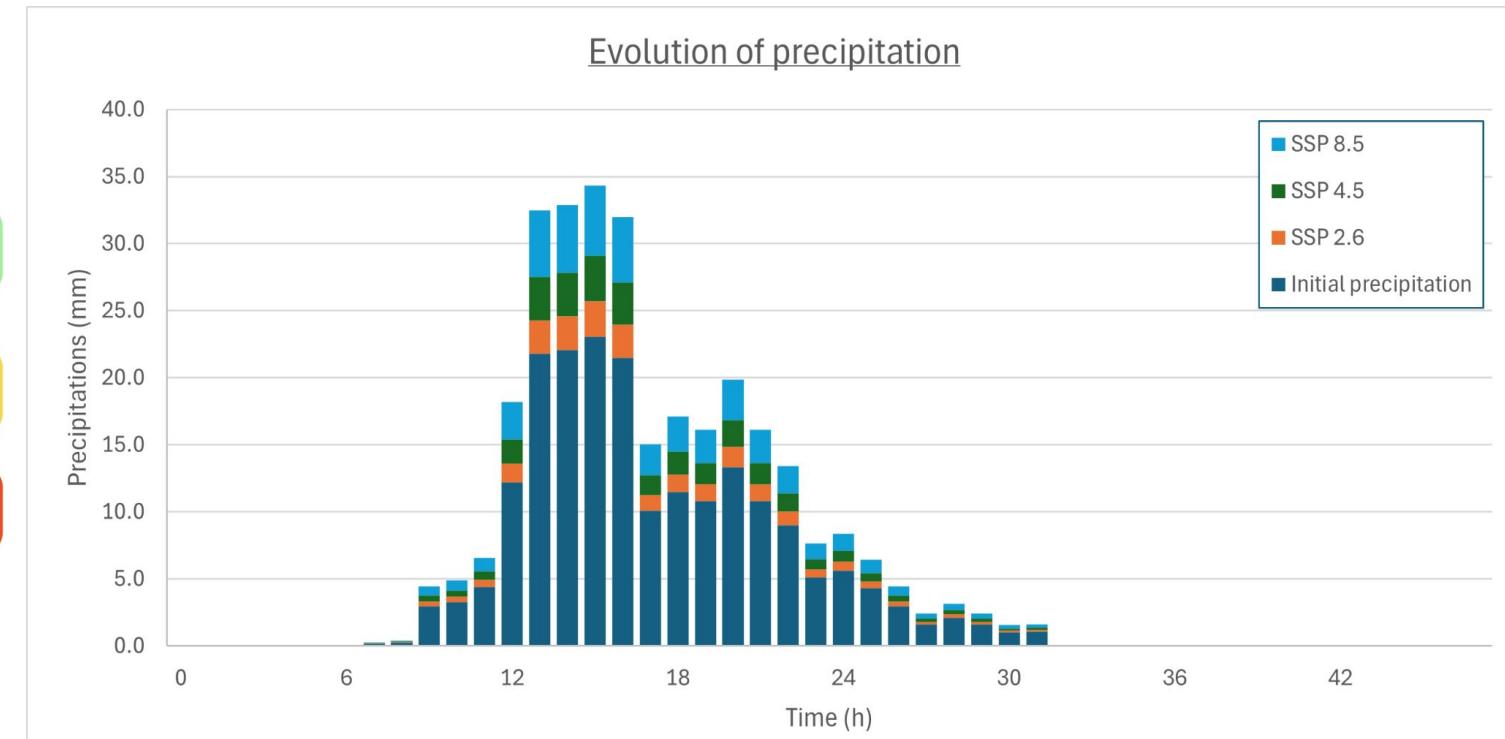
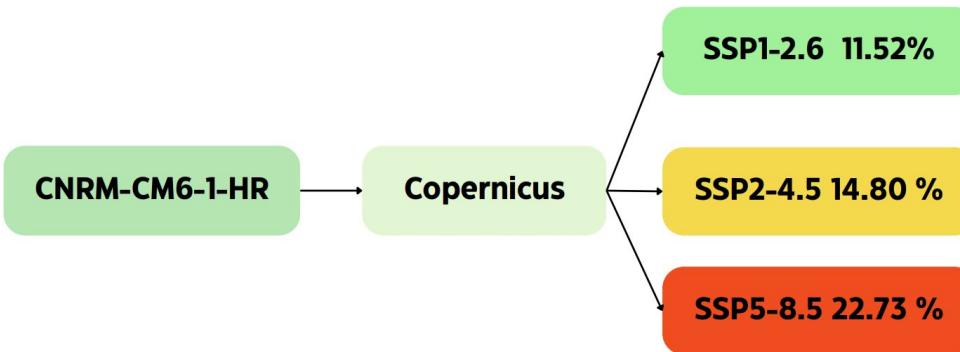


**Visualisation of the rainfall data results of CNRM-CM6-1-HR model in the three scenarios**



# Var Catchment - Input DATA

"Gumbel Method  $\Rightarrow$  100-year return event yields 202mm  
 $\Rightarrow$  initial hydrograph for climate change scenarios."





# Var Catchment - Hydraulic model

## TELEMAC 2D

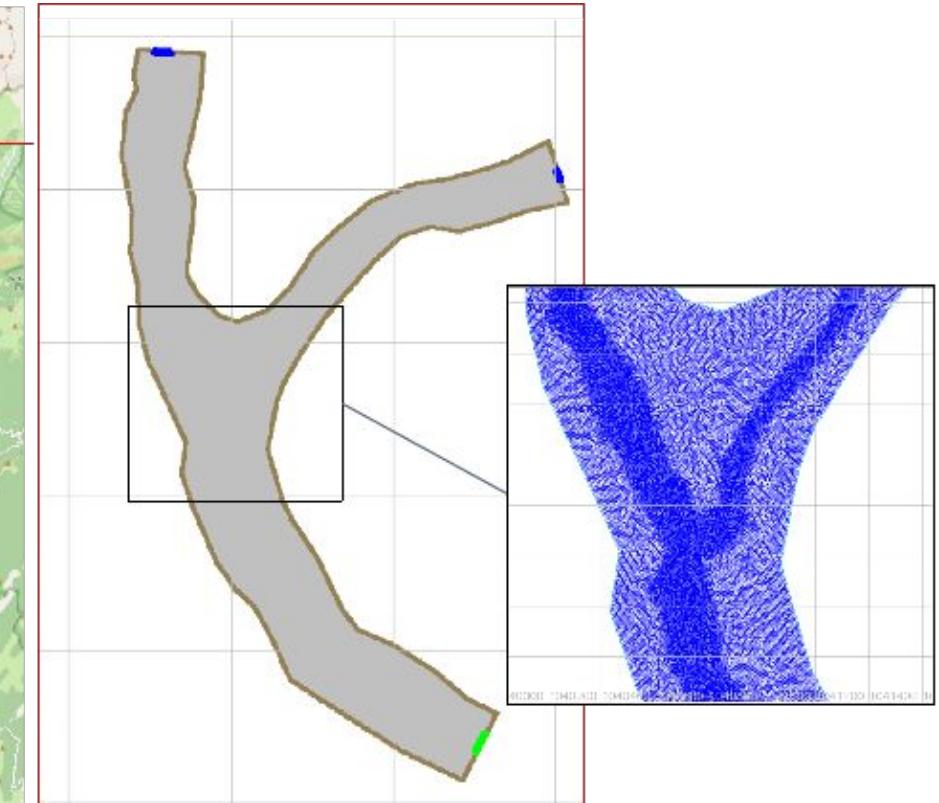
### Situation

- Nearest station at 20 km
- DEM from Lidar 1 m
- Numbers of nodes = 100085
- Number of elements = 198111
- Strickler's law
- 4 bridges on the model zone
- $Z_{min} = 735.9$  m
- $Z_{max} = 1485.9$  m

Parameters	Value
CFL	0.5
Time step (s)	0.8
dx mesh size (m)	5



Localisation of the station



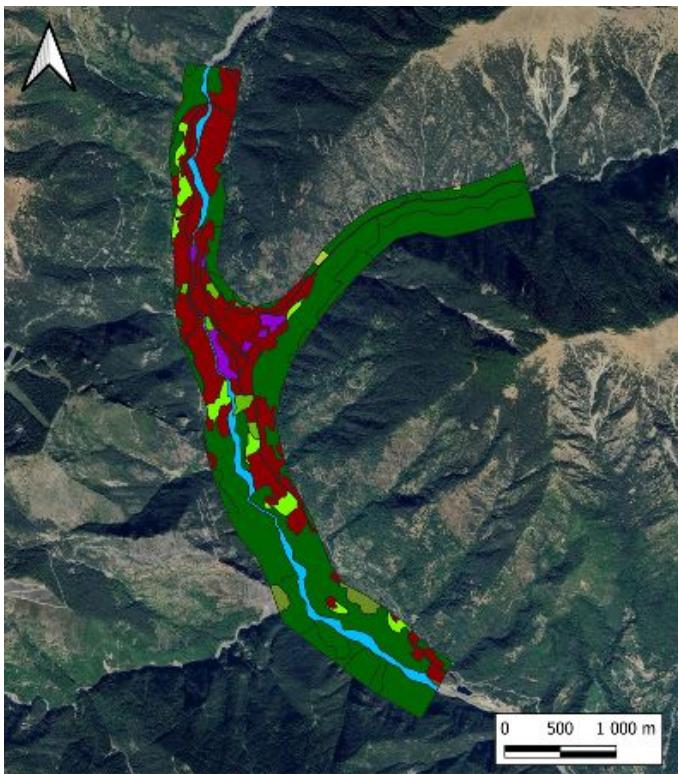
Visualisation of the mesh and the boundaries conditions



# Var Catchment - Hydraulic model

TELEMAC 2D

## Landuse Saint Martin de Vésubie



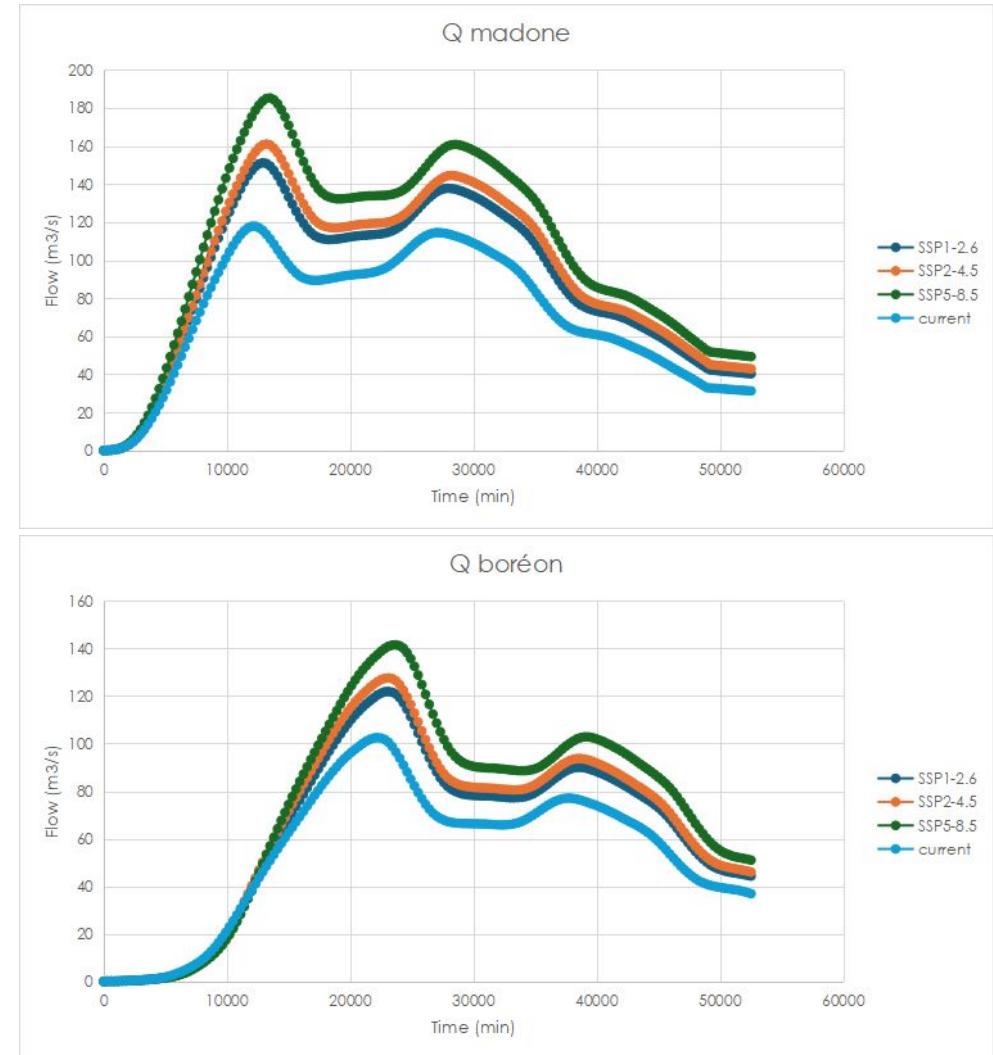
Nature	K Strickler
Artificialized zone	65
Agriculture zone	35
Forest	15
River bed	27

- River bed
- Urban open spaces and recreational areas
- Open spaces with little or no vegetation
- Forests
- Herbaceous vegetation environments
- Mines, landfills and construction sites
- Grasslands
- Industrial or commercial zones and equipment
- Urbanized areas

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# Var Catchment - Hydraulic model

**TELEMAC 2D**

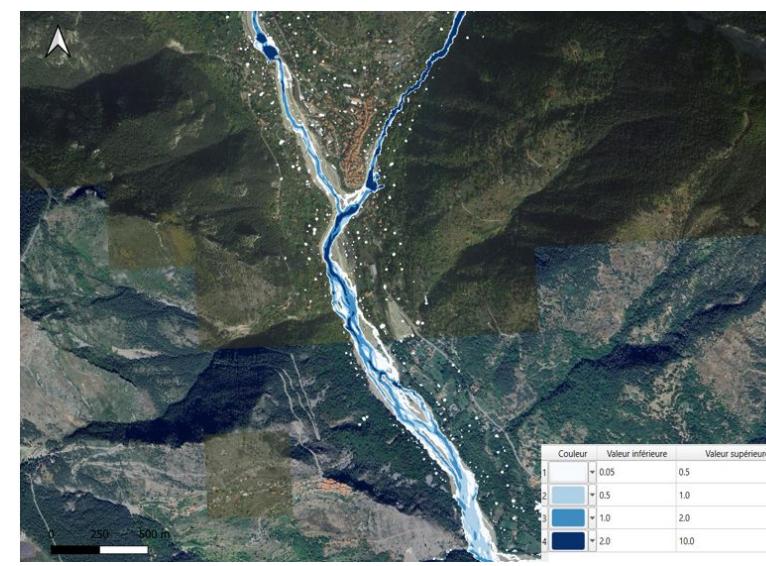
## Result: map flooding (Hmax)

- Water accumulation upstream of bridges,
- Possibility of installing the wwtp: Boréon (less vulnerable), eastern side of Vésubie



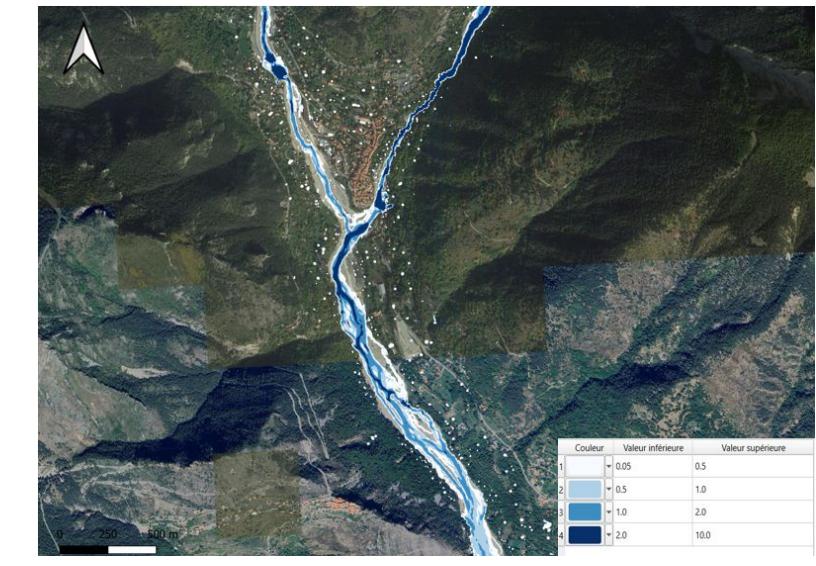
Scenario SSP1-2.6

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Scenario SSP2-4.5

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Scenario SSP5-8.5

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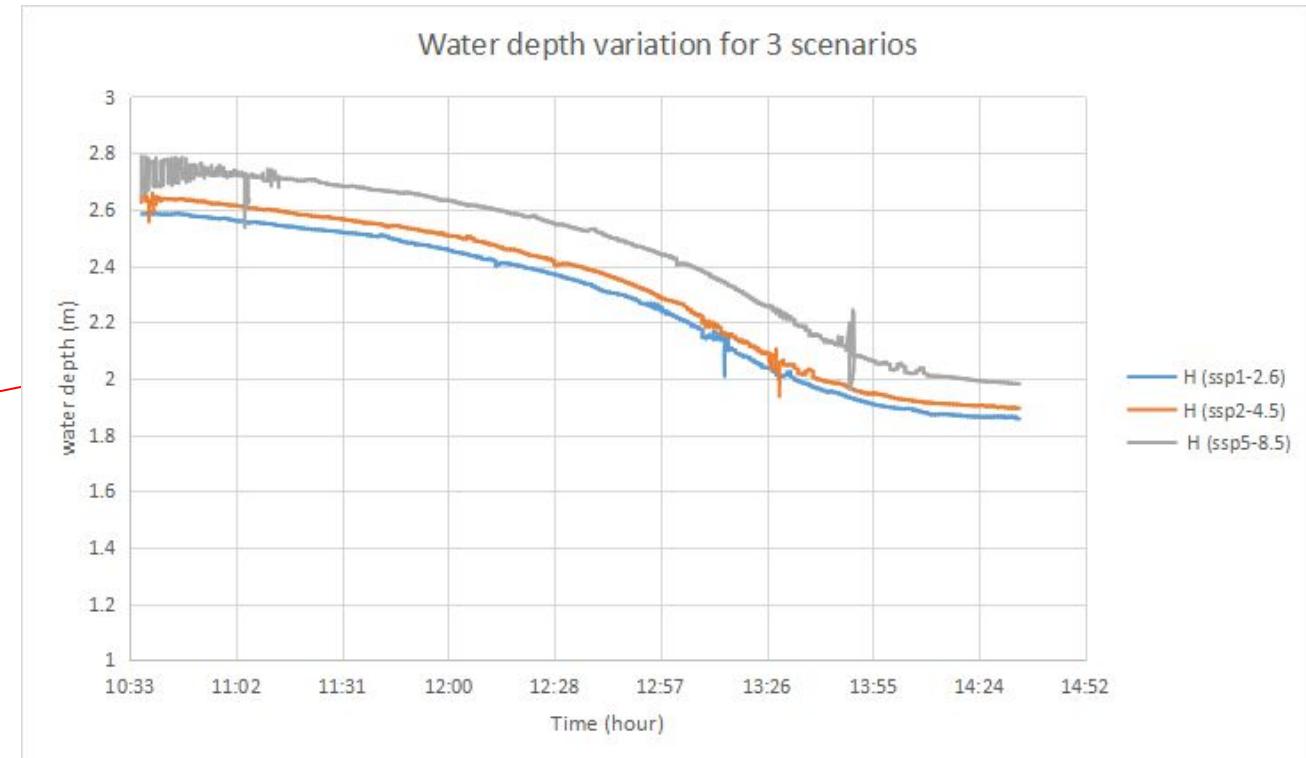




# Var Catchment - Hydraulic model

**TELEMAC 2D**

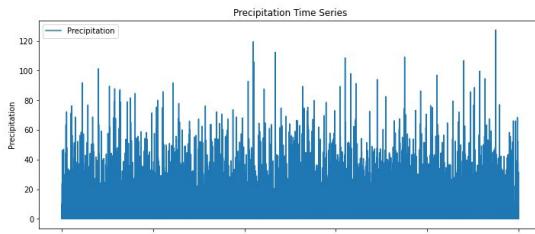
**Result: variation of water depth on the intersection Madone and Boréon**



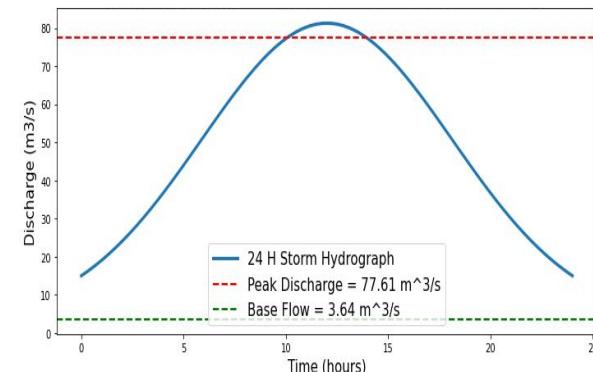
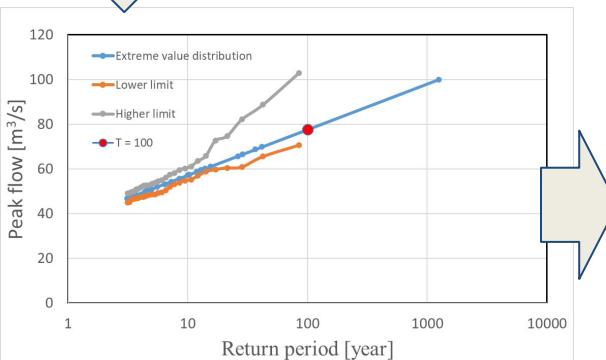
# MIKE11 - verification for WWTP location



CMIP6 climate projections :  
**SSP1-2.6**, CNRM-CM6-1-HR (France)  
Daily precipitation 2015-2100.



↓  
Precipitation to Surface runoff via HEC-HMS.  
Hydrological extreme value analysis via WETSPRO.  
[<https://bwk.kuleuven.be/hydr/pwtools.htm>]



Normal distribution + T100yr Peak flow

→ Input hydrograph for MIKE 11

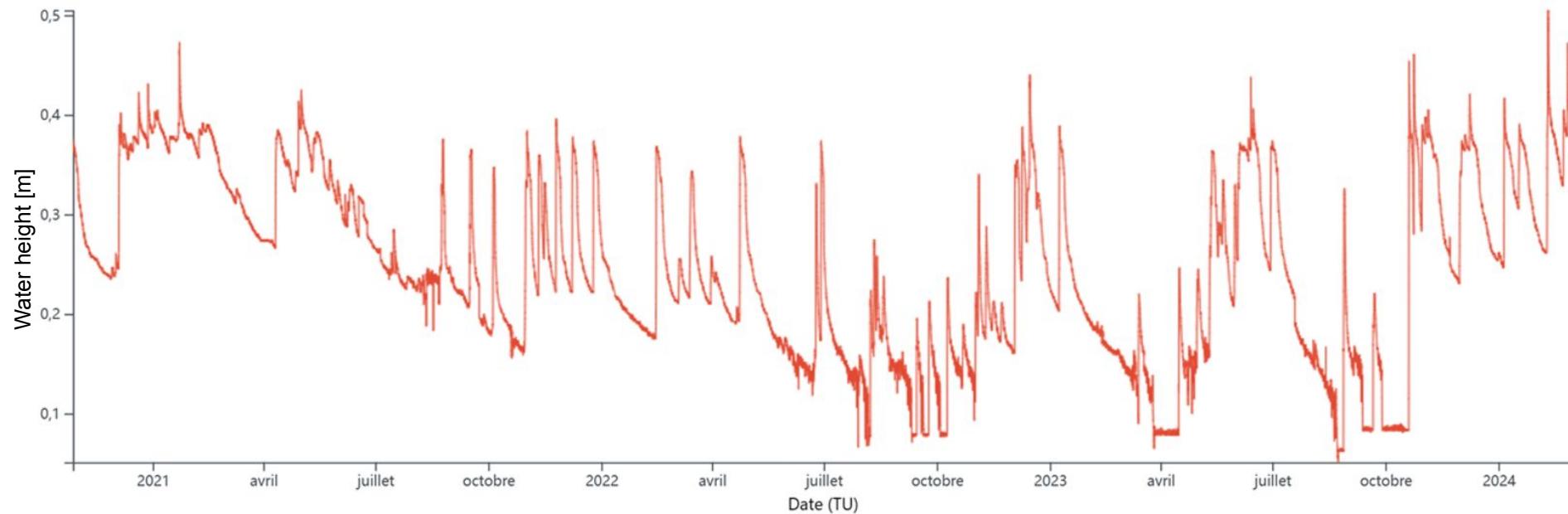
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# MIKE11 - verification for WWTP location



Number of gauge station : Y651-7010

- Minimum observed the 23/08/2023 : 0.051 m
- Maximum observed the 10/02/2024 : 0.505 m



# Var Catchment - Locations of the WWTP



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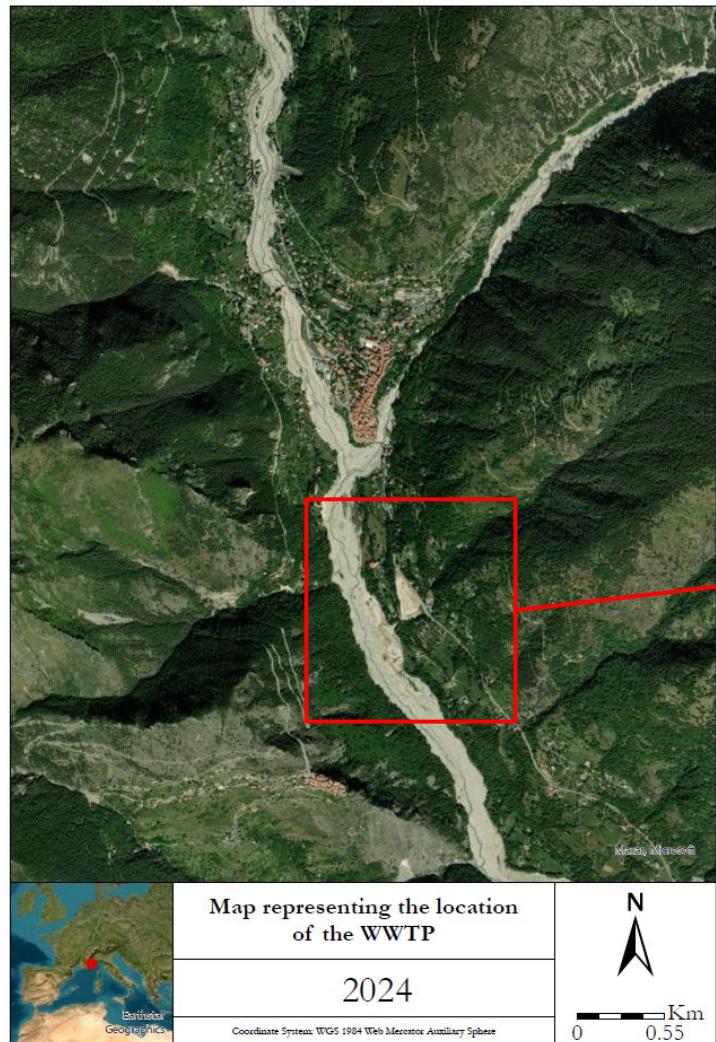


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# Var Catchment - Locations of the WWTP



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Thanks for your attention !

Any questions ?