BELGIUM

World Groundwater Congress
IAH2024DAVOS
Switzerland
Interacting Groundwater
8.–13.9.2024

Evaluation and modelling of drought impacts on groundwater reserves in Wallonia (Belgium) in the context of climate change

LIÈGE université
Sciences Appliquées

POLYTECH MONS

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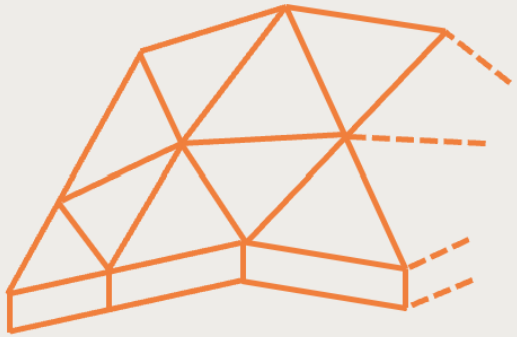
Wallonie environnement Awac

La société wallonne des eaux

Objective

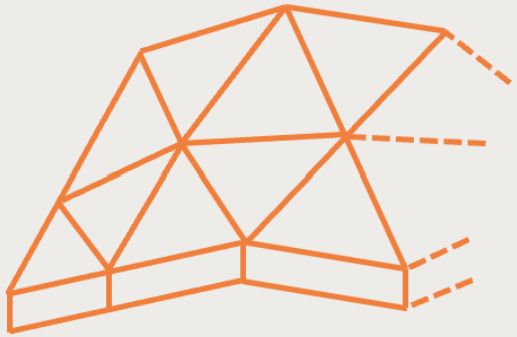
‘’How can we quantify the impact of drought on groundwater reserves in Wallonia?’’

Table of content



Creation of groundwater models

Table of content



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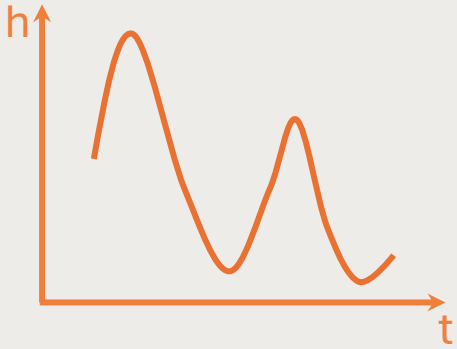

Analysis based on piezometric evolution

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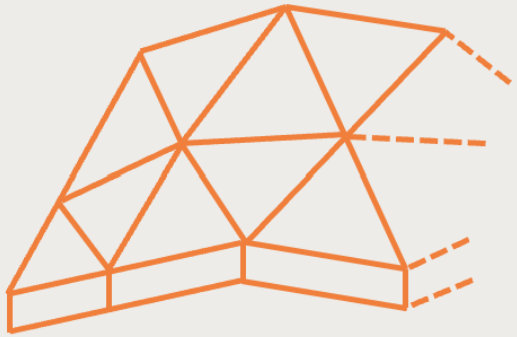

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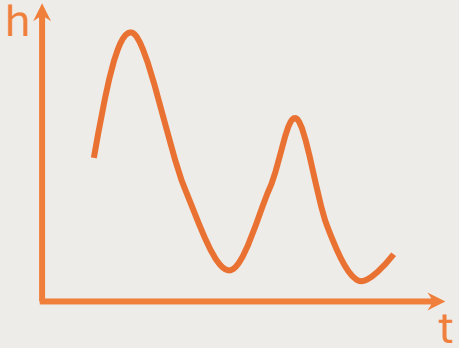

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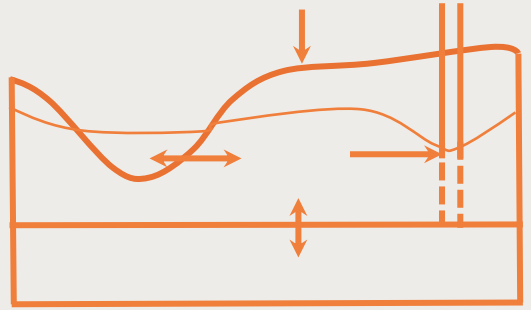
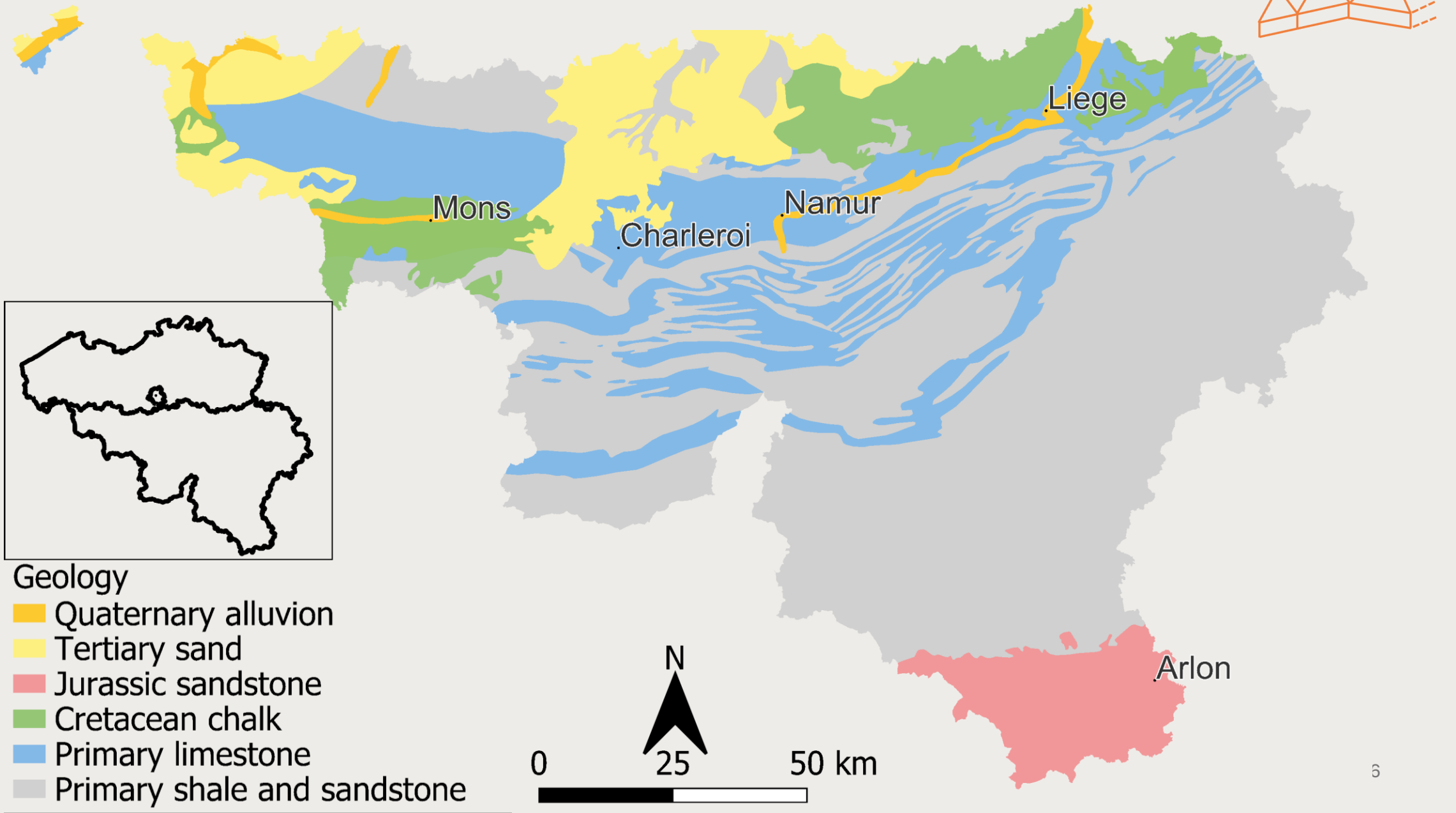
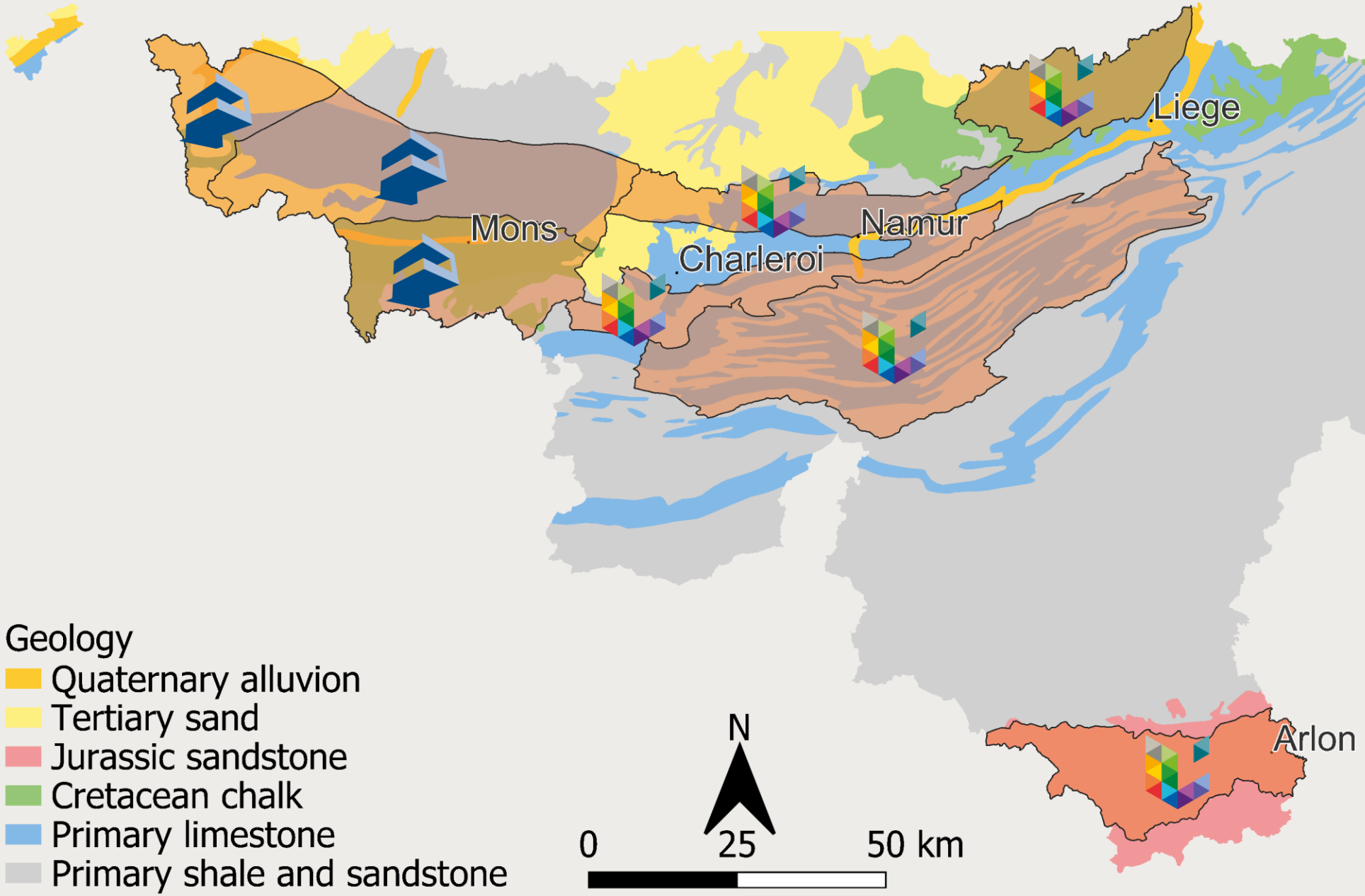


Analysis based on groundwater transfer

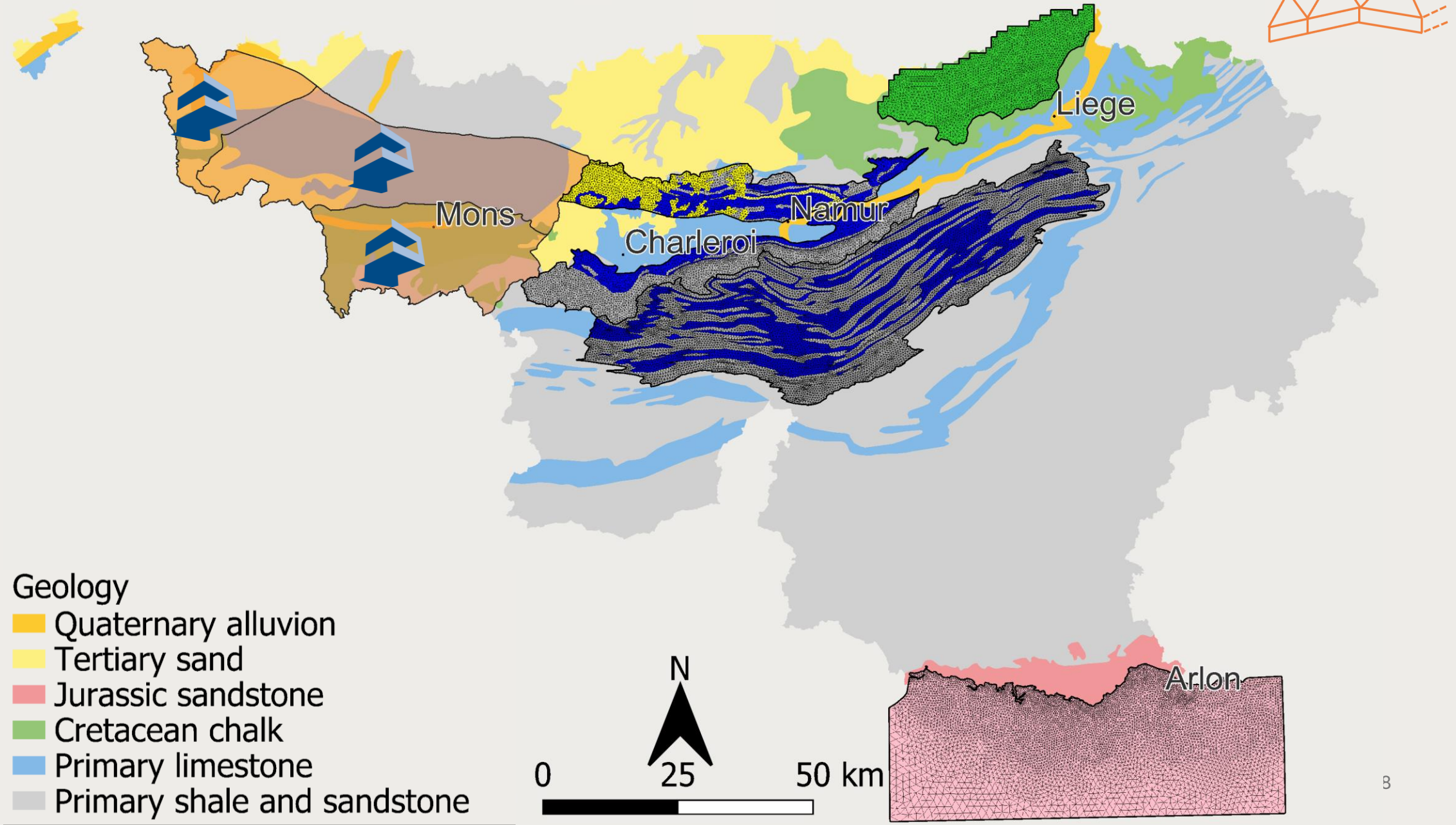
Simplified lithology



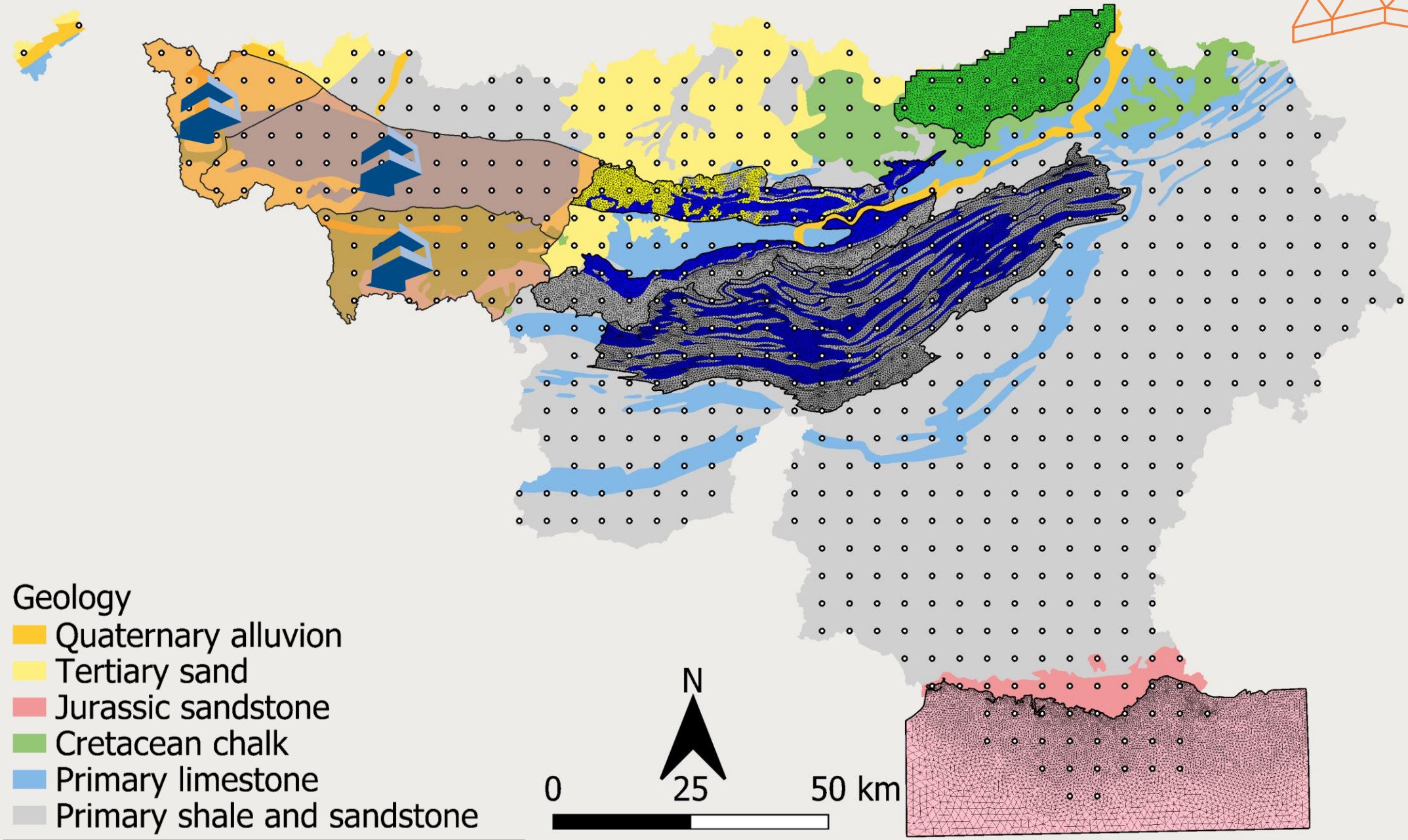
Groundwater bodies & models



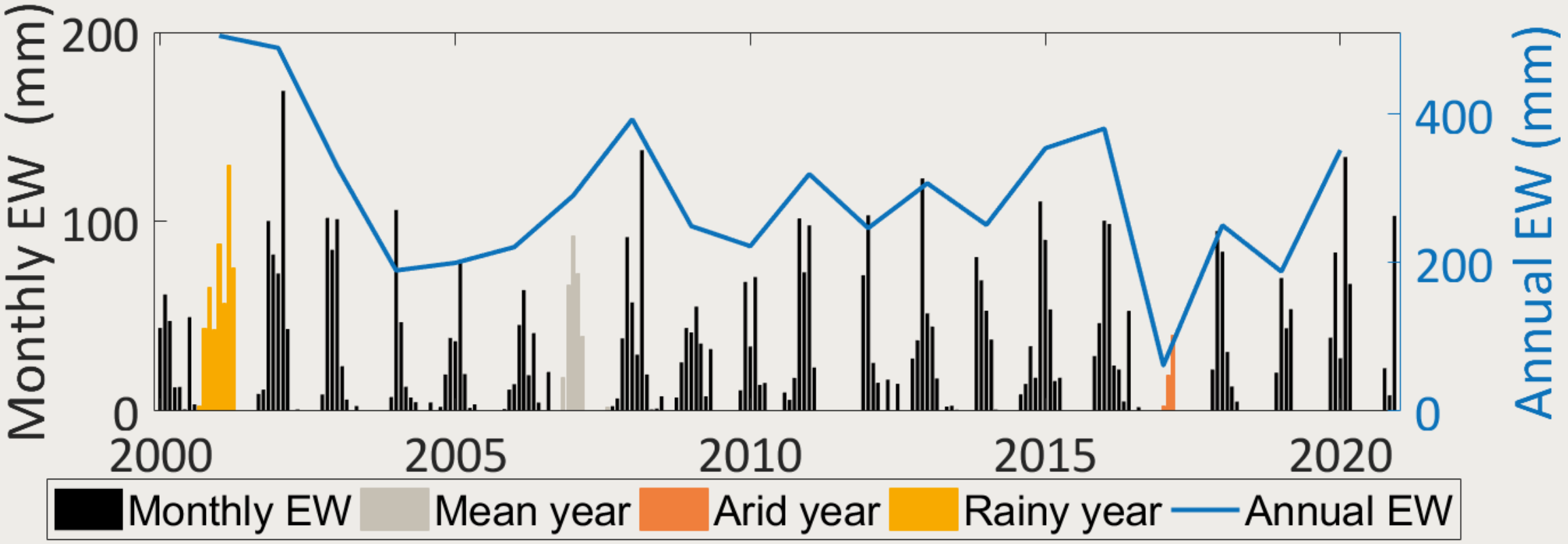
Mesh of models



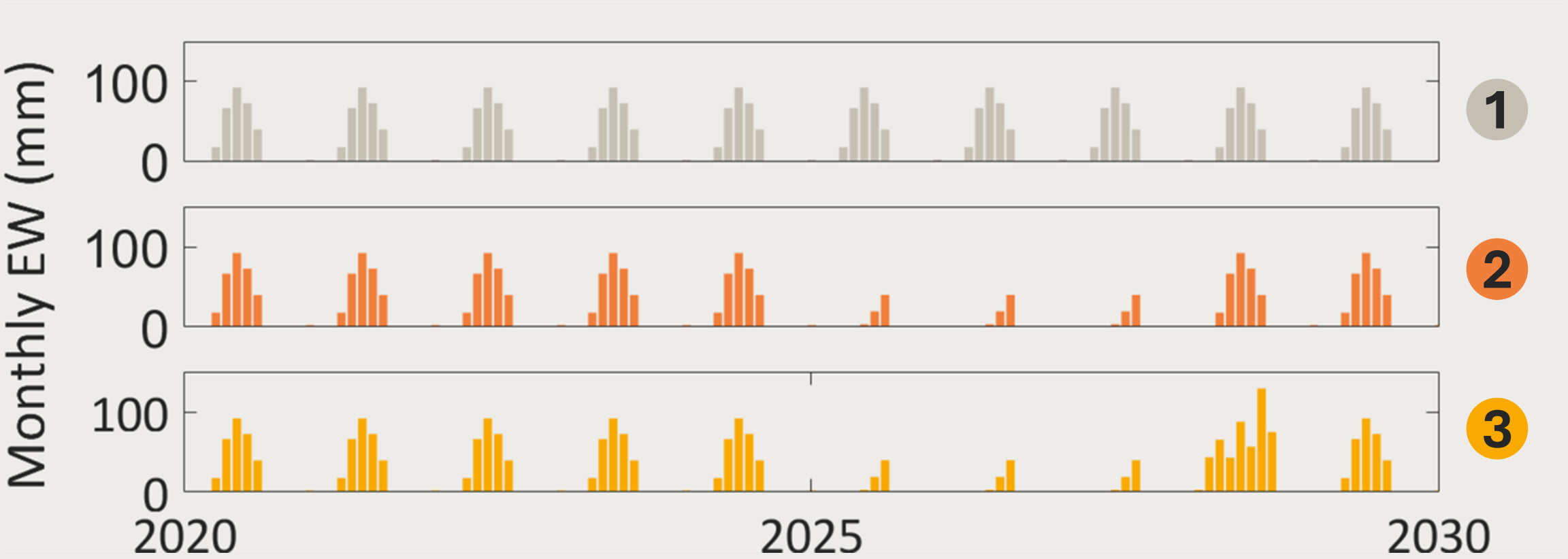
Input


Geology
Quaternary alluvion
Tertiary sand
Jurassic sandstone
Cretacean chalk
Primary limestone
Primary shale and sandstone
N
0
25
50 km

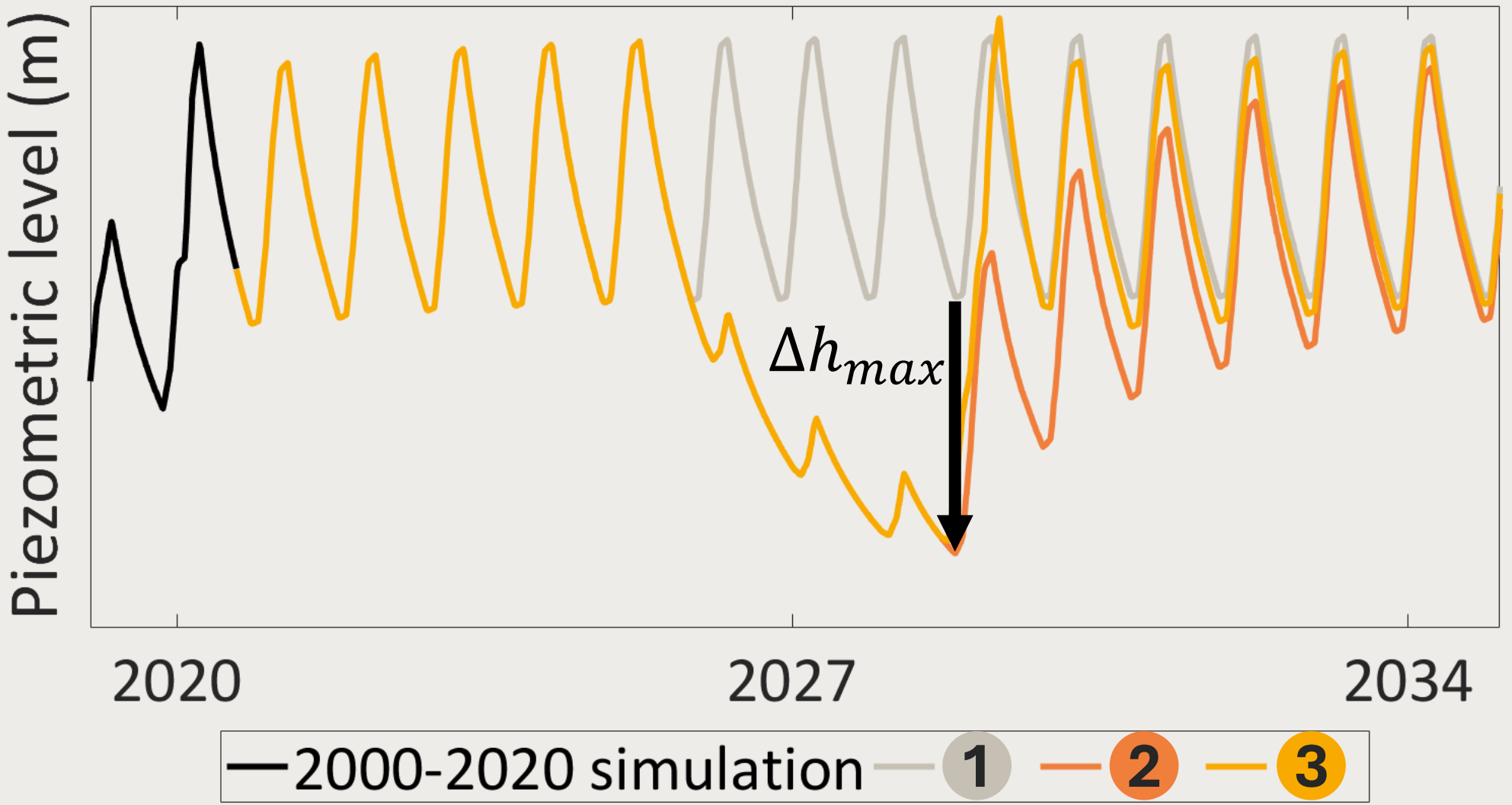
Recharge


Monthly EW (mm)
200
100
0
2000
2005
2010
2015
2020
400
200
0
Annual EW (mm)
Monthly EW
Mean year
Arid year
Rainy year
Annual EW

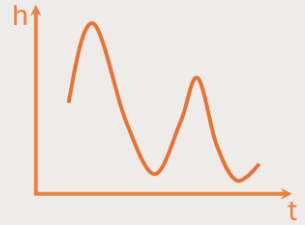
3 Scenarios

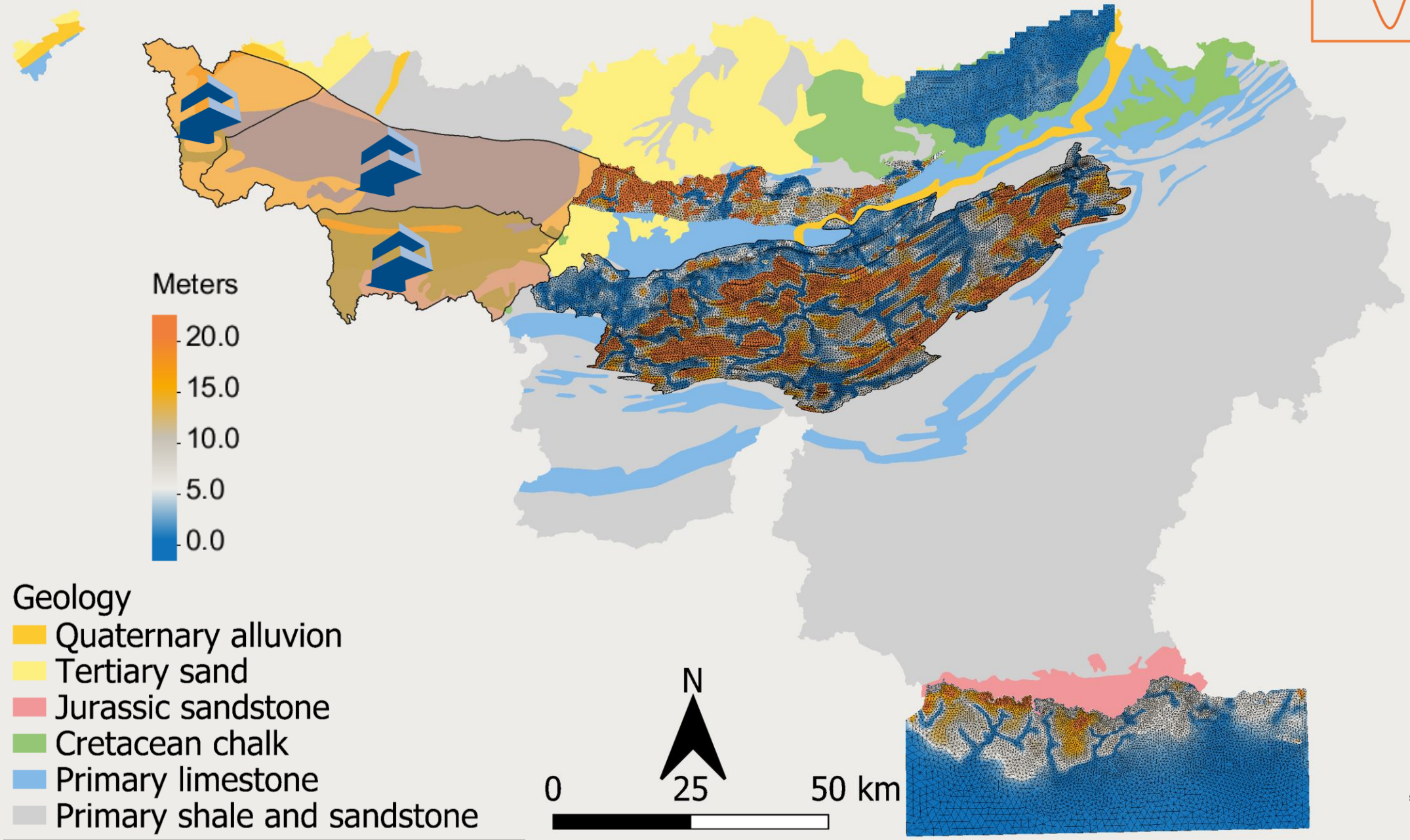


Δh_{max}


Piezometric level (m)
Δh_{max}
2020
2027
2034
2000-2020 simulation
1
2
3

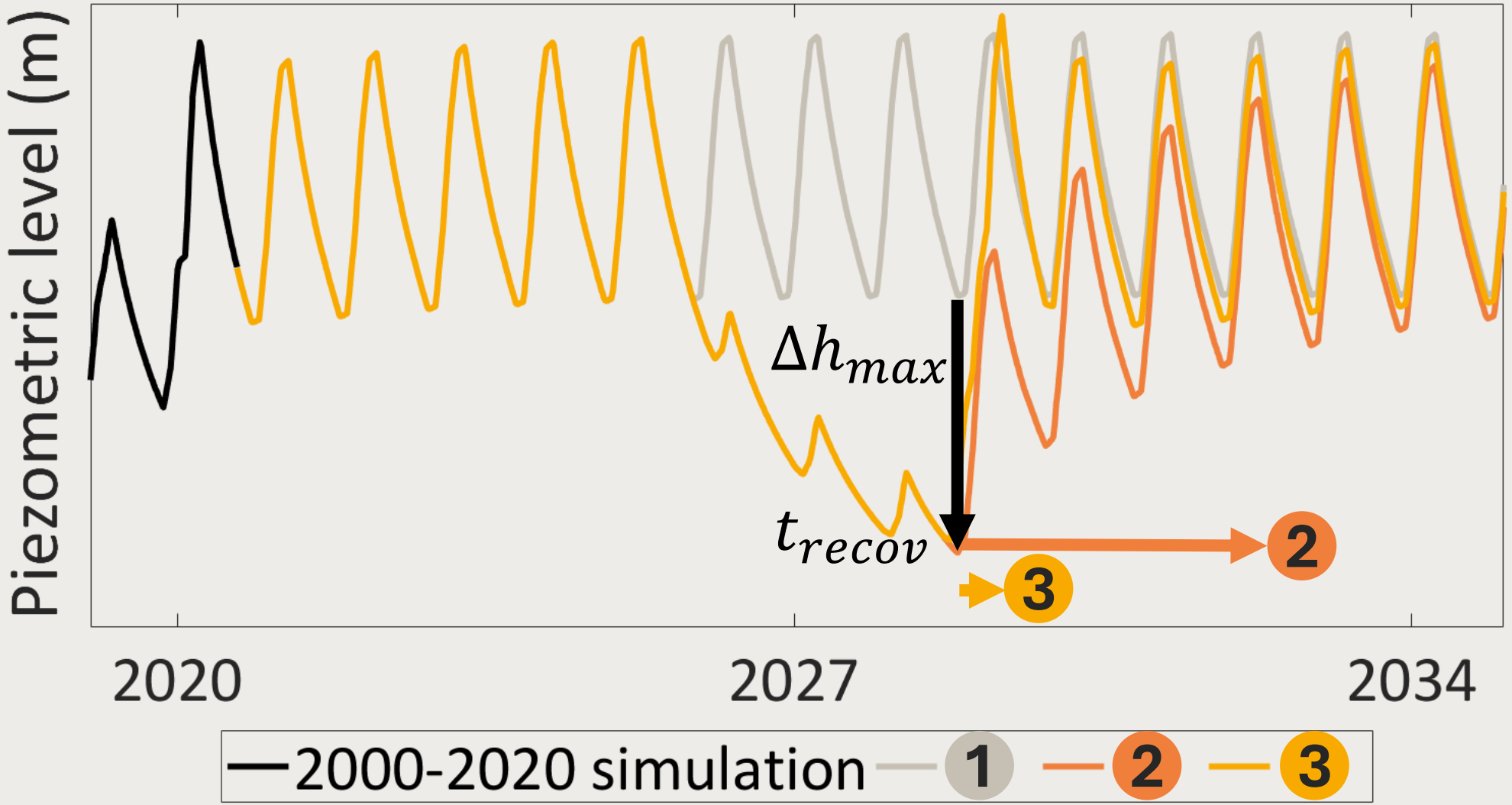
Δh_{max} 1 & 2



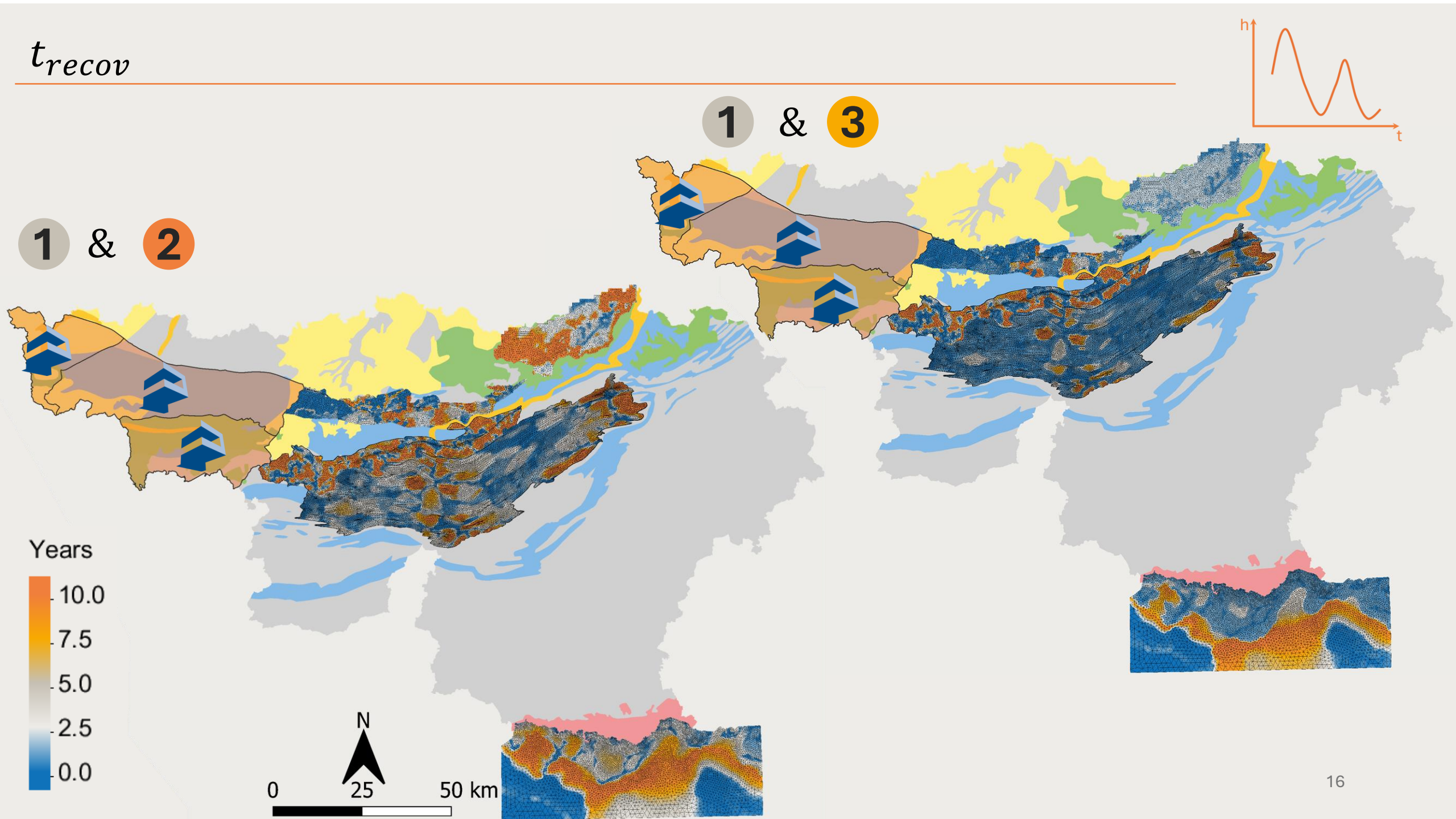


t_{recov}

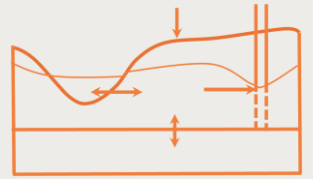

h
t

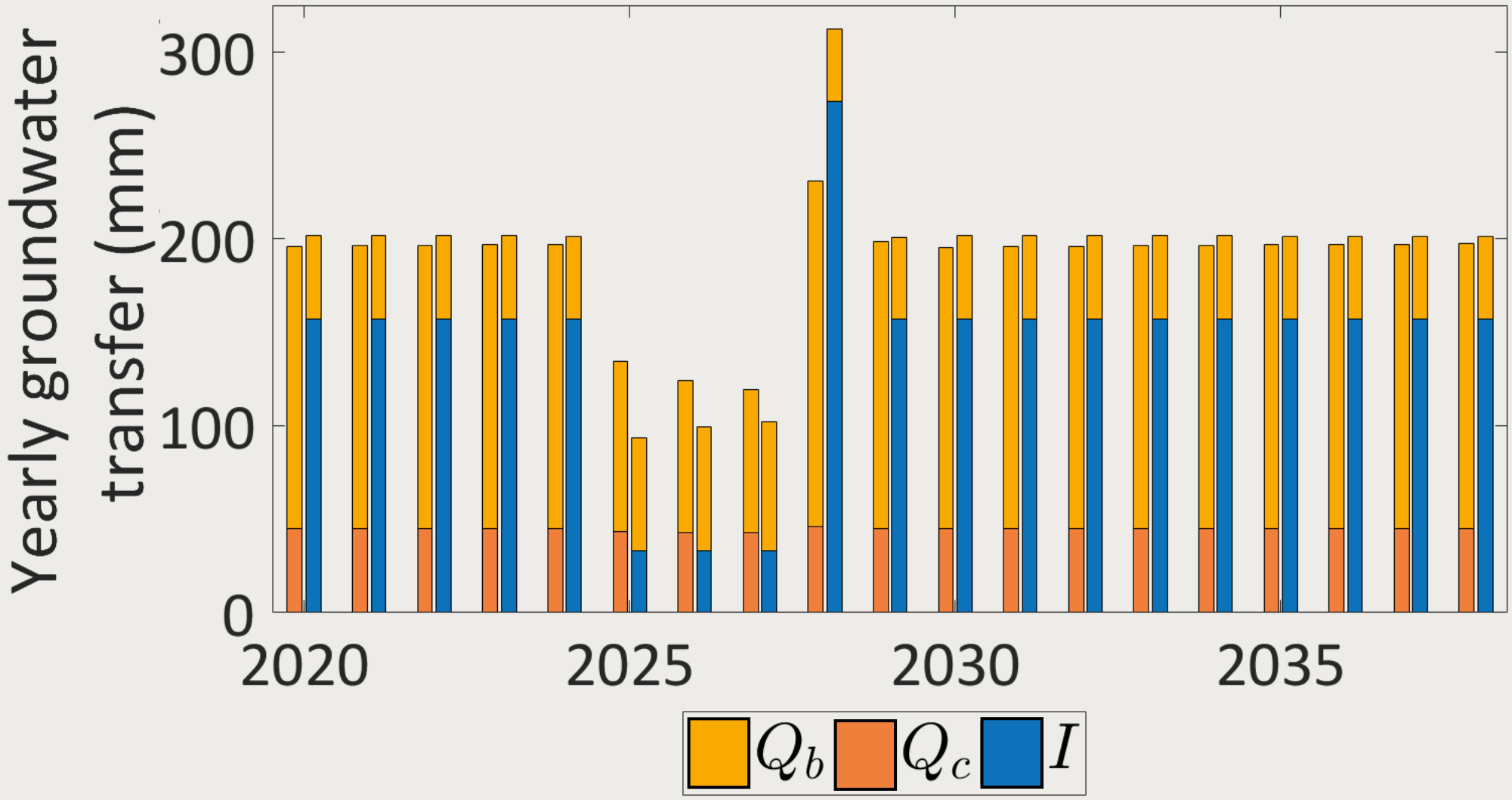

Piezometric level (m)
Δh_{max}
t_{recov}
2
3
2020
2027
2034
2000-2020 simulation
1
2
3

t_{recov}

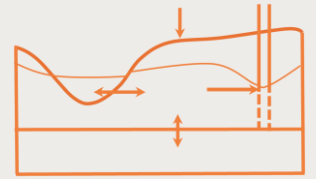


Yearly groundwater transfers of scenario 3



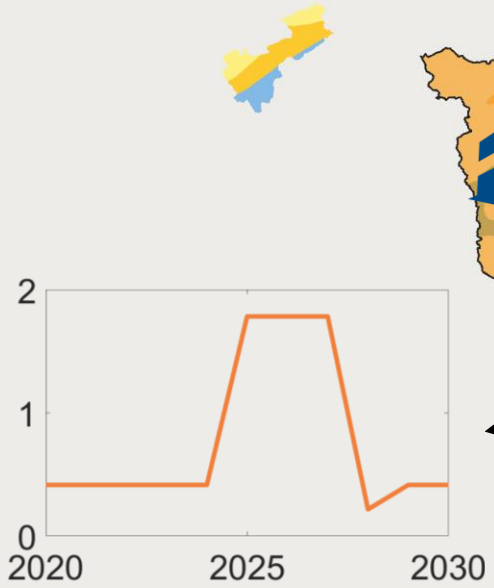


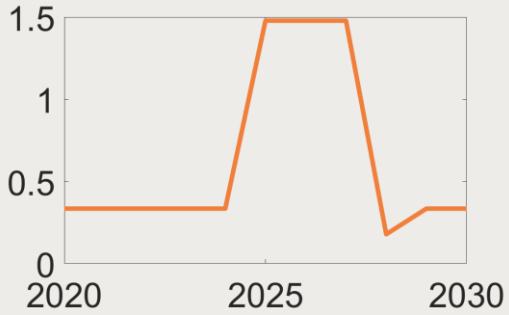
Indicators

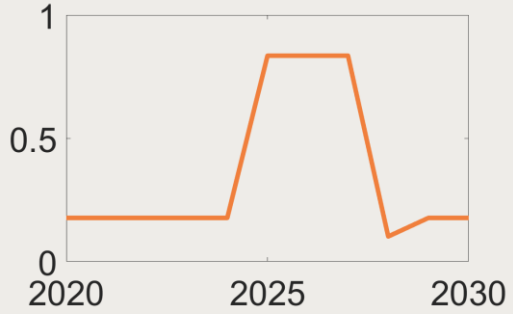


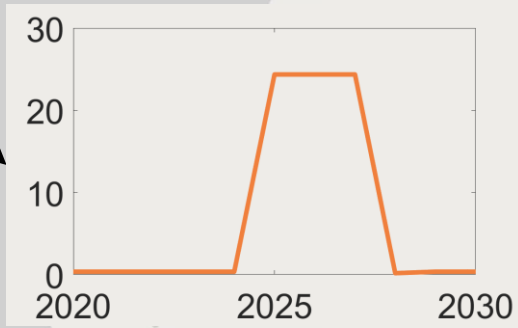
	Symbol	Formula	Description
INTRINSIC	I_{gw}^{1}	I/EW	Infiltration index
	I_{sw}^{1}	R/EW	Run-off index
	I_{gw}^{2}	Q_{gw}/I	Subsurface drainage with neighboring aquifers
	I_{sw}^{2}	Q_b/I	Drainage through rivers
	BFI	Q_b/Q_T	Base flow index
PRESSURE	P_1	Q_c/EW	Groundwater abstraction index vs effective water
	P_2	Q_c/I	Groundwater abstraction index vs infiltration
	P_3	$Q_c/(Q_c+Q_T)$	Groundwater abstraction vs streamflow

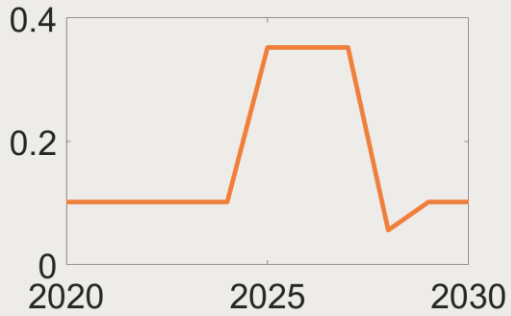
Pressure indicator of scenario 3, Qc/I











Conclusion & perspectives

- Two complementary, physically based, approaches were implemented:
  - Piezometric evolution → throughout the aquifers
  - Groundwater transfer → general fluxes at the regional scale

- Same methodology applied to more complex scenarios:
  - Climate change + evolution of water demand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Thank you
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