

Evaluation et modélisation de l'impact de sécheresses sur les réserves d'eau souterraine en Wallonie



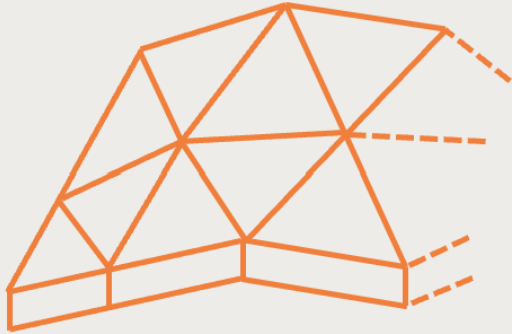
**LIÈGE université
Sciences Appliquées**

J. Hutzemakers, Ph. Urban, S. Brouyère

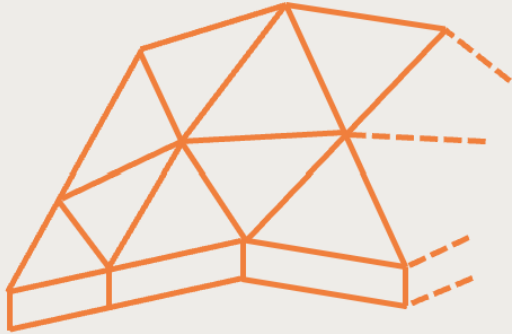




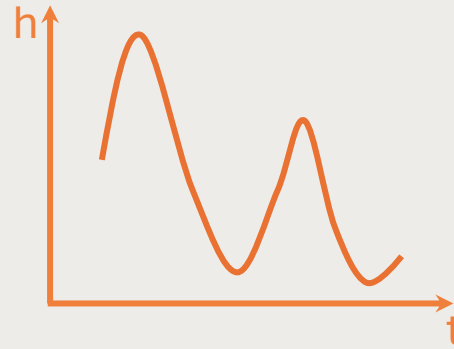
“Comment quantifier l’impact de sécheresses sur les réserves en eau souterraine en Wallonie?”



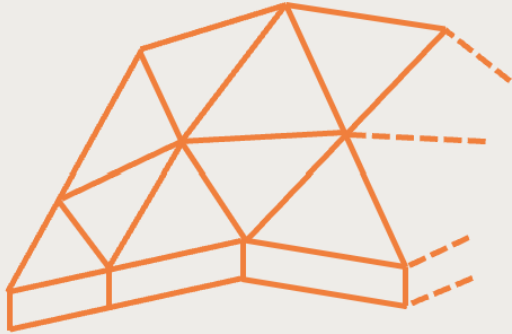
Création de modèles
régionaux d'écoulement
d'eau souterraine



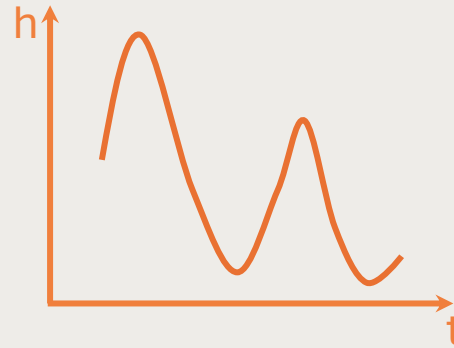
Création de modèles
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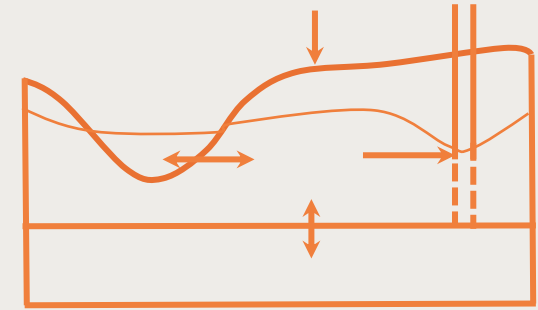
Analyse basée sur
l'évolution
piézométrique



Création de modèles régionaux d'écoulement d'eau souterraine

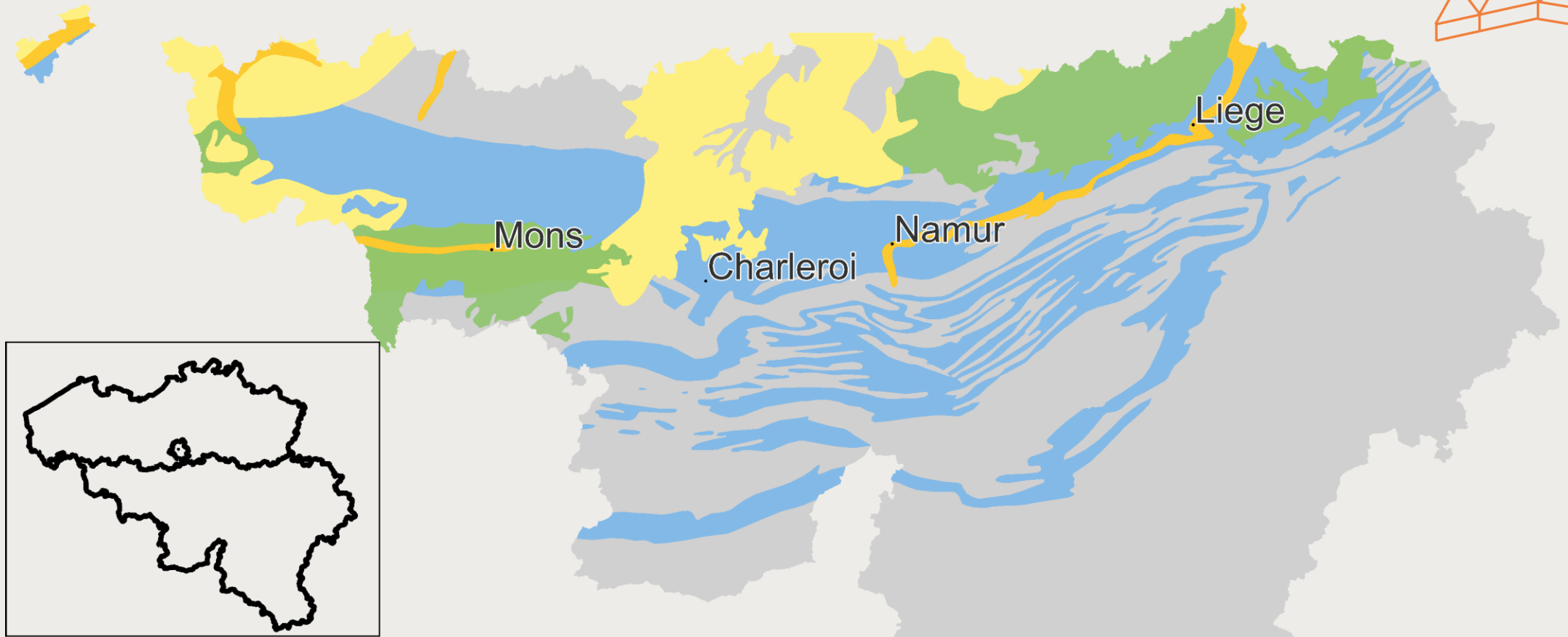
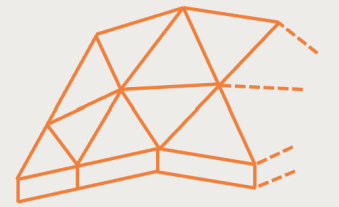


Analyse basée sur l'évolution piézométrique



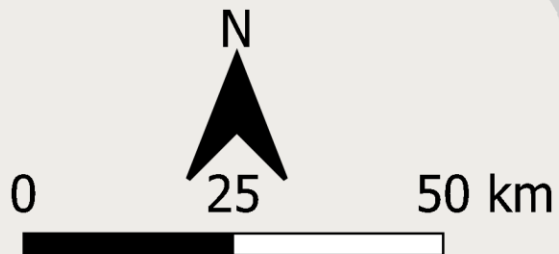
Analyse basée sur les transferts d'eau souterraine

Lithologie simplifiée

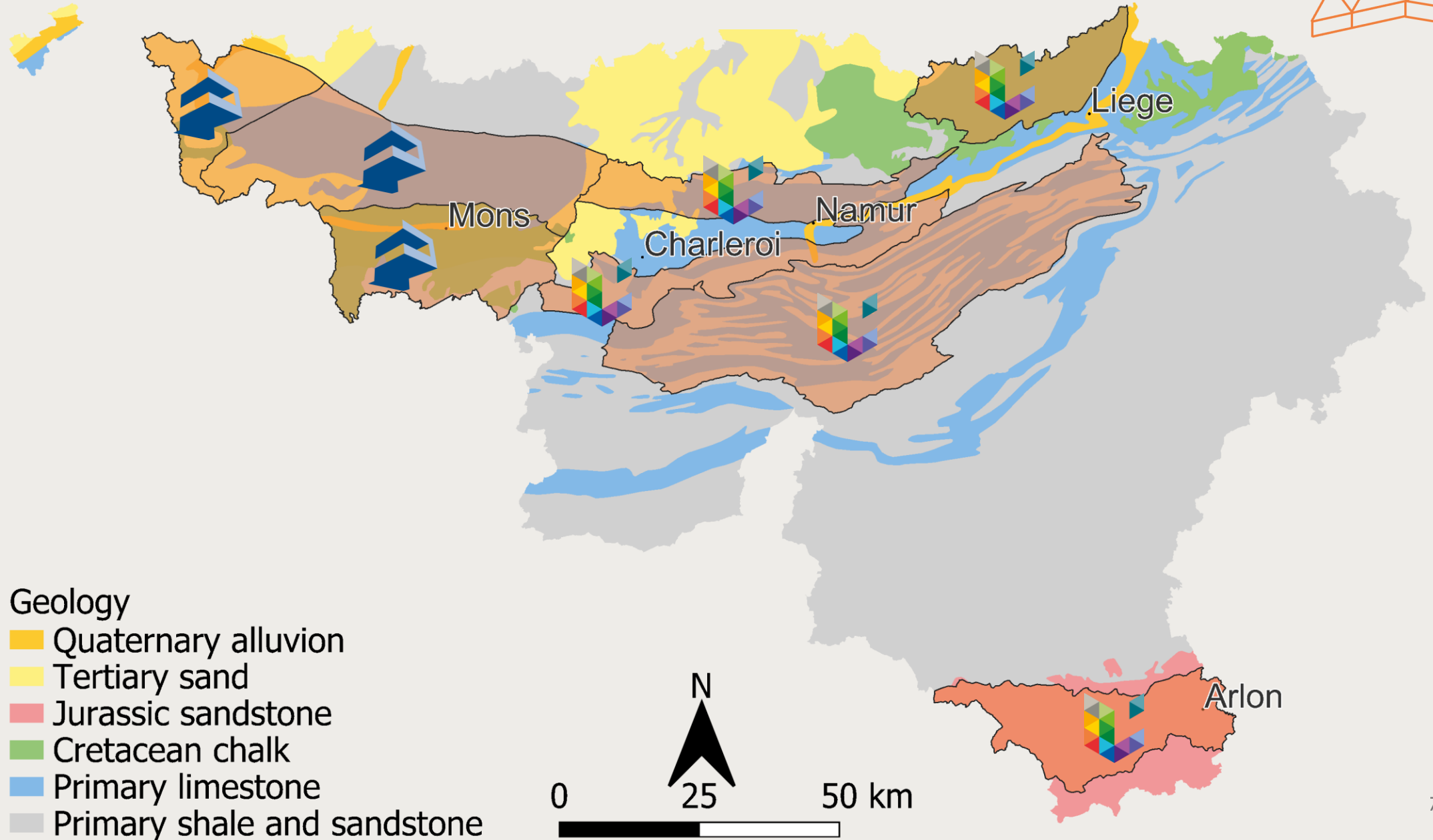
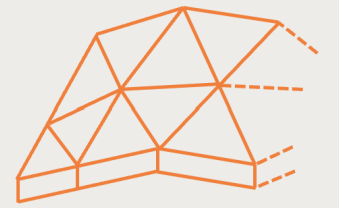


Geology

- Quaternary alluvion
- Tertiary sand
- Jurassic sandstone
- Cretaceous chalk
- Primary limestone
- Primary shale and sandstone

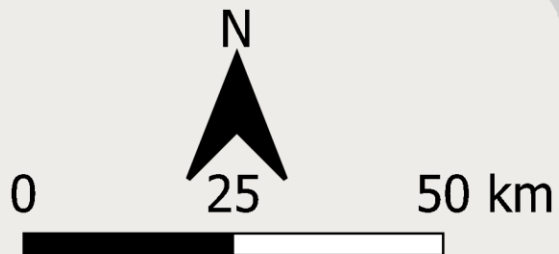


Masses d'eau souterraine et modèles

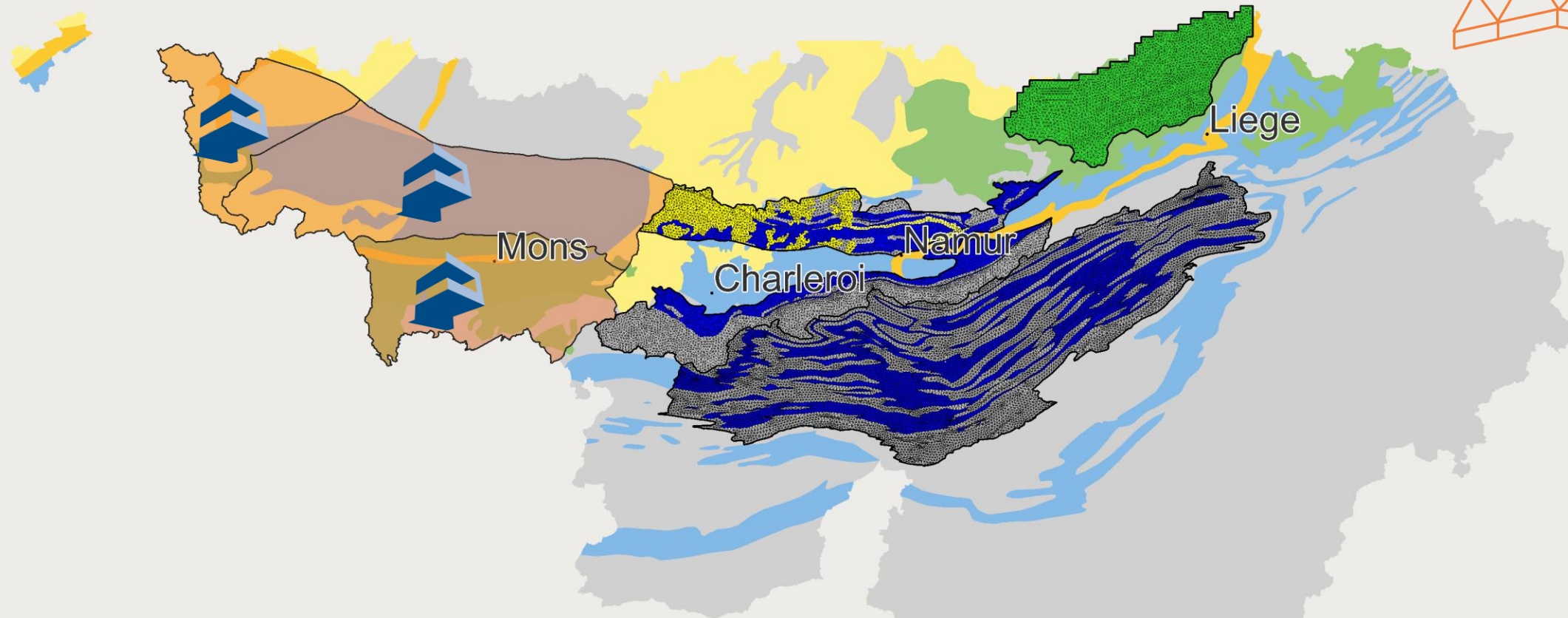
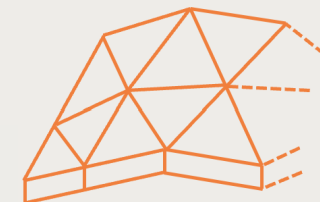


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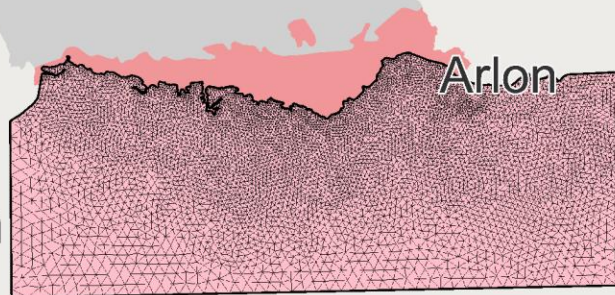
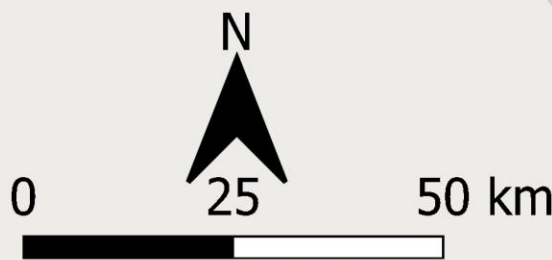


Maillages

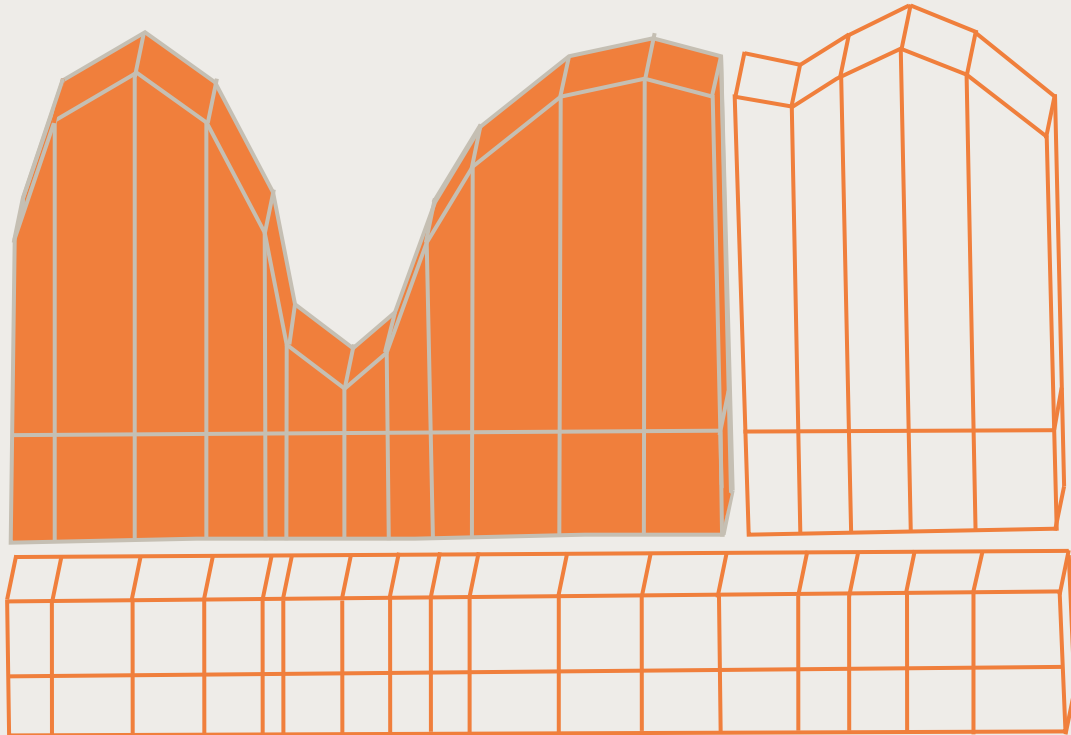
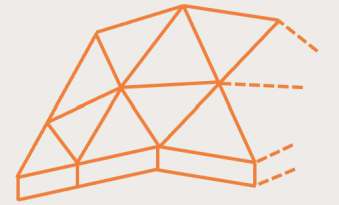


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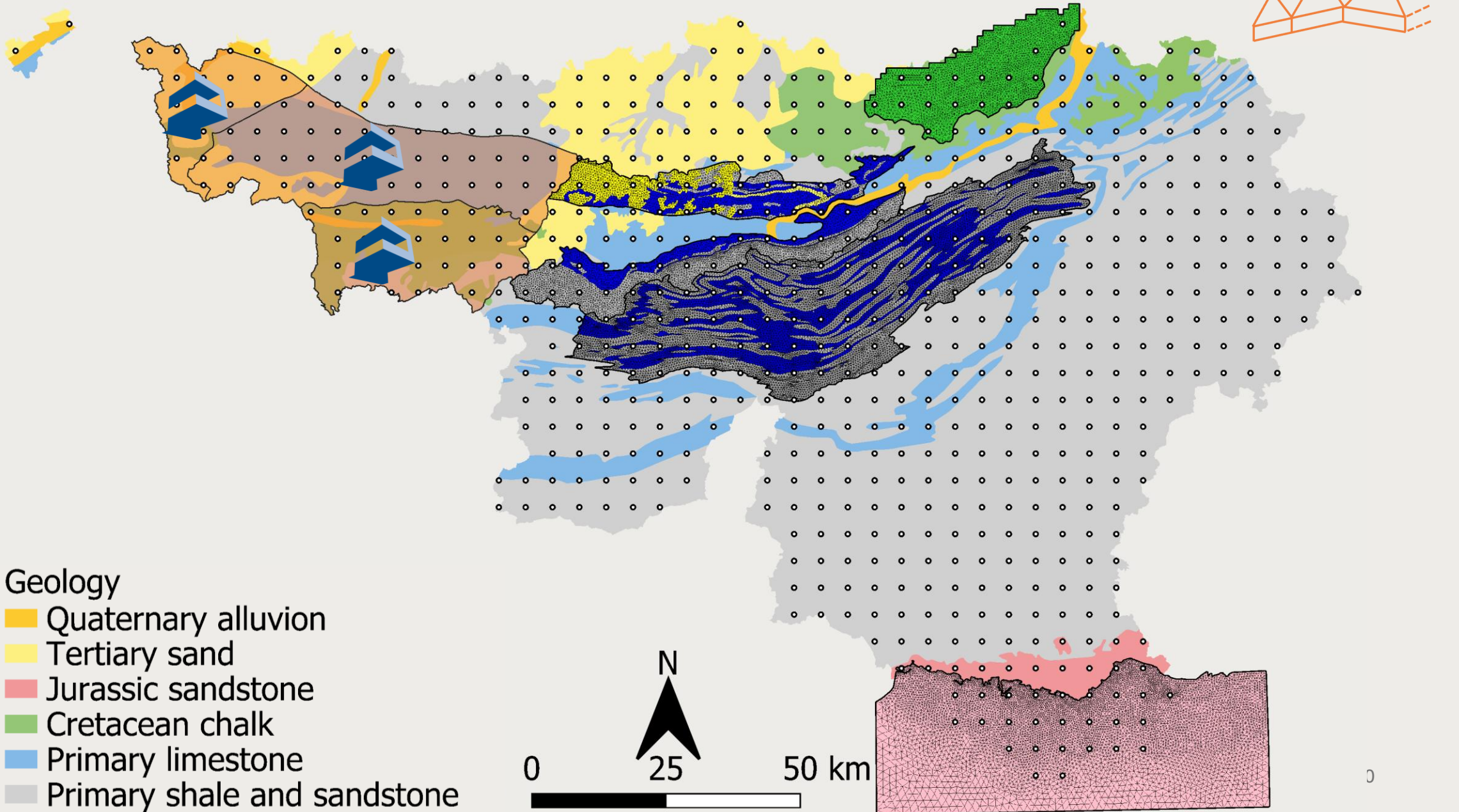


Avantages du code SUFT3D

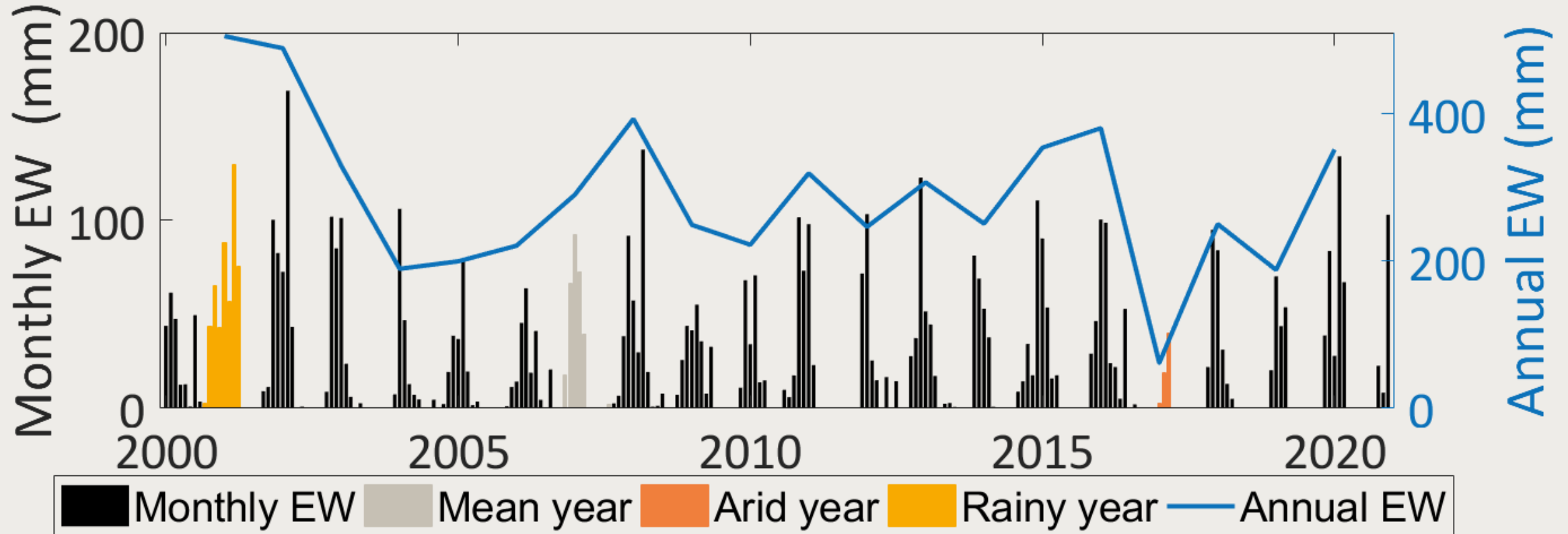
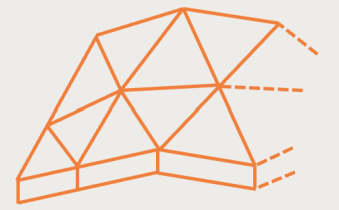


- Simulation de l'écoulement et le transport dans les zones partiellement et complètement saturées
- Division du maillage en sous-domaines et conditions limites internes
- Calcul de la piézométrie et de bilans

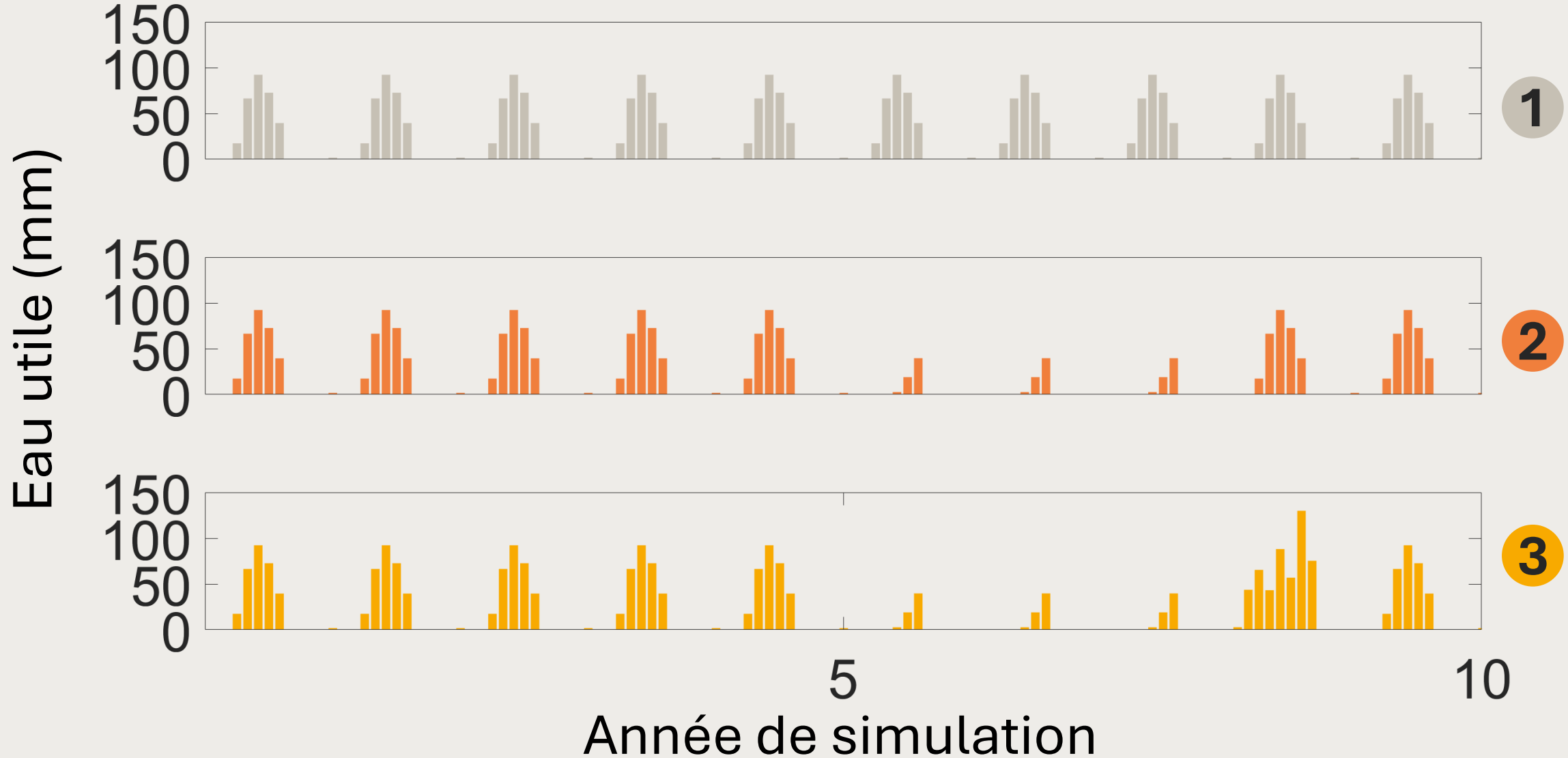
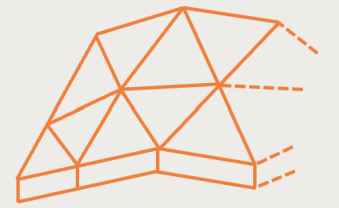
Calibration & input



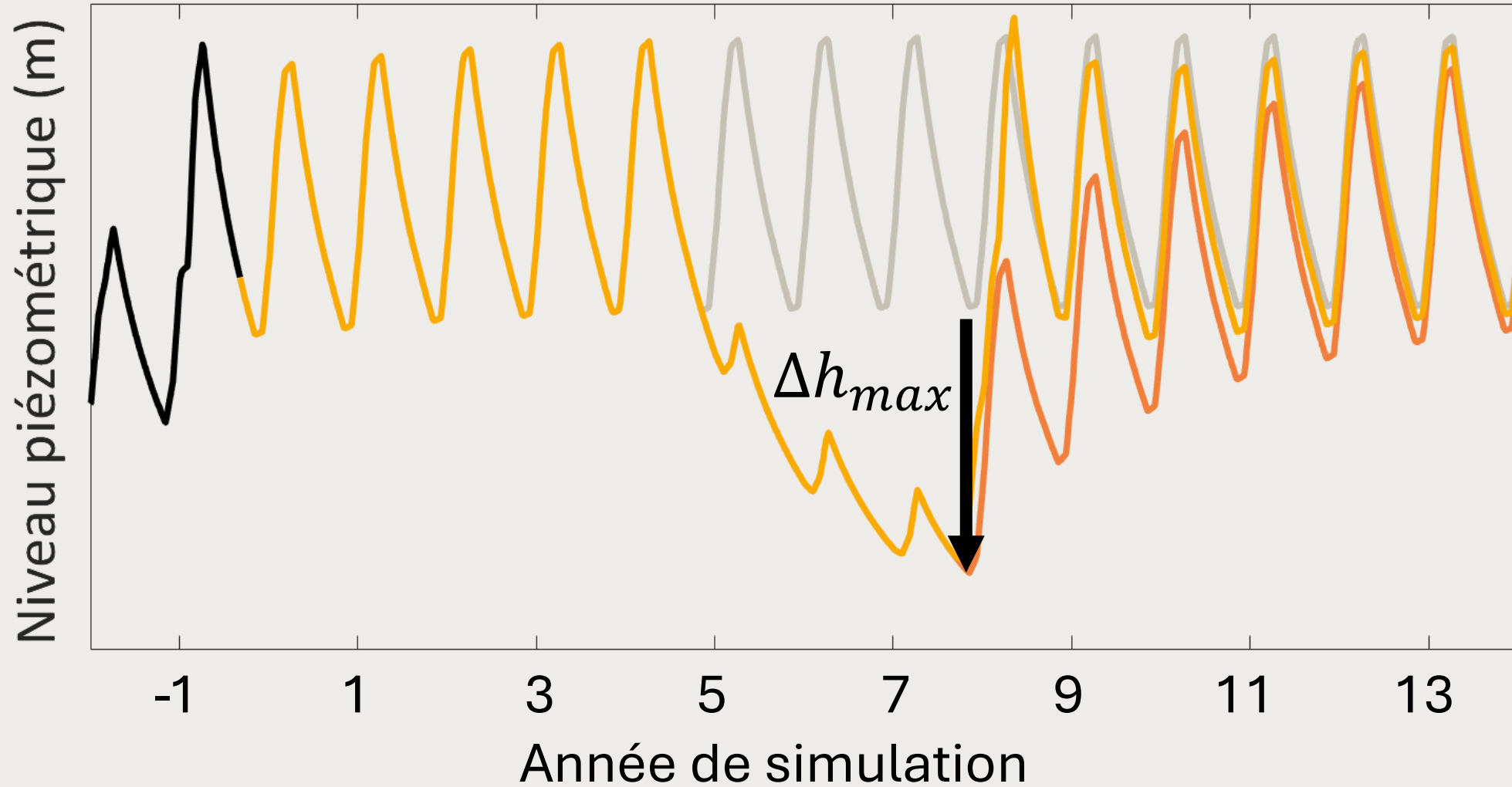
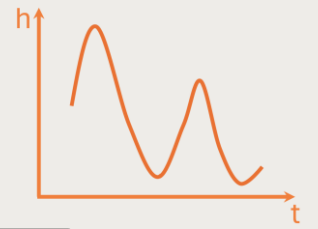
Recharge



3 Scenarios

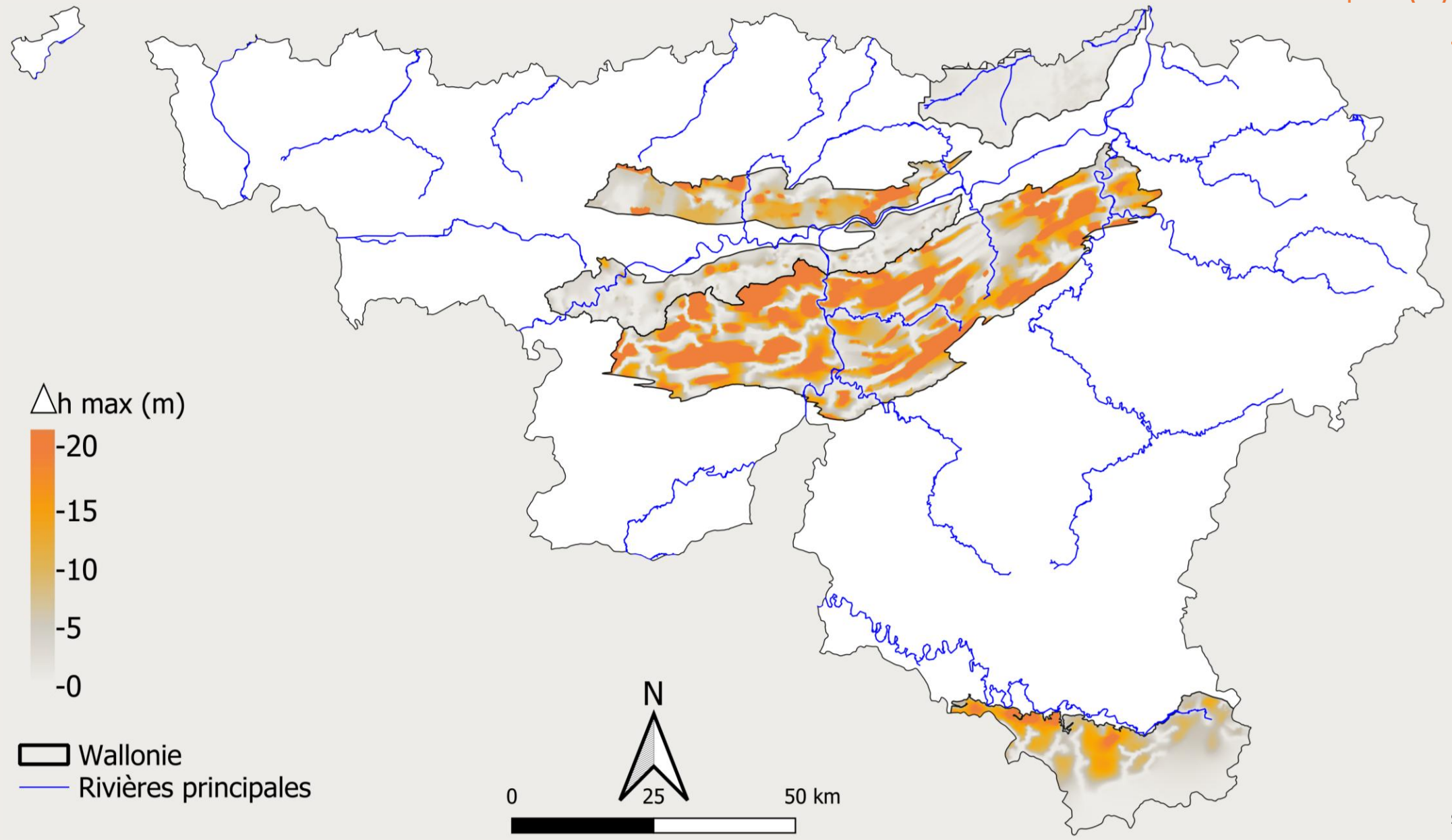


Δh_{max}

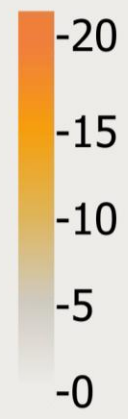


— Simulation historique — 1 — 2 — 3

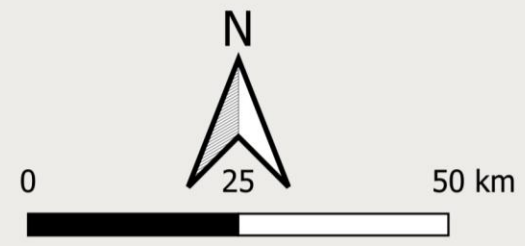
Δh_{max} 1 & 2



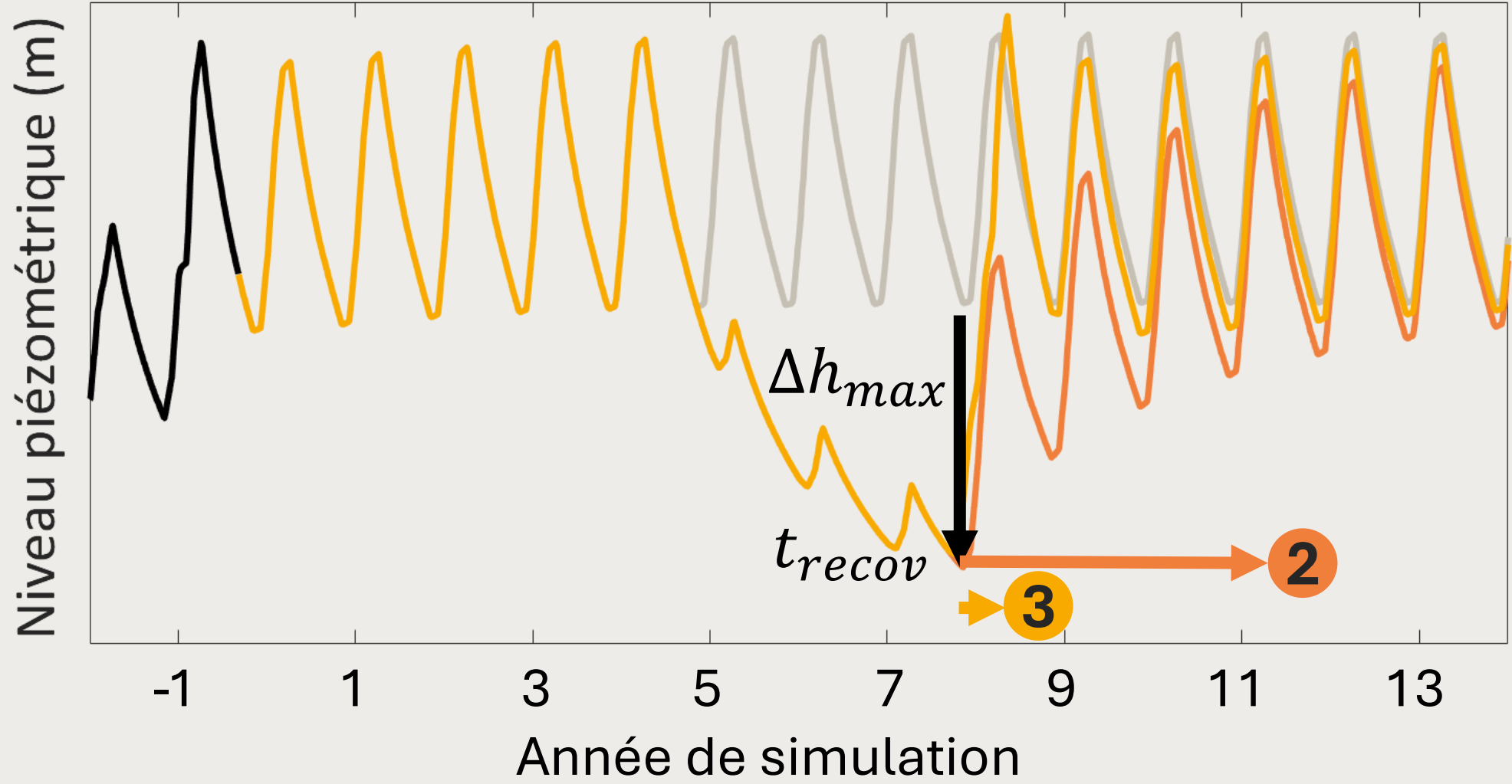
Δh_{max} (m)



Wallonie
Rivières principales



t_{recov}



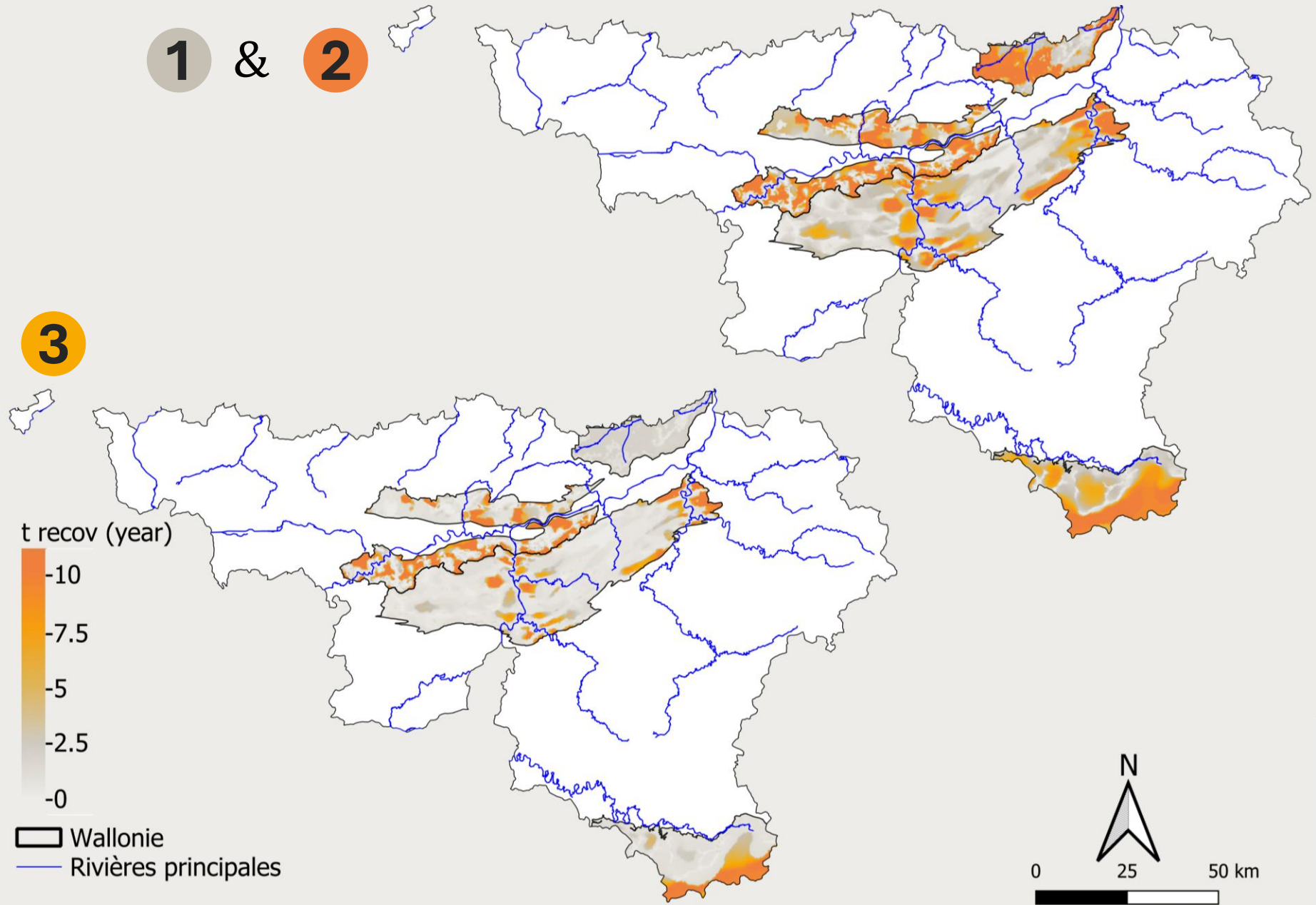
— Simulation historique — ① — ② — ③

t_{recov}



1 & 2

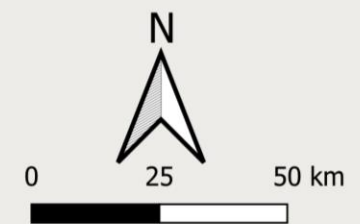
1 & 3



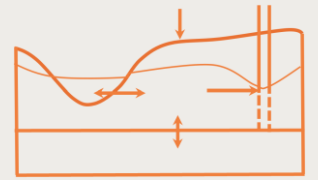
t_{recov} (year)



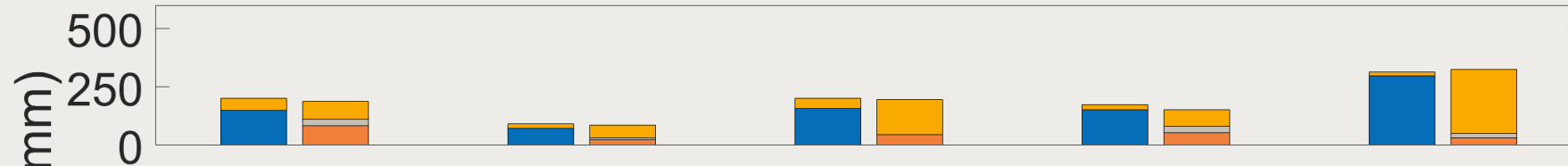
Wallonie
Rivières principales



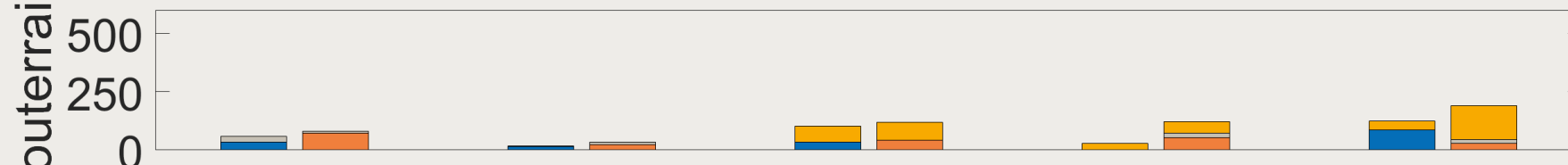
Yearly groundwater budget of scenario **3**



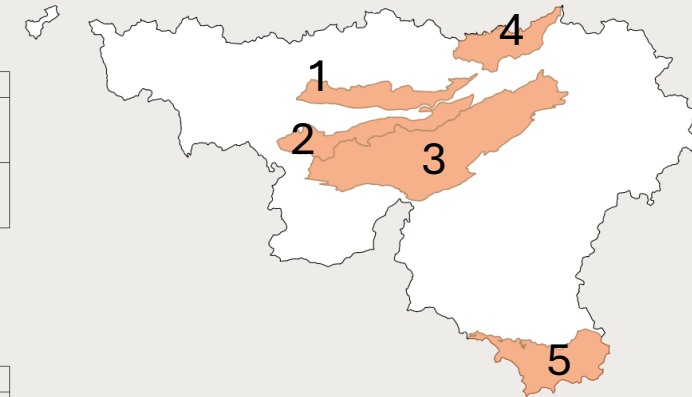
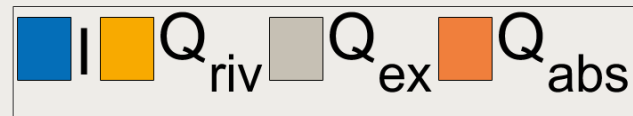
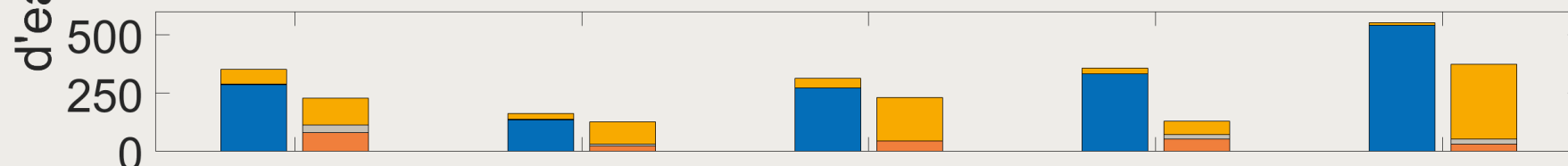
5ème année moyenne



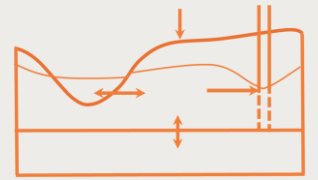
3ème année de sécheresse



Année humide

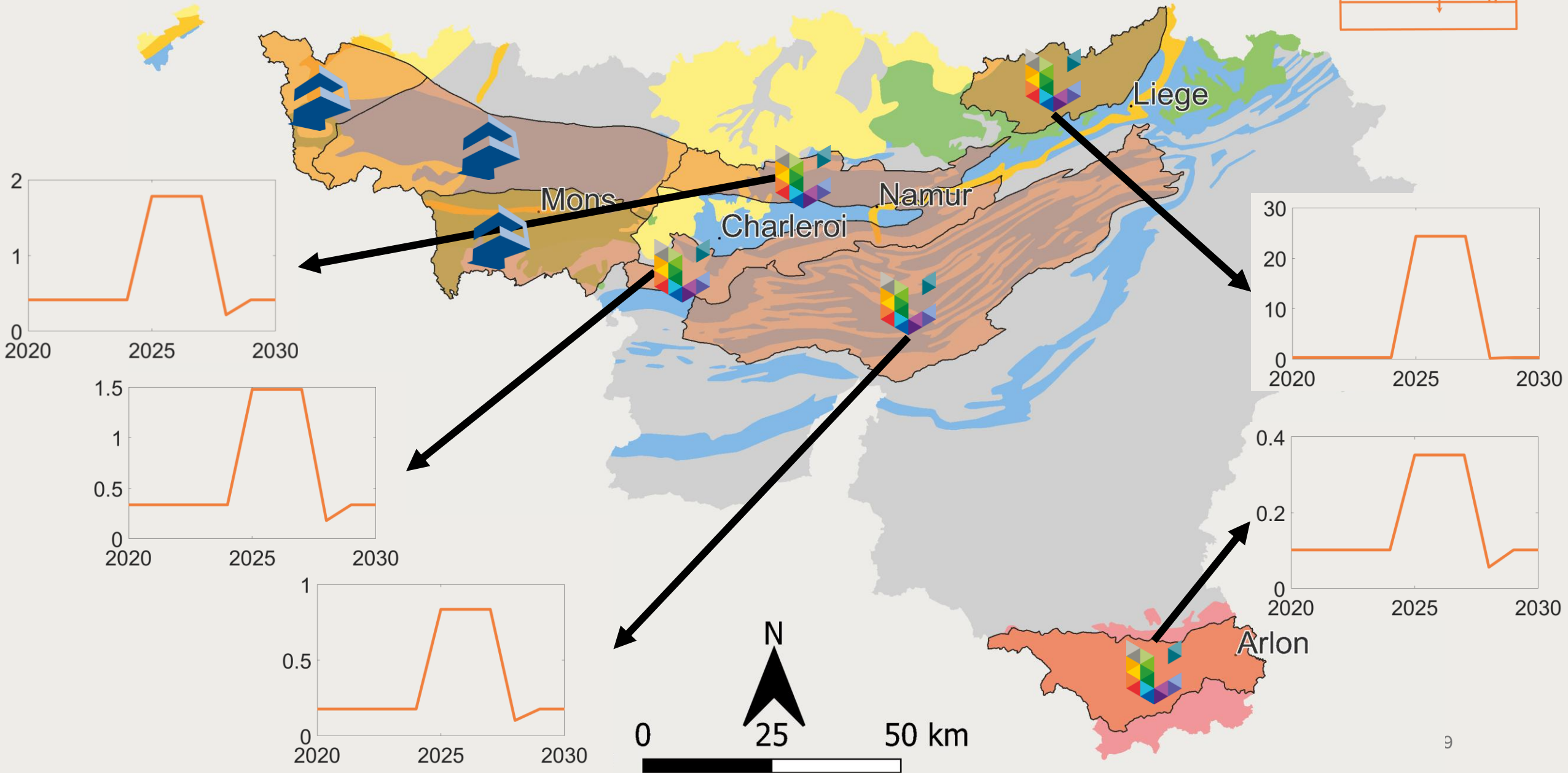
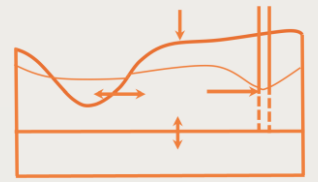


Indicateurs



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

Pressure indicator of scenario **3**, Q_c/I



Conclusion & perspectives

- **Deux approches** complémentaires, basées sur la physique:
 - Evolution piézométrique
 - Evolution des transferts d'eau souterraine à l'échelle régionale
- Application de la même méthodologie sur des **scenarios plus complexes**:
 - Changements climatiques + Evolution de la demande en eau