



LIÈGE université  
Urban & Environmental  
Engineering

*Impact of future droughts on  
groundwater reserves in Wallonia using  
percolation scenarios*

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*ESPECES Workshop*

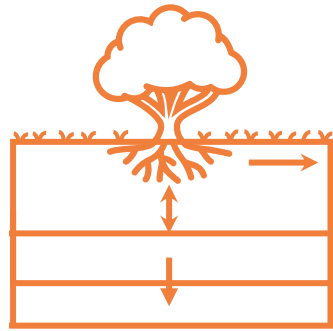
*7<sup>th</sup> February 2025*

*J. Hutzemakers, Ph. Orban, S. Brouyère*

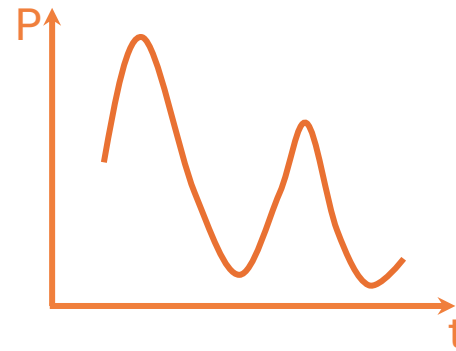


*In Wallonia, 75% of the water of distribution comes from underground.*

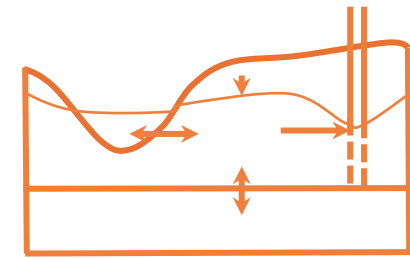
*How will climate change impact the resources throughout the territory?*



Percolation scenarios



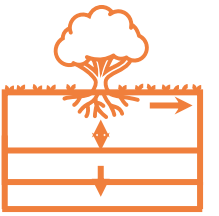
Characterization of drought



Impact of future droughts

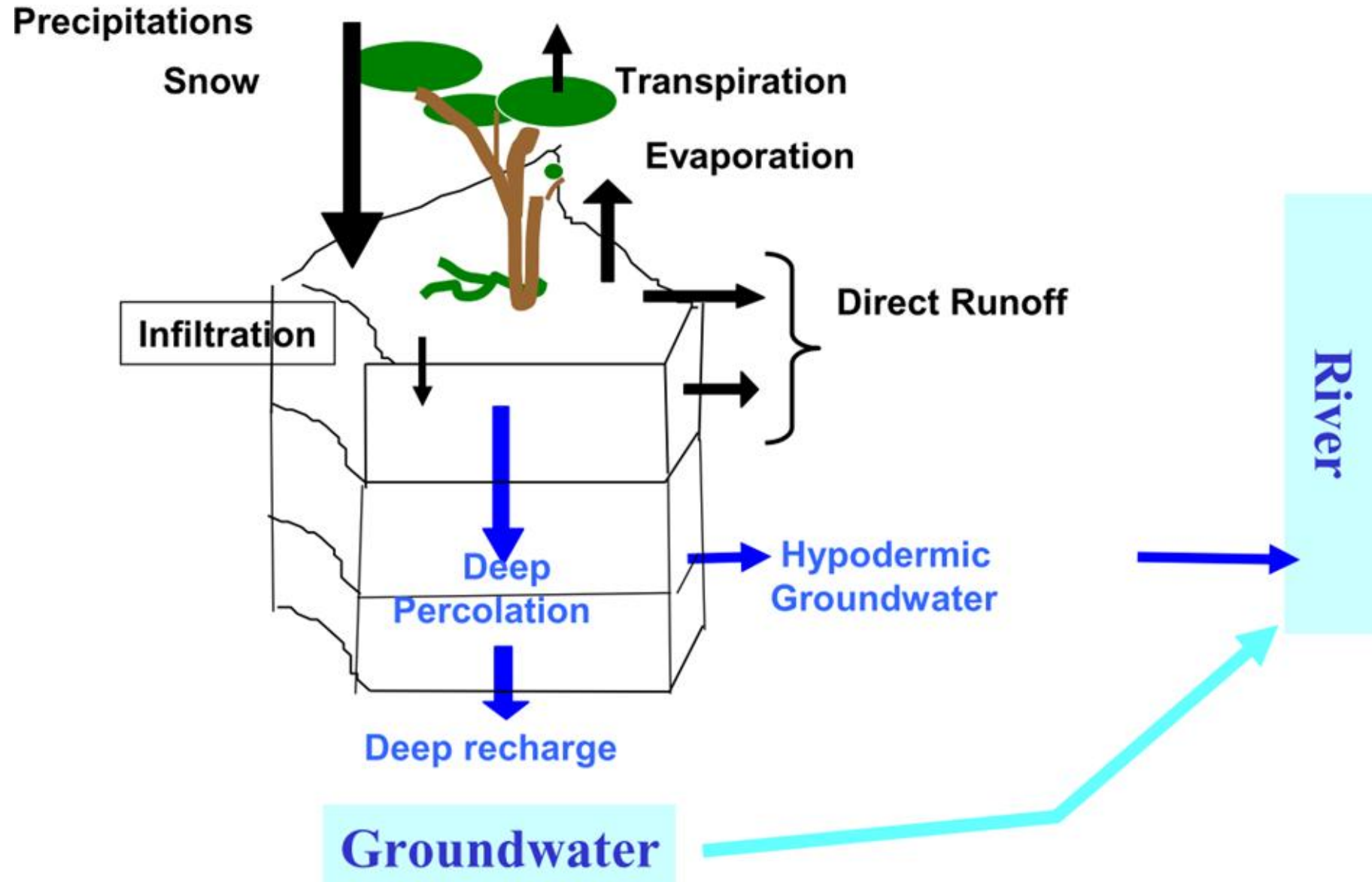
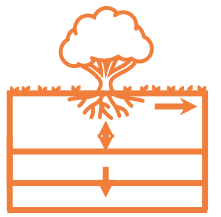
# Origin of the data

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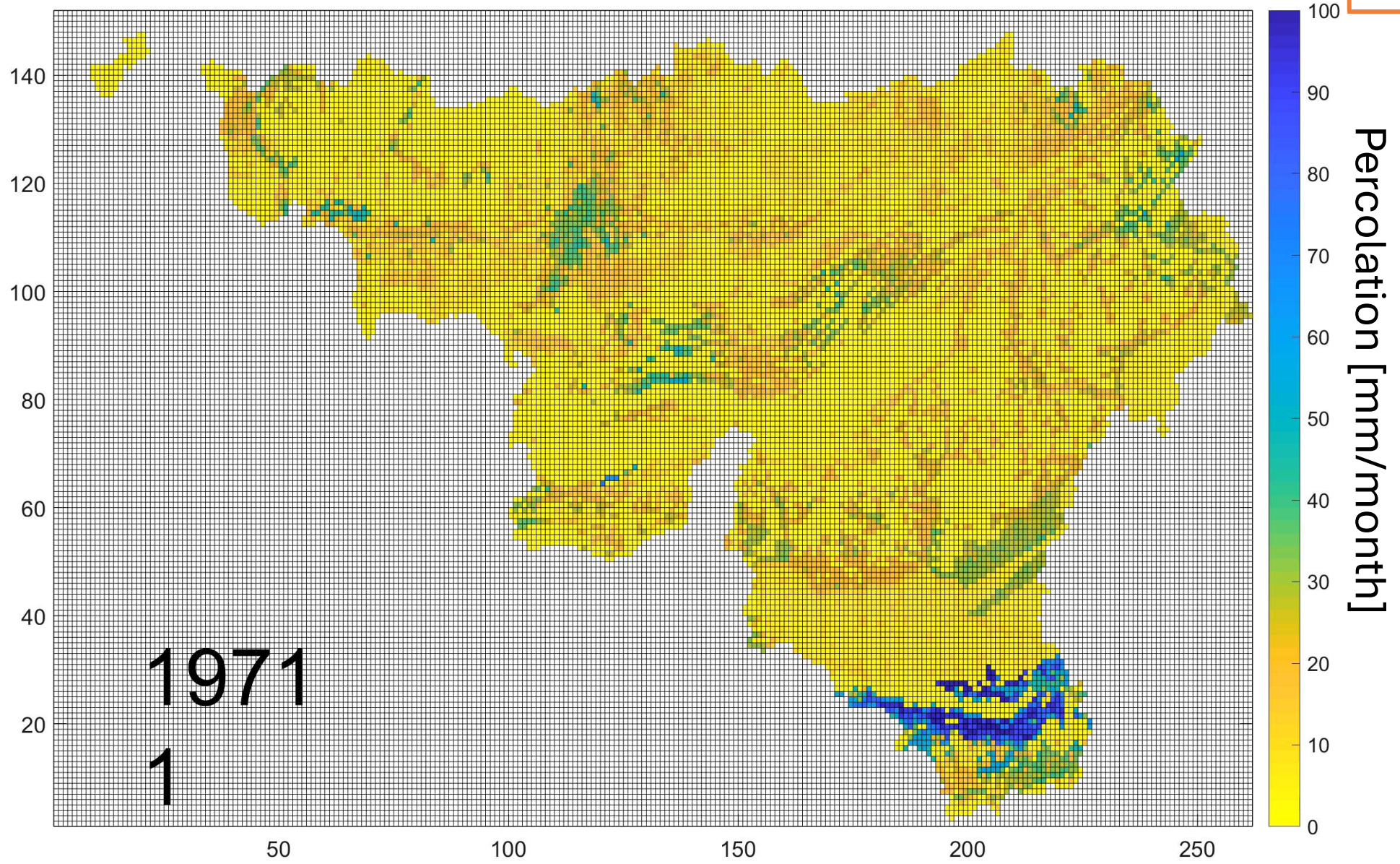
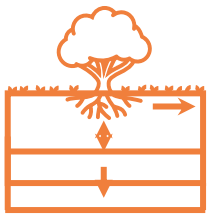
- Project funded by the AWAC (Agence Wallonne pour l'air et le Climat), in collaboration with MAR and Gembloux (Fettweis, (2021))
- Series of maps on the impact of climate change on soil, water, biodiversity,...
- Available on a website in the future
- Simulation with MARv3.14 for historical data (1971-2022) and climatic scenarios
- Use of 3 global circulation model (CMCC, MPI and MIROC6) and two shared socio-economic pathways (SSP3-7.0 and SSP5-8.5)

# From Regional Climatic Model to percolation with EPIC-Grid



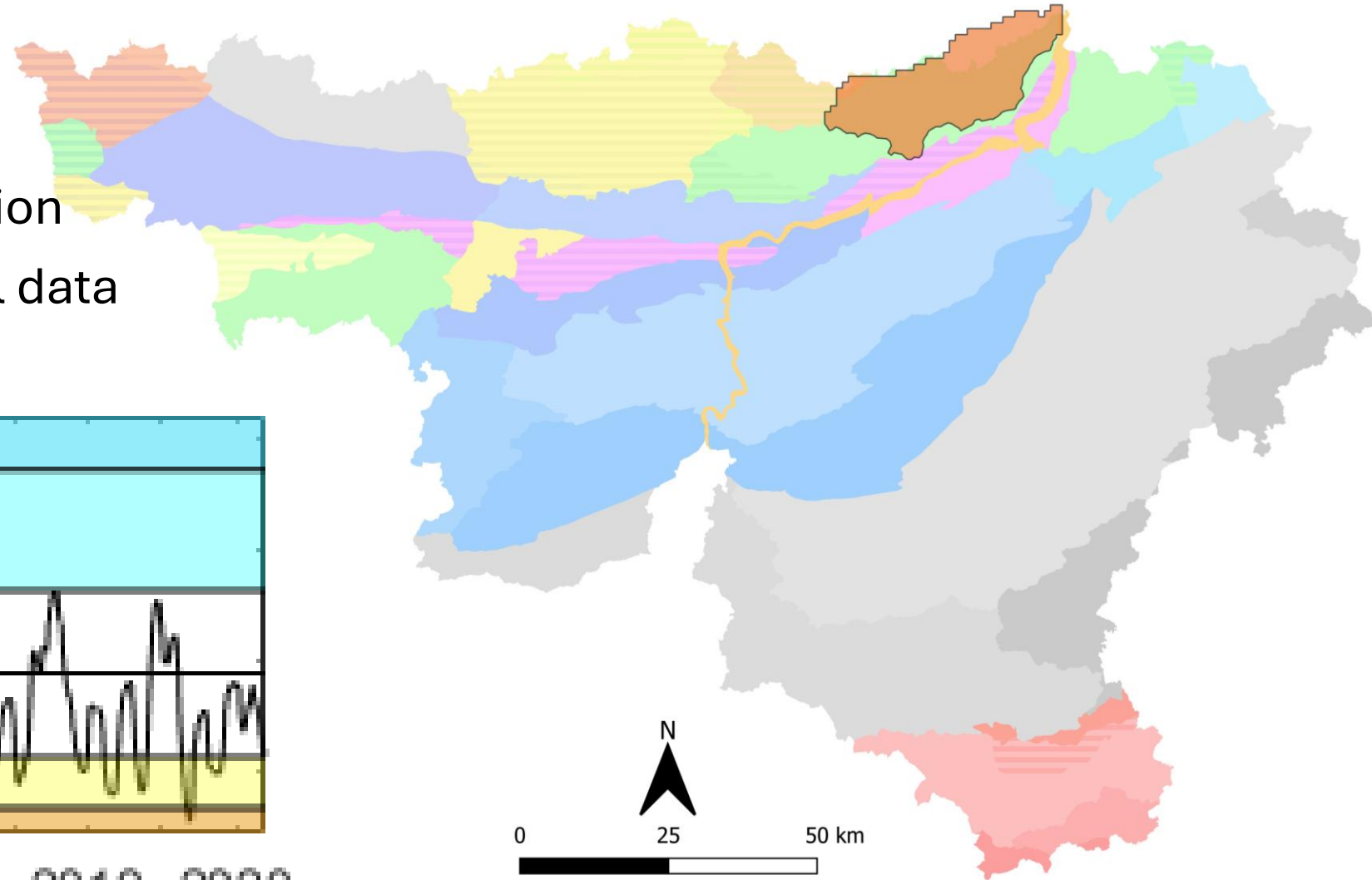
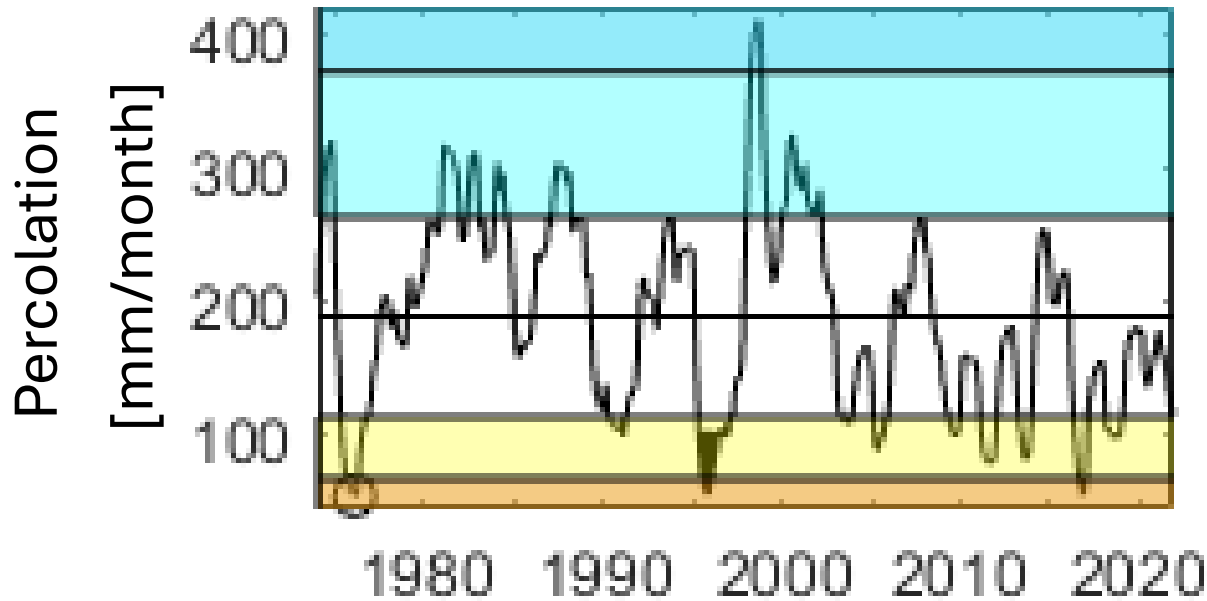
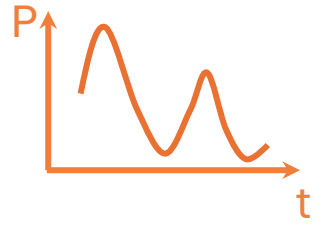
(Hutzemakers et al. (2024), modified from Sohler 2011))

# Historical percolation simulated with EPICgrid



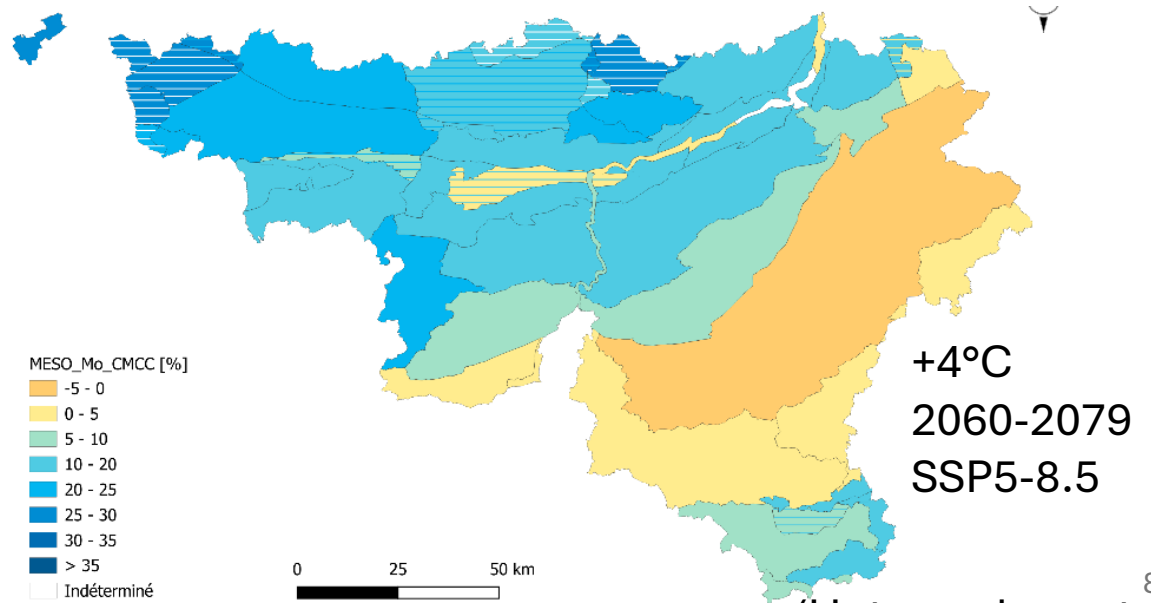
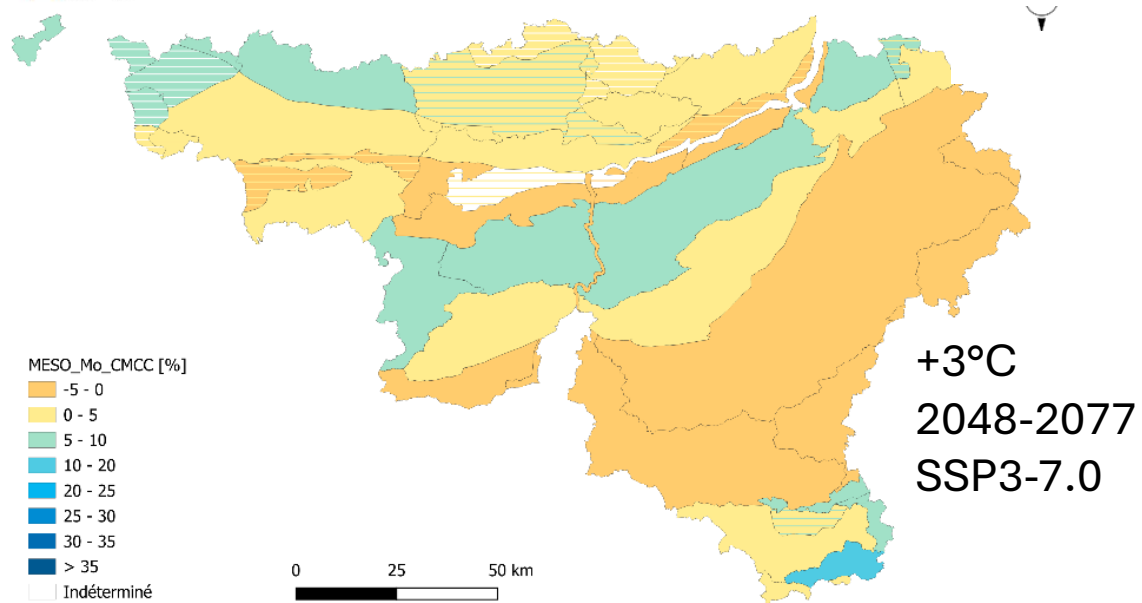
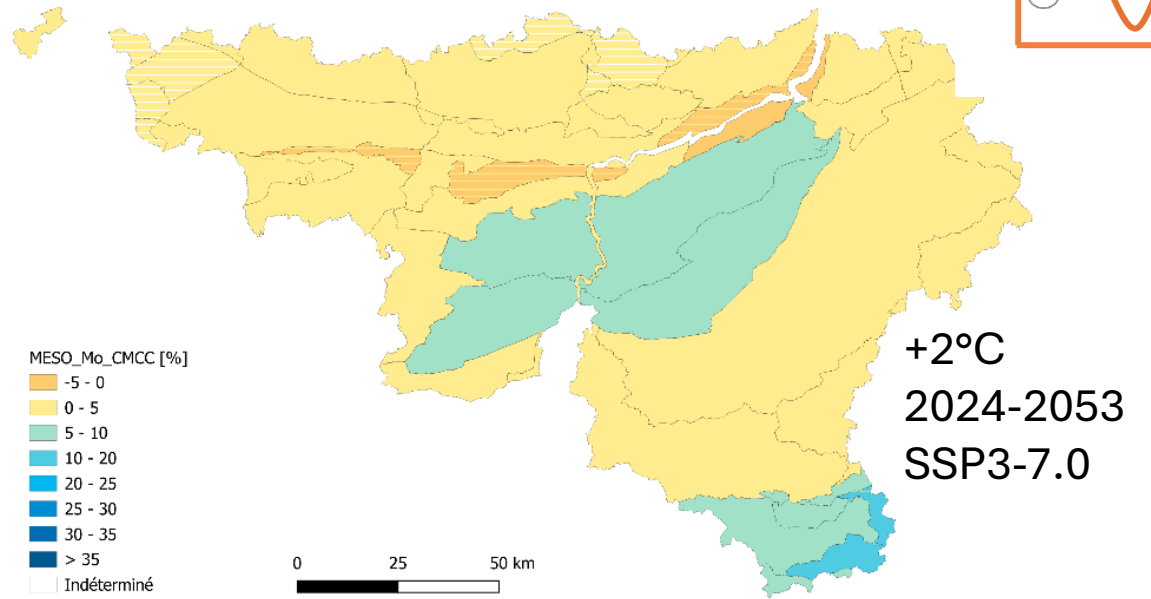
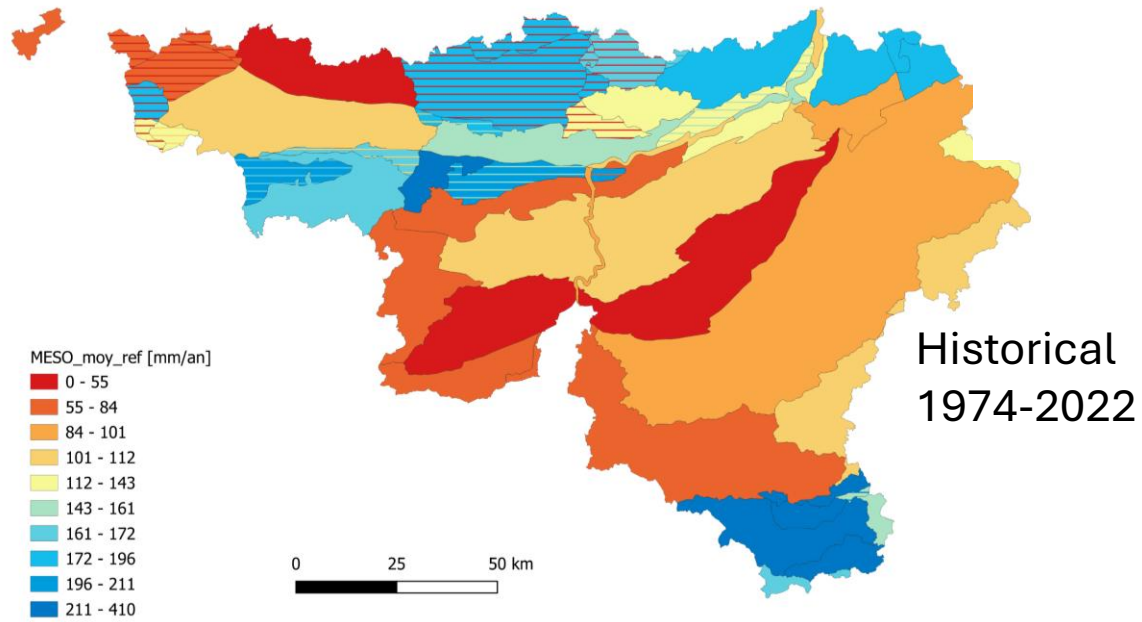
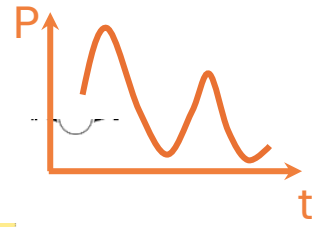
# Characterization of every groundwater body

- The percolation is different for every groundwater body
- Mean, minima and longest deficit of cumulated percolation over 12 months with historical data

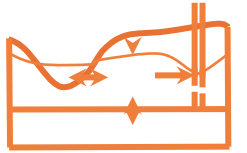


(Modified from WalonMap (2025))

# Evolution of mean cumulated percolation for one GCM



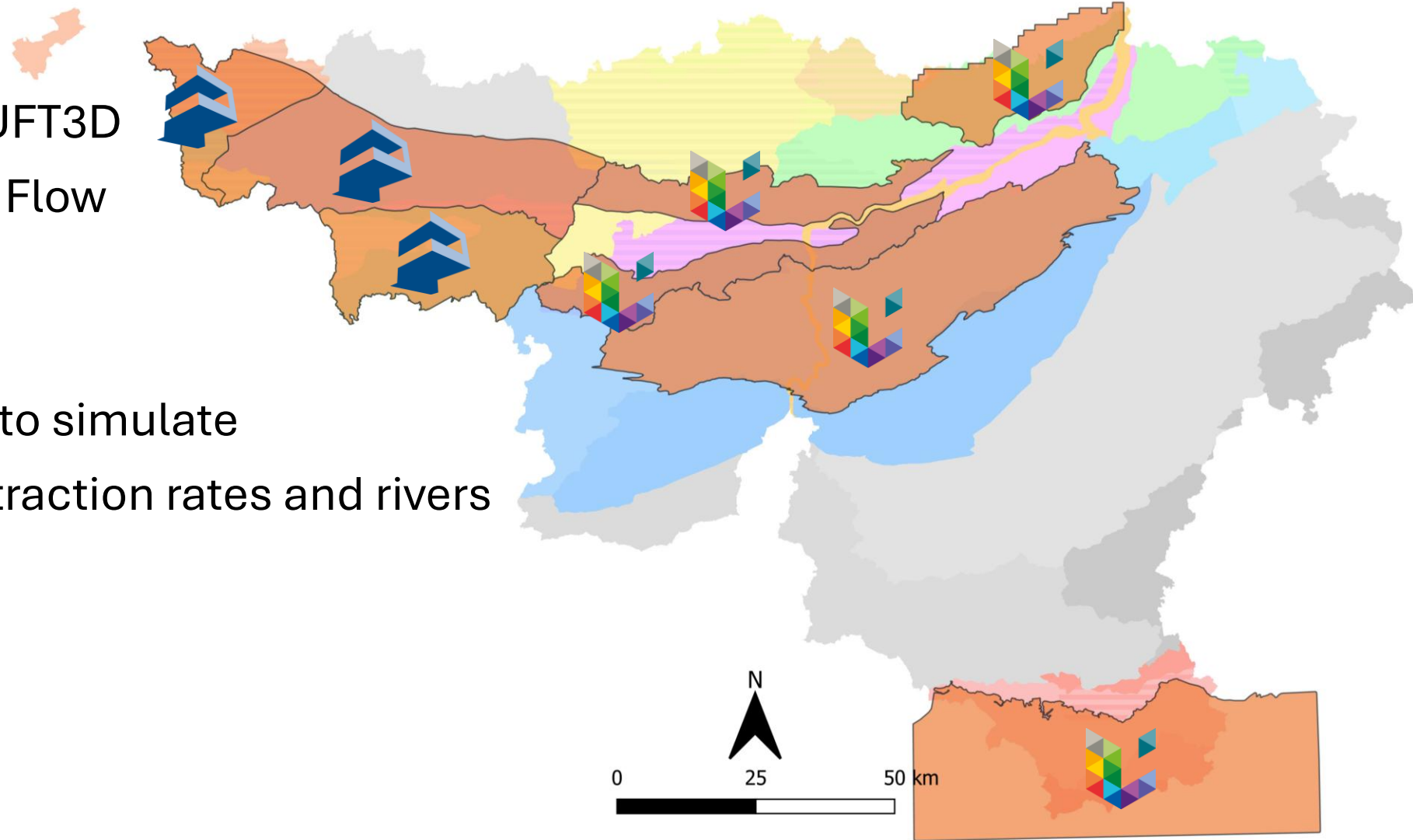
# Use of groundwater models



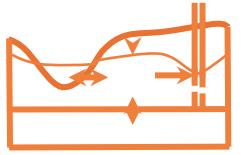
➤ 8 of the main groundwater bodies have been modelled by ULiège and UMONs

➤ At ULiège, use of the SUFT3D (Saturated Unsaturated Flow and Transport in 3D)

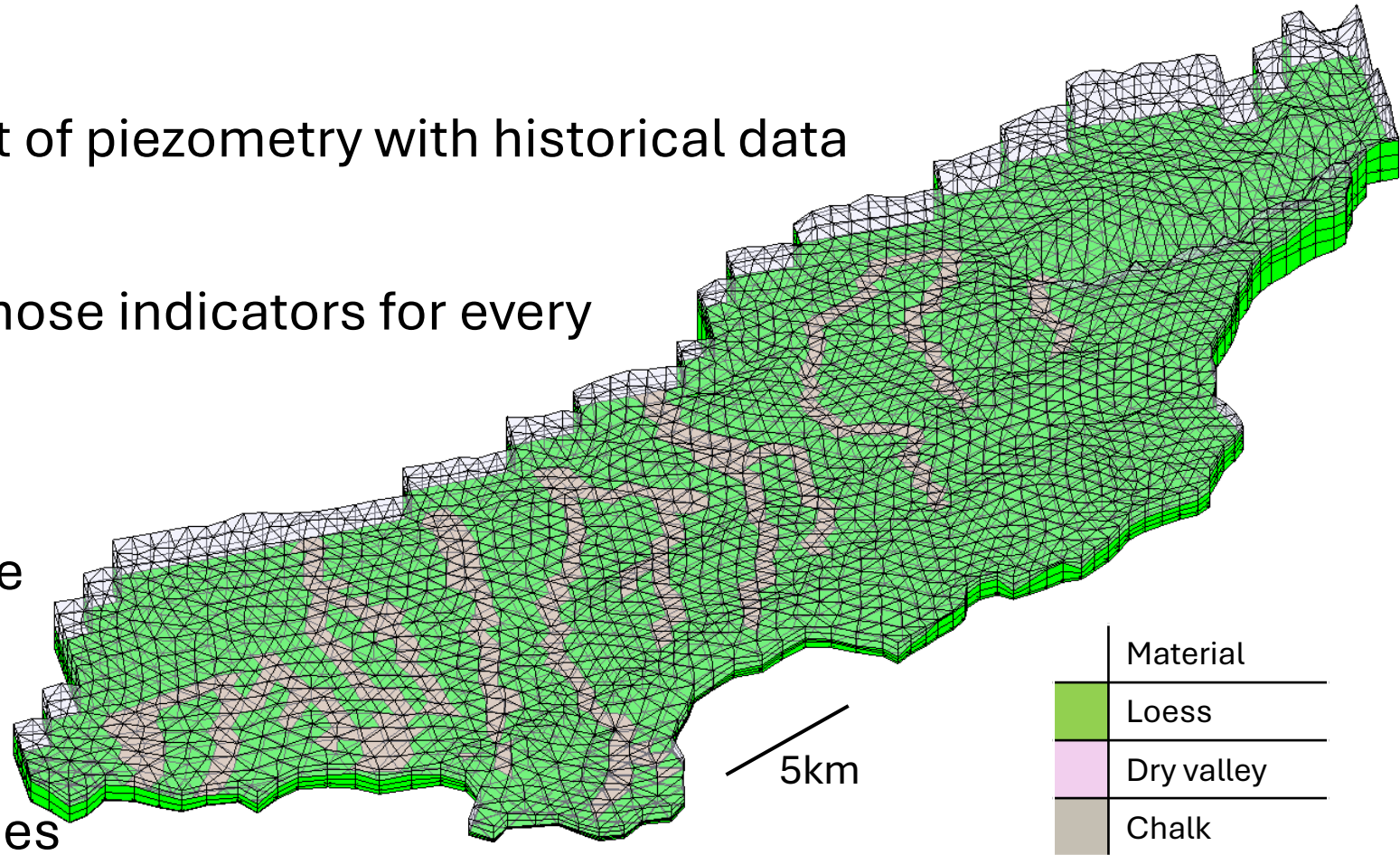
➤ Finite element method to simulate groundwater level, abstraction rates and rivers



# Use of groundwater models



- The water level dynamic is different throughout the model
- Mean, minima and longest deficit of piezometry with historical data
- Comparison of the evolution of those indicators for every node of the model to build maps
- Comparison of the river discharge
- Possible comparison of the drainage capacity of some galleries



(Vertical exaggeration x20)

# Conclusion

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- Use of different percolation scenarios simulated from MAR and EPICgrid
- Construction of physically based indicators to understand the evolution of percolation throughout Wallonia
- Use of groundwater models to simulate the groundwater levels and fluxes throughout major aquifers
- Construction of physically based indicators to understand the evolution of the impact of drought on groundwater resources

# Bibliography

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