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FACULTY OF SCIENCES

DEPARTMENT GEOLOGY
HYDROGEOLOGY AND APPLIED GEOLOGY

GROUNDWATER MODELLING

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REPORTING

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OBJECTIVE

Your report should describe, step by step, the modeling process you followed to solve the problem

The report should allow someone else to reproduce the results you obtained

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GENERAL ADVICES

1) **Clearly state all your choices and assumptions** (choice of the numerical methods, choice for the boundary conditions, etc.)
2) When possible, **justify your choices based on hydrogeological** arguments
3) **Describe the distribution of parameters in your calibrated model** (this is the model used for prediction, its description is mandatory)
4) Do not forget to **describe the results** (what do we observe?) **and assess their validity** (are the results expected or surprising ?)
5) **Be critical**: are the choices made influencing the results ?
6) Pay attention to the **quality of your figures** (lisibility, scale, units, orientation, etc.)

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TABLE OF CONTENTS

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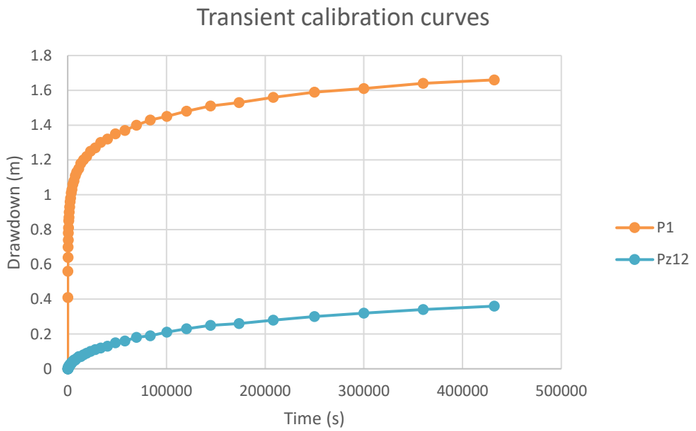
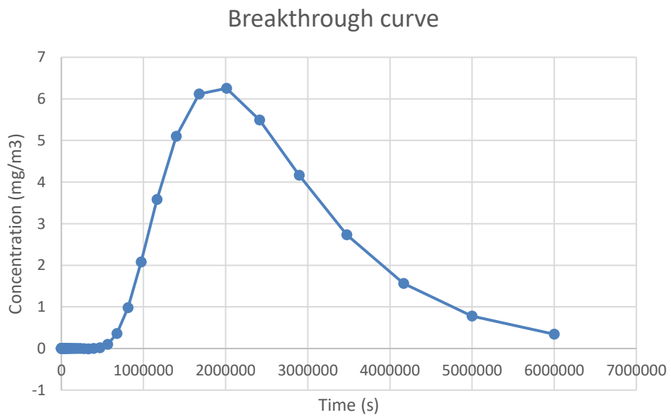
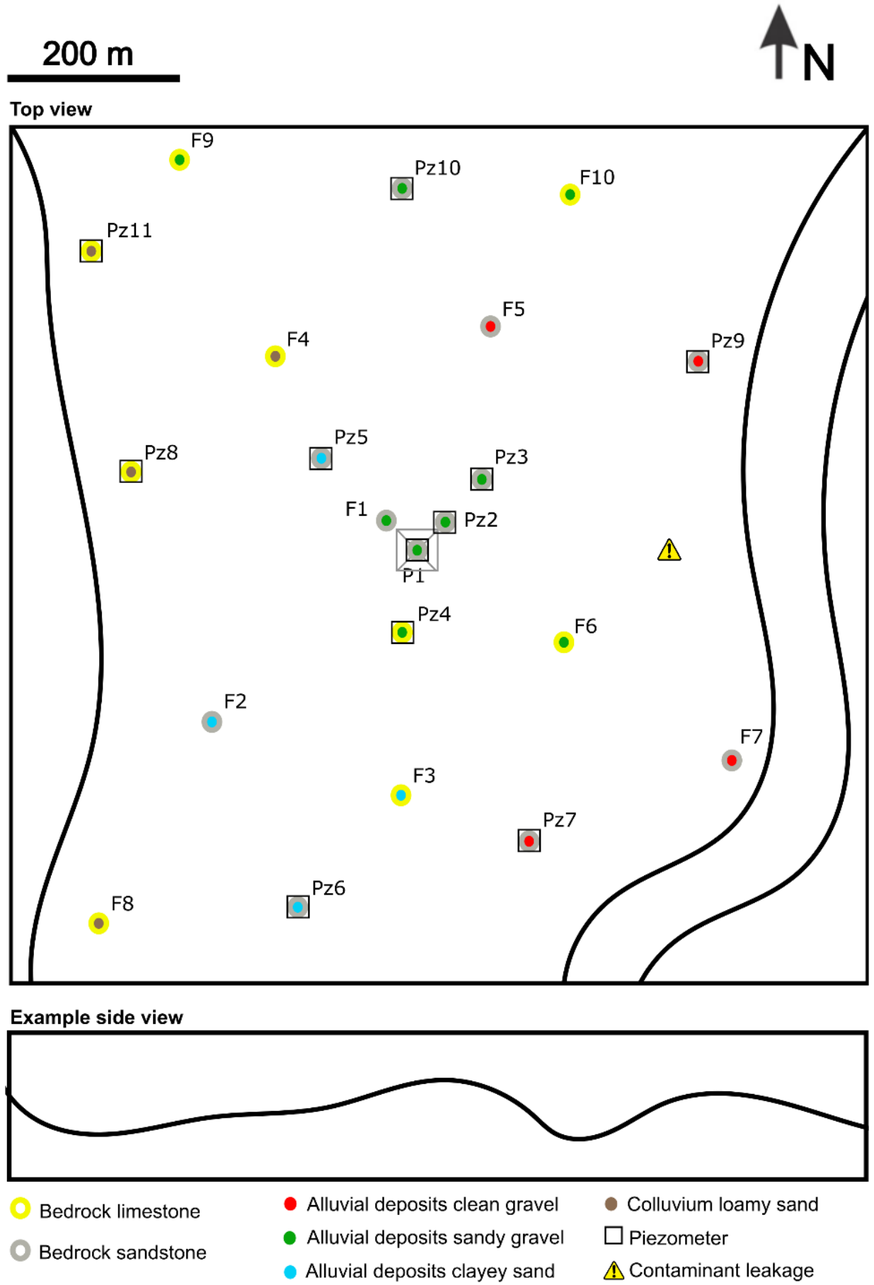
1. INTRODUCTION

- General context
- **Objective of the study**
- Available data (short description)

detailed data description in annex







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2. CONCEPTUAL MODEL

Essential!

-Description of the hypotheses and translation of the geology/hydrogeology into a numerical model

-Description of the relevant geological and hydrogeological context

-Limits of the model (lateral and vertical)

-Number of layers

-Simplifying hypotheses (Anisotropy? Coupling? Homogeneity? …)

-Modeling choices (Steady-state vs transient, transport processes, etc.)

-Boundary conditions (**Flow AND transport, steady-state AND transient**), description (type, value), discussion and justification

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3. MATHEMATICAL MODEL

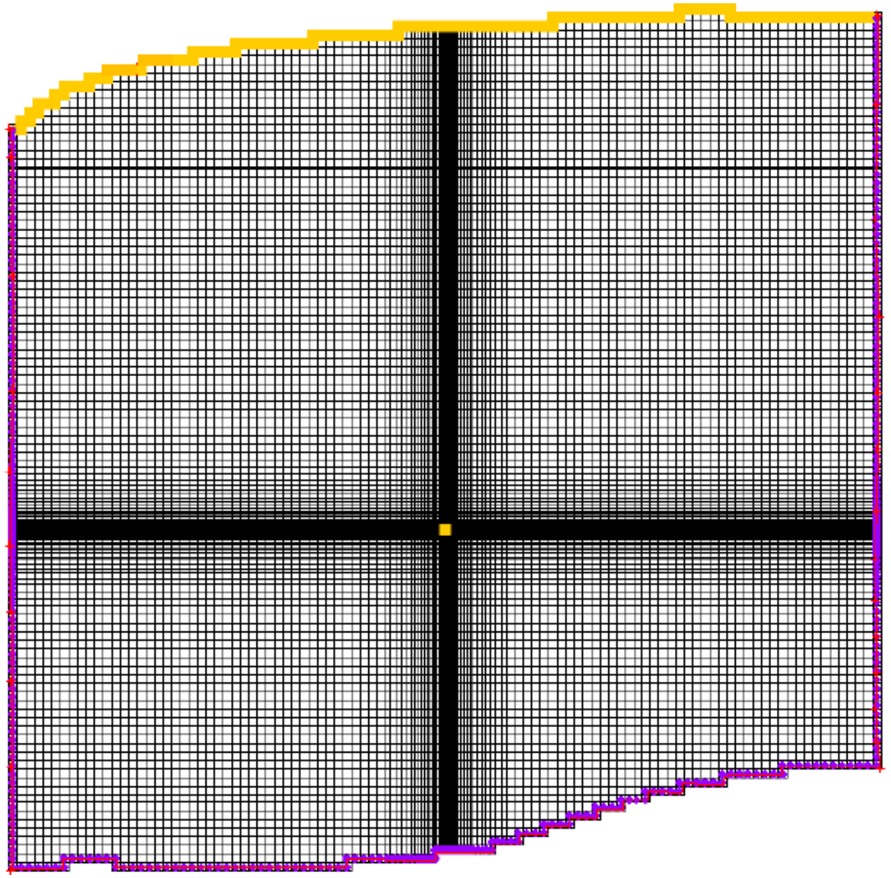
-Equations to be solved (steady-state, transient, transport)

-Description of related parameters (! For transport !, which processes are considered ?)

-Link to the boundary conditions

4. NUMERICAL MODEL

- Choice of the software
- (short) description of the numerical methods used:
  - Finite-difference, Finite element ?
  - Explicit vs. Implicit for transient simulations
  - Conditions for stability, convergence
  - Transport (finite-difference, MOC, etc.)
  - …
- Description of the grid
  - Discretization, refinement and number of layers
  - Limits imposed by the numerical methods on the size of cells
  - …



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5. CALIBRATION

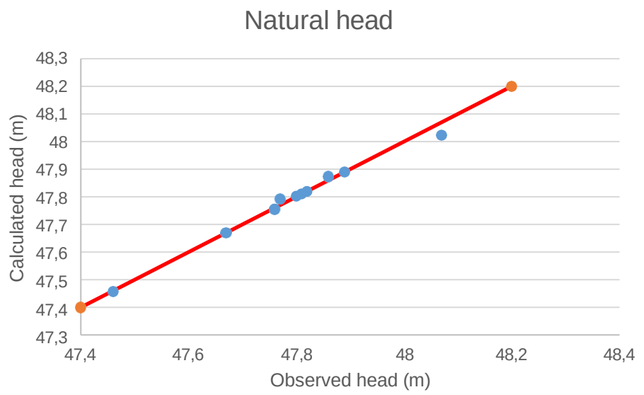
-Approach used for the calibration (trial and error, automatic, stochastic, zonation, **objective function**, etc.)

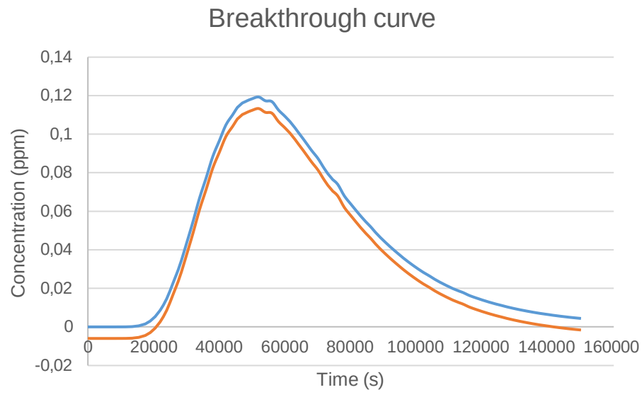
-Calibration results (parameters and quality of the calibration)

-Analysis of residuals

Hydraulic conductivity in m/s

Geological medium	Initial values	Calibration 1
Alluvial deposits		
Clean gravel	$5 \cdot 10^{-2}$	10^{-2}
Sandy gravel	$5 \cdot 10^{-3}$	10^{-3}
Loamy sand	$5 \cdot 10^{-4}$	10^{-4}
Clayey sand	$5 \cdot 10^{-5}$	$5 \cdot 10^{-5}$
Bedrock		
Sandstone	$5 \cdot 10^{-5}$	$5 \cdot 10^{-5}$
Limestone	$5 \cdot 10^{-4}$	$5 \cdot 10^{-4}$





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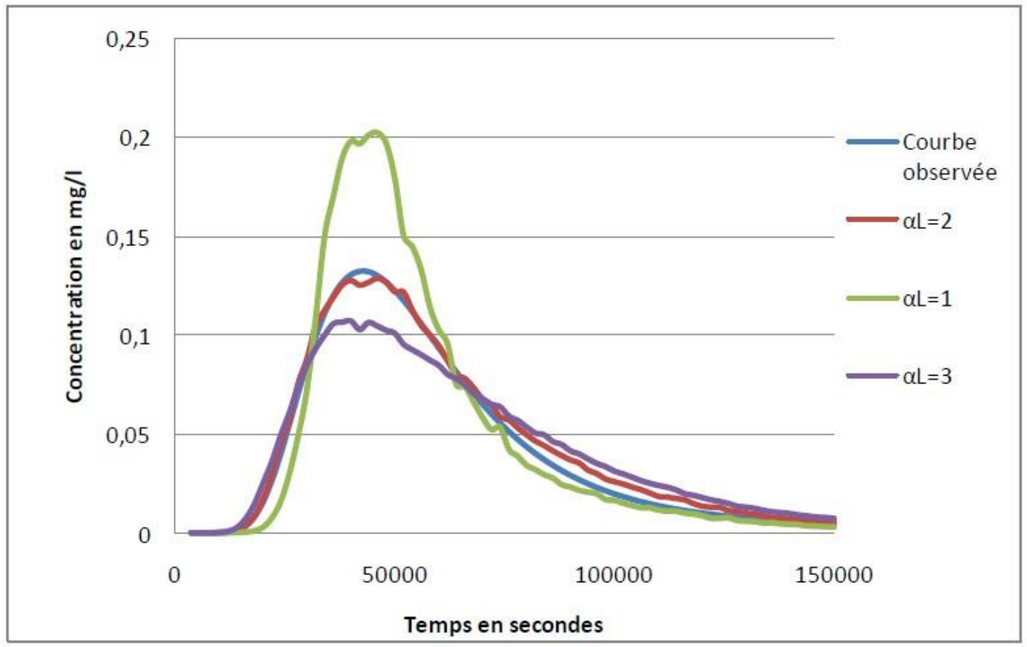
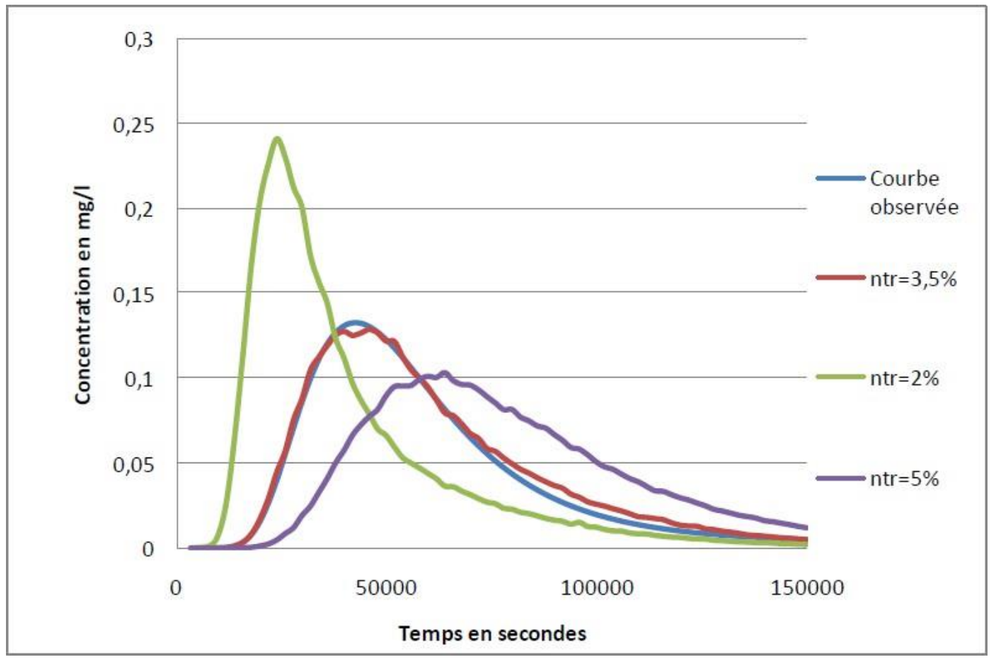
6. SENSITIVITY ANALYSIS

-Identification of the **sensitive parameters** (local sensitivity)

-Link with the hypotheses and assumptions

-Influence on the results and predictions





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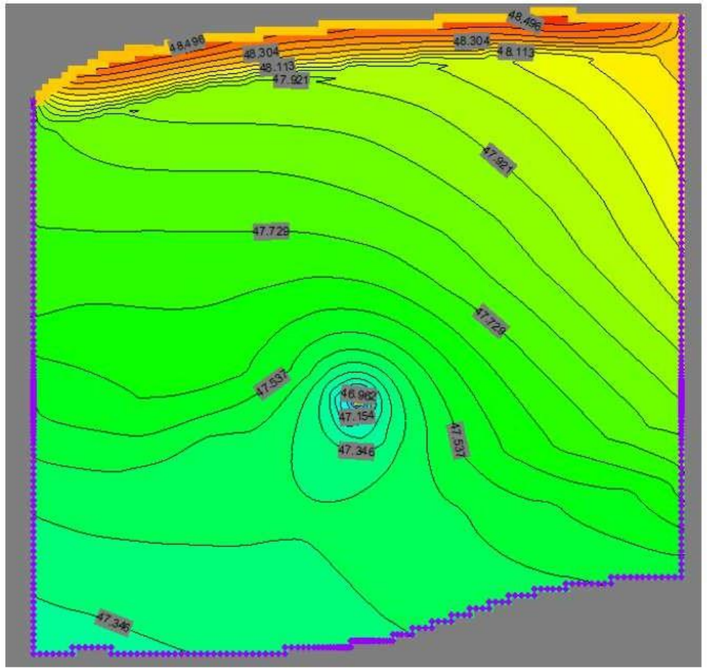
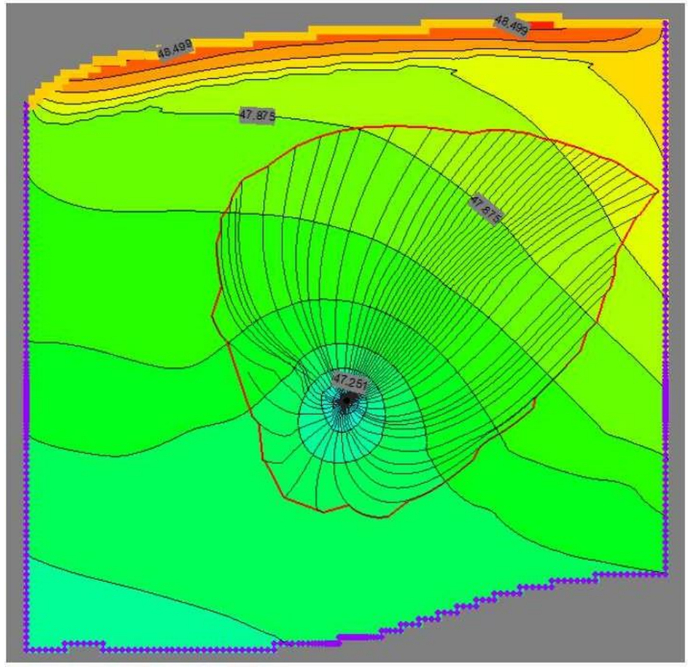
7. RESULTS ANALYSIS

-For each simulation, description of the results (e.g. piezometric map in natural and pumping conditions, pathlines,..) + link with the (hydro)geology

-Do the results make sense?





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8. CONCLUSION AND RECOMMENDATIONS

-Summary of the modeling process

-Discussion of the results for the prediction (also answer the questions in the project description pdf!), validaty, uncertainty

-Limitations of the model and influence on the results

-Recommendations to improve the model

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9. REFERENCES

—List of bibliographic references (if any)

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