

Form 2

Technology Information	
Area	Groundwater flow and radionuclide transport modeling (point 6.1)
Title	SIMULATING THE RADIONUCLIDE TRANSPORT IN GROUNDWATER
Submitted by	CEA

1. Overview of Technologies

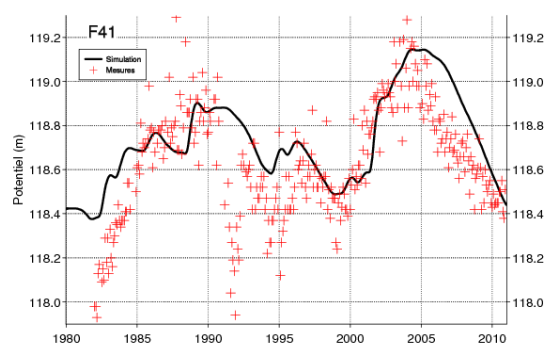
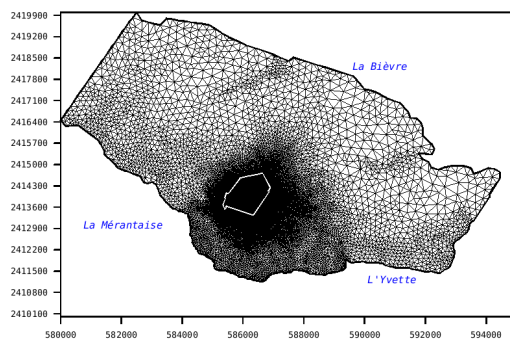
Functions

Modelling the groundwater flow and the radionuclide transport into the unsaturated and saturated zones:

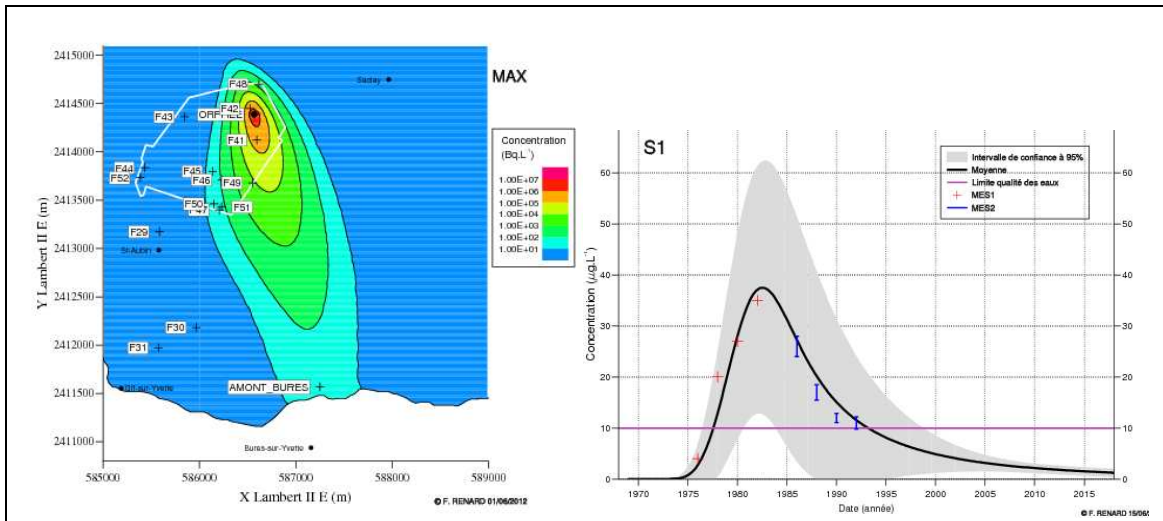
- To understand water transfers from ground surface toward the discharge system,
- To determine extended pollution and long-term concentrations in the water table and within the discharge system.

Summary Descriptive

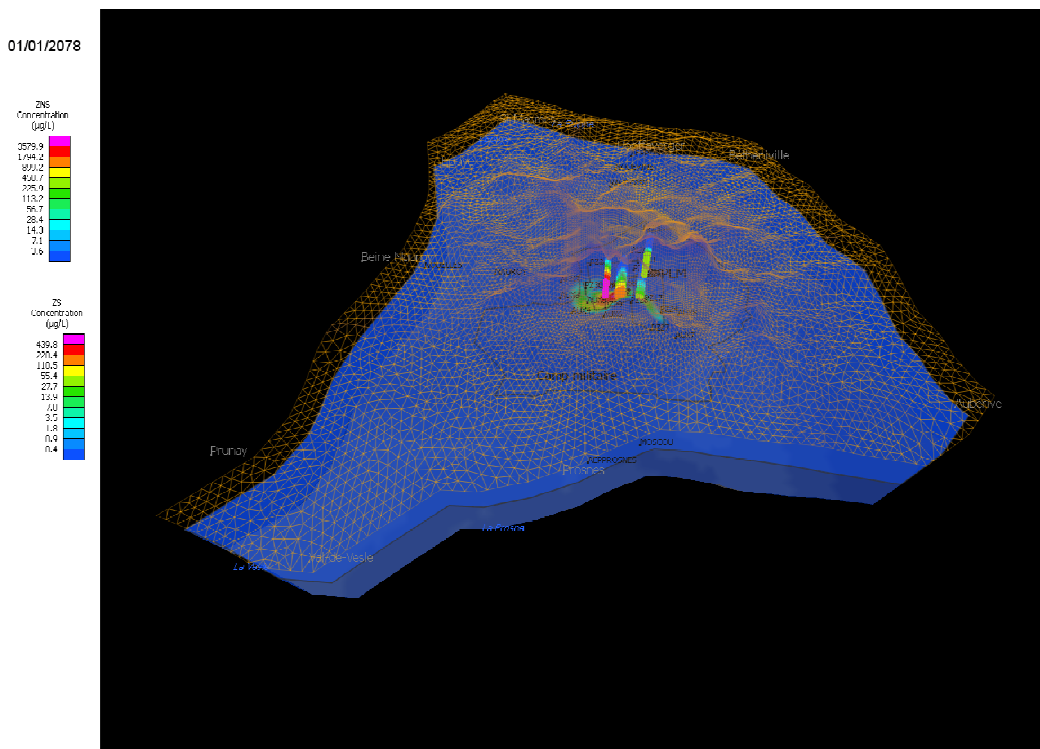
1. The hydrogeological context is analyzed.
2. The saturated groundwater flow model is built in steady state: the permeability field is estimated by inversion using the average piezometric level and rainfall infiltration.
3. The unsaturated linked saturated groundwater flow model is built in unsteady state: the effective porosity and specific unsaturated zone parameters are estimated by fitting the piezometric level time series.
3. The radionuclides are transported using either a Kd approach, either reactive transport.
4. The uncertainties are estimated using statistical methods.

Features & Specifications

Voronoi mesh (saturated model) – Piezometric levels measured (red) and simulated (black)



Radionuclide simulated plume – Radionuclide concentration versus time. Estimated uncertainty (grey)



Radionuclide migration 3D view

The code named THYRSIS is composed of the following parts:

- A user friendly preprocessing,
- Simulation tools like inversion process to calculate permeability field with piezometric level only, or uncertainties estimation based on statistical methods

- An automatic post processing giving 1D, 2D and 3D view to facilitate results analyses.

Advantages of the Technology

- The groundwater model is only built with geological information, rainfall and piezometric levels
- A user friendly pre and post processing.
- The non reactive transport model (THYRSIS) can be completed by a reactive transport model (HYTEC)

Owner

CEA

2. Notes

Technology readiness level

This software is already available.

Challenges

- Taking into account uncertainties on hydrogeological parameter
- Define contamination management strategy.

Others

- Our team, composed of hydrogeologists, is able to determine hydrogeological parameter by experiments on site (pumping test,...) or in laboratory (column experiment,...). Specific on site equipment are developed by our team



Trailer for pumping test up to 150 meter depth – Column experiment

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