

## PhD Course: Models and Methods for Material and Environmental Sciences

### **SHORT COURSE**

# ***Natural tracing, and modelling of the water-rock interactions***

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Aim and content:

Natural tracing is a tool that is widely used by hydrogeologists in order to evaluate the future behavior of the waters that infiltrate towards the aquifers. This is made possible insofar as the quality of a water source reflects the water-rock interaction, provides information about the origin of the water, the residence time, and the types of flows within the aquifer. The most commonly used tracers are the major ions and traces, the isotopes of oxygen and strontium, carbonate compounds, electric conductivity, pH, and temperature. Geochemical models describe mass transfers in water-rock systems, first by implementing the classical laws of thermodynamics. It is a matter of considering this water-rock system a thermodynamic system consisting of an assembly of components: the rock minerals and the chemical species in solution. Classical kinetic laws, incorporated into the calculation code, describe the dissolution and precipitation rates of the minerals and make it possible to give the time scale with which the water-rock system evolves towards a new thermodynamic equilibrium. The use of geochemical models allows for the determination of the mechanisms that govern the acquisition of water on contact with minerals from the cracked environments.

The aim of this course is:

- To understand the chemical composition of the different type of water (rain and surface water; groundwater and sea water);
- To know the chemical balances which lead to the mineralization of water: balances gas-water, mineral-water;
- To define the chemical reactions which allow in water (acidic/base, complexation, ionic exchange, redox reaction);
- To understand the principles of water analysis;
- To interpret the result of the water analysis;
- To define bases for geochemical modelling.

**DOVE:** Dipartimento Scienze Chimiche e Geologiche, via Campi 103 – Modena. Aula 1.4

**QUANDO:** 23 MAGGIO ORE 14.00-18.00; 25 MAGGIO ORE 14.00-18.00.

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