Ecole Doctorale - 104

Sciences de la Matière, du Rayonnement et de l'Environnement

EDSMRE

**ESTABLISHMENT : Lille University**

**Laboratory(ies) of affiliation : LGCgE**

**Scientific field, Speciality: the speciality of the thesis must be one of those of the thesis (co)-director**

- ☐ DS2 Dense media, materials and components
- ☐ DS2 | Diluted media and fundamental optics
- ☐ DS3 | Earth and Universe Sciences
- ☑ DS3 | Earth, fluid envelopes
- ☐ DS4 | Theoretical, Physical and Analytical Chemistry
- ☐ DS4 | Organic, Inorganic and Industrial Chemistry
- ☐ DS4 | Materials chemistry
- ☐ DS5 | Molecular and Cellular Aspects of Biology
- ☐ DS8 | Energy, heat, combustion
- ☐ DS8 | Mechanics of solids, materials, structures and surfaces
- ☐ DS10 | Food Biotechnology, Food Science, Physiology
- ☐ DS10 | Biology of the environment, organisms, populations, ecology

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**Co-director:**

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**Affiliate programme(s): PRIMA EUROP PROGRAM**

**Planned (co)-funding** *(mention: in progress/obtained)* **:**

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**Title of the thesis:**

**Hydrogeochemical modelling of coastal aquifers subject to saline intrusions in a context of climate change**

**THESIS SUBJECT (ABOUT 1/2 PAGE)**

Hydrogeological modelling of saline intrusion is a major challenge for the sustainable management of coastal aquifers, which are particularly vulnerable to salinization as a result of overexploitation and climate change. This thesis aims to develop and apply numerical and analytical tools to understand, quantify and anticipate saline intrusion processes in porous aquifers. The study will focus on the detailed characterization of aquifer geometry and lithology, as well as hydrodynamic and transport properties, all of which are essential for simulating the evolution of the salt wedge. The approach will integrate analysis of operating conditions, the impact of pumping and variations in sea level, taking into account the temporal and spatial variability of the phenomenon, particularly in a context of climate disruption. Logging methods (resistivity logs, natural radioactivity) and hydrochemical approaches will be used to validate the numerical models. A specific modelling tool will be selected for each case study, depending on the particularities of the case studies: northern Tunisia, northeastern Algeria, Bonifica della Capitanata in Italy and the Nile Delta coastal basin in Egypt. The aim is to propose management scenarios and recommendations to limit the progression of saline intrusion, preserve water quality and ensure resource resilience in the face of anthropogenic and environmental pressures. This work will contribute to a better understanding of the interactions between fresh and salt water, and strengthen decision-making tools for the integrated management of water resources.

This subject is aimed at anyone with a Master's degree, or equivalent, in hydrogeology/hydrochemistry or environmental geosciences, and a good knowledge of numerical modelling software in hydrogeology, as well as a taste for experimentation.

***Keywords:*** *Hydrogeology, hydrochemistry, modelling, saline intrusion, sustainable management.*

**Expected date of recruitment :10/10/2025**

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**Additional remarks/comments:**

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