

**Announcement for post-doc position for 2015-16 (18 months)**  
**“ESPER: Evaluation and Sensitivity of models for Predicting the  
depletion and Remediation of organic pollution sources”,**  
**at Institut de Mécanique des Fluides de Toulouse, France**  
**(application deadline: 15 November 2015)**

**THIS POSITION IS AVAILABLE WITHIN THE ESPER PROJECT**

**ESPER** : Evaluation de la Sensibilité des modèles de Prédiction d’Epuisement et de Rémédiation des sources de polluants organiques (approches déterministes et probabilistes pour sécuriser les choix de gestion).

*ESPER* : *Evaluation and Sensitivity of models for Predicting the depletion and Remediation of organic pollution sources (deterministic and probabilistic approaches for safe management choices).*

**Objectives and Scientific Strategy**

The ESPER project was initiated within the framework of a research program by ADEME (French Environ. Agency) entitled « GESIPOL » (**G**estion **I**ntégrée des sites **P**ollués – integrated management of polluted sites). The ESPER project is designed to help engineers in choosing a relevant method for the management of organic contaminant sources in aquifers. The project objective is to improve the prediction of the source dynamics (duration required for complete remediation, transient evolution of concentrations and fluxes) through modeling of various envisioned management scenarios (in situ remediation, monitored natural attenuation, reduction of transfer paths, confinement, etc.). Most of the time in modeling studies, the sensitivity analyses are summarily implemented, given spatial heterogeneities and uncertainties on measured and estimated values. The problem is made even more complex by the diversity of available models. The project should help assess the uncertainty and sensitivity of source depletion models for the improvement of predictions, and *in fine*, for a better reliability of cost benefit analysis among the various management possibilities.

**Expected results**

The ESPER project will contribute to methodological developments (logical diagrams and flowcharts, prototype cases, mathematical procedures, numerical choices...), and will contribute to the development of an integrated software (*Work Flow*) under the form of a “meta-code” toolbox designed to generate reliable sensitivity studies of the source evolution from predictive models (source attenuation or complete disappearance).

These developments will be based on various modeling approaches (deterministic or stochastic), and they will include the following topics:

- (i) Identification of the most sensitive parameters, depending on context and management scenarios;
- (ii) Definition of the target criterion (e.g., maximum duration of the source); and
- (iii) Proposing and implementing, for the most important parameters, the simulations to be performed in order to explore efficiently the probability distribution of the results.

The study will be performed, first, on a few prototypical cases, and then on 2 contaminated sites (2 datasets).

The experience feedback from these studies will be used to assess the advantages and drawbacks of each modeling approach (analytical vs. numerical, deterministic vs. probabilistic), and to define the needs in terms of number, density and quality of data (such as aquifer properties and pollution levels) required to obtain a reliable prediction of the source duration. The latter is the major criterion that conditions the choice of the management technique, as well as the costs and risks, for the given contaminated site.

## **POST-DOCTORAL POSITION (OBJECTIVES AND TASKS)**

The work of the post-doctoral candidate will include the following goals:

- State of the Art review on NAPL pollution (with reference to previous projects like “MACAOH”), on estimation methods for uncertain parameters (geostatistics), on sensitivity analyses (helped by dimensionless groupings), and on the generation of scenarios following experimental design methods.
- Use of simplified models to study classical cases (prototypes).

Tools:

- Statistical and geostatistical tools will be used for the generation and estimation of parameters which are uncertain and/or spatially distributed.
- Transport models, including dissolution/degradation of the source zone, and advection/dispersion of the contaminant plume, will be implemented.

Work Flow / Meta-code:

- It is intended to develop a meta-code based on free available simulation tools; the meta-code will include Design of Experiments methods, and will involve triggering multiple calls to the transport codes or models.

## **Consortium and budget**

The ESPER project is partially founded by ADEME (Agence de l’Environnement et de la Maîtrise de l’Energie -- French Environmental & Energy Agency), and it is conducted by a consortium composed of the academic research laboratory IMFT, the BURGEAP engineering company, and an independent consultant (N. Tribouillard). The post-doc will be located at IMFT (Institut de Mécanique des Fluides de Toulouse, France). The salary will be supported through an ADEME grant (gross salary about 2500€/month, i.e., about 2000€/month net).

## **Contacts at IMFT, Toulouse, France**

Rachid ABABOU, Pr. INPT :	<a href="mailto:ababou@imft.fr">ababou@imft.fr</a> +33 (0)5 34 32 28 45
Manuel MARCOUX, MdC UPS:	<a href="mailto:marcoux@imft.fr">marcoux@imft.fr</a> +33 (0)5 34 32 28 73
Michel QUINTARD, DR1 CNRS	<a href="mailto:quintard@imft.fr">quintard@imft.fr</a> +33 (0)5 34 32 29 21

## **IMFT laboratory**

IMFT is a research laboratory affiliated to Centre National de Recherche Scientifique (CNRS) and 2 Academic Institutions (INPT & UPS) from Toulouse University, France.

IMFT: UMR 5502 CNRS-INPT-UPS.

*Institut de Mécanique des Fluides de Toulouse (IMFT)*  
*1 Allée du Professeur Camille Soula*  
*31400 Toulouse, France.*  
<http://www.imft.fr>