



# Postdoctoral Researcher Spatial Optimization of a Siren Network

Job Offer from the Joint Research Unit for Environmental Acoustics (UMRAE).

<b>Research</b>	Acoustics, Model Optimization.
<b>Assignment</b>	UMRAE - Nantes
<b>Duration</b>	1 year
<b>Publication date</b>	January 11th, 2023
<b>Location</b>	Gustave Eiffel University, Nantes Campus

## L'Unité Mixte de Recherche en Acoustique Environnementale

The Joint Research Unit for Environmental Acoustics (UMRAE) is a research laboratory shared between Gustave Eiffel University and the Center for Studies and Expertise on Risks, Environment, Mobility and Planning (CEREMA). It brings together teams of researchers, engineers, technical staff and doctoral students from these two organizations to carry out research missions related to reducing noise and its impact on the environment. The activities of the UMRAE focus on reducing noise and its impacts in the environment through experimental, numerical, theoretical and interdisciplinary approaches.

## Scientific Context

Civil defense sirens are an essential means of alerting the public in the event of rapid-onset natural or human-made hazards. However, the densification of the siren network is often based solely on technical constraints. When spatial optimization of their sound coverage is taken into account, the distance to the siren is often the only factor considered, ignoring the phenomena related to acoustic propagation such as the influence of terrain or soil type, or masking from surrounding sources like traffic noise.

In collaboration with Paul Valéry University - Montpellier 3 and LASTIG (IGN-ENSG, Univ. Gustave Eiffel, EIVP), the UMRAE is working on the audibility of civil defense sirens in urban areas [1,2]. A first audibility model has recently been proposed and implemented in the open-source tool NoiseModelling [3].

In May 2022, NoiseModelling was technically coupled with the open-source tool OpenMOLE [4]. This tool allows for the exploration, diagnosis, and calibration of numerical models by taking advantage of distributed computing environments. This coupling opens up the possibility of developing a methodology for the spatial optimization of the siren network through the use of pre-implemented genetic algorithms in OpenMOLE.

## Objectives and activities

Based on these tools, the goal will be to develop a methodology for optimizing the number and positioning of sirens based on an estimate of the alert signal's audibility by the largest possible number of people exposed to risks. The person hired will be responsible for developing the methodology and applying it to a study area. The work done will result in the publication of these findings in a peer-reviewed scientific journal.

## Research framework

The person hired will be based at the Joint Research Unit for Environmental Acoustics (Nantes), but will also have interactions with Matthieu Péroche (Paul Valéry University - Montpellier 3, specialist in population evacuation in case of tsunami) and Paul Chapron (LASTIG, IGN-ENSG, Univ. Gustave Eiffel, EIVP, specialist in the analysis of simulation models). The person will be working in a multidisciplinary team with the aim of developing a methodology for optimizing the number and positioning of sirens based on an estimate of the alert signal's audibility by the largest possible number of people exposed to risks. The person will have the opportunity to work with state-of-the-art tools and methodologies and be part of a dynamic and stimulating research environment.

## Qualifications and experience required

- > Ph.D. or equivalent with at least one publication in a peer-reviewed journal
- > Experience related to environmental acoustics or model exploration
- > An interest in scientific programming is necessary for this position

- > Programming languages such as JAVA, Groovy, Scala

## Application process

- > Submit a CV, cover letter, and at least one writing sample (preferably a published paper)
- > Include the names and contact information of at least two references
- > Submit all application materials to pierre.aumond@univ-eiffel.fr

## Bibliography

- 1 Siliézar, J., Aumond, P., Chapron, P., Péroche, M., Can, A. (2022, April). Méthode d'évaluation de l'audibilité d'un système d'alerte SAIP. In 16ème Congrès Français d'Acoustique.
- 2 Péroche, M., Siliézar, J., Aumond, P. « Modéliser l'audibilité des sirènes pour optimiser la couverture du signal d'alerte en cas de tsunami », IRMA.
- 3 <https://noise-planet.org/noisemodelling.html> : outil gratuit et open-source développé à l'UMRAE pour produire des cartes de bruit environnemental sur de très grandes zones urbaines.
- 4 <https://next.openmole.org/> : plateforme open-source dédiée à l'exploration de modèles de simulation, développée à l'ISCFIF