

ESR 3.3 - Effect of dense urban areas as metamaterials for seismic waves

A Research PhD position in the URBASIS ITN funded by the EC

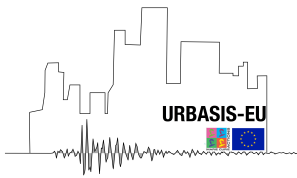
Supervisors - Philippe Roux (UGA Grenoble) - Stefano Parolai (OGS Trieste)

Recent devastating earthquakes and induced seismicity near infrastructures must become the centrepiece of analysis in reducing risk and increasing resilience, facing up to global urban population growth in the coming decades and the concentration of wealth in cities. The prediction of seismic ground motion and response of structures are key issues in reduction of seismic urban risk. There is therefore a demand for highly trained scientists with a broad understanding of engineering seismology and earthquake engineering, skills being essential in academic research, in private companies with activities related to risk mitigation and energy facilities and for policy makers. The URBASIS-EU project aims to provide a multi-disciplinary training platform for young scientists in order to develop their individual project and to promote their entrepreneurship and their employability toward the academic, private and insurance or decision-making sector. High-quality supervision of the young scientists will be ensured through the international recognition of the URBASIS-EU partners. A comprehensive set of transferable skills will be developed through innovative and interdisciplinary joint research projects between academic and non-academic partners on the prediction of seismic hazard in urban areas considering low-probability/high-consequences events and induced seismicity related to the exploitation of energy resources; the seismic ground motion prediction within the non-free-field urban area; the coupling between ground motion and structures/infrastructures responses for natural and induced seismicity including time dependent vulnerability; and the systemic risk of interconnected urban systems. URBASIS-EU will create a lasting collaboration for the establishment of a European network of academic and non-academic experts, improving the interface with decision-makers.

More information: <https://urbasis-eu.osug.fr/?lang=en>

Job description

The main goal of the present project is to achieve and analyse an ambitious and novel experiment where autonomous seismic sensors will cover a square grid with small inter-element spacing that is to be set up in a dense urban area. This spatial density of sensors is mandatory to accurately measure the dispersion curve inside the area that will hopefully confirm the meta-material behaviour of the city, and in particular, demonstrate the hybridization effect associated with the resonances in the buildings. It appears clear that such a multidisciplinary experiment will have a strong impact in the scientific community and on the general public. However, we believe that this subject will also lead to important geophysical applications. For example, forbidden frequency bands or 'band gaps' might be exploited for the cancellation of ambient seismic noise at locations where ground vibrations are an issue for highly sensitive scientific measurements. Similarly, band gaps might be used to protect sensitive structures, like power plants, from potentially destructive surface waves caused by earthquakes and the design of a seismic meta-material that can 'hide' human structures from damage through a natural 'cloak of invisibility' would be a societal revolution in the field of seismic hazards protection.



The URBASIS consortium is funded by European Commission's Innovative Training Network (ITN) program. This research project will take place at the University Grenoble Alpes, France, within the Institute of Earth Science (ISTerre). This project will involve close collaboration with OGS Trieste (IT), where the researcher will spend several months. The project will also involve secondment with IFSTTAR-Paris (France).

Requirements and Application

The successful applicant must have a Master degree in seismology, earthquake engineering and engineering seismology or similar. The applicant is expected to have a very strong statistics and signal processing background. Furthermore, knowledge in wave physics is an advantage. Excellent undergraduate and master degree grades are expected. A high level of written and spoken English is also expected.

PhD stipends are allocated to individuals who hold a Master's degree. PhD stipends are normally for a period of 3 years. It is a prerequisite for allocation of the stipend that the candidate will be enrolled as a PhD student at the Doctoral School of University Grenoble Alpes in accordance with the regulations of Terre-Univers-Environment on the PhD Program at the University. According to the URBASIS-EU, the progress of the PhD student shall be assessed every 12 months. It is a prerequisite for continuation of salary payment that the previous progress is approved at the time of the evaluation.

The qualifications of the applicant will be assessed by the **Selection committee**. On the basis of the recommendation of the **Selection** committee, the Dean of the Doctoral School of University Grenoble Alpes will make the final decision for allocating the stipend.

URBASIS-EU wishes to reflect the diversity of society and welcomes applications from all qualified candidates regardless of personal background or belief. We encourage applications from everyone irrespective of gender and ethnic group but, as women and members of ethnic minority groups are currently under-represented at this level of post, we would encourage applications from members of these groups. Appointment will be based on merit alone.

Application must be in a form of a single PDF file including a CV, a cover letter, academic transcripts, and the names and complete contact information and letter of two referees sent through :

- **the consortium web-page <https://urbasis-eu.osug.fr/?lang=en>**
- **the EU EURAXESS portal <https://euraxess.ec.europa.eu/>**

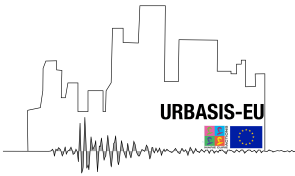
Vacancy number : URBASIS-EU ESR3.3 (to be reminded in the application form)

Deadline : February, 23rd 2019

Salary : According to the European Commission and local standards ; minimum gross wage is 3500 euros before local taxes

Contact Information

You may obtain further information from :



- **Philippe Guéguen**, URBASIS project coordinator : philippe.gueguen@univ-grenoble-alpes.fr (Earth Science Institute, Université Grenoble Alpes) for general questions regarding the URBASIS consortium or concerning the scientific and training aspects of the ITN program.
- **Philippe Roux** : philippe.roux@univ-grenoble-alpes.fr (Earth Science Institute, Université Grenoble Alpes) for specific questions regarding this PhD project.
- **Florence Cataye**, URBASIS project manager : florence.cataye@univ-grenoble-alpes.fr for administrative questions.

For more information of Doctoral School: <https://doctorat.univ-grenoble-alpes.fr/en/> and <https://ed-tue.osug.fr/?lang=en>