

## **2024 Tenure Track Position Solid Earth Division of the INSU-CNRS**

### **Seismological observations for the understanding of the physico-chemical processes controlling the dynamics of the Solid Earth (SeisObs)**

#### **Links between SeisObs and the INSU-CNRS strategy**

Understanding the physical processes affecting the solid Earth and its interactions with the external envelopes requires the acquisition and exploitation (including modelling) of long-term observations of the Earth system. The recruitment of researchers who study the physico-chemical processes controlling the Earth's dynamics from observational data on the universe and the planet is a major challenge for the CNRS, and in particular for the *Institut des Sciences de l'Univers* (INSU), which leads this task of continuous observation of the planet in the framework of national observational actions involving networks of instruments deployed by the *Observatoires des Sciences de l'Univers* (OSU).

The physico-chemical processes that affect the Solid Earth, in particular its most superficial envelopes: the lithosphere and asthenosphere, control the heat exchanges and chemical fluxes between the Earth's interior and the external envelopes, shaping the Earth's surface. These processes are responsible for telluric hazards (earthquake and volcanism) and control the formation of georesources. These envelopes represent the outer boundary layer of the mantle convection system and are characterised by very high thermal and chemical heterogeneity. A better understanding of the processes that affect them is necessary to understand the dynamics of the Earth, the formation and evolution of the biosphere and the conditions for habitability of our planet, and to evaluate the telluric hazards and natural resources.

The SeisObs Chair aims to develop approaches to acquire and, above all, to exploit and model observational data on the structure and processes in the Solid Earth across multiple scales or through multi-method seismological networks. Labelled via the National Observation Services (SNO) in the Solid Earth and structured within the EPOS-France Research Infrastructure, seismological observations, in combination with other types of data (GNSS, etc.), are essential to our knowledge of the Earth. The CNRS-INSU is committed to perpetuating French excellence in geophysics by investing in instrumental resources and data distribution within EPOS-France. This chair will reinforce this investment in terms of human resources. The challenge is to recruit a researcher/observer who is a driving force in the development of new approaches for the acquisition and exploitation of seismological data, in particular by valorising those coming from the National Observation Services and National Instrument Parks of the INSU Solid Earth division, which are all associated with the EPOS-France Research Infrastructure. The objective is to take advantage of the national and European structuring of EPOS to develop new methodological approaches and to use them to address major scientific and societal issues. Ultimately, the candidate will be expected to take on responsibilities within the EPOS-France research infrastructure.

#### **Objectives for the SeisObs tenure-track position in terms of scientific research**

This chair is dedicated to the understanding of the dynamics of the Solid Earth through the development of innovative methods of acquisition, analysis and modelling of seismological data. The objective is to better image the structures and thus constrain the physico-chemical processes controlling the dynamics of the solid Earth, in particular the crust and upper mantle and their coupling with the deep mantle and outer shells. Many scientific questions essential to our understanding of the Earth system can be addressed: Does the continental lithosphere retain a memory of the successive stages of its formation? Does this memory affect its dynamics? Is the lithosphere-asthenosphere boundary a purely thermal boundary or is it partly compositional, involving local partial melting? Why does mantle

convection produce plate tectonics on Earth?

One way, not the only one, to reach this objective would be to complete the data from the permanent observation networks of SNO by temporary experiments in metropolitan France, overseas and in Europe using terrestrial and/or maritime instrumentation networks. The objective is to achieve suitable spatial and temporal resolutions to image the physical properties of the structures, in order to reveal the dynamics (thermo-mechanical states, role of internal and external fluids and forcing, etc.) at relevant spatio-temporal scales. Thus, the candidate should have demonstrated his/her ability to develop innovative methods of acquisition, analysis and modelling of large volumes of multi-scale data to answer major questions on the dynamics of the Solid Earth. The ability to build and set up instrumental projects involving several partners at national and European levels, as well as the ability to federate in these projects specialists from various Earth Sciences disciplines and/or other disciplines such as mechanics, mathematics, and new data science methods, such as artificial intelligence, will also be valued.

### **Objectives for the SeisObs tenure-track position in terms of teaching**

The teaching service within the university will be carried out in the form of an 'observation support mission' at the interface between the National Observation Services, the National Instrument Parks of the Solid Earth division and the national seismological data centre within EPOS-France. This mission will aim to establish a policy to address the challenges of integrating, archiving and distributing very large volumes of data from new seismic acquisition technologies. A major issue is the systematic FAIRisation of observational data, which is associated with a high level of data quality requirements and services in close interaction with the OSU acquiring these data. This will include adapting procedures to archive and make large volumes of data available to the scientific community in an efficient manner, while improving the quality control of these data.

The SeisObs tenure-track position has fixed-term duration of 4 years. A dedicated funding package of 200 k€ is provided to the SeisObs Chair in addition to their salaries. These funds will go towards salary support for project collaborators (for a minimum of 60%) and research project operations. This project will also benefit from the financial support of on-going ANR projects in seismology, the European Geo-Inquire project and the PEPRs SOUS-SOL and/or IRIMA.