



FarSide Seismic Suite – Lunar Quake Service software engineer

Job offer from the institut de physique du globe de Paris | CNRS UMR 7154

Category	A
BAP	E
Rank	Research Engineer
Job – type REFERENCE	Expert(e) en ingénierie logicielle (IR)
Duration	18 months, renewable
Affectation	Planetology and Space Team, InSight/FSS National Observation Service
Salary	3500-4000€ gross salary depending on diploma and experience plus benefit (travels, health coverage, remote work)
Location	Planétologie et Sciences Spatiale, IPGP/Université Paris Cité LAMARCK building 35, Rue Hélène BRION 75013 PARIS

The institut de physique du globe de Paris

A world-renowned geosciences organization, the IPGP is associated with the CNRS and an integrated institute of the Université Paris Cité. Bringing together more than 500 people, the IPGP studies the Earth and the planets from the core to the most superficial fluid envelopes, through observation, experimentation and modelling. IPGP is also one of the space laboratories recognized by the French Space agency, CNES

The research areas are structured through 4 main unifying themes: Interiors of the Earth and Planets, Natural Hazards, Earth System and Origins.

The IPGP is in charge of labelled observation services in volcanology, seismology, magnetism, gravimetry and erosion and planetary seismology. And the IPGP's permanent observatories monitor the four active French overseas volcanoes in Guadeloupe, Martinique, Réunion Island and Mayotte.

The IPGP hosts powerful computing resources and state-of-the-art experimental and analytical facilities and benefits from first-class technical support. The IPGP provides its students with geosciences training that combine observation, quantitative analysis and modelling, and that reflects the quality, richness and thematic diversity of the research conducted by the IPGP teams.

Team Department

The Planetary and Space Sciences team of the Institut de Physique du Globe de Paris ((<https://www.ipgp.fr/la-recherche/equipes/planetologie-et-sciences-spatiales/>), and more specifically the team of the National Observation Service InSight/FSS (<https://www.ipgp.fr/en/observation/insight/>), is one of the few teams in the world that has developed and operated a



planetary seismology experiment. It has led, with CNES and international partners, the seismology experiment of NASA's InSight mission to Mars and has been selected by NASA again for the Lunar FarSide Seismic Suite experiment.

The FarSide Seismic Suite (FSS) project by the Jet Propulsion Laboratory (JPL) aims to deploy an autonomous instrument on the far side of the Moon to conduct seismic measurements. Nearly 50 years after the Apollo missions, this project will be launched in 2026 as part of NASA's Commercial Lunar Payload Services (CLPS) program. The far side of the Moon will be studied, more specifically the Schrödinger crater located near the South Pole where the seismometer will be placed. This seismometer comes from the spare model of the SEIS instrument, which was deployed on Mars as part of the InSight mission. IPGP assumes scientific responsibility for the Lunar SEIS sensor (VBBZ) as well as the Lunar Quake Service and collaborates with CNES and other French laboratories for this project. The Lunar Quake Service will be responsible for the regular analysis of data, both to ensure the proper functioning of the instruments and to identify detected lunar quakes and their locations. The nominal mission duration is 4 Lunar day cycles, equivalent to 4 Earth months, with a high probability of a one-year mission extension after this nominal mission.

More on InSight : <http://seis-insight.eu>

More on FSS : <https://www.jpl.nasa.gov/missions/the-farside-seismic-suite>

Missions

Main mission (4/5 of the time): The engineer will be responsible for leading and implementing Lunar Quake Service (LQS) software developments as part of the Farside Seismic Suite (FSS) project. LQS is to provide software for observing and analyzing lunar earthquakes, enabling data to be visualized in time and frequency, documented with other visualized data (lunar orbitography, imagery and surface topography), calibrated, processed (rotation, filtering, cleaning), phase-pointed and azimuth-pointed ground motions, seismic events to be classified, and any other events that may occur to be labeled, and finally, to locate these events, either by associating them with known hypocentres of deep earthquakes on the visible face, or by inverting their position for any new focus or impact position. This software will be developed using SEISCOMP and WebObs, with interactions with IPGP's Volcanological and Seismological Observatories, which are developing a software environment with similar functionalities. The engineer will also be working with several post-doctoral scientists more involved in the algorithmic and research aspects of the processing modules.

Secondary mission (1/5 of the time): help with the management, installation, maintenance and administration of the Planetology and Space Sciences team's IT equipment, interfacing with the DSI of Université Paris Cité and the IPGP IS for network management and for installation and maintenance operations in the related technical premises, and providing ad hoc IT support for the team's small scientific projects.

Expected competences:

Main activities for SNO FSS:

- Analyze needs and write the project specifications.
- Define the software architecture.
- Manage the project.
- Develop software components (visualization, calibration, filtering, azimuth determination, cleaning, pointing, saving of points in a database...).
- Implement automatic integration into the LQS of data from the Moon provided by CNES in standard SEED format.
- Interface with software components provided by project scientists (location, clustering, source and structure inversion).
- Supervise project deployment (locally or on a server).



- Manage the software code in a GitLab repository.
- Write and update technical and user documentation

Secondary activities for the PSS team:

- Manage the purchase, installation and maintenance of PCs, compute servers, storage bays and other high-performance computers.
- Ensure the integration and network operation of this equipment, in coordination with the DSI of Université Paris Cité and IPGP.
- Manage security incidents in coordination with the UPC IT Department and the IPGP

Expected Skills

Knowledge

- Project management methodology
- Software engineering
- Information system concepts and architectures
- Programming languages (Python, C/C++, Matlab)
- Operating systems (Linux, Mac OS, Windows)
- Git and GitLab version control systems
- Fluent French/Technical English
- Signal processing
- Experience in processing seismological and/or scientific time series data
- Knowledge of computer system hardware concepts and architectures
- Sensitivity to information and communication system security
- Knowledge of computer network concepts to detect and diagnose problems.
- Mastery of common client-side (Windows, macOS, GNU/Linux) and server-side (GNU/Linux) operating systems and office software (MS Office suite, Open Office, Adobe)
- Maintenance of development environments (Matlab, IDL, Python environments, Fortran, C...)
- Scientific programming in various languages (IDL, Matlab, Python, Fortran, C, R, Labview) appreciated
- Bonus: seismological processing software (e.g. SEISCOMP, WebObs), standard formats for exchanging seismological data and metadata, including miniSEED, StationXML and QUAKEML

(SEISCOMP : <http://seiscomp.de> ; WebObs : <https://github.com/IPGP/webobs>)

Operational skills

- Develop and integrate software for signal and scientific data processing.
- Develop and integrate human-machine graphical interfaces.
- Facilitate a meeting.
- Manage a project.
- Analyze needs and translate them into technical specifications.



- Apply standards, procedures, and rules related to the activity.
- Design technical and functional training actions.
- Personal qualities

Sense of organization and priorities.

- Autonomy.
- Teamwork.
- Rigor/reliability.

Obligations and risks

Working hours: working time defined according to the internal regulations of the Institut de physique du globe de Paris. One teleconference per week within the time slot of 16:00-19:00 for coordination with the Jet Propulsion Laboratory.

On-call duty: no on-call duty planned during project phases B-D of the FSS (2024-2025). Some potential on-call duties during phases E1-E2 in case of contract extension.

Travel: Some potential trips to Toulouse and Pasadena (USA).

Vacation and working time: 37 hours /week with 45 days of vacation

Remote work: one day/week, fixed day.

Training and experience required

Position of Research Engineer (Engineering School, PhD or equivalent)

Experience in developing software for visualization and processing of geophysical or temporal data.

Experience with seismic data visualization or processing software will be a plus but is not required.

How to apply

> CV and cover letter sent to the three contacts persons below

> Contacts:

Philippe LOGNONNÉ, lead co-investigator, VBBZ-FSS experiment (lognonne@ipgp.fr)

Taichi KAWAMURA, lead Lunar Quake Service (kawamura@ipgp.fr)

Sébastien RODRIGUEZ, lead, Planetology and Space Team (rodriguez@ipgp.fr)