

L'ÉCOLE NORMALE SUPÉRIEURE-PSL

Créée en 1794, l'École normale supérieure, membre de l'Université PSL, est un établissement d'enseignement supérieur et de recherche qui recrute sur concours les étudiants les plus talentueux en France et à l'étranger. Établissement d'élite, dont l'activité recouvre l'essentiel des disciplines scientifiques et littéraires, l'ENS-PSL jouit d'un grand prestige international par la qualité de ses étudiants mais aussi par la réputation de ses centres de recherche dont 30 unités mixtes de recherche.

Située au cœur de Paris et classée parmi les 50 premières universités mondiales, l'ENS-PSL fait dialoguer tous les domaines du savoir, de l'innovation et de la création en formant au plus près de la recherche des chercheurs, ingénieurs, artistes, entrepreneurs ou dirigeants conscients de leur responsabilité sociale, individuelle et collective.

L'ENS-PSL mène une politique dynamique en matière de qualité de vie au travail et d'égalité professionnelle, offrant ainsi un cadre de travail enrichissant et propice au développement et à l'épanouissement professionnel.

Recrute un / une

Post-doc (F/H) – CLIMSEISM project

The CLIMSEISM project will be carried out within the “Laboratoire de recherche conventionné Yves Rocard”. This off-site laboratory is a research program involving teams from the CEA's Department of Analysis, Surveillance and Environment (DASE) (Military Applications Division, CEA/DAM) and the Geosciences Department at ENS-PSL. Its aim is to develop research actions that meet the objectives of the DASE, drawing on the expertise of the teams in the Geosciences Department at ENS-PSL, and in particular the ENS Geology Laboratory, into which the candidate will be integrated.

Human activities, notably the burning of fossil fuels and deforestation, are driving significant alterations in the global water cycle, as documented by the Intergovernmental Panel on Climate Change (IPCC). These changes, manifesting in rising sea levels and increased frequency of Hydro-Meteorological Extreme Events (HME), have far-reaching impacts on millions worldwide, posing substantial mitigation and adaptation challenges. One critical but less recognized effect of climate change is its impact on regional patterns of earthquake recurrence.

HME can cause increased seismic activity by changing the weight distribution of the Earth's crust. For example, melting glaciers due to rising temperatures and changes in precipitation patterns can cause massive shifts in land and water and seasonal inundation of land by water during extreme flood events. In particular, HME load perturbations comparable with tectonic loads can trigger seismic events in inactive intraplate faults away from plate boundaries. Seismic hazard modeling in intraplate faults is poorly constrained as major events in these faults are very rare (1356 Basel, 1692 Verviers, 1755 Lisbon, 1756 Düren, 1887 Nice). Even moderate earthquake events in such faults beneath a major city can cause an extremely high level of destruction, especially if regional seismic hazard maps don't account for such inactive faults.

Ground earthquake monitoring stations observe the fault sliding behavior to help us understand the earthquake recurrence patterns. With increasing sophistication in ground observation techniques such as the Global Navigation Satellite System (GNSS), the accuracy of the kinematic behavior of the fault is improving. Also, using Hydro-meteorological observations (HM), we can monitor the changes in rainfall patterns, which is vital to quantify the change in surface loading due to changing groundwater table levels, droughts, floods, glacier retreating, etc. Scientists are trying to collaborate these observations to determine the causality between HME surface loading and observed seismicity from ground motion and predict the long-term behavior of fault systems due to it. However, developing mechanical models for fault zones and interaction with the surface loading is crucial to establishing causality in two phenomena and providing the evidence needed to convince the scientific community.

In this study, we will adapt existing mechanical models of earthquake cycles in complex fault networks developed at ENS as part of an ERC project PERSISMO (in 2D and in 3D) to account for climate-induced HMEE surface loading on the Earth's surface. This project also addresses part of the questions posed in the ERC project iQuake led at ENS. We will use this mechanical model to simulate earthquake seismic cycles of 100 to 1000 years and quantify the effect of IPCC climate/seasonal HMEE loading predictions on the long-term behavior of such a system.

MISSION PRINCIPALE

The project revolves around the proposed postdoctoral fellow and will involve four main components. We plan to address the following: 1) What is the impact of HMEE on a simplified description of a fault system? 2) How will HMEE affect fault systems in realistic 3D geometries? 3) Are existing numerical models sufficient to tackle HMEE loading? and 4) What should we expect in ground observations to get evidence of causality between HMEE and seismicity? We hope this work will help the research community develop and update the seismic hazard maps of the area to mitigate the impact of HMEE loading in high-risk intraplate regions.

ACTIVITES PRINCIPALES

The candidate is expected to conduct research at an international level, attend international meetings and publish findings in internationally peer reviewed journals.

CHAMPS DES RELATIONS

Internes : Laboratoire de Géologie

Externes : Département Analyse, Surveillance, Environnement (DASE) du CEA (Direction des Applications Militaires, CEA/DAM)

COMPETENCES ATTENDUES

Diplôme : PhD

Expérience professionnelle : At least 1 year of postdoc

Connaissances :

- Continuum Mechanics
- Earthquake Source Physics
- Numerical methods

Compétences techniques :

- Programming in Fortran, C, Matlab, Python and Julia

Compétences comportementales :

- Outgoing personality
- Fluency in English
- Team Player

AUTRES INFORMATIONS

CDD de 2 ans – Rémunération selon grille et expérience

Poste à pourvoir le : 1^{er} janvier 2025

Lieu de travail : Laboratoire de géologie de l'ENS, 24 rue Lhomond, 75005 Paris

MODALITES DES CANDIDATURES

Merci d'envoyer votre dossier complet (CV, lettre de motivation et prétentions salariales nettes mensuelles) avant le 31 octobre 2024

par mail : Harsha S. Bhat bhat@geologie.ens.fr

L'ENS-PSL est un établissement handi-accueillant et attaché à la mixité et à la diversité

Non-discrimination, ouverture et transparence

Les établissements membres de l'Université PSL s'engagent à soutenir et promouvoir l'égalité, la diversité et l'inclusion au sein de ses communautés. Nous encourageons les candidatures issues de profils variés, que nous veillerons à sélectionner via un processus de recrutement ouvert et transparent.