JOB PROFILE : Post-Doctoral researcher in geosciences

PROJECT TITLE: Accounting for aseismic deformation in seismic hazard assessment through numerical modelling approach
INSTITUTION: Univ. Grenoble ALpes (France, Grenoble)
SCIENTIFIC HOSTING DEPARTMENT: ISTerre
CONTRACT DURATION : 12 months
JOB STATUS (Full time or part time): Full time.
CONTRACT STARTING DATE: December 2019
APPLICATION DEADLINE: 28 October 2019
ANNUAL GROSS SALARY : 28800€ - 31200€ according to experience
CONTACT: Erwan Pathier, erwan.pathier@univ-grenoble-alpes.fr

DESCRIPTION:

We are looking for a motivated postdoctoral researcher with interest in understanding the mechanical processes of crustal deformation at the time-scale of the seismic cycle. The project will be focused on aseismic deformation in the upper crust with a main scientific question: can permanent deformation be distinguished from elastic deformation? To address this question, the successful candidate will use numerical modelling approach based on a case study on Taiwan where geologic and geodetic observations are available. The research activity will include implementation of numerical models of at the scale of a fault system of a thrust-and-fold belt with quasi-static approach and typical time-scale ranging from days to seismic cycle time-scale.

Scientific Context

One relevant way to improve earthquake disaster prevention is by improving seismic hazard assessment. A key ingredient in seismic hazard assessment is our knowledge of the slip deficit on active faults that will be released by the next earthquakes on those faults (coseismic slip). Surface deformation measured by geodesy are often used to estimate that slip deficit at depth, assuming that this deformation is caused by an elastic behavior of the rocks.

However in some places, like in the Thrust-and-Fold belt of South-Western Taiwan (a 50km by 70km area), large deformation rate (up to µstrain/year) are observed by geodesy on relatively shallow structures (fault-related folds < 5-8 km depth), which show very low instrumental or historical seismicity. In addition, over the 25 years of geodetic observation, some small-scale (several km) time-dependent and aseismic deformation patterns have also been observed in response to earthquakes whose fault planes are located several tens of km away and not directly connected to the investigated thrust and fold system. This and other geological observations suggest that aseismic non-elastic deformation can occurs. Two main modes of deformation (that can coexist) has been proposed to explain those observations. One corresponds to localized aseismic deformation on interfaces, like fault creep, causing mainly elastic deformation in the surrounding rocks, the other is a bulk permanent deformation due to visco-plastic behaviors (a several-km thick layer of mudstone is said to be prone to such behaviors).

Objectives

The research project aims to answer, through numerical modelling, whether bulk visco-plastic deformation is a key ingredient or not to reproduce the spatial and temporal patterns of deformation

observed by geodesy. This research will be based from our knowledge of the surface displacement field over the last 25 years, including dense spatial measurements by InSAR (Satellite Synthetic Aperture Radar Interferometry), displacement time-series of permanent GNSS (Global Navigation Satellite System) network, and levelling data. Those data will also help to fix the boundary condition of the models. In addition, the geological knowledge of the SW Taiwan will be used to construct the geometry of the model with realistic style of fault-related fold and to set characteristic rock properties (even if the goal of the project is not to reproduce exactly the observations). A quasi-static approach will be used over typical time-scale range from days to earthquake cycle time-scale (100y to Ky), which correspond to relatively small strain.

REQUIRED SKILLS:

The successful applicant must have a PhD degree with a significant research experience in numerical modelling using Finite Element method or Discrete Element Method. The applicant is expected to have knowledge in Earth sciences, ideally in Tectonics and Fault mechanics.
Good knowledge of the written and spoken English language is also expected.

WORKING ENVIRONMENT :

The post-doc research program is for one year starting by the end of 2019. The post-doc researcher will be hosted at ISTerre (https://www.isterre.fr/?lang=en). He/she will be part of the "Seismic Cycle and Transient Deformation" team and but will have opportunities to work with other teams, like the "Fault mechanics" team for instance. He will also join a project with a Taiwanese research team in the framework of the Dragon Gate program project, which aims at "Detecting aseismic slip using repeating earthquakes and seismic swarms, and geodetic measurements". The team include prof. CHEN Hui-Hsuan Kate, prof. HU Jyr Ching, Chen Yao-Chieh (Taiwanese PhD) and Wei-Peng (Taiwanese post-doc).

ELIGIBILITY CRITERIA

Applicants must hold a PhD degree (or be about to earn one) or have a University degree equivalent to a European PhD (8-year duration)

Applicants will have to send an application letter in English and attach:
- Their last diploma
- Their CV
- Letters of recommendation are welcome.

Address to send their application to: erwan.pathier@univ-grenoble-alpes.fr

SELECTION PROCEDURE

Application deadline: **28 October 2019** at 23:59 (CET)

Applications will be evaluated through a three-step process:

1. Eligibility check of applications in 29 and 30 October 2019
2. 1st round of selection: the applications will be evaluated by a Review Board in 31st of October 2019. Results will be given in 1st November 2019.

3. 2nd round of selection: shortlisted candidates will be invited for an interview session in Grenoble on 14 November 2019.

HOST INSTITUTION: Institute of Earth Sciences (ISTerre) at Univ. Grenoble Alpes

ISTerre, a major lab in Earth Sciences in France, is part of one of the major research-intensive French universities. Univ. Grenoble Alpes enjoys an international reputation in many scientific fields, as confirmed by international rankings. It benefits from the implementation of major European instruments (ESRF, ILL, EMBL, IRAM, EMFL*). The dynamic ecosystem, grounded on a close interaction between research, education and companies, has earned Grenoble to be ranked as the 5th most innovative city in the world. Surrounded by mountains, the campus benefits from a natural environment and a high quality of life and work environment. With 7000 foreign students and the annual visit of more than 8000 researchers from all over the world, Univ. Grenoble Alps is an internationally engaged university.

A personalized Welcome Center for international students, PhDs and researchers facilitates your arrival and installation.In 2016, Univ. Grenoble Alpes was labeled «Initiative of Excellence ". This label aims at the emergence of around ten French world class research universities. By joining Univ. Grenoble Alpes, you have the opportunity to conduct world-class research, and to contribute to the social and economic challenges of the 21st century ("sustainable planet and society", "health, well-being and technology", "understanding and supporting innovation: culture, technology, organizations" "Digital technology").

* ESRF (European Synchrotron Radiation Facility), ILL (Institut Laue-Langevin), IRAM (International Institute for Radio Astronomy), EMBL (European Molecular Biology Laboratory), EMFL (European Magnetic Field Laboratory)

Key figures:

- + 50,000 students including 7,000 international students
- 3,700 PhD students, 45% international
- 5,500 faculty members
- 180 different nationalities
- 1st city in France where it feels good to study and 5th city where it feels good to work
- ISSO: International Students & Scholars Office affiliated to EURAXESS