TREAD: ***daTa and pRocecesses in sEismic hAzarD***
Marie Sklodowska-Curie Doctoral Network project

11 PhD positions *will be available soon in the Marie Sklodowska-Curie Doctoral Network "TREAD: data and pRocessess in sEismic hAzarD" project.*

The Project

The aim of TREAD is to train a new generation of researchers to tackle the challenges of earthquake forecasting in complex tectonic settings using integrated observations and physics.

The TREAD objectives are:
(i) to develop a novel integrative approach to seismic hazard analysis in Europe and the Mediterranean from small-scale laboratory experiments to large-scale observations.
(ii) to establish physics-based earthquake modelling bridging time scales from millions of years to fractions of a second in complex tectonic settings.
(iii) to improve the link between earthquake geology, computational modelling and hazard and risk assessment with a focus on the needs of governments, industry and scientific stakeholders.

The Consortium

To reach these objectives the **TREAD consortium** comprises 14 academic and 8 non-academic institutions, of which 8 private partners, of high scientific level, from 7 European countries, covering cutting-edge knowledge and expertise in observational, experimental and modelling fields:

- Università degli Studi di Chieti-Pescara (**Ud'A**), Italy
- Centre National de la Recherche Scientifique (**CNRS**), France
- Universiteit Utrecht (**UU**), Netherlands
- Fondazione GEM (**GEM**), Italy
- Université Grenoble-Alpes (**UGA**), France
- Ludwig-Maximilians-Universität München (**LMU**), Germany
- Universitat de Barcelona (**UB**), Spain
- Università degli Studi di Padova (**UNIPD**), Italy
- Swiss Federal Institute of Technology (**ETH**), Switzerland
- Institut de Sureté Nucléaire et de Radioprotection (**IRSN**), France
- Istituto Nazionale di Oceanografia e Geofisica Sperimentale (**OGS**), Italy
- Istituto Nazionale di Geofisica e Vulcanologia (**INGV**), Italy
- Ruhr University Bochum (**RUB**), Germany
- Institut de Physique du Globe (**IPGP**), France
- Helmholtz Institute Freiberg for Resource Technology (**HZDR**), Germany
- Willis Tower Watson (**Willis**), United Kingdom
- IFP Energies Nouvelles (**IFPEN**), France

- Eléctricité de France (**EDF**), France
- Università degli studi di Milano Bicocca (**UNIMIB**), Italy
- Munich REb (**MUNCHRE**), Germany
- TNO (**TNO**), Netherlands
- TRE-Altamira (**TRE**), Italy
- Aix-Marseille Université (**AMU**), France

Benefits

- TREAD fellows will be employed according to the rules for Doctoral Candidates in MSCA DNs and the general regulations of each host institution.
- The financial package will include the monthly researcher allowances subdivided into 1) *a living allowance* of €3,400 (country correction coefficient applies), 2) *a mobility allowance* of €600 and, 3) a *family allowance* (€660), if applicable. Employer costs and other deductions depend on recruiting host.

Requirements

- MSc, MRes, MEng, or equivalent in Earth Science, Physics, Engineering or a related discipline.
- **Research experience, in particular in the fields of earthquake geology, seismology, computational geophysics or seismic hazard.**
- Interested to work in the field of seismic hazard or risk.
- Appreciation for interdisciplinary work and proactive drive to collaborate across disciplines.
- Proficient in the English language.

Eligibility criteria

- **Supported researchers**: Applicants must be doctoral candidates, i.e., not already in possession of a doctoral degree at the date of recruitment.
- **Mobility rule**: researchers must not have resided or carried out their main activity (e.g., work, studies) in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their recruitment date.
- Other eligibility criteria may apply depending on the recruiting beneficiary.

Selection process

The selection procedure will be open, transparent, merit-based and in line with the Code of Conduct for the Recruitment of Researchers. **The details will be published in January 2023 and the recruitment process will be completed by June 2023.**

The following PhD projects are available:

Project #1: Earthquake timing in complex fault zones: new approaches in paleoseismology.
Main Supervisor: Maria Ortuno (UB) **Co-Supervisor:** Lucilla Benedetti (CNRS-CEREGE)
Location: University of Barcelona (Spain) – www.ub.edu - (duration of the PhD: 3 years)
Objectives: This project aims at improving earthquake chronologies (EQ-Chronologies) with the use of advanced techniques to detect and date paleoearthquakes at a better resolution. Two main types of paleoseismological methods will be used: trenching across a fault and dating of exhumed portions of bedrock scarps. We will test for the first time the hyperspectral imagery (HIS) in paleoseismological studies of active seismogenic faults. Dating events by a more precise location of the bracketing units and the use of advanced chronological techniques (violet stimulated luminescence, ^{36}Cl and U-Th combination, OSL in quartz grain of the fault breccia). Those approaches will improve the spatial resolution of paleoseismological records. The high-resolution DEMs (derived from LiDAR and drone photogrammetry) will help improving the mapping of different fault segments. The expected definition of completer chronologies will allow to better understand the behaviour of the studied faults in the three-particular case-studies (normal faults at the Apennines and the Catalan Coastal ranges and oblique reverse-strike slip faults at the Eastern Betics), serving as a reference for future studies worldwide. Main issues discussed are the characteristics of the seismic cycles, synchronic behaviour among faults and possible triggered events, contributing to a better understanding of the fault system inter-dependencies.
Expected Results: (1) High resolution paleo-earthquake record in two different types of tectonic settings; (2) Workflow for paleoseismological studies to improve paleoearthquake identification and dating resolution.
The doctoral candidate will work in collaboration with CEREGE – Aix Marseille University in France and with Helmholtz Institute Freiberg for Resource Technology in Germany.
Contacts: maria.ortuno@ub.edu; benedetti@cerege.fr

Project #2: Optimizing inversion of InSAR measurements for seismic hazard assessment in complex fault systems using seismo-thermo-mechanical models
Main Supervisor: Erwan Pathier (UGA) **Co-Supervisor:** Ylona Van Dinther (UU), Anne Socquet (UGA)
Location: Université Grenoble-Alpes (France) – www.univ-grenoble-alpes.fr - (duration of the PhD: 3 years)
Objectives: Recent developments in InSAR technology provide unprecedented surface displacement measurements complementing the GNSS permanent network. This offers new opportunities to incorporate geodetic data into seismic hazard assessment in active tectonic areas characterized by complex and distributed fault systems. However, this involves three challenges we aim to assess and overcome in the Central Apennines: (1) separate earthquake cycle from hydrological, and local and regional tectonic signals at different spatial scales, (2) isolate elastic fault loading from visco-elastic relaxation, and (3) extrapolate the decadal geodetic and seismological signal to representative time scales for many earthquake sequences. We will build a map with surface displacements every 200 m and isolate the signals generated by (a) the interseismic loading, (b) earthquakes and associated post-seismic relaxation and (c) seasonal loading. The interseismic velocity map will then be used to invert for more reliable estimates of interseismic fault slip rates and their uncertainties. To do so we assess the potential and limitations and improve the inversion procedure using synthetic surface deformation time-series and Green's functions generated by 2D and 3D seismo-thermo-mechanical (STM) models with realistic rheology and loading that currently resolve the interseismic period. In the last year, we will use developments and simulations to simulate and analyse spontaneous earthquake sequences in the Central Apennines in 2D and 3D to evaluate the temporal variability of surface displacements and earthquake catalogues, correlation between past and current seismic cycle deformation and include it in slip rate and hazard uncertainties.
Expected Results: (1) Surface displacements in the Apennines combining InSAR and GNSS isolating the interseismic deformation signal; (2) Improved geodetic inversion procedures for complex fault system settings, (3) 2D and 3D earthquake sequence simulations using a visco-elasto-plastic rheology, realistic tectonic loading and fault systems for the Central Apennines; (3) Statistical analysis of the simulation and comparison with geodetic observations and seismic catalogues.
The doctoral candidate will work in collaboration with Universiteit Utrecht in Netherlands and TRE Altamira in Italy.
Contacts: erwan.pathier@univ-grenoble-alpes.fr, y.vandinther@uu.nl, anne.socquet@univ-grenoble-alpes.fr

Project #3: The seismic signatures of aseismic processes with deep learning powered monitoring
Main Supervisor: Men-Andrin Meier (ETH Zurich); **Co-Supervisor:** David Marsan (UGA)
Location: Swiss Federal Institute of Technology (Switzerland) – ethz.ch - (duration of the PhD: 3 years)
Objectives: Aseismic processes can play a first-order role in the build-up to large earthquakes, but they are hard to detect and monitor. The strong recent advances in deep learning powered seismic monitoring is an opportunity to fundamentally improve the detection and characterisation of the subtle seismic signatures that aseismic processes leave behind. The doctoral candidate will i) develop new DL methods that are tailored to characterise the seismic signatures of aseismic slip during earthquake sequences, in particular stress migration and rotation, strain acceleration as captured by repeating earthquakes, and fluid pressure build-up as evidenced by seismic swarms; and ii) study the predictive value of aseismic observations for anticipating large earthquakes. We will use some of the recent, exceptionally well recorded earthquake sequences to constrain transient aseismic deformation, including deformation caused by underground fluid flow. From this observational basis we will be able to develop a mixture seismicity model that accounts for the observed triggering of earthquakes by both previous shocks and by aseismic transients. This will allow us to study how the total deformation is partitioned into seismic and aseismic contributions, in space and in time. The goal is to understand the physics of the hard-to-observe aseismic deformation, and to design a seismicity model that provides substantially improved probability gain, compared to state-of-the-art models.
Expected Results: (1) Development and implementation of DL monitoring method to generate next-level, deep seismicity catalogues; (2) Observational monitoring and inference of aseismic deformation, and their underlying driving mechanisms such as fluid flow; (3) Operational seismicity model for predicting the evolution of earthquake sequences; (4) Improved understanding of the interactions between seismic and aseismic deformation mechanisms; (5) Data-driven, objective inference of fault structures and geometries at small, decametre scale.
The doctoral candidate will work in collaboration with Université Grenoble-Alpes in France.
Contacts: menandrin.meier@erdw.ethz.ch, david.marsan@univ-smb.fr

Project #4: Linking fault damage zone mechanical and geometrical characteristics with fault seismic history
Main Supervisor: Lucilla Benedetti (CEREGE - CNRS) **Co-Supervisor:** Giulio Di Toro (UNIPD)
Location: CEREGE – CNRS – Aix Marseille University (France) – www.cerege.fr - (duration of the PhD: 3 years)
Objectives: The objective of this project is to study the links between coseismic slip distribution, fault segmentation and associated damage zones. Indeed, recent studies suggest that such large variations in slip are possibly due to the presence of barrier zones that stop the rupture. The knowledge accumulated by UNIPD on damage zones distribution and their mechanical properties on one hand, and the experience in mapping active faults and acquiring their seismic history gained by CEREGE over the last 10 years, will allow the PhD student to study those links. In particular, the surface expression of the fault based on the quantification of cumulative displacement (e.g. faceted spurs, fault scarps, geological displacement) along with the accurate mapping of the active portions of the fault will allow him/her to relate slip distribution with fault segmentation, damage and their link with inherited structures. Several sites will be selected on faults displaying different damage zone characteristics and fault cumulative displacement (e.g. the Vado di Corno fault, the Roccapreturo fault) in the Apennines, to quantify geometrical characteristics such as fault length, specific geometrical features in the fault surface expression such as bends, steps of a few km, maximum cumulative displacement, thickness of damage zone, degree of fracturation, specific mechanical properties, using high resolution topography based on digital elevation model acquired from Lidar drone or photogrammetry. Moreover, the fault slip-rate and, if the sites are suitable, its seismic history, will be estimated with 36Cl fault scarp dating and dating of offset markers. Those data will allow the PhD student to unravel how fault maturity, coseismic rupture extent and clustering (coefficient of variation between slip rate and earthquake occurrence) are linked. Seismic ruptures scenarios could be proposed for each target areas on the base of those results and adapted to numerical modelling.
Expected Results: (1) relations between fault maturity, coseismic rupture extent and fault slip rate vs. earthquake occurrence; (2) relations between fault damage zone distribution and fault rupture segmentation.
The doctoral candidate will work in collaboration with Università degli Studi di Padova in Italy and Eléctricité de France in France.
Contacts: benedetti@cerege.fr, giulio.ditoro@unipd.it

Project #5: Flow to friction transition and back in carbonate rocks.
Main Supervisors: André Niemeijer (UU), Giulio Di Toro (UNIPD) **Co-Supervisors:** Hans de Bresser (UU), Telemaco Tesei (UNIPD)
Location: Universiteit Utrecht (Netherlands) – www.uu.nl - (duration of the PhD: 4 years)
Objectives: The rheology of carbonates during the seismic cycle, especially in the presence of pressurized fluids and at the viscous-plastic to elasto-frictional transition, remains poorly understood. In the project, we will perform experiments on both intact carbonate rocks as well as fault gouges under conditions where the transition from crystal-plastic flow to frictional behaviour might be activated. Detailed microstructural analyses down to the nanoscale (UU & UNIPD) of the experimental products and comparison with natural fault rocks from the deep roots of fault zones exposed in the Apuane Alps (Italy) and Western Alps (Switzerland) (UNIPD) will allow us to 1) test whether the deformation mechanisms activated in the experiments occur in natural faults, 2) test and update existing calcite paleo-piezometers to estimate the state of stress at earthquake nucleation depths and beyond, 3) define the conditions under which the transition from volume-conservative crystal-plastic deformation to volume-dependent frictional deformation occurs (i.e., viscous-plastic to elasto-frictional transition). Additionally, existing flow laws for creep in fine-grained calcite aggregates that have been used to predict shear strength during seismic sliding will be tested and updated, also for their utilization in other fellow projects on the modelling of the seismic cycle proposed in TREAD.
Expected Results: (1) Identification of the dominant deformation mechanisms across the transition from friction to flow behaviour in experimental and natural carbonate fault rocks; (2) Updated and tested microphysical models (laws) for the full range of velocities encountered in the seismic cycle; (3) Critical assessment of existing paleopiezometers for wet calcite rocks
The doctoral candidate will work in collaboration with Università degli Studi di Padova in Italy.
Contacts: A.R.Niemeijer@uu.nl, giulio.ditoro@unipd.it

Project #6: Formation of fault damage zones in carbonates and their role in the seismic cycle
Main Supervisors: Giulio Di Toro (UNIPD), Alice Gabriel (LMU) **Co-Supervisors:** Manuele Faccenda (UNIPD)
Location: Università di Padova (Italy) – www.unipd.it - (duration of the PhD: 3 years)
Objectives: The doctoral candidate will exploit the rich dataset already available at UNIPD of field studies regarding the spatial distribution of fault damage zones in active faults of the Italian Central Apennines and perform other few selected studies. By means of dynamic rupture earthquake as well as seismic sequence modelling simulations, the mechanism of formation and spatial distribution of fault damage zones will be discussed with respect to (1) the maximum magnitude of the earthquake associated to the studied fault, (2) fault geometry (length, presence of step overs, etc.), (3) lithology of the wall rocks. The earthquake modelling simulations will exploit powerful computational facilities and numerical models (e.g., the discontinuous Galerkin method) which will integrate frictional constitutive laws obtained from the laboratory with realistic fault zone geometries. This approach will result in the identification of the physical, geological and loading conditions which control the propagation of seismic ruptures and the formation and distribution of fault damage zones. Computational facilities are available at UNIPD and LMU both for development, benchmarking and testing of the methodology. This PhD position will provide a young researcher with a quite unique background spanning from field geology to sophisticated numerical modelling. Additional research stays at the Scripps Institution of Oceanography, UC San Diego, are possible.
Expected Results: (1) mechanism of formation of fault damage zones; (2) how the presence of damage zones affects individual seismic ruptures and the evolution of seismic sequences; (3) how the presence of damage zones affects the near field seismic wave radiation and associated strong ground motions.
The doctoral candidate will work in collaboration with Ludwig-Maximilians-Universität München in Germany.
Contacts: giulio.ditoro@unipd.it, gabriel@geophysik.uni-muenchen.de

Project #7: How tectonics affects seismic hazard parameters in complex continental settings
Main Supervisor: Ylona van Dinther (UU) **Co-Supervisor:** Taras Gerya (ETH), Alice Gabriel (LMU)
Location: Universiteit Utrecht (Netherlands) – www.uu.nl - (duration of the PhD: 4 years)
Objectives: Recent 2D tectonic earthquake sequence modelling of the Northern Apennines reveals that realistic tectonic loading and deep structures and rheology have a major impact on earthquake sequences in the upper continental crust. Specifically, the stress field and the type, distribution and rate of earthquakes in Northern Apennines are significantly affected by slab pull and lower crustal rheology, although these are not taken into account in earthquake sequence modelling or seismic hazard assessment. To understand these key features this doctoral candidate will first extend 2D/3D visco-elasto-plastic, seismo-thermo-mechanical models, simulating earthquake sequences following millions of years tectonic, topography and fault evolution, down to milliseconds of earthquakes from strike slip to complex continental settings. To computationally efficiently simulate wave-mediated stress transfer in 3D, faults stress states will be coupled to the dynamic rupture model following recent achievements. Second, these new state-of-the-art models will be applied to spontaneously simulate and understand seismic hazard parameters (i.e., Mmax and b-value) as a function of important tectonic and rheological parameters (e.g., loading by mantle and lower crust, carbonate rheology, fluid flow). Third, a scenario in the Betics will be tightly constrained by observations from field studies, geodesy, seismology and fault geometries, and microphysical friction laws, using instantaneous modelling to assess its seismic hazard and compare those outcomes to more traditional PSHA approaches to converge towards a more physics-inspired PSHA methods.
Expected Results: (1) 2D/3D coupled visco-elasto-plastic tectonic earthquake sequence models for complex continental settings; (2) Improved understanding of how key tectonic and rheological parameters affect seismic hazard parameters in complex continental settings; (3) Data-constrained physics-based scenario for seismic hazard assessment in the Betics.
The doctoral candidate will work in collaboration with Ludwig-Maximilians-Universität München in Germany and TNO in Netherlands.
Contacts: y.vandinther@uu.nl, gabriel@geophysik.uni-muenchen.de

Project #8: Integrating physics-based earthquake rupture models in seismic hazard assessments
Main Supervisor: Alice-Agnes Gabriel (LMU) **Co-Supervisors:** Sebastien Hok and Oona Scotti (IRSN), Yann Klinger (IPGP)
Location: Ludwig-Maximilians-Universität München (Germany) – www.lmu.de - (duration of the PhD: 3 years)
Objectives: Recent, well recorded earthquakes reveal complex fault-ruptures involving many different fault sections. Evaluating the possibility of future complex ruptures in any given fault system remains to this day a major challenge for seismic and surface fault displacement hazard assessments. This project will develop 3D dynamic earthquake rupture scenarios across complex fault systems combining nonlinear frictional failure and seismic wave propagation. Empowered by supercomputing, such models will produce physics-based forecasts of ground motions and surface fault displacement as well as fault interaction, thus providing insight into fundamental processes of earthquake physics. The rich amount of data available in the Central Apennines, Italy, will be used among others to first validate dynamic rupture simulations for chosen recent events integrating data from field work, geodesy, seismology and laboratory data. A special focus will be the characteristics of surface rupture that can shed light on shallow fault rupture processes during earthquakes, which in turn open the way to a better assessment of earthquake surface rupture hazards. This work will use an approach similar to that developed for the modelling of the 2016 Mw7.8 Kaikôura earthquake, New Zealand and the 2016 Norcia, Italy earthquake. In a second step, the doctoral candidate will extract all mechanically viable earthquake rupture scenarios, compute physics-based ground motion models accounting for source/site and path effects, and use this information to construct a range of plausible fault models for hazard assessment using tools such as SHERIFS to explore epistemic uncertainties and OpenQuake Engine to compute seismic hazard at selected sites. Additional research stays at the Scripps Institution of Oceanography, UC San Diego, are possible.
Expected Results: (1) Physically constrained ground motions and surface ruptures including the exploration of non-linear source-path-site effects in complex dynamic earthquake ruptures; (2) Physically viable multi fault rupture scenarios constrained by and validated against available data; (3) Integration of physics-based complex fault rupture scenarios in fault-based seismic and surface fault displacement hazard assessments.
The doctoral candidate will work in collaboration with Institut de Physique du Globe and Institut de Sureté Nucléaire et de Radioprotection in France and Munich-RE in Germany.
Contacts: gabriel@geophysik.uni-muenchen.de, sebastien.hok@irsn.fr, oona.scotti@irsn.fr, klinger@ipgp.fr

Project #9: Modelling synthetic catalogues of earthquake ruptures in complex interacting fault systems

Main Supervisor: Bruno Pace (Ud'A) **Co-Supervisors:** Alessandro Verdecchia (RUB), Laura Peruzza (OGS), Francesco Visini (INGV)

Location: Università degli Studi di Chieti-Pescara (Italy) – www.unich.it - (duration of the PhD: 3 years)

Objectives: The doctoral candidate project will investigate the recurrence times, their variability and probability of occurrences of moderate-to-large magnitude earthquakes in a fault-based 3D model, including coseismic Coulomb stress changes, and time-dependent fluid migration and viscoelasticity. The 3D fault model will mimic complex networks of active faults (e.g. central Apennines or lower Rhine graben). The objective is to build a workflow, computational resources and realistic benchmarks that can be tuned to include alternative inputs. These will simulate synthetic catalogues of earthquake ruptures, including multi-fault ruptures, useful to study how inputs affect the resulting space-time evolution of earthquake series and their epistemic uncertainties. The available earthquake catalogues (instrumental, historical and paleoseismological catalogues) will be used to rank the modelled space-time earthquake series.

Expected Results: (1) Synthetic catalogues of earthquake ruptures; (2) Sensitivity analysis on input variability and uncertainties.

The doctoral candidate will work in collaboration with Ruhr University in Germany and with Istituto nazionale di Oceanografia e Geofisica Sperimentale and Istituto Nazionale di Geofisica e Vulcanologia in Italy.

Contacts: bruno.pace@unich.it, alessandro.verdecchia@rub.de, lperuzza@inogs.it, francesco.visini@ingv.it

Project #10: Modelling distributed seismicity using innovative approaches
Main Supervisor: Marco Pagani (GEM) **Co-Supervisors:** C. Beauval, A. Soquet, D. Marsan (UGA), F. Agliardi (UNIMIB)
Location: GEM Foundation Pavia (Italy) www.globalquakemodel.org- (duration of the PhD: 3 years)
Objectives: In this PhD we aim to address two aspects related to the modelling of distributed seismicity sources. We will test methods that define earthquake occurrence by considering deformation transients (e.g., changes in long-term background rates/coupling or fluid intrusions and related swarms). For example, we will test the definition of time-varying seismicity rates inverted from geodetic data and examine the definition of a strain-dependent corner-magnitude in a tapered Gutenberg-Richter distribution. We will test the methodologies proposed using seismicity models based on ETAS or MISD. In a second part, we will address the problem of combing distributed and fault sources within active areas. Firstly, the doctoral candidate will study the scaling of seismicity occurring in the proximity of faults. In the following phase, they will test various criteria for combing faults and distributed seismicity models and analyze the impact that different approaches have on the spatial pattern of earthquake occurrence and seismic hazard. Overall, the expected results will have an impact on the way in which we model seismic hazard in various tectonic regions and will help to improve the hazard and risk forecasts based on probabilistic methods.
Expected Results: (1) New approaches to define distributed seismicity sources, relying on geological and geodetic information; (2) New methods for combining distributed seismicity and fault sources.
The doctoral candidate will work in collaboration with Université Grenoble-Alpes in France.
Contacts: marco.pagani@globalquakemodel.org, celine.beauval@univ-grenoble-alpes.fr

Project #11: Assessment of the impact of advanced seismic hazard modelling approaches in earthquake risk
Main Supervisor: Vitor Silva (GEM) **Co-Supervisor:** Bruno Pace (Ud'A)
Location: GEM Foundation Pavia (Italy) www.globalquakemodel.org- (duration of the PhD: 3 years)
Objectives: In this project the impact of advanced hazard modelling approaches will be investigated for earthquake scenarios and probabilistic seismic risk. For the earthquake scenarios, historical and hypothetical events will be modelled. We will explore metrics such as the number of collapsed structures, fatalities and economic losses. This part of the project will be performed in close collaboration with public partners of GEM, which have experience with the integration of risk results in disaster risk management. Through a secondment at Ud'A, different time-dependent and fault-based seismic hazard models will be used to assess earthquake losses and select seismic scenarios. On the probabilistic seismic risk counterpart, this doctoral candidate will explore critical risk metrics for the (re)insurance industry such as average annualized losses and probable maximum losses. These metrics will be computed using OpenQuake, thus allowing the scientific community to replicate the results. Different PSHA models will be considered, based on the different modelling techniques. This part of the doctoral candidate project will be performed in collaboration with Willis Limited (with a secondment in UK), who has extensive experience in the development of insurance products. These activities will allow understanding how different hazard modelling techniques affect the risk results, and therefore how risk assessment should be designed, potentially suggesting a review of the existing building codes.
Expected Results: (1) A suite of case studies and openly accessible tools for assessing the impact of different hazard modelling techniques on the earthquake risk. These tools will be incorporated into the existing OpenQuake framework; (2) A set of recommendations to perform earthquake scenarios and probabilistic seismic risk analyses using advanced hazard modelling approaches.
The doctoral candidate will work in collaboration with Università degli Studi di Chieti-Pescara in Italy and Willis Tower Watson in United Kingdom.
Contacts: vitor.silva@globalquakemodel.org, bruno.pace@unich.it