SPIN ESR 2.1: Rock Mechanics and Seismology

Host institution: GFZ Helmholtz Centre Potsdam

Supervisors:

main supervisor: Christoph Sens-Schönfelder
co-supervisor: Georg Dresen

Application deadline: 1st April 2021. Position remains open until filled.
Starting date: 1st July – 1st October

General information

This PhD position is one of the 15 Early Stage Researcher (ESR) positions within the SPIN project (http://spin-itn.eu). SPIN is an Innovative Training Network (ITN) funded by the European Commission under the Horizon 2020 Marie Sklodowska-Curie Action (MSCA).

SPIN will focus on training 15 PhD candidates in emerging measurement technologies in seismology. We will research the design of monitoring systems for precursory changes in material properties, all while optimizing observation strategies. The unique interdisciplinary and inter-sectoral network will enable PhDs to gain international expertise at excellent research institutions, with a meaningful exposure of each PhD to other disciplines and sectors, thus going far beyond the education at a single PhD programme. For further information on the project, please consult our website at: http://spin-itn.eu.

Project description

Time-dependent monitoring of seismic velocity changes in the past decade has shown that the velocity of seismic waves is not constant but varies in response to a number of external drives like precipitation, temperature and deformation from passing seismic waves. Especially the systematic decrease of elastic wave velocities during dynamic deformation and the subsequent recovery that may last for months to years are of interest potentially providing a window into physical processes affecting hazard relevant material properties.

Within SPIN we investigate the different expressions of the complex mechanical behavior of heterogeneous materials in laboratory experiments to develop an empirical and physical description of time variable material properties. A calibrated setup allows to jointly observe changes in wave velocity, attenuation, waveform distortion together with changes in static modulus - both in the fast damage phase when the material is loaded and during the slow recovery phase. Using static loading as well as dynamic loading with oscillatory strain are expected to lead to a strain and strain-rate dependent model for the damage and recovery processes.

The developed concepts are tested against centimeter scale rock-laboratory observations, measurements on meter scale concrete specimens and seismological observations on the decameter to kilometer scale. The results will aid the interpretation of seismological field observations of nonlinear effects in terms of mechanical property changes and may improve time dependent assessment of natural hazards related to material failure.
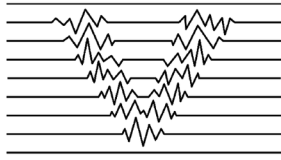
Required skills and experience

We welcome applications from candidates who fulfill the following criteria:

- A completed research-oriented university degree, such as a Master's degree or BSc Hons, in a relevant field (e.g. Geophysics, Physics, ..) The PhD enrollment requirements will depend on the hosting institute, please refer to the individual project descriptions and institute webpages.
- An outstanding academic track record
- An good command of English, both verbal and written
- Dedication and enthusiasm for research, combined with scientific curiosity, reliability and the capacity to teamwork in an interdisciplinary environment.
- Background in seismology wave propagation
- Strong programming ability (python, matlab)
- Motivation to work in an interdisciplinary and international team
- Willingness for research visits of several weeks at partner institutions of SPIN

Please ensure that you fulfill the following **eligibility criteria** for ESR (Early Stage Researcher) positions in H2020 MSCA-ITNs, as ineligible candidates cannot be considered:

https://spin-itn.eu/recruitment/#eligibility-criteria

What we offer

- Intergration in a versatile European Training network with dedicated workshops, research visits and high level of intellectual exchange with your peers and supervisors
- Dynamic, interdisciplinary and international research environment at GFZ
- Close supervision and technical support

Application Procedure

The **application deadline** is 1st April 2021. Application evaluations will start immediately, and will continue until all positions are filled. We wish to reflect the diversity of society and we welcome applications from all qualified candidates regardless of personal background. The selection will be exclusively based on qualification without regard to gender identity, sexual orientation religion, national origin or age.

Applications must include:

- A cover letter in which you describe your motivation and qualifications for the position.
- A CV including relevant competences, skills and publication list, if applicable
- Copies of degree certificate(s) and transcripts of records for previous studies (Bachelor and/or Master). Please indicate expected date of graduation if your Master's degree is not completed
- Contact information of two references
- Completion of the SPIN application form: http://uhh.de/min-spin-apply

Please use the GFZ application form provided at https://www.gfz-potsdam.de/en/career/job-offers/

Applications including the requested documents should additionally be sent in **one single pdf file** with filename `SPIN_YourLastname_YourFirstname.pdf' to spin-applications.min@uni-hamburg.de

Data handling

By applying to a PhD position, you agree that all data concerning your application may be stored electronically and distributed among the supervisors involved in the selection procedure within the MSCA ITN SPIN. If you do not agree, your application can not be processed further, due to the project's centralised recruitment process. The data are used solely for the recruitment process and we do not share information about you with any third party.