

SPIN

MONITORING A
RESTLESS EARTH

SPIN ESR 3.2: Numerical models across the scales

Host institution: Ludwig-Maximilian-University Munich, Germany (LMU)

Supervisors:

main supervisors: Heiner Igel and Alice Gabriel, LMU, Munich
co-supervisor: Yann Capdeville, University of Nantes



Application deadline: 1.4.2021. Position remains open until filled.

Earliest possible starting date: 1.10.2021

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 Skłodowska-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

Objectives: The observations indicative of nonlinear wave propagation as well as experimental concepts involving all motion components recorded by new sensors types (displacement, strain, and rotation) are currently not fully supported by classic 3C modelling schemes. We build on our decades-long experience in developing forward and inverse solutions in computational seismology to adapt computer programs serving the scientific tasks of all work packages in SPIN. In particular we 1) include nonlinear models for wave propagation, 2) provide test data sets to explore sensitivities of various nonlinear rheologies, 3) provide wave simulation scenarios across the scales from laboratory (rock), to local (crust), to global scales (incl. mantle), and 4) use scenario calculations to optimize the experimental design. This project transfers simulation technology to all other work packages and partly builds on the EU project ExaHyPE, that has developed a new scalable solver for large-scale supercomputers, and it links to ongoing collaboration on waves in strongly heterogeneous media (homogenization, CNRS-Nantes). We seek candidates with experience in numerical modeling, interest in theoretical wave propagation, and experience and enthusiasm for programming. The successful candidate will be able to work with implementations of simulation software on parallel supercomputers (e.g., SuperMUC-NG).

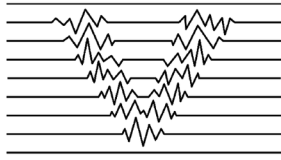
Expected results:

- Improved physical model for material response to stress and dynamic strain, resulting wave propagation



Funded by the European Union's Horizon 2020 research and innovation programme
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- Benchmark synthetic data set for multi-component large-N experiment at LSBB
- Multi-scale open source solver for nonlinear seismic wave propagation problems

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, Earth Sciences, Mathematics, Computational Sciences) 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.
- Experience in programming (ideally with Python), Jupyter notebooks, numerical analysis, parallel computing (if possible)

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>

Application Procedure

The **application deadline** is April 1, 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>

Applications should 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.



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