

## Public Job Advertisement

In October 2015, the DFG Research Training Group “Natural Hazards and Risks in a Changing World” (NatRiskChange) was established at the University of Potsdam and is run in cooperation with the Freie Universität of Berlin, the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Helmholtz Centre for Environmental Research UFZ and the Potsdam Institute for Climate Impact Research (PIK).

NatRiskChange aims to develop methods that improve hazard and risk analyses and quantifications based on the transient, non-stationary nature of hazards and risks in response to changing natural and anthropogenically altered components of the Earth system. Key scientific aims are the development, testing and pilot application of studies on the identification, quantification and prediction/projection of transient natural hazards and associated risks. Floods, earthquakes, and mass movements are of major research interest, but windstorms and wildfires also play a role.

Together with its partners, the University of Potsdam jointly offers the following positions in the DFG-Research Training Group “Natural Hazards and Risks in a Changing World” (NatRiskChange):

### 12 Academic Staff Members (12 PhD-positions, 0.75 part-time at the salary grade E 13 TV-L)

Applicants can apply for up to three of the following topics:

- 324-I10/2021: Point process modelling of induced seismicity (Supervisors: PD Dr. Sebastian Hainzl, GFZ Potsdam; Prof. Dr. Matthias Holschneider, apl. Prof. Dr. Gert Zöller, both University of Potsdam)
- 324-I11/2021: Discrimination of Subglacial Flood Types based on seismological and remote sensing data (Supervisors: Prof Dr. Eva Eibl, University of Potsdam; Dr. Sigrid Rössner, GFZ Potsdam)
- 324-I12/2021: The spatiotemporal signature of extreme rainfall under climate change: cross-scale propagation of effects on flash flood hazard (Supervisors: PD Dr. Maik Heistermann, University of Potsdam; Prof. Dr. Henning Rust, FU Berlin; Mentor: Dr. Gerd Bürger, University of Potsdam)
- 324-I13/2021: Multiple flood experience and social resilience (Supervisors: Prof. Dr. Christian Kuhlicke, UFZ Leipzig & University of Potsdam; Prof. Dr. Annegret Thieken, University of Potsdam)
- 324-Q9/2021: The effect of meteorological hazards on dynamics of vulnerability (Supervisors: Prof. Dr. Henning Rust, Prof. Dr. Uwe Ulbrich, both FU Berlin)
- 324-Q10/2021: Impact of extreme events on topological robustness of interdependent infrastructure networks (Supervisors: Dr. Norbert Marwan, PIK Potsdam & University of Potsdam; Prof. Dr. Bruno Merz, GFZ Potsdam & University of Potsdam)
- 324-Q11/2021: Quantifying the contributions of hazard, exposure and vulnerability changes to flood damage trends (Supervisors: Prof. Dr. Bruno Merz, GFZ Potsdam & University of Potsdam; PD Dr. Heidi Kreibich, GFZ Potsdam & HU Berlin)
- 324-Q12/2021: Contribution of wind and topography on wildfire hazard (Supervisors: Dr. Kirsten Thonicke, PIK Potsdam; Prof. Dr. Henning Rust, FU Berlin)
- 324-Q13/2021: Quantifying changes in exposure, vulnerabilities and risks of pluvial and fluvial floods (Supervisors: Prof. Dr. Annegret Thieken, PD Dr. Maik Heistermann, Dr. Tobias Sieg, all University of Potsdam; Prof. Dr. Fabrice Cotton, GFZ Potsdam & University of Potsdam)
- 324-P8/2021: Changing water and energy conditions and their relevance for water and sediment pulses in Alpine areas (Supervisors: Prof. Dr. Axel Bronstert, Prof. Oliver Korup, PhD, both University of Potsdam)
- 324-P9/2021: Introducing big-data and crowdsourcing to seismic hazard assessment (Supervisors: Prof. Dr. Fabrice Cotton, GFZ Potsdam & University of Potsdam; Dr. Matthias Ohrnberger, Dr. Niels Landwehr, both University of Potsdam)
- 324-P10/2021: Predicting large landslides in a changing climate (Supervisors: Prof. Oliver Korup, PhD, University of Potsdam; Prof. Dr. Jürgen Kurths, PIK Potsdam & HU Berlin, Dr. Norbert Marwan, PIK Potsdam & University of Potsdam)

### Description of the single posts:

#### PhD-Project 324-I10/2021: Point process modelling of induced seismicity

(Supervisors: PD Dr. Sebastian Hainzl, GFZ Potsdam; Prof. Dr. Matthias Holschneider, apl. Prof. Dr. Gert Zöller, both University of Potsdam)

Responsibilities: The PhD project “Point process modelling of induced seismicity” deals with model design for induced and triggered seismicity, which can have fundamentally different characteristics in comparison with natural seismicity. Potential models include stochastic point processes of Hawkes type, like the “Epidemic Type Aftershock Sequences” (ETAS) model, Gauss process models, as well as physics-based seismicity models, e.g. related to rate-and-state dependent dynamics. The goal is the characterization of observed spatiotemporal seismicity, e.g. migration patterns,

and the identification of potential driving mechanisms. A main focus will be the proper statistical treatment and uncertainty assessment, preferably in a Bayesian framework.

Requirements: We are seeking applications from highly motivated candidates with excellent Master's degree in mathematics, geosciences, physics or a related discipline. Programming skills (preferably Python) are mandatory. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are expected.

**PhD-project 324-I11/2021: Discrimination of Subglacial Flood Types based on seismological and remote sensing data** (Supervisors: Prof. Dr. Eva Eibl, University of Potsdam; Dr. Sigrüd Rössner, GFZ Potsdam)

Responsibilities: The PhD-project "Discrimination of Subglacial Flood Types based on Seismological and Remote Sensing Data" aims at defining and differentiating the fingerprints of subglacial floods using a combination of seismological as well as remote sensing tools and observations. The project will start with a dataset of the flood in September-October 2015 in Iceland to quantify the links between the different methods and assess the fingerprint of this event. We will then compare this to other subglacially propagating floods mainly in Iceland from the Skaftá cauldrons and Grímsvötn caldera lake, and in Switzerland at Gornersee and Plaine Morte glaciers. We will assess the link between flood trigger, flood mechanism, tremor amplitude, flood discharge and the possible pressure wave at the beginning of a flood. Methods for this project will involve analyses of seismological data, remote sensing data as well as modelling of lake outburst and flood propagation.

Requirements: We are seeking applications from highly motivated individuals with a strong background in seismology and physics with an interest in remote sensing and interdisciplinary data analysis. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are essential. Experience with seismological software packages, processing of seismological datasets and remote sensing data or modelling is desirable. We expect a solid background in mathematics, physics, programming skills (e. g. Python) and interest in natural hazards such as subglacial floods. A basic knowledge of glaciology or seismic tremor will be of advantage for this post.

**PhD-project 324-I12/2021: The spatiotemporal signature of extreme rainfall under climate change: cross-scale propagation of effects on flash flood hazard**

(Supervisors: PD Dr. Maik Heistermann, University of Potsdam; Prof. Dr. Henning Rust, FU Berlin; Mentor: Dr. Gerd Bürger, University of Potsdam)

Responsibilities: The PhD-project "The spatiotemporal signature of extreme rainfall under climate change: cross-scale propagation of effects on flash flood hazard" is based at the research team "Hydrology and Climatology" of the University of Potsdam. The successful candidate will investigate the effects of global warming on the frequency and amplitude of flash floods and pluvial floods in Germany. To that end, the interaction between spatio-temporal attributes of convective heavy rainfall events (as extracted from weather radar observations) and terrain surface properties will be explicitly taken into account. The candidate will build on previous research to link rainfall event attributes to atmospheric circulation patterns (obtained from climate reanalyses), and hence to detect past and future changes in the occurrence of specific event realisations. E.g., a change towards larger convective cells, would activate runoff generation at larger areas, yet the local terrain would control whether such a larger activation would in fact propagate towards higher peak flows.

Requirements: We are seeking applications from highly motivated individuals with an excellent Master's degree in geocology, hydrology, meteorology, physics, or a related discipline. The candidates are expected to have advanced programming and data analysis skills in Python and R, as well as a strong background in hydrological modelling, DEM analysis and GIS, remote sensing, and statistics. Experiences in working with Linux, parallel processing, and atmospheric model outputs are desirable. The PhD project will be carried out in an interdisciplinary research team. Fluency in the English language (speaking and writing) is mandatory.

**PhD-project 324-I13/2021: Multiple flood experience and social resilience**

(Supervisors: Prof. Dr. Christian Kuhlicke, UFZ Leipzig & University of Potsdam; Prof. Dr. Annegret Thieken, University of Potsdam)

Responsibilities: The PhD-project "Multiple flood experience and social resilience" is based at the Helmholtz Centre for Environmental Research GmbH, UFZ, Department Urban and Environmental Sociology (Leipzig) and at the research team "Geography and Disaster Risk Research" of the University of Potsdam. The PhD-project assesses how multiple flood experience interacts with the resilience of exposed households and communities. The PhD-project will follow a multi-method approach, including advanced statistical analysis of survey data, focus group discussions with members of exposed communities and participatory modelling approaches. By applying different methods, the PhD-project

focuses particularly on interactions between resilience on the level of households and the resilience on the level of communities and how both are shaped by the experience of multiple damaging flood events.

Requirements: We are seeking applications from highly motivated individuals with an excellent Master's degree in geography, sociology, statistics, digital humanities or a comparable field of studies. Advanced statistical as well as modelling skills are essential. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are essential, too. Knowledge of social science research in the field of risk, disaster or environmental studies and high motivation to work in this field of research is beneficial.

#### **PhD-project 324-Q9/2021: The effect of meteorological hazards on dynamics of vulnerability**

(Supervisors: Prof. Dr. Henning Rust, Prof. Dr. Uwe Ulbrich, both FU Berlin)

Responsibilities: The PhD-project "The effect of meteorological hazards on dynamics of vulnerability" is based at FU Berlin. Based on insurance data on losses from meteorological hazards (wind storms and precipitation) in Germany, the successful candidate will investigate effects antecedent weather events may have. Based upon an exploratory data analysis, generalized linear and additive models will be used to quantify effects and separate them from the actual hazard intensity. Wind storm-related relationships will be compared to other hazards, e.g. precipitation. In a second step, it shall be explored if and how strongly official warnings from the German Meteorological Service influence loss amounts, for example through precautionary measures taken to reduce exposure and/or vulnerability.

Requirements: We are seeking applications from highly motivated individuals with an excellent Master's degree in meteorology, physics, or a related discipline. The candidates are expected to have advanced programming and data analysis skills (R, Julia, Python or similar), as well as a solid background in meteorology and statistics. Experiences in working with Linux and atmospheric model outputs are desirable. The PhD project will be carried out in an interdisciplinary research team. Fluency in the English language (speaking and writing) is mandatory.

#### **PhD-project 324-Q10/2021: Impact of extreme events on topological robustness of interdependent infrastructure networks**

(Supervisors: Dr. Norbert Marwan, PIK Potsdam & University of Potsdam; Prof. Dr. Bruno Merz, GFZ Potsdam & University of Potsdam)

Responsibilities: The PhD-project "Impact of extreme events on topological robustness of interdependent infrastructure networks" is based at the research department "Complexity Science" at PIK Potsdam. The aim of the project is to investigate several aspects of robustness and vulnerability of interdependent infrastructure networks during local and large-scale disruptive (extreme weather) events and due to potential changes in the occurrence and synchronization of such extreme events. Changes and transitions in the extent, directionality, and redundancy in the networks will be modelled using conceptual network models and estimated from real infrastructure networks, whereas disruptive events will be derived from past observations and from a flood modelling chain. The study will further attempt to develop measures for improving the resilience of the infrastructure networks. Methods for this project will involve networks of networks, recurrence analysis, and Bayesian statistics.

Requirements: We are seeking applications from highly motivated individuals with a strong background in physics or mathematics, statistics, and data analysis as well as very good knowledge and experience in programming (preferably Python or Julia). Knowledge on hydro-meteorological processes is desirable. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are essential.

#### **PhD-project 324-Q11/2021: Quantifying the contributions of hazard, exposure and vulnerability changes to flood damage trends**

(Supervisors: Prof. Dr. Bruno Merz, GFZ Potsdam & University of Potsdam; PD Dr. Heidi Kreibich, GFZ Potsdam & HU Berlin)

Responsibilities: The PhD-project "Quantifying the contributions of hazard, exposure and vulnerability changes to flood damage trends" is based at the section Hydrology at GFZ Potsdam. Understanding and quantifying the drivers of temporal changes in disaster damage is an important but weakly developed scientific field. The PhD-project is expected (1) to provide methodological progress and novel insights in the possibilities and limitations of attributing observed damage changes to the underlying drivers, and (2) to attribute the changes in river flood damage for Germany for 1951-today to the important drivers.

Requirements: We are seeking applications from highly motivated individuals with a strong background in quantitative methods (e.g. environmental engineering) and very good knowledge in programming. Good knowledge of hydro-meteorological processes and simulation methods is desirable. Fluency in the English language as well as the willingness to work in an interdisciplinary team are essential.

#### **PhD-project 324-Q12/2021: Contribution of wind and topography on wildfire hazard**

(Supervisors: Dr. Kirsten Thonicke, PIK Potsdam; Prof. Dr. Henning Rust, FU Berlin)

**Responsibilities:** Based on observations of meteorological conditions, specifically wind speed, vegetation status (fuel composition and dryness), and on topographical information, the successful candidate will investigate the environmental conditions that led to recent fire extremes in Europe using exploratory data analysis. In a second step, the successful candidate will use this new knowledge to develop and incorporate a respective modeling function into the established, process-based fire model SPITFIRE which is embedded in the dynamic global vegetation model LPJmL. The improved model should then be used to simulate changes in fire interacting with vegetation to analyse future risk of fire extremes that lead to extreme ecosystem impact under climate change.

**Requirements:** We are seeking applications from highly motivated individuals with an excellent Master's degree in meteorology, physics, or a related discipline in environmental sciences with strong modeling background. The candidates are expected to have data analysis (statistical methods) and advanced programming skills (R, Julia, Python, or similar for data analysis), as well as a solid background in environmental physics and meteorology. Experiences in working with Linux, C and version control software, in setting up extended simulation experiments and in analysing atmospheric model outputs are desirable. The PhD-project will be carried out in an interdisciplinary research team. Fluency in the English language (speaking and writing) is mandatory. We expect willingness to travel for work to present scientific results in workshops and scientific conferences.

#### **PhD-project 324-Q13/2021: Quantifying changes in exposure, vulnerabilities and risks of pluvial and fluvial floods**

(Supervisors: Prof. Dr. Annegret Thieken, PD Dr. Maik Heistermann, Dr. Tobias Sieg, all University of Potsdam; Prof. Dr. Fabrice Cotton, GFZ Potsdam & University of Potsdam)

**Responsibilities:** The PhD-project "Quantifying changes in exposure, vulnerabilities and risks of pluvial and fluvial floods" is based at the research team "Geography and Disaster Risk Research" of the University of Potsdam. The aim of this PhD-project is to quantify changes in exposure of urban areas and assets towards different types of flooding based on available land use data, including open building data sets (OSM). For future scenarios, the application of land use models and the transfer of their meso-scale output to the micro-scale (i.e. creation of typical building patterns) is foreseen. For the final risk analysis, exposure data will be combined with hazard scenarios and vulnerability models. Implications of (past and potential future) changes in risk for land management should be discussed with stakeholders.

**Requirements:** We are seeking applications from highly motivated individuals with an excellent Master's degree in environmental sciences, hydrology, geomatics, geography, data sciences or related fields with a strong background in GIS, machine learning, statistics and modelling. Programming skills are essential. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are essential. We expect a strong interest in flood vulnerability, exposure and risk research.

#### **PhD-project 324-P8/2021: Changing water and energy conditions and their relevance for water and sediment pulses in Alpine areas**

(Supervisors: Prof. Dr. Axel Bronstert, Prof. Oliver Korup, PhD, both University of Potsdam)

**Responsibilities:** The PhD-project "Changing water and energy conditions for alpine surface areas regarding water and sediment events" is based at the research groups "Hydrology and Climatology" and "Natural Hazards" at UP. The overall aim of the project is to learn more about the system dynamics of cascading meteo-/hydro-/geomorphological events, composed of heavy rainfall (or snow melt), heavy runoff, soil saturation and mass movements. The research work will include: establishing a data base on heavy sediment events and corresponding event and site conditions; comparison of different sediment flow event types by pattern analysis of suspended sediment time series; exploring the feasibility of novel satellite products and UAV technology to derive relevant surface information on soil water and temperature; and modelling of surface water and energy dynamics for key surface areas to create the methodological basis for regional transfer and prediction for future climatic conditions.

**Requirements:** We are seeking applications from highly motivated individuals with a strong background in some of the following research areas: hydrology, geomorphology, statistical and data analysis as well as proven experience and good knowledge in programming. Experience or at least motivation for field campaigns in the Austrian Alps (including their planning) is desirable. Fluency in the English language as well as the willingness to work in an interdisciplinary team are essential.

#### **PhD-project 324-P9/2021: Introducing big-data and crowdsourcing to seismic hazard assessment**

(Supervisors: Prof. Dr. Fabrice Cotton, GFZ Potsdam & University of Potsdam; Matthias Ohrnberger, Dr. Niels Landwehr, both University of Potsdam)

**Responsibilities:** The PhD-project "Introducing big-data and crowdsourcing to seismic hazard assessment" is based at the research teams "General Geophysics" of the University of Potsdam and "Seismic Hazard and Risk Dynamics" of the

GFZ German Research Centre for Geosciences. The recruited person will be in charge of testing, analysing and exploring the new datasets, e.g. using methods (e.g. Machine learning) which have been developed by the team recently (R and Python codes, Jupyter notebooks), but also suggest/develop innovative processing strategies and new ideas to use these data to improve ground-motion and hazard models.

Requirements: We are seeking applications from highly motivated candidates with excellent Master's degree in mathematics, geosciences, physics or a related discipline. Programming skills are mandatory. We expect a solid background in seismology, statistics, signal processing, and interest in the quantitative assessment of hazards and the application/development of new machine learning methods. The PhD-project will be carried out in an interdisciplinary research team. Fluency in the English language (speaking and writing) is mandatory.

**PhD-project 324-P10/2021: Predicting large landslides in a changing climate** (Supervisors: Prof. Oliver Korup, PhD, University of Potsdam; Prof. Dr. Jürgen Kurths, PIK Potsdam & HU Berlin, Dr. Norbert Marwan, PIK Potsdam & University of Potsdam)

Responsibilities: The PhD-project "Predicting large landslides in a changing climate" is based at the research team "Geohazards" of the University of Potsdam. The PhD-project aims at developing methods to identify from existing landslide catalogues those landslides that have the highest likelihood of having had a rainfall trigger, and thus separate them from co-seismic landslides. Methods for this project will involve the analysis of large and partly inhomogeneous landslide inventories from selected mountain belts using complex spatially embedded networks, and probabilistic classification methods using Bayesian Reasoning and Machine Learning.

Requirements: We are seeking applications from highly motivated individuals with a strong background in quantitative geosciences, remote sensing, engineering geology, or landslide research. Fluency in the English language (speaking and writing) as well as the willingness to work in an interdisciplinary team are essential. Experience with statistical software and learning, processing of large and in-homogeneous geodata is desirable. We expect a solid background in mathematics, programming skills, and interest in the quantitative assessment of geohazards and -risks. Basic knowledge of time-series analysis, data mining or machine learning, and modern risk concepts will be of advantage for this post.

Responsibilities and requirements depend on the PhD-project and are outlined on the website <http://www.uni-potsdam.de/en/natriskchange/index/job-opportunities.html>. Candidates can apply for up to three projects and shall explain their motivation for choosing them. The PhD-posts are part-time (75%), fixed-term employment contracts for 3 years. The salary scale is TV-L E13. Employment in all positions shall begin on 1<sup>st</sup> October 2021. Handicapped applicants will be given preference in case of equal suitability. The NatRiskChange consortium strives to increase the proportion of women in research and specifically encourages females to apply for these positions.

Applications should include the following components: CV, letter of motivation, research interests (specific interests and research plan for PhD-project), a record of studies, master and bachelor certificates including a transcript of records, two letters of recommendation as well as an English language certificate. Applications can only be submitted in one single PDF-file through <https://www.geo-x.net/natriskchange/>. Deadline for applications is **15<sup>th</sup> May 2021**.

Potsdam, 31<sup>st</sup> March 2021