Call for Applications: 2 PhD Positions for International Doctoral Candidates

The Graduate School for Climate and Environment (GRACE) at Karlsruhe Institute of Technology (KIT) invites applications for two PhD research projects for non-German doctoral candidates, which can be financed by the Graduate School Scholarship Programme (GSSP) of the German Academic Exchange Service (DAAD). The PhD projects start in 2025. Applicants can choose between the two research topics proposed below.

Proposed Research Topics

Topic A: Ground-based remote sensing of low-level clouds and fog

Supervisor: Prof. Dr. Jan Cermak (IMK ASF and IPF)

Water vapor and clouds play an essential role in the climate system, as clouds reflect solar radiation on the one hand and both retain thermal radiation in the earth-atmosphere system on the other. In addition, they are directly related to each other, as air saturated with water vapor, usually in the presence of aerosol particles, can turn into clouds and vice versa. Furthermore, they directly impact ecosystems by their radiation impacts and potential water provision.

The aim of this research topic is the analysis of fog and low cloud life cycle stages and how they link the biosphere and the climate system by using ground-based remote sensing measurements. With the instruments of the Karlsruhe Low-Cloud Exploratory Platform (KLOCX) as part of the European network Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS), cloud properties are recorded (ceilometer, cloud radar), vertical profiles of temperature and humidity and the liquid water path are measured (microwave radiometer), the atmospheric aerosol load is detected (solar photometer), long- and shortwave radiation components are measured (pyrano- and pyrgeometer), and the droplet size and liquid water distribution in clouds are quantified (cloud radar, GFAS). These measurements can be used for the identification of life cycle stages of fog and low clouds, an in-depth analysis of water vapor and radiation impacts on the individual life cycle stages, and a quantification of water available to ecosystems.

The selected candidate will be part of the ACTRIS team within the Satellite Climatology group at the Institute of Meteorology and Climate Research - Atmospheric Trace Gases and Remote Sensing (IMK ASF) at KIT.

Specific profile for this research topic

- Above-average Master's degree or equivalent in meteorology, climate science, earth sciences, or related discipline
- Interest in fog and low-level clouds
- Interest in working with observational data and instruments
- Excellent teamwork skills

Topic B: Atmospheric correction of Ground-Based SAR (GBSAR) measurements using a meteorological low-cost sensor network

Supervisor: Prof. Dr.-Ing. Stefan Hinz (IPF)

Water vapor is the meteorological quantity whose modeling and prediction is least reliable. At the same time, it is the most relevant parameter that deteriorates high precision geodetic measurements in the field. This is especially true for observations in mountainous regions, where water vapor exhibits a very high degree of spatial and temporal variability. In the joint project on Dams and Induced Seismicity (DAMAST), an extensive measuring field was installed in the vicinity of the Enguri Dam in the southern Caucasus (Georgia), which includes, besides the GBSAR, GNSS antennas and around 30 meteorological multi-sensor low-cost stations. The sensors are supplemented by cameras in the optical and infrared channels as well as by high-resolution satellite data.

The aim of this research topic is to obtain the distribution of water vapor by means of machine learning approaches and to improve atmospheric correction beyond standard approaches. The research work is expected to contribute in two ways: (i) the separation of atmospheric influences from GBSAR observations to correct the runtime delays of GBSAR and other geodetic methods and to increase their quality and significance and (ii) providing a high-resolution water vapor field estimate by means of tomographic approaches, which can be used in further studies on local climate and water vapor in alpine mountain valleys.

The selected candidate will join the Radar group at the Institute of Photogrammetry and Remote Sensing (IPF) at KIT.

Specific profile for this research

- Above-average Master's degree in a relevant field, such as geodesy, geophysics, geoinformatics or computer science
- Strong academic background in signal processing, radar imaging or remote sensing
- Proficiency in image processing and machine learning
- Interest in working with Radar instruments and data
- Excellent teamwork skills

Formal requirements for both PhD projects

- Completed Master's degree (or equivalent) at the starting date of the scholarship/ preparatory German course
- Graduation no more than six years prior to nomination (exceptions apply, see DAAD website)
- Non-German citizenship and no residency in Germany for more than the past 15 months before nomination
- No completed PhD degree
- Proficiency in English

What we offer

- International and interdisciplinary research environment with access to the latest research infrastructure
- Possibility for DAAD full scholarship for up to four years (for details see GSSP Guidelines and Information)
- Structured doctorate at the graduate school GRACE

- 3-months research stay at another research institute
- Additional funding for attending conferences, summer schools and training events
- Preparatory German course (if available and applicable)

Application documents

- Letter of motivation, including the chosen research topic
- Curriculum vitae
- Bachelor and Master degree certificates and certificates on annual examinations taken at the home university (transcript of records in original language and English translation) including grades and explaining the home university's grading system (explanation of grading system)
- Documents certifying English language skills
- List of publications (if applicable)
- Names and contact information of two referees willing to provide a recommendation letter upon request

Please send your application exclusively in PDF format by e-mail to application@grace.kit.edu. The application deadline is February 2, 2025.

Application process for a DAAD scholarship

The scholarship awardees will be selected in a two-step process. After applying at the graduate school GRACE, suitable candidates will be nominated for the scholarship and asked to upload their application in the DAAD portal. The DAAD is responsible for awarding and administering the scholarships.

Timeline

- Application deadline: February 2, 2025
- Selection of nominees and submission of application documents by nominated candidates via DAAD portal until end of February 2025
- Start of the PhD project: 2025 (April at the earliest)

Further Information

If you have questions regarding application documents and the application process, please contact GRACE Management at application@grace.kit.edu.

For further information on the proposed research topics, please contact:

- Dr. Jutta Vüllers (jutta.vuellers@kit.edu) for **topic A** or
- Dr.-Ing. Andreas Schenk (andreas.schenk@kit.edu) for **topic B**.