

## PhD project: A land surface-subsurface monitoring system for the African continent

The Helmholtz School for Data Science in Life, Earth and Energy (HDS-LEE) provides an interdisciplinary environment for educating the next generation of data scientists in close contact to domain-specific knowledge and research. All three domains – life & medical sciences, earth sciences, and energy systems/materials – are characterized by the experimental generation of huge heterogeneously structured data sets, which have to be evaluated in order to obtain a holistic understanding of very complex systems.

As a member of the Helmholtz Association, Forschungszentrum Jülich makes an effective contribution to solving major challenges facing society in the fields of information, energy, and bioeconomy. It focuses on varied tasks in the area of research management and utilizes large, often unique, scientific infrastructures. Come and work with around 5,900 colleagues across a range of topics and disciplines at one of Europe's largest research centres.

### Project overview

The PhD-candidate will set-up an ensemble of runs with the model TSMP-PDAF for the African continent, which simulate water, energy and biogeochemical cycles for the subsurface and land surface including multiscale assimilation of various remote sensing products. The simulations allow the quantification of the impact of land use land cover change and human water use on the changes of the terrestrial water, energy and carbon cycles over the African continent, conditioned to remotely sensed satellite products. In order to explore the large amount of output data generated by the ensemble simulations at high spatial resolution (>100 TB), parallel big data analytical methods are an important tool. Besides classical uni-, bi- and multivariate statistics, and time series analysis, also methods suited to detect more complex patterns in space and time like wavelet analysis and machine learning (ML) algorithms will be used.

We are looking for a PhD-student (f/m) in simulation sciences to work within the HDS-LEE project linked to the Helmholtz graduate school for data science. The successful candidate will model the water, energy and carbon cycles over Africa with the terrestrial systems model TSMP-PDAF.

### Your Job:

- Set-up ensemble of TSMP-models over the African continent
- Further develop continental-scale data assimilation system
- Perform simulation runs including data assimilation analyzing the impact of land use land cover change, human water use and soil property uncertainty
- Perform extensive analyses of the simulation results using big data analytics methods
- Contribute to an international research team, publish in international journals and present results at international conferences

### Your Profile

- University degree in either simulation sciences, applied mathematics, geosciences, physics, civil engineering or computer science
- A high level of scholarship as indicated, for example, by bachelor and master study transcripts and two reference letters
- Experience in modeling, data analysis
- Knowledge on inversion or data assimilation is a clear advantage
- Programming skills like Python, R, Fortran or C/C++ and experience with HPC-systems are also a clear advantage
- Ability to work independently as well as collaboratively in an international, interdisciplinary team; good communication and organizational skills
- Very good command of the English language: TOEFL or equivalent evidence of English-speaking skills
- Excellent communication and organizational skills

### Our Offer

- HDS-LEE program with comprehensive training courses, e.g. in parallel computing, machine learning and deep learning, visualization, and scientific computing
- Outstanding scientific and technical infrastructure – ideal conditions for successfully completing a doctoral degree
- A highly motivated group as well as an international and interdisciplinary working environment at one of Europe's largest research establishments
- Chance of participating in (international) conferences and project meetings
- Continuous scientific mentoring by your scientific advisor
- Doctoral degree conferred by RWTH Aachen University
- Further development of your personal strengths, e.g. via a comprehensive further training programme
- Pay in line with 100 % of pay group 13 of the Collective Agreement for the Public Service (TVöD-Bund)

Forschungszentrum Jülich aims to employ more women in this area and therefore particularly welcomes applications from women.

We also welcome applications from disabled persons.

Apply at: [http://www.fz-juelich.de/SharedDocs/Stellenangebote/\\_common/dna/2019D-121-EN-IBG-3.html?nn=718260](http://www.fz-juelich.de/SharedDocs/Stellenangebote/_common/dna/2019D-121-EN-IBG-3.html?nn=718260)

Apply until: 31<sup>st</sup> May 2019

Starting date: 1<sup>st</sup> July 2019