



Conducting research for a changing society: This is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association, we aim to tackle the grand societal challenges of our time and conduct research into the possibilities of a digitized society, a climate-friendly energy system, and a resource-efficient economy. Work together with around 7,500 employees in one of Europe's biggest research centres and help us to shape change!

Apply your data science skills to real-world challenges!

At the Helmholtz School for Data Science in Life, Earth and Energy (HDS-LEE), we train the next generation of data scientists to tackle key global issues in domain sciences such as life, earth or energy. Learn more at [www.hds-lee.de](http://www.hds-lee.de)

In the air quality and emission optimization group at the Institute of Climate and Energy systems - Troposphere (ICE-3) we answer current challenges on the health impact of air pollutants. For this, we follow an integrated approach of combining high resolution modelling with big data and machine learning applications. Our work is focussed on understanding how human activities influence air quality.

Further information on the project is available at:  
<https://www.hds-lee.de/admission/openpositions/>

**We are offering a**

## **PhD position - Machine learning based assimilation of satellite data to improve air quality predictions (HDS-LEE graduate school)**

### **Your Job:**

Remote sensing data from satellites are an extremely valuable information source to improve air quality predictions. They monitor aerosol and trace gases often with global coverage, which is far beyond in-situ observational networks. However, the accuracy of satellite retrievals depends on several assumptions leading to biased observations.

- The aim of the PhD-project is to overcome this limitation in the use of satellite observations by make a direct use of radiance observations retrieved by satellites using machine learning without the need of radiative transfer calculations. The new

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application via our

**Online-Recruitment-System!**

**Questions about the vacancy?**

Get in touch with us by using **our contact form**.

Please note that for technical reasons we cannot accept applications via email.

[www.fz-juelich.de](http://www.fz-juelich.de)

model will be developed using the example of the novel Earth Explorer EarthCARE and will be integrated as observation operator to the sophisticated data assimilation system of the EUROpean Air pollution Dispersion – Inverse Model (EURAD-IM).

The PhD project will be conducted in the atmospheric modeling group of the Institute of Climate and Energy Systems (ICE-3) at Forschungszentrum Jülich and the Meteorological Institute at the University of Cologne. At ICE-3 detailed investigations of the emission of atmospheric constituents are performed using the 4-dimensional variational (4D-var) data assimilation method implemented into the EURAD-IM. In atmospheric chemistry modeling, the 4D-var method is a powerful tool to assess the state of the atmosphere and the corresponding emissions that are in compliance with observations. The AWARES group at the University of Cologne provides extensive expertise in remote sensing and radiative effects in the atmosphere. To include the observations in the assimilation procedure, so called observation operators, mapping the model state to the observation space, are essential.

- Within the project, the direct use of radiance measurements from EarthCARE will be explored by developing a machine learning model that directly maps the radiances on the aerosol properties. Thus, the modelling framework of the EURAD-IM will be enabled to use radiance assimilation for operational services.

The innovative application of machine learning to exploit satellite data within numerical modelling links to other scientific applications beyond those of the atmosphere. The project builds on strong cooperation between ICE-3, the University of Cologne and other partners within and outside Forschungszentrum Jülich, which provides an ideal fundament to combine competences across different disciplines (meteorology, environmental science, high performance computing, software development and data science).

### **Your Profile:**

Mandatory qualifications are:

- M. Sc. degree in meteorology, physics, mathematics, or a related field
- Good knowledge in data handling and machine learning
- Good knowledge in software development and data processing and visualization with Python
- Strong interest in atmospheric physics and chemistry
- Outstanding organizational skills and the ability to work independently
- Very good cooperation and communication skills and ability to work as part of a team in an international and interdisciplinary environment

### **Our Offer:**

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! This HDS-LEE PhD position will be located at Forschungszentrum Jülich and University of Cologne. We offer ideal conditions for you to complete your doctoral degree:

- Outstanding scientific and technical infrastructure
- A highly motivated group as well as an international and interdisciplinary working environment at one of Europe's largest research establishments
- Continuous scientific mentoring by your scientific advisors
- Chance of participating in (international) conferences
- Unique HDS-LEE graduate school program (including data science courses, soft skill courses and annual retreats) <https://www.hds-lee.de/about/>
- Qualification that is highly welcome in industry
- Further development of your personal strengths, e.g. via a comprehensive further

training program; a structured program of continuing education and networking opportunities specifically for doctoral researchers via JuDocS, the Jülich Center for Doctoral Researchers and Supervisors: <https://www.fz-juelich.de/judocs>

- 30 Days of annual leave and flexible working arrangements, including partial remote work
- Targeted services for international employees, e.g. through our International Advisory Service

The position is initially limited to three years, with a planned one-year extension. Pay in line with 75% of pay group 13 of the Collective Agreement for the Public Service (TVöD-Bund) and additionally 60 % of a monthly salary as special payment („Christmas bonus“). The monthly salaries in euro can be found on the BMI website: <https://go.fzj.de/bmi.tvod.entgelt> Further information on doctoral degrees at Forschungszentrum Jülich (including its various branch offices) is available at <https://www.fz-juelich.de/en/careers/phd>

Further information on doctoral degrees at Forschungszentrum Jülich including our other locations is available at: [www.fz-juelich.de/gp/Careers\\_Docs](http://www.fz-juelich.de/gp/Careers_Docs)

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us. The following links provide further information on diversity and equal opportunities: <https://go.fzj.de/equality> and on specific support options for women: <https://go.fzj.de/womens-job-journey>