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!

Understanding biogeochemical and hydrological processes in terrestrial systems is critical to cope with climate and land-use change as key drivers influencing terrestrial environmental systems that will need to be managed by society in the coming decades. The subinstitutes Agrosphere (IBG-3) and Bioinformatics (IBG-4) of the Institute of Bio- and Geosciences (IBG) connect process-based and data-driven modeling for understanding, predicting and adapting water, energy and matter exchange processes in the soil-plant-atmosphere continuum with structure-based bioinformatics focusing on understanding, predicting and modulating of the dynamics and interactions of biomolecules. This collaborative interdisciplinary research bridges spatio-temporal scales from molecules to soil-plant systems. It contributes to a fundamental understanding of high-dimensional data and functioning of biomolecules in life sciences and bioeconomy to enable sustainable and resource-conserving use of soils and water under climate and land-use changes in terrestrial ecosystems.

We are offering an interesting

PhD position - Analysis and modeling of biomolecule functioning in soil systems towards digital twinning of sustainable carbon farming

Your Job:
The work is part of the joint project "Towards sustainable production by regenerative agriculture and agroecology in a changing climate" (ReGenFarm). Together with Bayer Crop Science, IBG-3 and IBG-4 work in action field 4 to establish a molecular basis of carbon storage in soil. The research relates structural-physical properties with chemical and biochemical analyses at the molecular level to identify biomolecules (organic "glue" compounds) that promote soil structure and carbon storage. These data will be connected with genetic pathways of microorganisms that produce them to establish a robust functional baseline of "glue" compound production in healthy soil. This

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

pathway-focused reference enables the identification of novel microbial biosynthetic gene clusters, fostering our understanding of how genomic architectures drive soil carbon sequestration and will highlight microbial biodiversity suited to specific soils and climates, paving the way for more sustainable soil management practices.

Within this framework you will:

- extend and use a process-based modeling approach which explicitly represents microorganisms and biomolecule functioning in soil systems.
- use process-based modeling and machine learning to establish a modeling framework that uses omic data for providing effective degradation rates of biomolecules and predictions of their impact on soil organic matter turnover, which will be used to inform the digital twin for regenerative agriculture developed in action field 1 of ReGenFarm.
- work in an interdisciplinary team with other doctoral and postdoctoral researchers within action field 4 and other action field of the ReGenFarm.

Your tasks in detail:

- Extend a bioenergetic process-based model to include the decomposition of specific biomolecules and their effects on soil organic matter cycling
- Literature research and (meta-)analysis to provide evidence-based knowledge for model parameterization
- Quantify the coupled carbon and energy turnover of specific biomolecules (carbohydrates and proteins) in short-term decomposition experiments
- Model conditioning with integrated biogeochemical and omic data on carbon cycling in soil
- Derive effective process descriptions and model approaches for the integration with the digital twin for regenerative agriculture
- Perform scenario simulations and analyze simulation results
- Present and publish results at conferences and in peer-reviewed journals

Your Profile:

- Master’s degree in soil chemistry, bioengineering, biochemistry, bioinformatics, or applied mathematics
- Hands-on experience in using differential calculus
- Solid knowledge in soil physics, microbial ecology, plant nutrition, plant physiology, plant ecology, biochemistry, and/or bioinformatics
- Strong interest in using process-based mathematical modeling to simulate biogeochemical processes related to carbon cycling in the soil-plant system
- Experience with Bayesian inference and machine learning is an asset
- Ability to work independently and cooperatively as part of an interdisciplinary team
- Very good communication and organizational skills
- Very good command of the English language

Please feel free to apply for the position even if you do not have all the required skills and knowledge. We may be able to teach you missing skills during your induction.

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! We offer ideal conditions for you to complete your doctoral degree:

- Competent and interdisciplinary working environment, as well as an excellent framework in the areas of experiments and modelling
- Vibrant international work environment on an attractive research campus, ideally

situated between the cities of Cologne, Düsseldorf and Aachen
- Attendance at national and international conferences and workshops
- Possibility for further scientific and technical training through international experts
- Exceptional research infrastructure
- Flexible working hours
- 30 days of annual leave and provision for days off between public holidays and weekends (e.g. between Christmas and New Year)
- Special services for international employees through our International Advisory Service
- Further development of your personal strengths, e.g. through an extensive range of training courses; 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/en/judocs

The employment of doctoral researchers at Jülich is governed by a doctoral contract, which usually has a term of three years. Pay is in line with 65% 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.tvoed.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

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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.

Further information on diversity and equal opportunities: https://go.fzj.de/equality