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Two Fully Funded PhD Positions in Climate Dynamics

Understanding Climate Tipping Points Through Earth System Modeling, Machine Learning, and Dynamical Systems Theory

The School of Environmental Studies at Queen's University invites applications for two fully funded PhD positions beginning September 1, 2027. The projects will investigate the dynamical mechanisms underlying climate tipping points and transitions between alternative climate states by combining Earth system modeling, reduced-complexity modeling, machine learning, and dynamical systems theory. The overarching research goal is to understand how and why the climate system can transition between different states, and whether the mathematical and dynamical mechanisms underlying such transitions can be identified in complex Earth system models. Rather than treating Earth system models as black boxes, the projects will use reduced-complexity models and dynamical systems approaches to investigate climate feedbacks, stability, multiple equilibria, and tipping behavior. Each position provides guaranteed minimum funding of $35,000 per year for four years, consisting of a combination of Queen's Graduate Award, teaching assistantships, and supervisor-supported research funding.

PhD Project 1: Reduced-Complexity Modeling for Paleoclimate Dynamics

This project will investigate the dynamics of past climate states and abrupt climate transitions. The research will combine Earth system model simulations with the development and analysis of reduced-complexity dynamical models. The student will investigate questions related to climate equilibria, stability, feedbacks, and the mechanisms that can lead to transitions between alternative climate states.

PhD Project 2: Reduced-Complexity Modeling for Future Climate Change

This project will investigate the dynamical response of the Earth system to future anthropogenic climate change. The research will use Earth system models, reduced-complexity dynamical models, and computational and machine-learning methods to explore climate trajectories, stability, feedbacks, and potential tipping behavior under different forcing scenarios.

The two projects will be closely connected, allowing the students to develop complementary perspectives on climate dynamics across past and future climate states.

Who should apply?

We seek highly motivated candidates with a strong quantitative background in computer science, mathematics, physics, meteorology, oceanography, environmental science, or a related discipline. Experience with scientific programming (e.g., R, Python, Linux, Fortran, or similar), numerical modeling, statistical methods, or machine

learning is highly desirable. Prior experience with climate or Earth system science is an asset but is not required. Applicants do not need expertise in all of these areas. The projects are interdisciplinary, and successful candidates will have opportunities to develop expertise in areas beyond their initial training. The projects are particularly well suited to candidates who are interested in combining quantitative and computational methods with fundamental questions about the dynamics of the Earth system.

Research Environment and Training

The successful applicants will enroll in the School of Environmental Studies at Queen's University and join an interdisciplinary research group led by Prof. Christian Seiler. Prof. Seiler is a faculty member in Environmental Studies and is cross-appointed with the School of Computing, providing opportunities to integrate natural and computational sciences and to develop expertise in scientific computing, machine learning, and Earth system science. The research will involve computational experiments with an Earth System Model, development and analysis of reduced-complexity dynamical models, machine learning, numerical methods, and high-performance scientific computing. Students will have access to high-performance computing resources and opportunities to collaborate with academic and government research partners in Canada and Europe. The projects are designed to provide broad interdisciplinary training in climate science, Earth system modeling, dynamical systems theory, machine learning, and scientific computing, preparing graduates for careers in academic research, government science, climate modeling, data science, and computational science. Students will be supported in developing a strong publication record, with an expectation of approximately three peer-reviewed research articles during the PhD.

Funding and Research Support

The position provides guaranteed minimum funding of $35,000 per year for four years, consisting of a combination of Queen's Graduate Award, teaching assistantships, and supervisor-supported research funding. Current domestic tuition and fees are approximately $7,565 per year and are paid by the student from the funding package. In addition, all reasonable costs associated with conference participation, summer school, and publication will be covered by the research group. Students who obtain additional competitive scholarships or awards may receive additional funding in accordance with Queen's University policies.

Eligibility

Due to funding restrictions, these positions are open to Canadian citizens and permanent residents of Canada only. Queen's University is a research-intensive institution committed to fostering an inclusive and equitable academic environment. Applications are welcome from all qualified individuals, including women, visible minorities, Indigenous Peoples, persons with disabilities, and individuals of any sexual orientation or gender identity.

How to Apply

Please email Prof. Christian Seiler at christian.seiler@queensu.ca with the subject line "PhD in Climate Dynamics". Please include: a cover letter describing your research interests, quantitative background, and motivation for pursuing a PhD in climate dynamics; a curriculum vitae; academic transcripts; and contact information for three referees. Applications received by December 1, 2026 will receive full consideration in the initial review. Applications will continue to be considered until the positions are filled. Early applications are encouraged. For further information, please visit the School of Environmental Studies at Queen's University (https://www.queensu.ca/ensc).