The ExaGEO Student Experience

A Summary

NERC Doctoral Landscape Award in Exascale Computing for Earth, Environmental, and Sustainability Solutions (ExaGEO)

What is ExaGEO?

ExaGEO will deliver the next generation of Earth and environmental PhD scientists trained in exascale computing. We do this through a holistic and multidisciplinary program targeting excellence in both the technical (graphical processing unit, GPU) skills required for the development and application of software and multidisciplinary 'domain' training in the complexity of simulated Earth system processes.

ExaGEO will empower graduates with the skills to develop and apply software for next-generation exascale computing for environmental applications (**Fig. 1**). ExaGEO provides multidisciplinary training in software and model development while nurturing domain expertise in the Earth, environmental, sustainability, and climate sciences. Our mission is to tackle the most pressing challenges in NERC's remit through exascale-oriented numerical model development and big-data analysis.

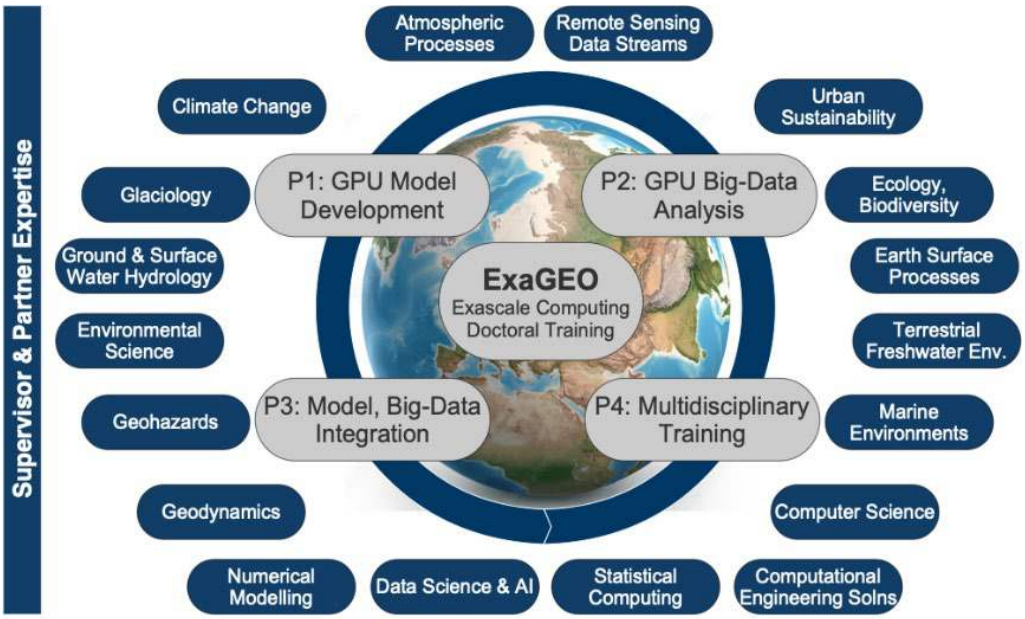

Figure 1: Scope of the ExaGEO doctoral training vision. Grey ellipses indicate our research and training platforms (P1-P4). Blue ellipses represent the research expertise of our >200 supervisors responsible for training 92 doctoral students in five different cohorts at the Univ. Glasgow, Lancaster Univ./CEEDS, and the supercomputing centre at the Univ. Edinburgh (EPCC).

What can you expect when you start?

A cohort of 13+ ExaGEO students will start every September/October. We will recruit each year for 5 years such that >65 students will be in the programme across our three partner institutions (University of Glasgow, Lancaster University/CEEDS, University of Edinburgh/EPCC). This means that as an ExaGEO scholar, you will have a peer group of students working on similar problems and a stimulating environment in which you can flourish!

Other key highlights:

- You will have a **minimum of 3 project supervisors** with diverse expertise advising you. At least one of these advisors will be from a different institution or an industry/government partner. You will meet with your Principal Supervisor regularly and then have at least annual meetings with your whole supervision team to

discuss your progress and milestones for the next year. Regular supervision feedback and support is a key component of ExaGEO.

- Each year, the new cohort of students will **go through an induction together** where you meet your peers and learn the nuts and bolts of the ExaGEO doctoral programme.
- Once per year, ExaGEO has an **'Annual Research Festival'** where all students meet in person, have an opportunity to present their research to peers, and hear keynote lectures from academic staff or industry leaders.
- You will have the opportunity for regular **'Hack-a-thons'** with your peers where you can discuss any programming problems you have encountered and get feedback from others on how to solve them.
- You will be assigned a **'graduate buddy'** who is a more senior student at the same institution and who can help guide you through your studies.
- In the first year, you will work on each of the **two 'Teaser Projects'** with your supervision team, and by the end of year 1, you will have a choice of which topic you will focus more on.
- Numerous **'soft skills' training opportunities** will be available on topics such as 'scientific writing,' 'best practices in software development,' 'teamwork in software development,' 'science communication,' and more!
- You will not only learn state-of-the-art computing techniques but also have **interdisciplinary training** in Earth system processes so that you understand the physical, chemical, and biological principles underlying your research.
- Finally, **learning work-life balance and best practices for wellbeing** are an important part of being a PhD student and your career afterward. Support mechanisms exist within our partner institutions and supervision processes to help you along your pathway.

An example course plan is provided in **Table 1** below to give you a sense of the breadth of training opportunities available through ExaGEO. Please note that in the first year, students will participate in a series of courses (not for credit) or workshops on different topics so that every ExaGEO scholar is equipped with the tools needed to support their research. The exact combination of courses you take will be discussed with your supervision team such that students with prior expertise in a topic can partake in a substitute course/workshop. The availability of the 'industry/partner internship' in years 2-3 is project-dependent and depends on the project you applied for and what opportunities are available.

Table 1: The ExaGEO training approach and learning outcomes. UofG equivalent course credits given in ( )

	Year 1 Semester 1	Year 1 Semester 2	Year 2	Year 3	Year 4
Continual Learning	Collaborative Computing Research Skills		Industry/Partner Internship (3-18 mo.)		
	Scientific writing practice	Hackathon' programming workshops			
	Soft Skills and Skills for Responsible Research and Innovation				
Core Taught Courses	GPU programming / Exascale principles (20)	Scientific Computing / numerical analysis (10)			
	Intro to Earth Systems Science and Sustainability (20)	Big-Data Analysis (10)			
Elective Courses			Domain Training options (10 each)		
Research	Teaser PhD Project 1	Teaser PhD Project 2	PhD Research		
Learning Outcomes	GPU Algorithm development (Julia/Python/CUDA/AMD)	Agile software development	Communication to non-specialists		
	Exascale/GPU computing	Statisical and numerical methods in computing	Research integrity principles		
	Exascale applications to Earth and Environmental Problems	Team work in software development			

That summarises the ExaGEO student experience. We hope you will join us! Should you have any queries, please contact the ExaGEO Team via email (exageo-info@glasgow.ac.uk).

Apply Now!