School of Science
Department of Mathematical Sciences

Research Associate in Applied Mathematics
Development of a high-end computational technology to predict meteotsunami impact
(Fixed-term for 18 months)
Job Ref: REQ180008

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

School/Department summary
The Department of Mathematical Sciences is part of the School of Science at Loughborough. The Department has attracted staff and students from all over the world, making it a diverse and stimulating environment in which to study. Active in high quality research across the broad spectrum of mathematics, the Department has an international reputation, with four fifths of research rated internationally leading or better in REF 2014. Further information about the Department can be found here: http://www.lboro.ac.uk/departments/maths/, and about the School here: http://www.lboro.ac.uk/science/

Project Description
This project is funded through an EPSRC grant entitled "Development of a high-end computational technology to predict meteotsunami impact". Meteotsunamis (meteorological tsunamis) are sudden and massive waves which are triggered by fast-moving storms far at sea. Protecting the coastline from meteotsunami impact is of economic and social interest. Regrettably, the UK does not possess the technology to predict meteotsunami impact on its shores. This project will use mathematical modelling coupled with high performance computing (HPC) to identify UK regions vulnerable to meteotsunami attack, thereby leading to safer coastal communities, harbours and beaches. The successful applicant, with the supervision of Dr Emiliano Renzi, will develop a new system of depth-averaged partial differential equations to model meteotsunami generation by atmospheric pressure anomalies. The numerical solution of the model equation will be attained via a finite element method, implemented in the software COMSOL Multiphysics. The project will be undertaken jointly by the RA and Dr Emiliano Renzi as supervisor/principal investigator (PI).

Job Description

Job Grade: Specialist and Supporting Academic, Grade 6

Job Purpose
To conduct research in the area of Applied Mathematics Fluid Mechanics to understand, develop and optimise models of depth-averaged partial differential equations in compressible fluids, with free-surface forcing. Initially, this will be to be responsible for the development of enabling tools and computational work for the modelling of fluid dynamics via a compressible, forced mild-slope equation describing the generation and propagation of surface gravity and underwater compressible waves. Following this, the role will require the analysis of results applicable to meteotsunami inundation and the generalisation of models and results to a wider context.

Job Duties

- To work on all aspects of the above project.
- To become familiar with and evaluate the present literature on compressible depth-averaged wave models.
- To develop and analyse a forced, compressible depth-averaged model coupled to equations describing the propagation of surface gravity and underwater acoustic waves.
- To develop numerical codes based on COMSOL Multyphysics (or similar) for the effective solution of the problem.
- To generate inundation maps for selected areas of Southern Britain and to develop relevant engineering formulae with data assimilation.
- To write research papers suitable for publication in high quality academic journals.
- To disseminate results both at national/international conferences and in the scientific literature, and be involved in providing accessible content for online use to the wider public.
- To write up regular progress reports and present outcomes to Investigators and Collaborators at weekly meetings.
- Maintain confidentiality at all times and ensure that formal collaboration agreements with project partners are not violated.
- To support the project team by enhancing relationships with existing collaborators and by assisting the establishment of relationships with new collaborators.
- To undertake tasks assigned by the Principal Investigator (Dr Emiliano Renzi).
- To assist the academic staff in the project team with the supervision of undergraduate MSc and PhD project work and day-today supervision and support of other researchers.
- There will be an opportunity to do a small amount of teaching in the Department of Mathematical Sciences.
- Engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Department.
- Undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

Points to Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to the Principal Investigator.

Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

1 – Application
2 – Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Experience of conducting research in Applied Mathematics, Theoretical Physics, Engineering, or a related area.	1, 2, 3
	Proficiency in using computers to solve mathematics problems.	1, 2, 3
	Experience of obtaining the solution of Partial Differential Equations (PDEs) numerically.	2, 3
	Authoring original work for academic journal papers, conference papers or technical reports.	1
Skills and Abilities	Ability to publish in high quality journals in the field of Fluid Mechanics.	1, 2
	Excellent written and oral communication skills.	2, 3
	Self-motivated with ability to meet deadlines.	3
	Excellent interpersonal, and organisational skills.	2, 3
	Working knowledge of mathematical modelling techniques for Partial Differential Equations.	2, 3
	Working knowledge of computational modelling software such as COMSOL Multiphysics or similar.	1, 2, 3
	Ability to work as part of a team and to collaborate with others.	1, 2, 3
Training	Willingness to undertake further training as appropriate and to adopt new procedures as and when required.	3
Qualifications	A PhD degree (or near completion) in Applied Mathematics, Theoretical Physics, Engineering, or a related area.	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria

Area	Criteria	Stage
Experience	Knowledge of the mathematical theory of ocean waves	1, 2, 3
	Knowledge of Computational Fluid Dynamics	1, 2, 3
	Collaborating with non-academic partners	1, 2, 3
	Working in a high quality academic research environment	1, 3
	Experience of teaching and / or supervision of students in relevant areas	1, 3
Skills and Abilities	Authoring original work on Computational Fluid Dynamics, in the highest quality refereed academic journals	1, 2, 3
	A strong publication track record	1

	Ability and willingness to teach at undergraduate level	1, 3
	Working knowledge of software packages such as Matlab.	1, 2, 3
Qualifications	Postdoctoral experience.	1, 3

Conditions of Service

The position is full-time and fixed-term for 18 months. Salary will be on Specialist and Supporting Academic, Grade 6, £29,799 to £31,604 per annum, at a starting salary to be confirmed on offer of appointment. Subject to annual pay award.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff, details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/

Informal Enquiries

Informal enquiries should be made to Dr Emiliano Renzi, Lecturer in Applied Mathematics, by email at e.renzi@lboro.ac.uk or by telephone on +44 (0)1509 223186.

Applications

The closing date for receipt of applications is **13 February 2018**.