L-Università ta' Malta

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Call for Applications
Post/s of Full-Time Research Support Officer II (PhD Student)

MARCAN PROJECT – Horizon 2020: European Research Council
"Topographically-driven meteoric groundwater – An important geomorphic agent"

Marine Geology and Seafloor Surveying group
Department of Geosciences, Faculty of Science
(https://www.um.edu.mt/science/geosciences/mgss)

1. Applications are invited for a full-time Research Support Officer II (Ph.D. student) to work on the "Topographically-driven meteoric groundwater – An important geomorphic agent" (MARCAN), a project financed by Horizon 2020: European Research Council.

2. Applicants should ideally be in possession of undergraduate and Masters degrees in geoscience, mathematics, computer science, engineering or physics. The Research Support Officer II (Ph.D. student) should also:
    - Be experienced in landscape evolution and numerical modelling;
    - Be proficient in one or more programming languages (especially Fortran);
    - Be familiar with field geological data collection and interpretation techniques;
    - Have a working knowledge of GIS software (especially ArcGIS);
    - Have an adequate level of proficiency in English;
    - Be organised, enthusiastic and ambitious;
    - Have good problem solving, interpersonal and communication skills;
    - Be able to work independently and under minimum supervision.

3. The full-time post is for a period of 36 months starting in December 2018 and carries an initial remuneration of €24,960 per annum.

4. Candidates should submit their letter of application, a copy of their curriculum vitae and copies of their certificates. Applications may be sent by e-mail to projects.hrmd@um.edu.mt. Applications should be received by not later than **noon of 30th September 2018. Late applications will not be considered**.

5. Further information may be obtained from the website: http://www.um.edu.mt/hrmd/vacancies.

erc European Research Council

MARCAN

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Further Information

1. The Research Support Officer II (Ph.D. student) will be responsible for the execution of a number of tasks related to MARCAN, a project financed by Horizon 2020: European Research Council, in which the Department of Geosciences is the co-ordinator.

   Project Description:
   Topographically-driven meteoric (TDM) recharge is a key driver of offshore groundwater systems because sea level has been lower than at present for 80% of the last 2.6 million years. Groundwater has been implicated as an important agent in the geomorphic evolution of passive continental margins and the canyons that incise them. However, the geomorphic efficacy of groundwater remains dubious, and a diagnostic link between landscape form and groundwater processes remains poorly quantified, especially for bedrock and cohesive sediments. Obstacles that prevent going beyond the current state-of-knowledge include: (i) a focus on terrestrial contexts and a lack of mechanistic understanding of groundwater erosion/weathering; (ii) limited information on offshore groundwater architecture, history and dynamics. By addressing the role of TDM offshore groundwater in the geomorphic evolution of the most prevalent types of continental margins, MARCAN is expected to open new scientific horizons in continental margin research and bring about a step-change in our understanding of some of the most widespread and significant landforms on Earth. The project's methodology is rooted in an innovative, multi-scale and multidisciplinary approach that incorporates: (i) the most detailed 3D characterisation of TDM offshore groundwater systems and their evolution during an integral glacial cycle, based on state-of-the-art marine data and hydrogeologic models, and (ii) the development of a comprehensive continental margin geomorphic evolution model, based on realistic laboratory simulations, accurate field measurements and advanced numerical solutions. By placing better constraints on past fluid migration histories, MARCAN will also have strong applied relevance, primarily by improving assessment and exploitation of offshore freshwater as a source of drinking water.

2. The key research question that the Research Support Officer II (Ph.D. student) will be exploring is if, and under which geologic and hydrogeologic conditions, topographically-driven meteoric groundwater can be a significant landscape denudation process, both onshore and offshore. The study areas for this project include the eastern coast of the South Island of New Zealand, and the north-western coast of the Maltese Islands.

3. The main tasks of the Research Support Officer II (Ph.D. student) will involve the following:

i. Carry out desktop studies and fieldwork to update a database of geoscientific data from the study areas (which currently includes aerial imagery; digital elevation models; geomorphological maps; geophysical data (ground-penetrating radar, electromagnetic induction, electrical resistivity tomography, reflection seismics); sediment, bedrock and water samples, and their geological, chemical, hydraulic and geotechnical properties; 3D geological models).
ii. Develop an advanced 3D continental margin geomorphic evolution model that accounts for both surface and sub-surface flows. The model should integrate the following components:
    - MARSSIM landscape evolution model [1,2];
    - Recently published geomorphic laws for canyon network growth by groundwater erosion and weathering;
    - Geomorphic rate laws and models for groundwater erosion and weathering at the micro-scale derived from simulation experiments (generated by another MARCAN team member);
    - Slope stability limit equilibrium models (generated by another MARCAN team member);
    - Hydrogeological models derived from PGEOFE[3,4] (generated by another MARCAN team member);
    - Models of submarine canyon erosion by turbidity currents.
iii. Taking into consideration the geologic and hydrogeologic frameworks of the two study areas, as well as known changes in sedimentation, eustatic sea level and regional uplift/subsidence from published literature, run model for last glacial cycle, and repeat for Quaternary, using a supercomputing cluster.
iv. Statistically compare modelled canyon morphometry and evolution (in planform and cross-section) with that recorded in the field.
v. Identify topographic signatures of canyon formation by groundwater in different settings.
vi. Quantify hydrogeologic conditions required for canyon erosion and determine when these are satisfied during a glacial cycle.
vii. Produce a minimum of three articles, for submission to international scientific journals, by the end of the project.
viii. Travel and participate in meetings/conferences/fieldwork/cruises as the need arises.
ix. Keep detailed progress reports and abide to all the conditions imposed by the project;
x. Perform any other project related task as instructed by the Project Coordinator.

4. The appointee is expected to work at such places and during such hours as may be determined by the University authorities.

5. The appointment will be subject to the eligibility of the candidate to enrol in the University of Malta Ph.D. programme.

6. The selection procedure will involve:
    a. scrutiny of qualifications and experience claimed and supported by testimonials and/or certificates (copies to be included with the application); and
    b. an interview and / or extended interview.

7. The post is for a period of 36 months, which will be subject to a probationary period and to the provisions of the Statutes, Regulations and Bye-Laws of the University of Malta which are now or which may hereafter be in force.

References:

1 Luo, W. & Howard, A. D. Computer simulation of the role of groundwater seepage in forming Martian valley networks. *Journal of Geophysical Research* **113**, E05002 (2008).

2 Howard, A. D. *Geomorphology Home Page*, <http://erode.evsc.virginia.edu/>

3 Cohen, D. *et al.* Origin and extent of freshwater paleowaters on the Atlantic continental shelf, USA. *Groundwater* **48**, 143-158 (2010).

4 Siegel, J. *et al.* Influence of late Pleistocene glaciations on the hydrogeology of the continental shelf offshore Massachusetts, USA. *Geochemistry, Geophysics, Geosystems* **15**, (2014).