

Job Title: Internal Research Fellow (PostDoc) in Lunar Landing Sites Analyses and Lunar Data Management

Job Requisition ID 10741 - Posted 02/10/2020



EUROPEAN SPACE AGENCY

Research Fellowship Opportunity in the Directorate of Human & Robotic Exploration Programmes.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. Applications from women are encouraged.

Post

Internal Research Fellow (PostDoc) in Lunar Landing Sites Analyses and Lunar Data Management

This post is classified F2.

Location

ESTEC, Noordwijk, The Netherlands

Our team and mission

The Research Fellow will be based in the Lunar Lander Team, whose objectives are to flight-prove technologies and capabilities for future exploration missions and to gain knowledge to plan safe, effective and efficient human exploration at the Moon. In particular in cooperation with the Russian Space Agency Roscosmos, ESA will provide products and services to the upcoming Russian lunar robotic missions, particularly to a landing mission (planned for 2025). The European contributions encompass several elements: a precision and safe landing system (PILOT), a low-temperature drilling system together with a sample analysis instrument (PROSPECT), landing sites analyses and operations support.

The Lunar Lander Team is also developing other lunar payload for other robotic missions and supporting feasibility studies of future lunar missions as well as related technology/payload activities.

Field(s) of activities/research

Knowledge of the prospective landing site(s) for a surface mission in the lunar south polar region is essential to:

1. define the needs for autonomous hazard detection and avoidance (HDA) on board the spacecraft and for the verification of requirements in analysis, simulation and tests;
2. understand the properties of the terrain and environment in relation to scientific objectives, such as investigations of potential volatiles, and in relation to the lander capabilities, particularly thermal properties, illumination and Earth visibility conditions.

HDA systems (under development by ESA and others) generate in real time during the last minutes of landing a 3D terrain model of the landing site. Based on this model, HDA generates hazard maps and uses these to advise the GNC system on retargeting to a safe landing point.

There is a need for high fidelity representations of real terrains to validate HDA systems. Typical sizes of the hazards to be represented are 10–15 degree slopes over a baselength of ~3 m and roughness (deviation from a mean plane) of 30–50 cm. 3D models, generated on board, therefore need a resolution of ~15 cm. Terrain models to be used in HDA simulation and tests need to be equal to or better than this. The objective of this research fellowship is to generate "semi-synthetic" terrain models with ground resolutions better than the existing lunar datasets for provisional landing sites. This should be done for example by:

- combining different datasets at different resolutions (e.g. LOLA DEM's and LROC stereo-DTM);
- analysing other datasets (e.g. images) to extract surface features (craters, boulders, etc.) at higher resolution than those provided by existing terrain models, and combine those;
- generating boulders and craters distributions, in order to extrapolate populations at sizes lower than those visible in images / DEMs and generate terrain models from those, in order to reach resolutions down to <50 cm.

The study shall also focus on the statistical confidence of the generated models, e.g. by assessing the probability of having small-scale features also based on geological considerations (e.g. generation of boulders by impact, realistic spatial distribution of boulders, etc.)

Proposals for complementary analyses of landing sites (see point 2. above) are also very much encouraged.

Terms of Reference

The Research Fellow shall:

- interface with HRE-LL to understand HDA requirements and needs in terms of validation and associated terrain models;
- perform a survey of the available data suitable for the work;
- liaise, if needed, with instrument teams to understand data characteristics (errors, etc.), generate intermediate products, etc.;
- use the collected data to generate a number of semi-synthetic terrain models, establishing a suitable software framework and interfacing with tools used to render landing images;
- perform a preliminary validation of the technique and/or devise a validation experiment;
- interface with other teams in the HRE Directorate and with the SCI Directorate to understand other needs related to lunar landing site analyses;
- conduct other complementary analyses.

Technical competencies

Knowledge relevant to the field of research

Research/publication record

Ability to conduct research autonomously

Breadth of exposure coming from past and/or current research/activities

General interest in space and space research

Ability to gather and share relevant information

Behavioural competencies

Innovation & Creativity

Continuous Learning

Communication

Relationship Management

Self Motivation

Problem Solving

Cross-Cultural Sensitivity

Education

You should have recently completed, or be close to completion of a PhD in a related technical or scientific discipline.

Preference will be given to applications submitted by candidates within five years of receiving their PhD.

Additional requirements

Candidates are expected to have research experience in:

- planetary geology;
- the management of planetary datasets;
- using GIS tools and other software tools and programming, as required.

Tools (e.g. PANGU) available at ESA can be used for the research, but there is no obligation to do so.

Specificities

The position of Research Fellow in the ESA Lunar Lander Team presents a few notable key differences with respect to a regular academic Post-Doc placement:

1. The RF has no teaching obligations.
2. As the team does not have a professor-like position, the RF is academically more independent than most post-docs. This implies more freedom but also more responsibility for his/her research directions and approaches.
3. The RF is joining a diverse, interdisciplinary project team embedded in a large space agency, in contrast to a more specialised, focused research group with close or similar competences. Close links and interfaces with other RFs in the HRE and SCI Directorates will be set-up.
4. The RF needs to communicate their expertise and research results internally and externally, including potential implications and importance for ESA's long-term strategy.

Other information

For behavioural competencies expected from ESA staff in general, please refer to the [ESA Competency Framework](#).

The Agency may require applicants to undergo selection tests.

The closing date for applications is 01 November 2020.

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section.

If you require support with your application due to a disability, please email contact.human.resources@esa.int.

Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom. Nationals from Latvia and Slovenia, as Associate Member States, or Canada as a Cooperating State, can apply as well as those from Bulgaria, Cyprus, Lithuania and Slovakia as European Cooperating States (ECS).

Priority will first be given to candidates from under-represented Member States.

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment