Job Description: Postdoctoral Fellow in Mars Data Assimilation

General Information	
Job Title:	Postdoctoral Fellow in Mars Data Assimilation
Department:	National Space Science and Technology Center
Division:	Earth and Planetary Science Unit
Location:	UAE University, Al Ain, United Arab Emirates
Type:	Full time
Closing date:	Review of applications will begin on 1 October 2021, and the position will remain open until filled.
Length of contract:	Two years in the first instance, with the possibility of renewal. The employment contract is renewed on a 1-year rolling basis.
Contact:	Dr Roland Young (roland.young@uaeu.ac.ae)

Direct Supervisor's Job Title:

- Director of the National Space Science and Technology Center.
- Day-to-day supervision will be by Dr Roland Young.

Subordinate's Job Title(s):

- Where appropriate, some supervision of Research Assistants, Interns, and/or MSc students may be required.

Overall Objective of the Job

The National Space Science and Technology Center (NSSTC) at the United Arab Emirates University (UAEU) in Al Ain, UAE, invites applications for a Postdoctoral Fellow in Mars data assimilation. The anticipated start date is as soon as possible in Fall 2021, for an initial period of two years.

The Emirates Mars Mission (EMM) arrived at Mars in February 2021 to study the influence of Mars' climate and lower atmosphere on the escape of hydrogen and oxygen from its upper atmosphere, what atmospheric processes drive diurnal variations, and how energy is transferred from the lower-middle to the upper atmosphere.

Overall Objective of the Job

EMM's unique orbit and viewing geometry make it an ideal platform to use data assimilation to combine observations with Mars General Circulation Model (GCM) simulations. The purpose of this position is to expand an existing data assimilation scheme to also assimilate aerosol and trace gas data (dust, water ice, water vapour, and ozone) from EMM's instruments. This means primarily data from the thermal infrared instrument EMIRS (Emirates Mars Infrared Spectrometer), but also from the visible/UV imager EXI (Emirates eXploration Imager) where possible. The overall aim is to assimilate as many datasets from EMM's instruments simultaneously, to produce complete climate states that incorporate all of EMM's lower atmosphere observations. An important aspect of the work will be to find ways to overcome internal inconsistencies that occur when simultaneously assimilating observations that are correlated, such as water vapour and water ice.

The Postdoc will have some freedom to develop this research as they like, within the bounds of what has been done already. The assimilation scheme is based on the LETKF and uses the LMD Mars GCM, with previous work using observations from ExoMars-TGO-ACS and NASA-MRO-MCS. An ideal candidate will already have experience with some or all of these instruments and methods. The candidate will be expected to use the obtained data products to perform independent research on open science questions related to the Mars' atmosphere.

NSSTC will also require the successful candidate to devote some of their time contributing to its operational Earth Observation objectives, based on personal experience and expertise.

The position includes a competitive tax-free salary, medical coverage for the applicant and their family, and travel funds.

The National Space Science and Technology Center, Al Ain

NSSTC is a research and development institute of some 50 staff located on the UAEU campus in Al Ain, about 90 minutes' drive from Abu Dhabi and Dubai. UAEU is the largest and highest-ranked public university in the UAE.

The Center was established jointly by UAEU, the UAE Space Agency, and the UAE Telecommunications Regulatory Authority (ICT-Fund), motivated by UAEU's desire to strengthen its role in and contribute to the needs of the nation in Space Science and Space Technology, and to become a Space Science and Technology hub for the region. NSSTC focuses on research and development, higher education, and community outreach. The Center's priorities are three-fold: excellence in Space Science, leadership in Space Technology, and providing innovative solutions to a broad spectrum of societal challenges.

Recently completed at UAEU is NSSTC's Assembly, Integration, and Testing facility for satellites up to 250 kg, which will also support UAEU students' CubeSat projects with the capability of building multiple satellites at a time. The facility includes a cleanroom, thermal vacuum chamber, vibration system, anechoic chamber, ground station, and mission control room. The Center's other upcoming facilities include Global Navigation Satellite System and Propulsion laboratories, a Radio-Array

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Observatory for Astronomy, Space Situational Awareness and multidisciplinary space science research, and NSSTC's research staff also have access to UAEU's High-Performance Computing cluster.

NSSTC has expertise in spacecraft communications and precision positioning, on-board real-time systems, space situational awareness, global navigation systems, space resource utilization, Geospatial Information System, Earth Observation, and Planetary Science. The Planetary Science Group currently includes two faculty, one senior researcher, two research assistants, and several MSc students. Alongside Mars, its members have expertise in modelling giant planet atmospheres, geophysical fluid dynamics laboratory experiments, visible and radar remote sensing, and small satellite spacecraft. The group members have ongoing collaborations with the EMM Science Team, Oxford University, the Laboratoire de Météorologie Dynamique (LMD), the Space Science Institute, the ExoMars Trace Gas Orbiter ACS instrument team, and Aeolis Research.

Application instructions

To apply, please submit the following via UAE University's jobs portal at https://jobs.uaeu.ac.ae/:

(1) Cover letter (max 2 pages)

(2) CV (max 2 pages)

(3) Publications list

(4) Contact details of two professional references.

Tasks and Responsibilities

- Modify an existing Mars data assimilation scheme to also assimilate 2D aerosol optical depth maps.
- Conduct an Observing System Simulation Experiment (OSSE) with synthetic EMIRS aerosol observations.
- Assimilate both EMIRS and EXI observations into the LMD Mars GCM.
- Provide reanalysis products to the EMM Science Team.
- Conduct independent Mars atmospheric research based on these data products.
- Develop internal and external collaborations to meet the goals of the research program.
- Publish peer-reviewed research work in the open scientific literature.
- Stay up-to-date in your knowledge of relevant areas of scientific literature.
- Present research work to a variety of audiences within the University, the UAE, and at international conferences.
- Where appropriate, contribute to supervision of interns, research assistants, and research students.
- Contribute to NSSTC operational Earth Observation objectives, based on personal experience and expertise.
- Contribute to NSSTC capacity building, outreach events, and other community services.
- Take part in NSSTC research group and business meetings.

Tasks and Responsibilities

- Represent NSSTC and UAE University within the UAE and internationally.

This is not intended to be an exhaustive list of tasks and responsibilities and will be subject to periodic review by NSSTC.

Organizational Relationships & Communications

Internal Communications:

- NSSTC Planetary Science Group
- NSSTC Earth and Planetary Science Unit
- UAEU Department of Physics

External Communications:

- National and international project partners

Job Requirements

Educational Level/ Required Certificates:

- Undergraduate degree in Physics, Mathematics, Meteorology, Astrophysics, Physical Earth Science, Engineering, Computer Science, or a related subject.
- PhD degree in Physics, Atmospheric Science, Planetary Science, Meteorology, Astrophysics, Data Science, or a closely related field.

Experience:

Essential:

- Extensive knowledge background in Atmospheric and Planetary Science.
- Experience with at least two of data assimilation, atmospheric modelling, and planetary data analysis.
- Experience with large-scale scientific software and related scientific programming (for example: GCMs, radiative transfer codes, spacecraft data processing pipelines, etc.).
- Expertise in Linux, Fortran, and at least one of Python, IDL, or Matlab.
- A publication and conference record that compares favourably with others at a similar career stage.

Desirable:

- Experience with all three of data assimilation, atmospheric modelling, and planetary data analysis.
- Technical knowledge background in data assimilation.
- Research experience related to other planets, preferably Mars.
- A working knowledge of French would be useful, but is not essential.

Recommended Training Courses:

- If required, a 2-week training abroad in Mars climate modelling may be arranged once the applicant is in post.

Required Knowledge, Skills, and Competencies
▪ Excellent communication skills in English, both verbal and written. ▪ Self-motivated with the ability to work independently on a research project. ▪ Ability to work well within a team. ▪ Flexibility to work on both numerical modelling and observational datasets. ▪ A strong desire to contribute to cutting edge Mars research. ▪ Ability to write high-quality research papers and grant proposals. ▪ Ability to accomplish goals within expected timelines. ▪ Willingness to travel overseas when necessary.