Job opening: Senior Researcher Earth Climate Observatory (ECO) space mission - FED-tWIN mandate ROB/VUB

1 - Context

Monitoring the Earth Energy Imbalance (EEI) is of paramount importance for a predictive understanding of global climate change. The innovative Earth Climate Observatory (ECO) space mission concept for the monitoring of the EEI was recently proposed as a candidate ESA Earth Explorer 12 mission, see https://www.esa.int/Applications/Observing_the_Earth/FutureEO/Call_opens_for_ESA_s_twelfth_Earth_Explorer. The ECO scientific consortium is led by Belgium, Sweden and France, with additional contributions from the UK, Germany and Switzerland. The baseline industrial consortium for the realisation of the ECO, space mission is Thales Alenia Space – France as mission prime, and OIP from Belgium as instrument prime.

A first iteration of the ECO payload instruments was made in a recently concluded joint PhD in a collaboration between the Royal Observatory of Belgium (ROB), and the Vrije Universiteit of Brussels (VUB).

The position is open in the context of the FED-tWIN programme, a federal research programme of the Belgian Science Policy ("Belspo"), aiming to create a sustainable long-term cooperation between the Federal Scientific Institutions and the Belgian Universities through the funding of joint research profiles.

This is a full-time position combining a half-time position at the Royal Observatory of Belgium (ROB), and a half-time position at the Vrije Universiteit of Brussels (VUB).

The general theme of this research profile - the "Earth Climate Observatory" (ECO) research profile - is to provide a long term sustained contribution to the further development of the ECO space mission for the measurement of the Earth's Energy Imbalance following the ESA Earth Explorer logic. In this logic, the scientific consortium of which the newly recruited senior researcher becomes a part, focuses on the advancement of the Scientific Readiness Level (SRL) – see https://eopro.esa.int/wp-content/uploads/2023/06/Scientific-Readiness-Levels-SRL-Handbook-version-2.0-10-February-2023.pdf, and provides the requirements for the industrial development, which deals with the advancement of the Technological Readiness Level (TRL) – see https://www.esa.int/Enabling_Support/Space_Engineering_Technology/Shaping_the_FutureTechnology_Readiness_Levels_TRL.

The FED-tWIN researcher who will be recruited in this context is expected to become part of the European ECO space mission scientific consortium, to contribute to the advancement of the ECO SRL, and to build and supervise an inter-institutional ROB-VUB research group around this space mission.

About the ROB:

The Royal Observatory of Belgium (ROB) was founded in 1826, before the independence of Belgium. It is a Federal Scientific Institution (FWI) belonging to the Belgian Science Policy ("Belspo"). Researchers at the ROB study planet Earth, the sun as well as other objects from the near and far universe. Among the scientific disciplines of the ROB we find astronomy, planetology, geophysics, seismology, space geodesy and solar physics. For these, the ROB cooperates with numerous international centers, and leads or contributes to various space missions.

At ROB, the ECO FED-tWIN researcher will work in the Operational Directorate (OD) "Solar Physics and Space Weather". This OD has about 50 staff on a full-time equivalent basis and has activities around solar observation from Earth, amongst others through the world data center for long-term sunspot observation, through the space missions Proba 2, EUI on Solar Orbiter and Proba 3, and through space weather services operating under the umbrella of the European Space Agency (ESA) and the International Civil Aviation Organization (ICAO).

About the VUB:

For already 50 years, the Vrije Universiteit Brussel has stood for freedom, equality, and connectedness. These values are strongly present on our campuses, in our students as well as our staff. At the VUB, you'll find a diverse collection of personalities: pure innovators, but especially people who are 100% their authentic selves. With about 3,500 employees, we are the largest Flemish-speaking employer in Brussels, an international city with which we are all too happy to be affiliated and around which our four campuses are located.

Our education and research are grounded in the principles of free research with an eye on human progress. We disapprove of every purely authoritative argument and guarantee the free formation of judgement that is necessary for this basic principle to be incorporated in the community. The VUB is autonomous and managed democratically. As such, we guarantee fundamental freedoms within our university, as well as the right of the university community to be involved in making and checking university policy.

The host research group at the VUB is "Brussels Photonics" (B-PHOT), part of the Department of Applied Physics and Photonics (TONA) of the Faculty of Engineering. The core activities of this research group are articulated around "photonics" - the science and technology of light - which is an essential digital technology of the 21st century and the key technology that uses the unique properties of light for peaceful purposes. B-PHOT has a unique research and innovation centre at VUB's Photonics Campus Gooik. B-PHOT unites a critical mass of 70 highly trained researchers and technology experts, providing research, innovation and STEM education, and connecting photonics with other scientific and engineering disciplines. B-PHOT addresses current and future global challenges in various sectors thanks to photonics: climate, biomedical engineering, industry 4.0, "agrifood", information and communication, mobility, sustainability and smart cities.

2 - Function

Area

ECO: Earth Climate Observatory - towards a new space mission to monitor the Earth's energy imbalance (Research profile Prf-2022-010 ECO between ROB and VUB)

Research

Climate change is one of the major challenges of our time. The most Essential of all Climate Variables is the so-called Earth Energy Imbalance (EEI). EEI is the direct cause of global temperature rise. Its accurate measurement and monitoring are necessary to ensure that the Paris Climate Agreement and the European Green Deal are implemented fast enough to prevent catastrophic climate change by keeping the global temperature rise below 2 °C.

The FED-tWIN researcher will continue to work on a recently completed joint ROB-VUB PhD research, in which the conceptual design of new space instruments for the measurement of the EEI was made. These conceptual new space instruments are a wide-angle radiometer, a wide-angle camera operating in the visible part of the electromagnetic spectrum and a wide-angle camera operating in the thermal infrared part of the electromagnetic spectrum. The initial designs are described in the following papers:

Schifano, L., Smeesters, L., Geernaert, T., Berghmans, F. and Dewitte, S., 2020. Design and analysis of a next-generation wide field-of-view earth radiation budget radiometer. *Remote Sensing*, *12*(3), p.425. https://www.mdpi.com/2072-4292/12/3/425

Schifano, L., Smeesters, L., Berghmans, F. and Dewitte, S., 2020. Optical system design of a wide field-of-view camera for the characterization of earth's reflected solar radiation. *Remote Sensing*, *12*(16), p.2556. https://www.mdpi.com/2072-4292/12/16/2556

Schifano, L., Smeesters, L., Berghmans, F. and Dewitte, S., 2021. Wide-field-of-view longwave camera for the characterization of the Earth's outgoing longwave radiation. *Sensors*, *21*(13), p.4444. https://www.mdpi.com/1424-8220/21/13/4444

An updated design for the wide angle cameras as included in the ESA Earth Explorer 12 proposal is described in:

Dewitte, S., Abdul Nazar, A., Zhang, Y. and Smeesters, L., 2023. A Multispectral Camera Suite for the Observation of Earth's Outgoing Radiative Energy. https://www.preprints.org/manuscript/202310.1346/v1

As part of the ECO scientific consortium, the researcher will be co-responsible for the further refinement of the requirements for fabrication of the instruments, for the further advancement of the ECO Scientific

Readiness Level, and for the long-term scientific support of the concrete implementation of the ECO space mission in cooperation with various stakeholders such as funding bodies (in particular Belspo responsible for the Belgian space budget – see https://www.belspo.be/belspo/space/bePolicy_en.stm), the European space agency ESA, the European space industry, and the international scientific community. In doing so, the focus will gradually shift from instrument design and end-to end mission simulation to data processing over a 10-year period.

The FED-tWIN researcher is expected to:

- publish in peer-reviewed scientific journals belonging to the Q1 quartile with high impact factor;
- acquire funding for research activities using various funding channels, including at least ESA/Belspo space funding, and various PhD grant funding possibilities;
- build a ROB-VUB research team on advanced space optics for Earth observation and climate monitoring;
- take responsibility to ensure the international reputation of the new research team.

The FED-tWIN researcher will be part of the Operational Direction "Solar Physics and Space Weather" of the ROB for 50% and of the Department of Applied Physics and Photonics (TONA), research group Brussels Photonics (B-PHOT) within the Faculty of Engineering of the VUB, also for 50%.

More information on the B-PHOT research group can be found on the website: https://www.b-phot.org.

More information on the Operational Direction "Solar Physics and Space Weather can be found on the websites: https://www.astro.oma.be/nl/wetenschappelijk-onderzoek/zonnefysica-en-ruimteweer/ and https://www.sidc.be/

Education

The FED-tWIN researcher contributes to the education of the Department of Applied Physics and Photonics (TONA). In view of the research objectives of the FED-tWIN mandate, **teaching activities will be limited during the first 5 years of the mandate**. The FED-tWIN researcher can contribute to teaching in the VUB Master of Science program: Master of Science in Photonics Engineering in the field of optical design and photonic systems for a total maximum of 6 ECTS per semester.

The FED-tWIN researcher is also supposed to supervise master's theses and PhDs related to the research to be conducted.

Others

The FED-tWIN researcher is expected to contribute to the internal and external services of both institutions and to the valorization and communication of research results.

3 – Profile

The candidate FED-tWIN researcher holds a PhD in Sciences or in Engineering Sciences, or a degree or certificate recognized as equivalent. When assessing a non-Benelux degree, an equivalence certificate must be requested from NARIC, see https://www.naricvlaanderen.be/en/recognitions/recognition-of-foreign-qualifications. We advise the candidate, if applicable, to start the recognition procedure at NARIC as soon as possible.

The candidate FED-tWIN researcher obtained this PhD up to 12 years prior to the predetermined submission date of his/her candidature file. This period is extended by 1 year for any absence due to pregnancy, parental or adoption leave, as well as any prolonged absence due to illness of the candidate himself and/or a first-degree relative.

In addition, the candidate ideally has:

- a field of specialization situated in photonics, instrument design and/or characterisation, data analysis, or in another domain that is close to the ECO space mission;
- carried out high-level scientific research, as substantiated by publications in peer-reviewed international journals;
- demonstrable experience in securing external funding for research or innovation projects.
- interest in the latest simulation and manufacturing methods of advanced optical systems, such as those using freeform optics;
- knowledge of advanced data processing methods, experience with the processing of large datasets and software engineering/programming experience (e.g. in C++);
- proven experience in leadership;
- experience in teaching at university level, and in supervising students at master's and doctoral level.

Are recommended:

- 3 years of postgraduate experience at the time of recruitment – the 3 years of experience is determined based on the date mentioned on the diploma requested above; knowledge of or experience in atmospheric radiation transfer and/or climate research; experience with space projects; experience of working in an international research consortium; communication skills in English and Dutch. Candidates without knowledge of Dutch must achieve a C1 Dutch qualification certificate within five years from the start of the mandate.

The FED-tWIN researcher is expected to endorse the university's vision and values (full text available on the VUB website).

4 - Offer

The appointment consists of two half-time contracts at ROB and VUB, respectively.

At ROB the candidate is appointed a half-time employment contract of indefinite duration as SW2 (work leader).

At VUB, we offer a full-time senior research position for an initial period of 5 years, renewable subject to a positive evaluation according to predefined Key Performance Indicators. At the VUB, the candidate will be appointed as ZAP amounting to 50% in the grade of lecturer with a temporary appointment for an initial term of 5 years.

Any first appointment is also subject to the successful teaching of a trial lesson, in this case a 30-minute master-level trial lecture in English. The tentative title of the trial lesson will be ‘Development of the Earth Climate Observatory space mission as a candidate ESA Earth Explorer’.

Members of the academic staff in charge of a teaching assignment as titular holders must be able to demonstrate the required knowledge of the teaching language of relevant course units. Example: if a course unit is taught in English, the candidate must have the required qualification certificate. More information on the language regulations can be found at: https://jobs.vub.be/content/Taalregeling/.

5 – Additional information

The expected starting date of the employment is 01-04-2024 (TBC).

The default deadline for applications is 15-01-2024. If the number of complete applications received by the default deadline is not large enough, the deadline may be extended; in that case all applicants will be informed about the new deadline and will get the chance to update their application.

For more information about this job opening, please contact:

- Steven Dewitte (steven.dewitte@oma.be)
- Francis Berghmans (francis.berghmans@vub.be)

6 – Application

Applying for the job can only be done by sending an application by email simultaneously to both promotors Steven Dewitte (steven.dewitte@oma.be) and Francis Berghmans (francis.berghmans@vub.be).

The application should at least contain the following annexes:

- a short CV;
- a short motivation of the application including a vision and workplan on the future research and development carried out jointly at ROB abd VUB – in particular the advancement of the Scientific and Technological Readiness level of the ECO space mission, the experience with instrument design and the related data processing, the experience with research management, and the guidance of master and PhD students (max 4 A4 pages);
- a well-argued vision on research & education with mentioning of the five most important publication related to this research profile;
- a copy of the relevant diplomas (master and PhD).