SLICE

Space Launch Impact on Climate and Environment

This project has received funding from the European Union's Horizon Europe research and innovation program under the MARIE SKŁODOWSKA-CURIE grant agreement no. 101227592.

PhD student - Doctoral Candidate (DC3)

Generation of experimental data for validating numerical modelling of launcher engine exhaust chemical composition in ground tests of CH4/O2 thrust chambers

About SLICE

Space utilisation plays a crucial role in understanding climate change, but due to a drastic increase in launch rates, there is an urgent need to understand and mitigate potential environmental impacts of space activities themselves, particularly of launchers. However, large knowledge gaps persist for their operational phase from lift-off to landing/reentry. Here, the largest Global Warming Potential and Ozone Layer Depletion Potential are expected. Especially in the higher atmospheric layers, which are only accessed by launchers, potential impacts of emitted pollutants are amplified by very long retention periods and substance accumulation effects. To investigate the Space Launch Impact on Climate and Environment, SLICE will therefore develop a research and training programme that bridges the current divide between space engineering and climate science to close the gaps that exist in the Life-Cycle Analysis of space launch systems. Thus, SLICE will contribute to advance the science of climate change by investigating the three most pressing research areas of this field: Launch Vehicle Emissions, Atmospheric Interaction & Climate Impact and System Analysis & Design. This will generate actionable insights, on which SLICE will develop solutions to reduce greenhouse gas emissions, accelerate the delivery of the Green Deal and establish an environmentally sustainable access to space. It's the ambition of SLICE to generate desperately needed novel results, which will enable cutting-edge innovations. At the same time, SLICE is committed to training a new generation of highly skilled, resilient, and environmentally aware researchers. They will combine deep scientific knowledge with an ecodesign mindset and the ability to communicate across disciplines and sectors. These doctoral candidates will be uniquely prepared to shape a sustainable future for space transportation in Europe - technically, environmentally, and politically. SLICE directly supports the European Green Deal, ESA's Agenda 2025, and will deliver crucial inputs for the EU Space Law and Product Environmental Footprint (PEF) regulations at European level, including the development of PEF Category Rules (PEFCR) for space.

About the host organization

DLR is the largest aerospace research institute in Europe. DLR has 10,000 employees at 30 locations throughout Germany and abroad. It also acts as the German space agency, responsible for planning and implementing the German space programme. (https://www.dlr.de/en)

In this project, the DLR team located at the Institute of Space Propulsion in Lampoldshausen will be responsible for collecting emission measurements from rocket engine exhaust plumes. The Institute of Aerodynamics and Flow Technology will also offer a secondment placement providing support from experts in numerically modelling cryogenic combustion and near-field rocket plumes. The Institute of Atmospheric Physics will also offer a secondment placement in its expert team on climate impact of anthropogenic emissions.

DLR brings to the project access to rocket exhaust streams at its unique ground testing infrastructure. Computational resources will also be made available in the form of the CARA supercomputer (Computer for Advanced Research in Aerospace), built in 2020 and used for CFD calculations and high-fidelity modelling. It has more than 300 TB of main memory, 17 PB of storage, and is able to perform almost 1.8 PetaFLOPS per seconds. (https://www.dlr.de/en/ra)

Task description for your Individual Research Project (IRP)

Problem Definition:

Publicly available data are inadequate for validating exhaust emission models from CH4/O2 engines. The aim is to identify greenhouse gas emissions in the exhaust plumes of liquid rocket engines and to provide data sets suitable for vali-dating numerical models.

Research Objectives:

- Develop spectroscopic measurement methodology and mobile instrumentation for application on test benches.
- Develop actively cooled probe and methodology for gas sampling in rocket exhaust plumes.
- Prepare and perform sub-scale CH4/O2 static firing tests (at test bench M3.1) for calibration of diagnostic parameters and systematic parametrical study of emission species dependencies on ROF for a fixed chamber pressure (10 bar).
- Perform measurements during testing of a sub-scale, high-power CH4/O2 thrust chamber at representatively high chamber pressure and energy density (at test bench P8), including collection of spectroscopic data, gas samples, accompanying imaging of plume structure.
- Analyse data for species identification, build database of plume characteristics for different operation conditions.
- Comparison of spectroscopic and gas sampling method results, uncertainty analysis.

Expected Results:

- Published database of exhaust plume measurements for representative engine operating conditions.

Secondments:

- *Centre Euopéen de Recherche et de Formation Avancée en Calcul Scientifique (CERFAS, Toulouse, France, ca. 3 months): alignment on validation measurement requirements*
- *University of Stuttgart (US, Stuttgart, Germany, ca. 7 months): verification of mobile instrumentation under cross-check conditions*

The IRP will have a strong link to other IRPs from different DCs for:

- Provision of data for model validation purposes
- Provision of the database to combine the data with new impact characterisation metrics

Profile and requirements

Essential skills and requirements:

- MSc or equivalent in the field of aerospace engineering, physics or similar
- Solid knowledge of Computer Science and Informatics (uncertainty quantification), Product and Processes Engineering (Space Engineering) and Atomic and Molecular Physics, Optics (spectroscopy for experimental measurements of emissions)
- Ability to work efficiently and self-reliantly in a diverse inter-disciplinary and multi-cultural environment
- Ability to work in a team as well as independently
- Ability to solve complex problems with adherence of strict deadlines
- Proactive attitude
- Excellent communication skills (both written and verbal) in English to derive the full benefit from the network training
- As secondments and events are foreseen, applicants must be ready to travel
- Applicants must be eligible to enroll on a PhD program at RWTH Aachen. **(see PROVIDE LINK PLEASE)**

Desired skills:

- Knowledge in EcoDesign, climate sciences and life-cycle assessments
- Project management
- Knowledge of the host institution language is a plus

Applicants can be of any nationality.

Candidates may apply prior to obtaining their master's degree, but cannot receive an employment contract before having obtained the master degree.

Candidates may apply to multiple positions offered within SLICE, but should carefully choose the ones that they apply for.

In addition:

Horizon Europe MSCA Mobility Rule: Researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the host organization (Germany) for more than 12 months in the 36 months immediately before the recruitment date – unless as part of a compulsory national service or a procedure for obtaining refugee status under the Geneva Convention.

Horizon Europe MSCA Eligibility Criteria: Doctoral Candidates (DC) must, at the date of recruitment by the host organization, have not been awarded a doctoral degree.

Applicants who do not fulfill the Mobility Rule and the Eligibility Criteria CANNOT be considered for the research position.

Benefits

- You will be working within our international group of > 30 researchers with experience in a broad range of sciences.
- You will get in contact with the other members of this international consortium.
- You will benefit from the well-structured training program offered by the host institution and the SLICE consortium to develop skills and thorough understanding of space transportation systems and their environmental impact.
- You will be employed by the host organization for 36 months.
- A competitive salary plus allowances. Moreover, funding is available for technical and personal skills training and participation in international conferences.
- You will participate in international conferences and secondments to other organisations within the SLICE network and in outreach activities targeted at a wide audience.

Please find additional information in the Information package for Marie Curie fellows in doctoral networks (https://op.europa.eu/s/z831).

Selection procedure

For the selection procedure, the SLICE consortium will appoint a Recruitment Committee (RC) for each position. The selection will be carried out in two consecutive stages. In the primary selection, the RC evaluates all submitted application documents. Eligible candidates of sufficient quality will be shortlisted. In the final selection, short-listed applicants are invited to interviews, held either in person at the host institution or via video-conference, and to complete a position-specific task. Both interviews and tasks are evaluated against predefined criteria, leading to a ranked list of candidates. Final decisions are made by consensus within the RC. Applicants will be informed about rejection or admission to the interview stage by the end of March 2026, and final outcomes will be communicated by the end of June 2026. The employment and relocation phase will then start immediately, allowing sufficient time for contracting, visa applications, and relocation before the official start of the DC projects in October 2026.

Timeline

Application deadline:	31.03.2026
Primary Selection:	30.04.2026
Final Selection:	30.06.2026
Starting date:	01.10.2026

Application

Interested candidates are invited to submit **one single PDF** containing the following documents in this exact order:

- Application form
- Cover letter
- An evidence-based CV that reflects a representative array of achievements and qualifications appropriate to the position you are applying for
- Reference letters or, at minimum, the contact details of persons that may be contacted for reference
- Educational and professional certificates (university degree(s) with marks, internships, workshops, languages, etc.)

Moreover, you must submit:

- Short video (maximum 30 seconds, not longer). The video must include: personal introduction, background and your motivation to apply to the research position

All the application documents must be submitted via email to **slice@tu-dresden.de**

The email subject must be "**Application for DC3 position**".

The email size incl. attachments **must not exceed 30 MB** in total.

You will receive an automatic reply if we have received your email. Please avoid any questions on the status of the selection process. We will inform you as soon as there is an update.

Candidates whose application is not compliant with the requirements above will not be considered.

Application deadline: 31 March 2026 at 11:59 PM CEST
Expected starting date: 1 October 2026

Applications and enclosures received after the deadline will not be considered.

More information and other vacant positions can be found at:

- Website: https://www.slice.eu/
- LinkedIn: https://www.linkedin.com/company/slice-dn/

Additional information

We in the SLICE consortium value diversity and we commit to equal treatment of all applicants irrespective of gender, sexuality, health status as well as social, cultural or religious background.

For additional information about the research project and this individual position, please contact: slice@tu-dresden.de

Technische Universität Dresden

DLR