**577_23_CASE_PTG_R0**

**Job Reference**

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**Position**

Undergraduate student - Aerothermochemistry analysis of combustion applications for aerospace propulsion (R0)

**Data de tancament**

Dimarts, 16 Gener, 2024

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**About BSC**

The Barcelona Supercomputing Center - Centro Nacional de Supercomputación (BSC-CNS) is the leading supercomputing center in Spain. It houses MareNostrum, one of the most powerful supercomputers in Europe, was a founding and hosting member of the former European HPC infrastructure PRACE (Partnership for Advanced Computing in Europe), and is now hosting entity for EuroHPC JU, the Joint Undertaking that leads large-scale investments and HPC provision in Europe. The mission of BSC is to research, develop and manage information technologies in order to facilitate scientific progress. BSC combines HPC service provision and R&D into both computer and computational science (life, earth and engineering sciences) under one roof, and currently has over 900 staff from 55 countries.

Look at the BSC experience:

[BSC-CNS YouTube Channel](BSC-CNS YouTube Channel)  
[Let's stay connected with BSC Folks!](Let's stay connected with BSC Folks!)

We are particularly interested for this role in the strengths and lived experiences of women and underrepresented groups to help us avoid perpetuating biases and oversights in science and IT research.

**Context And Mission**

Highly efficient and compact devices for space propulsion combustion applications depend on the utilization of high-pressure and cryogenic temperature injection conditions. These extreme operating regimes limit the amount of data that can be extracted from experimental diagnostics. Consequently, high-fidelity numerical simulations become crucial for achieving elevated reliability and readiness levels in the development of new
technologies. Dealing with these flows involves numerical challenges. Due to the strong non-linear coupling between real-fluid thermodynamics and governing equations, unphysical pressure oscillations may occur. Before embarking into the modelling and simulation of realistic engine geometries, a preliminary evaluation of the possible thermochemical states occurring during the fuel injection and combustion must be examined. In this context, one-dimensional flames in critical and transcritical conditions at elevated pressure and temperature featuring conditions of rocket engines will be analysed using the code Cantera with different equations of state for real gases.

The research team that the applicant will be involved is the Propulsion Technologies Group at CASE Department of BSC. The team is a multidisciplinary group with researchers from all disciplines and with strong background in Computational Fluid Dynamics (CFD). The team is involved in many EU and industrial projects related to this topic, where the successful activities and the publications on highly ranked scientific journals give the proved expertise.

Key Duties

- Investigate thermochemical states of mixtures at transcritical conditions found in combustion chambers of rocket engines. The work conducted will be performed with the Cantera framework, coded in Python.
- A literature review to assess the conditions and real equations of state to be evaluated.
- Study the combustion characteristics of one-dimensional flames in supercritical and transcritical conditions

Requirements

- Education
  - The candidate should be enrolled in a Bachelor’s Degree in Aerospace, Aeronautics or Mechanical Engineering with background in fluid mechanics and programming.

- Essential Knowledge and Professional Experience
  - General knowledge on fluid mechanics, propulsion, combustion chemistry and programing (Python) are expected (1-4 years' experience, at a bachelor student level)

- Additional Knowledge and Professional Experience
  - Computational skills (Linux, Latex) and parallel programming for HPC are not necessary, but will be considered an asset.

- Competences
  - Ability to work independently and make decisions
  - Fluency in English is essential, Spanish is welcome
Conditions

- The position will be located at BSC within the CASE Department
- We offer a full-time contract (37.5h/week), a good working environment, a highly stimulating environment with state-of-the-art infrastructure, flexible working hours, extensive training plan, restaurant tickets, private health insurance, support to the relocation procedures
- Duration: Open-ended contract due to technical and scientific activities linked to the project and budget duration
- Holidays: 23 paid vacation days plus 24th and 31st of December per our collective agreement
- Salary: we offer a competitive salary commensurate with the qualifications and experience of the candidate and according to the cost of living in Barcelona
- Starting date: 01/02/2024

Applications procedure and process

All applications must be made through BSC website and contain:

- A full CV in English including contact details
- A Cover Letter with a statement of interest in English, including two contacts for further references - Applications without this document will not be considered

In accordance with the OTM-R principles, a gender-balanced recruitment panel is formed for every vacancy at the beginning of the process. After reviewing the content of the applications, the panel will start the interviews, with at least one technical and one administrative interview. A profile questionnaire as well as a technical exercise may be required during the process.

The panel will make a final decision and all candidates who had contacts with them will receive a feedback with details on the acceptance or rejection of their profile.

At BSC we are seeking continuous improvement in our recruitment processes, for any suggestions or feedback/complaints about our Recruitment Processes, please contact recruitment [at] bsc [dot] es.

For more information follow this link

Deadline

The vacancy will remain open until a suitable candidate has been hired. Applications will be regularly reviewed and potential candidates will be contacted.

OTM-R principles for selection processes

BSC-CNS is committed to the principles of the Code of Conduct for the Recruitment of Researchers of the European Commission and the Open, Transparent and Merit-based Recruitment principles (OTM-R). This is applied for any potential candidate in all our processes, for example by creating gender-balanced recruitment panels and recognizing career breaks etc.

BSC-CNS is an equal opportunity employer committed to diversity and inclusion. We are pleased to consider all qualified applicants for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, disability or any other basis protected by applicable state or local law.

For more information follow this link
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