

JOB VACANCY ANNOUNCEMENT

VAC-2024-12 – Postdoc position in High Performance Computing

Number of places: 1

Category: Post Doc – From PDOC 3 to PDOC 1

Workplace: Barcelona

Salary (gross): From 28.608,23€/year to 40.051,52€/year

Weekly working hours: 40h

Functions to be developed:

The position is focused on the development of High Performance Computing (HPC) methods for the simulation of thermally coupled magnetohydrodynamic (MHD) flows in complex geometries. This problem is important for the development of fusion reactor technologies. Fusion is called to radically change the energy production worldwide, as it provides a large-scale, sustainable, carbon-free and, unlike fission, inherently safe source. A key component of fusion reactors is the breeding blanket which bound large part of the plasma chamber providing radiation shielding from free neutrons, extracting heat and regenerating the tritium burnt in the plasma. Its design is a complex task that requires advanced shape optimization based on MHD flows evaluation.

Existing tools are not mature enough to efficiently simulate MHD flows in the presence of strong magnetic fields, they are not able to properly capture complex blanket geometries, and therefore shape optimization methods are not available. The goal of the position is to contribute to the development of computational methods that include: fully monolithic solution schemes able to deal with the strongly-coupled problems associated with strong magnetic fields, embedded finite element methods to facilitate the discretization of complex blanket geometries, and new shape and optimization methods to optimize critical outputs of the MHD flow such as the pressure drop.

The developed methods will be implemented in the Julia programming language, using the [Gridap](#) ecosystem as a basis, will be released as free and open source and will exploit HPC resources. The resulting code, [GridapMHD.jl](#), will be applied to simulate and analyse real-world breeding blanket concepts and to find optimal designs. This will be done in collaboration with the Fusion technology department at CIEMAT.

Required skills:

- A PhD in applied mathematics or engineering related to the fields of computational mechanics, computational mathematics, optimization or statistics.
- Programming experience in scientific computing.
- Writing and communication skills (oriented towards the production of scientific articles and presentations).

Other valued skills (not mandatory):

- Advanced programming skills, e.g. distributed parallel programming, object-oriented and/or functional programming.
- Experience in finite element modelling, uncertainty quantification, optimization, adjoint solvers, automatic differentiation, machine learning, (non)linear multilevel solvers.

Qualification system:

The requisites and merits will be evaluated with a maximum note of 100 points. Such maximal note will be obtained summing up the following points:

- **Academic qualifications:** 30%
- **Training and development:** 10%
- **Professional experience:** 20%
- **Knowledge of the Catalan language:** 5%
- **Knowledge of the English language:** 15%
- **Selective tests and interview:** 20%

Candidates must complete the "Application Form" form on our website, indicating the reference of the vacancy and attaching the required documents.

The deadline for registration to the offer ends on March 26th, 2024 at 12 noon.

The preselected candidates may be requested to send the documentation required in the "Requirements" and "Merits" sections, duly scanned, and may be called to go through selection tests (which might be of eliminatory nature) and / or personal interviews.

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