

Internship offer (Master / Engineer)  
**Hybrid Computing for Climate Science**  
Climate Modeling Center - Institut Pierre-Simon Laplace

**Context:**

We are announcing an exciting internship opportunity at the Climate Modeling Center - Institut Pierre-Simon Laplace (CMC-IPSL) as part of the EUMaster4HPC program. IPSL is a premier, world-class institute that plays a crucial role in advancing climate, environmental and Earth system science through modeling. This internship is aimed at students who are passionate about the world of parallel programming and want to explore the potential of graphics processing units (GPUs) to solve large and complex problems.

**About the internship:**

- **Duration:** 4-6 months
- **Location:** Sorbonne University - Pierre and Marie Curie Campus, 75005 Paris,
- **Eligibility:** Master 2 or final year of engineering school, major in computer science, engineering, or a related field, with the skills: (i) Programming in Fortran 90-2003, Python, C++, (ii) Knowledge in parallel programming (MPI and/or OpenMP), (iii) Knowledge of standards development tools (compilers, debugger, profiler), (iv) Knowledge of computing architectures (CPU, GPU, memory management), (v) Knowledge of GPU computing (OpenACC and/or OpenMP), (vi) Knowledge of working with UNIX environments, and (vii) Knowledge of collaborative source code management tools (svn, git).

**Activities:**

In this internship, the main objective is to evaluate the viability of different Python Fortran parsers, notably Fparser, with regard to automating IPSL climate model migration on GPU architectures. This endeavor requires rigorous review and testing and benchmarking procedures, facilitated by industry-leading profiling tools such as NVIDIA Nsight Systems/Compute. Furthermore, refactoring of existing codes via code restructuring using compiler analyses, notably those provided by NVIDIA HPC and/or Intel, is expected. This refactoring process aims to exploit the benefits offered by hybrid parallelism and encompasses optimizations, vectorization, precision handling, and etc. The overarching goal is to improve computing efficiency and load distribution among computing nodes. IPSL climate models are primarily written in Fortran 90-2003, which provides the ability to run individual components in isolation or as integrated, coupled models.

**We offer at CMC-IPSL:**

- **Cutting-Edge Technology:** Dive into the world of GPU programming and harness the immense parallel computing capabilities of modern GPUs,
- **Real-World Application:** Gain practical experience by working on CMC-IPSL climate models that utilize GPU parallelism to solve real-world problems,
- **Expert Guidance:** Learn from experienced mentors who are experts in heterogeneous parallel computing, and receive personalized guidance throughout the internship,

- **A collaborative environment:** Collaborate with a team of engineers and researchers, and exchange ideas with colleagues to tackle complex parallel programming challenges,
- **Professional Development:** Enhance your resume and career prospects with valuable experience in GPU programming skills, a field in high demand across various industries,
- **Access to pre-exascale Tier-0 EuroHPC supercomputer:** access to LEONARDO Booster that combines the most advanced IT components for handling complex HPC problems.

### **Candidacy**

Send a CV, a brief cover letter, and your latest transcripts to [kazem.ardaneh@ipsl.fr](mailto:kazem.ardaneh@ipsl.fr), or [julie.deshayes@locean.ipsl.fr](mailto:julie.deshayes@locean.ipsl.fr).