



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



Context:

We announce a thrilling internship opportunity at Climate Modeling Center - Institut Pierre-Simon Laplace (CMC-IPSL). IPSL is a leading world-class institute that plays a crucial role in advancing climate, environmental, and Earth system science through modeling. This internship is for students who are passionate about the world of parallel programming and eager to explore the potential of Graphics Processing Units (GPUs) for solving large and complex problems.

About the Internship:

- **Salary:** minimum 550 Euros per month
- **Duration:** 4-6 months, starting from February 2024
- **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, you will evaluate the potential of available Python parsers, such as Psyclone and Loki, for automatically porting the ORCHIDEE land surface component of the IPSL climate model onto GPUs. This task will involve testing and benchmarking the modified code using state-of-the-art profiling tools such as NVIDIA Nsight Systems/Compute. You will also contribute to refactoring the ORCHIDEE code using compilers (NVIDIA HPC and/or Intel) reports to fully exploit the benefits of hybrid parallelism. This includes optimization, vectorization, precision control, and the implementation of hybrid CPU/GPU calculations, all aimed at improving the efficiency and load balancing of computing nodes. ORCHIDEE is a versatile model that represents various physical, hydrological, and biological processes governing the water and energy balance of the land surface. You can learn more about it at <https://orchidee.ipsl.fr/>. It is written in Fortran90 and can be run in stand-alone mode or coupled to the atmosphere in the IPSL Earth system model.

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 or olivier.boucher@ipsl.fr.