2018-00499 - Exponential Integrators for Non-Hydrostatic Ocean Models - Post-Doctorant Inria Grenoble Research center

**Contract type:** Public service fixed-term contract  
**Level of qualifications required:** PhD or equivalent  
**Function:** Post-Doctoral Research Visit

**About the research centre or Inria department**

Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 35 research teams and 9 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

**Assignment**

**Topic:**

The ocean is characterized by motions at a range of strongly separated temporal and spatial scales: baroclinic motions at 1ms⁻¹, barotropic motions at 100ms⁻¹ and sound waves at 1500ms⁻¹.

The model must be fast, which necessitates the use of time integration methods that are capable of taking baroclinic time steps while accurately resolving the barotropic motions. Essentially all current ocean models split-explicit time stepping to accomplish this, which requires careful design [1] to avoid stability issues and ensure accuracy. An unexplored alternative, especially for full 3D ocean models, would be the use of exponential integrators without any splitting. These methods can allow long time steps while still preserving the behavior of fast modes [2].

It might also be possible to develop an exponential integrator that preserves total energy, by combining the ideas in [3,4]. This postdoc will focus on the application of exponential integrators to a modern, non-hydrostatic ocean model: CROCO. Robust comparisons will be made to existing state of the art split-explicit schemes. If time permits, the development of an energy-conserving exponential integrator and its application to geophysical fluid flows (such as the shallow water equations) will be undertaken.

**References:**


**Additional information:**
Main activities

Skills
Technical skills and level required: Applied Mathematics (Calculus, Linear Algebra, ODE Integrators, Numerical Methods), Scientific Computing (Fortran/C/Python preferred),

English

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration
Gross salary: 2650 Euros per month

General Information
- **Theme/Domain**: Earth, Environmental and Energy Sciences
- **Town/city**: Saint Martin d'Hères
- **Inria Center**: CRI Grenoble - Rhône-Alpes
- **Starting date**: 11/1/18
- **Duration of contract**: 1 year, 4 months
- **Deadline to apply**: 3/31/18

Contacts
- **Inria Team**: AIRSEA
- **Recruiter**: Eldred Christopher / christopher.eldred@inria.fr

Conditions for application
Starting date: 1st November 2018, duration: 16 months.
Applicants should hold a PhD (defended between 1st September 2016 and 31st July 2018) in Systems and Control or Applied Mathematics.

Applications have to be made on-line on the Inria web site before end of March.

Contact: Laurent Debreu, AIRSEA, laurent.debreu_at_inria.fr
Thème: Earth, Environmental and Energy Sciences
Defence Security:
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy:
As part of its diversity policy, all Inria positions are accessible to people with disabilities.

Warning: you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.