Offer #2024-07805

Post-Doctoral Research Visit F/M Stochastic modelling of oceanic flow, small-scale dynamics, wave-current interaction

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

About the research centre or Inria department

The Inria Centre at Rennes University is one of Inria's nine centres and has more than thirty research teams. The Inria Centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Context

The Odyssey team is offering a 18 month postdoc position on ocean modelling within the ERC Stuod (Stochastic transport in ocean dynamics). Odyssey (for Ocean DYnamicS obSErvation analYsis) is a recently created team involving researchers from Inria (Rennes, France), Ifremer (Brest) and IMT Atlantique (Brest).

Inria is one of the leading research institute in Computer Sciences in France, and Odyssey is also affiliated to the mathematics research institute of the Rennes University (IRMAR).

The team expertise encompasses mathematical (stochastic) and numerical modelling of ocean flows, observational and physical oceanography, data assimilation and machine learning.

Gathering this large panel of skills, the team aims at improving our understanding, reconstruction and forecasting of ocean dynamics, and more specifically to bridge model-driven and observation-driven paradigms to develop and learn novel representations of the coupled ocean-atmosphere dynamics ocean models.

Assignment

For accurate climatic predictions, it is essential to have plausible forecasts of the future ocean state.Ideally, high-resolution ocean simulations would be used for this purpose. However, due to their associated computational costs, this approach is currently infeasible, and we must rely only on large-scale ocean representations.

To address this challenge and the urgent need to generate various likely scenarios, there has been a growing interest in geophysical sciences and climate studies in developing flow models that incorporate noise to account for modelling uncertainties or errors.

The introduction of noise into ocean dynamics models must be done on a theoretically rigorous ground. Ad-hoc choices for model noise can fundamentally disrupt the corresponding fluid dynamics models, leading to unrealistic properties. Rigorously justified methodologies for deriving stochastic dynamics models have been recently introduced in the Odyssey team within the ERC STUOD and a longstanding collaboration with Imperial College and Ifremer.

The theoretical framework on which we rely, referred to as "modelling under location uncertainty", decomposes the flow in terms of a resolved smooth component and a rapidly oscillating random component.The stochastic dynamics is then defined from a stochastic representation of the Reynolds transport theorem.From this modelling principle, stochastic equivalents of the classical geophysical flow models can be defined.

A set of models ranging from multi-layers quasi-geostrophic models to primitive equations have been in this way defined and numerically implemented. Ensemble data assimilation are currently under development as well as simplified ocean atmosphere coupled models.

The present post-doc position aims to explore a variational formalism, recently proposed by A. Debussche and E. Mémin for the incompressible Euler equation, to infer a dynamics for the noise term, and more specifically, the correlation tensor involved in the definition of the small-scale component. The

objective will be to extend this methodology to ocean dynamics and to study numerically and theoretically the corresponding system of equations. The second objective will be to explore more specifically such a system for wave-current interaction description. This post-doc will complement the numerical and theoretical efforts of the team on oceanic dynamics.

Main activities

This post-doc position takes place within the ERC project STUOD led by Inria, Ifremer and Imperial College. The post-doc will collaborate directly with the Odyssey group in Rennes (E. Mémin, Noé Lahaye and Gilles Tissot). He/She will be part of a small group devoted to the study of stochastic representation of ocean dynamics. Her/His work will undergo strong collaborations with the other PI of the ERC Stuod group (Bertrand Chapron, Dan Crisan, Darryl Holm).

Skills

The candidate should have a solid background in applied mathematics and in fluid dynamics dynamics. He/She should have knowledge on stochastic parameterization. She/he must have a good knowledge of Fortran, Python, Pytorch.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

Remuneration

Monthly gross salary amounting to 2788 euros.

General Information

- **Theme/Domain :** Earth, Environmental and Energy Sciences
- **Town/city :** Rennes
- **Inria Center :** Centre Inria de l'Université de Rennes
- **Starting date :** 2024-11-01
- **Duration of contract :** 8 months
- **Deadline to apply :** 2024-08-31

Contacts

- **Inria Team :** ODYSSEY
- **Recruiter :**
  Memin Etienne / etienne.memin@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

The candidate will work within an international collaboration. This will include in particular regular meetings and the writing of short regular reports on the advance oh his/her his work. She/he must be fluent in english.

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.

Instruction to apply

Please submit online : your resume, cover letter and letters of recommendation eventually

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.