



Offre n°2024-07871

PhD Position F/M Data assimilation of satellite data in oceanic models, learning of oceanic dynamics

Le descriptif de l'offre ci-dessous est en Anglais

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

Niveau d'expérience souhaité : Jeune diplômé

A propos du centre ou de la direction fonctionnelle

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center 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.

Contexte et atouts du poste

The Odyssey team is offering a PhD position on numerical ocean dynamics simulation, machine learning and data assimilation.

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.

Mission confiée

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 PhD position aim to explore: data driven dynamics specification and learning from high-resolution data as well as the devising of hierarchical data assimilation ensemble strategies to couple stochastic ocean model and high resolution satellite data such as the SWOT data

Principales activités

The PhD student will collaborate directly with the Odyssey group in Rennes (Noé Lahaye, E. Mémin, Gilles Tissot) and in Brest (B. Chapron and R. Fablet). He will be supervised by Etienne Mémin and co-supervised by Bertrand Chapron and Ronan Fablet to cover different aspects including stochastic modelling of ocean dynamics, satellite observation and machine learning for ocean dynamics and data assimilation.

He/She will be part of a small group devoted to ensemble method for forecast, learning and data assimilation of ocean dynamics. Her/His work will undergo also strong collaborations with the Odyssey group at IMT Atlantique (R. Fablet) as well as with the other PI of the ERC Stued group (Bertrand Chapron, Dan Crisan, Darryl Holm). During this PhD position we will explore in particular ensemble methods and kernel representation and data assimilation.

Compétences

The candidate should have a solid background in applied mathematics and/or in fluid mechanics and/or in geophysical dynamics.

She/he must have a good knowledge of Fortran, C/C+/ Python, Pytorch.

Avantages

- 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

Rémunération

Monthly gross salary amounting to 2100 euros for the first and second years and 2200 euros for the third year

Informations générales

- **Thème/Domaine** : Sciences de la planète, de l'environnement et de l'énergie Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Ville** : Rennes
- **Centre Inria** : [Centre Inria de l'Université de Rennes](#)
- **Date de prise de fonction souhaitée** :2024-10-01
- **Durée de contrat** :3 ans
- **Date limite pour postuler** :2024-08-21

Contacts

- **Équipe Inria** : [ODYSSEY](#)
- **Directeur de thèse** :
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A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

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.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

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

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.