CALL FOR A POST-DOCTORAL POSITION IN APPLIED MATHEMATICS

CLOUD AGGREGATION FROM SATELLITE DATA

The project is based on a collaboration between INRIA – Université Paris Dauphine (MOKAPLAN) and Ecole Normale Supérieure (Laboratoire de Météorologie Dynamique (LMD)). MOKAPLAN is expert in numerical methods for optimal transport and inverse problems with sparsity prior and their applications. The LMD team at ENS has the expertise in satellite imagery and cloud dynamics.

The project long term goal consists in improving our understanding of cloud aggregation, a key issue in climate change, by using a set of methods that have been developed at MOKAPLAN on quantitative models that include transport and growth process. The core of the project will be to develop new methods to analyze aggregation and the temporal evolution of cloud clusters. It will use recent methods of optimal transport that allow accounting for morphological evolution and can be used to extract information. In particular, the first step of the project consists in developing new methods to segment cloud data taking into account its dynamical evolution through the use of generalized optimal transport models.
References:
-Wing, A.A., Emanuel, K., Holloway, C.E. & Muller, C. (2017) Convective self-aggregation in numerical simulations : a review, Surv Geophys, doi:10.1007/s10712-017-9408-4
- Bretherton, C. S., and M. F. Khairoutdinov (2015), Convective self-aggregation feedbacks in near-global cloud-resolving simulations of an aquaplanet, J. Adv. Model. Earth Syst., 7, 1765–1787, doi: 10.1002/2015MS000499.
- Fiolleau, T., & Roca, R. (2013). An algorithm for the detection and tracking of tropical mesoscale convective systems using infrared images from geostationary satellite. IEEE transactions on Geoscience and Remote Sensing, 51(7), 4302-4315.
- Muller C. & Held, I. (2012) Detailed investigation of the self-aggregation of convection in cloud-resolving simulations, J. Atmos. Sci., doi:10.1175/JAS-D-11-0257.1
- Chizat, L., Peyré, G., Schmitzer, B., & Vialard, F. X. (2016). Scaling algorithms for unbalanced transport problems. arXiv preprint arXiv:1607.05816.
- Chizat, L., Peyré, G., Schmitzer, B., & Vialard, F. X. (2016). An Interpolating Distance Between Optimal Transport and Fisher–Rao Metrics. Foundations of Computational Mathematics, 1-44.

Skills: Since this project is exploratory, it requires a candidate who is able to conduct independent research. The ideal candidate has already a background in segmentation methods or in meteorological image processing. In both cases, the candidate should be willing to learn new methods and materials from the meteo/math areas to develop new interdisciplinary methods.
Programming experience in python/matlab/… are required.

Position: The position is offered for one year with a possible extension for a second year not yet funded. The salary is up to 2500€ net per month (that is about 2900€ before social taxes) according to the experience.
The position is open from September 1, 2017 or as soon as possible after this date.
The post-doc will be hosted by MOKAPLAN (located near Gare de Lyon in Paris).

Contact: The potential candidates are invited to get into touch with Jean-David Benamou (jean-david.banamou@inria.fr) and Bernard Legras (legras@lmd.ens.fr).