EDIPI

Laboratoire des Sciences du Climat et de l'Environnement
LSCE (UMR 8212)

PhD project, within the project EDIPI Horizon 2020 Marie Skłodowska-Curie Actions, Innovative Training Network.

Changes in the dynamics and predictability of explosive North Atlantic cyclones under anthropogenic forcing

Supervised by Davide FARANDA & Pascal YIOU
Where: LSCE-IPSL, CEA Saclay l'Orme des Merisiers, CNRS UMR 8212 CEA-CNRS-UVSQ, Université Paris-Saclay, 91191 Gif-sur-Yvette, France.
When: Starting in 2021, after the start of the EDIPI project on March 1st , 2021, preferably in September 2021.
Duration: A three-year PhD project.
Salary and condition: The PhD will benefit excellent salary conditions, training and networking plan, following the European Marie Curie ITN rules.

Objectives: This project aims to characterize (predictability and duration) and simulate North Atlantic cyclones under climate change, with a specific focus on explosive cyclones leading to European wet and windy extremes.

Expected Results: The PhD Candidate will elucidate changes in the predictability and duration of North Atlantic extra-tropical cyclones due to anthropogenic emissions in numerical climate models. A specific focus will be on explosive cyclones leading to European wet and windy extremes. These goals will be achieved by computing dynamical systems metrics (finite time Lyapunov exponents, transfer operator, local entropy, local dimension and persistence) for atmospheric fields associated to the cyclones under present day and future climate conditions. The hypothesis – supported by the recent work of Faranda et al. [1,2]– is that these metrics provide a direct indication of the intrinsic predictability of atmospheric features as well as an objective measure of their duration/persistence. The PhD Candidate will then evaluate whether simulated explosive cyclones in future emission scenarios yield the same dynamical features as those that have already been observed. In collaboration with other members of the PhD Candidate will further explore how the dynamical systems methodology may be used to constrain simulations with rare event algorithms. The model data analysed in the project will include the convection-permitting simulations produced at LSCE [3] (key for the study of precipitation extremes), those used by PhD Candidate and a subset of state-of-the art global climate models. The project will deliver a set of diagnostics to evaluate simulations of extratropical cyclones, and will use this to determine which climate simulations are most appropriate to use. A key step will be to determine which atmospheric observables (atmospheric pressure, wind speed, …) the dynamical systems metrics should be computed on.

[1] Faranda, D., Messori, G. & Yiou, P. Diagnosing concurrent drivers of weather extremes: application to warm and cold days in North America. Clim Dyn 54, 2187–2201 (2020). https://doi.org/10.1007/s00382-019-05106-3

[2] Faranda, D., Vrac, M., Yiou, P., Jézéquel, A., & Thao, S.. (2020). Changes in future synoptic circulation patterns: consequences for extreme event attribution. Geophysical Research Letters, 47, e2020GL088002. http://dx.doi.org/10.1029/2020GL088002

[3] Luu, L. N., Vautard, R., Yiou, P., and Soubeyroux, J.-M.: Evaluation of convection-permitting extreme precipitation simulations for the south of France, Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2020-77, in review, 2020.

Requirements: A Master's or corresponding degree in Climate Science, Earth Sciences, Physics, Mathematics, Meteorology, or related disciplines preferably obtained no later than one month before starting date. The applicant must be proficient in spoken and written English. In accordance with MSCA rules, applicants must not have resided and not have carried out their main activity (work, studies, etc.) in France for more than 12 months in the 3 years immediately before the recruitment date – unless as part of a procedure for obtaining refugee status under the Geneva Convention. The applicant at the time of recruitment must have a pending Master's degree and must not have been awarded a doctoral degree.

Further requirements: Candidates should be able to demonstrate motivation and a strong eagerness to learn and have the ability to both work independently and as part of a team. Previous research experience will be a distinct advantage. The fellow must be willing to travel and will be required to complete international secondments.

Application process: Applications must include a **cover letter**, a **CV**, any document that might attest the academic results during the last two years, **2 recommendation letters** and be sent directly to davide.faranda@cea.fr

The closing date is 30th April 2021.

After 30th April 2021, please contact davide.faranda@cea.fr to know if the position has already been granted or not.

The EDIPI project: Students will receive training within a pan-European academic sector research training network, specifically focused on research in climate extreme events.

The positions are posted as part of the EDIPI project - "European weather Extremes: DrIvers, Predictability and Impacts" - funded through the Horizon 2020 Marie Skłodowska-Curie Actions programme under Grant number 956396. EDIPI will train young researchers in Europe to address key scientific problems for the study of climate extreme events and their impact. The EDIPI consortium comprises universities and private entities with researchers who are leading experts on study of climate extremes. In cooperation with the other 13 early stage researchers (ESRs) to be recruited, the researchers will combine a physical understanding of high-impact weather extremes with a practical knowledge of predictability tools and an appreciation of user-relevant information required by the private sector. The research training will be hosted by universities with a track record of graduate training and industrial partners. It will be composed of an ambitious scientific program with ample opportunity for networking at network meetings, conferences and shared secondments. These are designed to enhance your career prospects in both academia and the private sector In addition to training young researchers for the challenges of tomorrow EDIPI will provide, from day one, excellent research with impressive scientific and societal impact.