12 month Postdoc or Engineer position on
"Statistical bias correction of climate simulations over France for the 21st century"
At LSCE-IPSL

In the framework of the convention with the French ministry of ecological transition ("ministère de la transition écologique"), coordinated by INRAE, the "Institut Pierre Simon Laplace" (IPSL) has an open position for a postdoc, or engineer to fulfil.

<u>Context</u>:
Climate change generates many questions from scientists and operational staff. What is the link between changes in the climate and those in the hydrology of hydrosystems? What are the impacts of climate change on the territories? On what scientific bases can we build climate change adaptation strategies to guarantee sustainable management of hydrosystems? A first project (Explore 2070 in 2012) analysed future climate simulations from various climate models to assess the impacts of climate change on aquatic environments and water resources by 2070. It is based on the 4th Assessment Report of the IPCC (AR4, 2007).

<u>Goal</u>:
The aim of the "Explore 2" project is to update the calculations and assessments with the most recent IPCC database (CMIP5, the first results of which were communicated in 2013). The results of this project will make it possible to characterize the climate at a resolution of 8 x 8 km^2 and to assess, in a context of climate change, the evolution of the available surface and groundwater resources over the whole of the 21st century for different emission scenarios of greenhouse gases (RCP2.6, RCP4.5 and RCP8.5).

To do so, hydrological models have to rely on relatively high-resolution climate simulations (8 x 8 km^2). However, regional climate model (RCM) simulations have a spatial resolution of ~25 x 25 km^2 on average and possess some statistical biases that can prevent their direct use by impact modellers. It is thus needed to downscale and/or bias correct them first.

<u>Tasks for the recruited person</u>:
The hired person will be in charge of the downscaling/bias correction of the climate simulations. She/he will have to manage the many databases of simulations and reanalyses, to apply bias correction methods (in several configurations) as well as to control the results before making them available for the partners of the project.
More precisely:
- the climate simulations to be downscaled/corrected are runs from the EURO-CORDEX exercise. The climate variables include temperature, precipitation, wind, radiation, etc., (i.e., variables needed to run hydrological models);
- the statistical downscaling/bias correction method to apply is multivariate: the "Rank Resampling for Distributions and Dependences" approach (R2D2, Vrac, 2018, Vrac & Thao, 2020). R2D2 will be applied under various configurations (e.g., local multivariate; spatial multivariate, including temporal constrains or not)

The hired person will have to interact with researchers and engineers from the other partners of the Explore 2 project (Météo-France, INRAE, BRGM, IGE, etc.), including climate scientists and hydrologists.

<u>Requirements</u>:
The position is preferentially open to PhD holders (postdoc or research engineers) but Master level or engineer candidates are also welcome.
The successful candidate must have shown her/his capability to manage large databases. She/he must also be able to understand and manipulate statistical tools and concepts and have knowledge in climate science.
An experience in R language is strongly recommended, as well as an aptitude to work in a multidisciplinary research environment.

Duration and salary:
The net salary will be between 1800 and 3000 euros per month, depending on qualification and experience. The position is expected to start in Spring 2021 and will last about 12 months (depending on salary).

Geographical location & scientific team:
This position will be located at Gif-sur-Yvette (France), in the "Extremes – Statistics – Impacts – Regionalization" (ESTIMR) scientific research team of the "Laboratoire des Sciences du Climat et de l'Environnement" (LSCE). The ESTIMR team develops a methodological research aiming to better understand the climate data: statistical analyses of observations and simulations in order to investigate the variability and identify the trends, modelling of extreme events, detection and attribution of their changes, downscaling, bias adjustment of simulations, uncertainty modelling of climate projections, etc. The ESTIMR team leads and participates in international projects, from pure to more applied science projects. The main activity of the team relies on the use and development of advanced statistical models via a strong multidisciplinary interaction among climatology, modelling and statistics.

How to apply:
Applications will be open until February 28, 2021 (or until the position is filled) and have to be submitted by e-mail to M. Vrac (mathieu.vrac[at]lsce.ipsl.fr) and S. Thao (soulivanh.thao[at]lsce.ipsl.fr) as soon as possible and must include:
  - a CV (max 2 pages + Publication list if exists),
  - a statement of interests describing why the candidate fits the position (max 2 pages),
  - the names of at least 2 references including e-mail addresses and telephone numbers.

More information on the "Extremes – Statistics – Impacts – Regionalization" (ESTIMR) team:
http://www.lsce.ipsl.fr/en/Phocea/Vie_des_labos/Ast/ast_groupe.php?id_groupe=56
More information on the "Laboratoire des Sciences du Climat et de l'Environnement" (LSCE):
http://www.lsce.ipsl.fr/

References:

Vrac, M. Multivariate bias adjustment of high-dimensional climate simulations: the Rank Resampling for Distributions and Dependences (R2D2) Bias Correction. Hydrol. Earth Syst. Sci., 22, 3175-3196, https://doi.org/10.5194/hess-22-3175-2018

Vrac, M., Thao, S. (2020) R^2D^2 v2.0: Accounting for temporal dependences in multivariate bias correction via analogue ranks resampling. Geosci. Model Dev., 13, 5367–5387, https://doi.org/10.5194/gmd-13-5367-2020