Engineer position

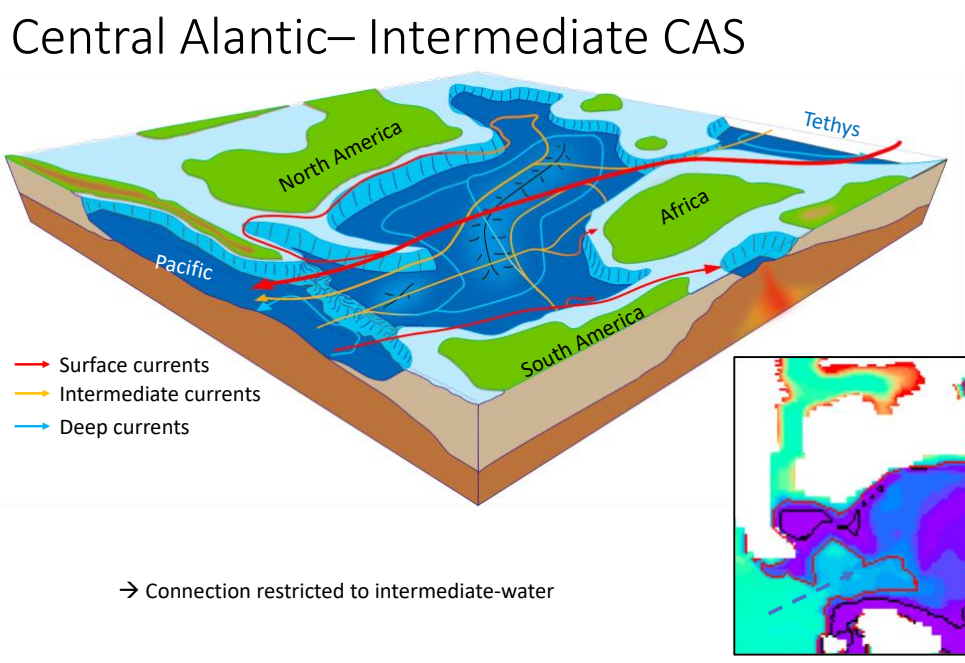
One engineer position of 2 years is offered as part of this project, with additional details below (and with the possibility of an extension). The project started in September 2020 with the recruitment of one engineer and one postdoc. From September 2021, a second postdoc candidate will join the project but the engineer (Wesley Banfield) will move to a new position for working on cloud dev. Hence, we are looking for a motivated, creative and dynamic candidate for the engineer position. The work achieved by Wesley Banfield took advantage of the following technologies.

1- Jupyter and interactive computing / graphs
2- Containerisation (e.g. Docker)
3- Flask / Panel (Holoviz).

More details can be found here: https://cerege-cl.github.io/netcdf_editor_app/multi
As described below, other skills more relevant to scientific computing sciences would be welcome too.

The work will be carried out mainly at CEREGE in Aix en Provence, a region benefiting from the exceptional climate of the Mediterranean. Collaborations with Y. Goddéris (GET, Toulouse), S. Arndt and P. Regnier (ULB, Brussels) and researchers from the IPSL (Paris) will provide the successful candidate with a strong network. These collaborations will involve frequent trips to these cities.

Please contact Yannick Donnadieu (donnadieu@cerege.fr)



General context

The research activities of the Climate team (https://www.cerege.fr/en/research/climate-research-group) have evolved since 2017 through the emergence of actions on long time scales, coupling aspects of pre-Quaternary long-term modelling and paleoclimatic reconstructions (https://cerege-cl.github.io)

This evolution stems from the imperative need to understand the climate system under conditions very different from the current one. The growth of computing resources, from the local level via the meso-centre of the OSU PYTHEAS, to the national level via the TGIR (IRENE and JEAN ZAY supercomputers) opens up a methodological field in modelling in the scientific fields of the CEREGE Climate team in close relationship with laboratories at the IPSL (LSCE, LOCEAN and LMD). The combination of the emergence of these computational tools and of complex and massive datasets makes it possible to envisage a more frequent use of climate models in conditions different from those we currently experience, such as the colder conditions of glacial climates and/or the warmer conditions of older periods (Miocene, Eocene, Cretaceous). The coupling of data analysis with a modelling approach is generally fruitful and often leads to major discoveries. These activities have been developed in recent years with several ANR and ERC projects and strong support from industrial partners.

Description of potential activities (please note that we are aware that only one person cannot fill in all these duties – depending on the skills, the profile will be adapted and sharpened)

- The engineer will be in charge of the development of software to configure the boundary conditions of climate simulations, to develop visualization tools to check the relevance of these boundary conditions and finally to analyze these climate model outputs. The successful candidate will be in charge of implementing this software and optimizing them for deployment on local, regional to national computer networks via computing centers.

- The engineer will be in charge of developing optimization and interfacing tools for coupling between different model compartments: Earth System models indeed imply many couplings between pre-existing models (i.e. atmosphere - ocean - sea ice - marine biogeochemistry - ecology etc.) that do not have the same numerical grids.

- The engineer will assist and help the two postdocs hired within this project to implement their own development in the IPSL model and in the GEOCLIM model and will work closely with support computing teams at the IPSL.

Requirements:

- The candidate should hold or be about to obtain a Master's degree, Engineer's degree or PhD in Earth sciences, physics or applied mathematics;
- The candidates should have the ability to work at other locations (weeks) including the IPSL in Paris, the GET in Toulouse and the ULB in Brussels;
- Ability and desire to work in a closely cooperating team but also independently;
- Excellent communication skills;
- Excellent skills in coding in Python, Java, Fortran, C++, Python, Java or equivalent and bash/command line tools.

Employment condition - The position is starting as soon as possible. Net salary will be between 1800 and 2750 euros (exact salary will depend on the experience). The contract is for a minimum of two years with full French social security benefits (medical insurance, unemployment benefit, pension, maternity leave and child benefit) and with a possibility of extension.

Selection criteria - Candidates will be evaluated based on their qualifications and ability to fulfill the responsibilities as outlined for this project.

Deadline for applying
All applications received prior to July, 31th 2021, will be given full consideration. The search will be continued until the positions are filled.
We are looking forward to receiving your application
Please include the following documents:

- A cover letter stating your motivations and interests
- A detailed resume including academic background
- The names, addresses, and telephone numbers of two referees (academics or industrials)

General description of the scientific project

Over the last decades, increasing acquirements of well-dated, high-resolution records from marine sediments and developments in carbon cycle models have raised much interest in understanding the role and impact of the organic carbon cycle on climate and on the biogeochemical state of the ocean. Its role in the regulation of atmospheric CO_2 may for example have been substantial, in particular during severe events of marine anoxia in generally extremely warm climates such as the mid-Cretaceous. In the current context of extreme climate change, upheavals in the marine organic carbon cycle may therefore crucially affect our future, yet our knowledge of this carbon sink remains incomplete.

The biological pump indeed integrates processes affecting several compartments of the Earth System, such as continental alteration, ocean dynamics, ocean biochemistry but also sedimentary burial and marine ecology. As part of a large industry-supported project, we propose to use major intervals of organic matter burial in the Cretaceous as extreme and constrained benchmarks to improve our understanding of the marine biological pump and its representation in the IPSLCM5A2 Earth System model. Embedded in a comprehensive model-data comparison framework, the results will then be used to evaluate the organic carbon burial response to future, millennial-scale projections.

Model developments envisioned in this project will improve the representation of both continental weathering and fluxes of nutrient and detrital material to the ocean. Up-to-date representation of the sulfur cycle in the ocean and different representations of marine ecology will be implemented, and the coupling with the marine sedimentary system will also be explored.