Master 2 Research Internship Proposal

Sea level rise along the North Atlantic coasts since 1850

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The internship will take place at the Laboratory for Ocean Physics and remote Sensing (LOPS), Brest-Plouzané, France.

Internship period
First semester 2023

Subject
The objective is to investigate sea level rise along the North Atlantic coasts (mostly U.S. and Europe), over the period 1850-2020. The candidate will analyse sea level data from in-situ observations (tide gauges) and coupled ocean-land-atmosphere climate models (CNRM-CM5 and CNRM-CM6 from the CMIP - Coupled Model Intercomparison Project, Voldoire et al., 2019).

The candidate will tackle down the following scientific questions:
- In which way the CNRM-CM climate models correctly simulate mean sea level rise in the North Atlantic coastal areas ?
- Which part of mean sea level rise in these coastal areas can be attributed to human-induced global warming ?
- What is the signature of the internal climate variability ?

The work will consist of the following steps:
1) extract long-term (> 80 years) sea level observations from GESLA-3 dataset (Global Extreme Sea Level Analysis Version 3, Haigh et al., 2021); process the sea level data to compute monthly mean sea levels,

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2) compute the monthly mean sea levels (and standard deviation) since 1850 from two climate models: CNRM-CM6 (30 historical members and a pre-industrial control run) and CNRM-CM5 (10 historical members and a pre-industrial control run); note that the pre-industrial control run is without greenhouse gas effects,
3) compare monthly mean sea levels from observations and climate models at tide gauges, in order to investigate if climate models correctly simulate mean sea level rise in coastal areas,
4) compare monthly mean sea levels from observations and climate models with and without greenhouse gas effects, in order to investigate which part of mean sea level rise can be attributed to human-induced global warming.

The tide gauge data and climate models have already been downloaded, and are available on Ifremer supercomputer (Datarmor).

This work takes place in the framework of the ClimEx project (https://climex.ifremer.fr).

Skills
Good knowledge in Marine Sciences, Physical Oceanography or Geosciences. Technical abilities in data analysis and scientific programming (Python, Matlab, NCL, CDO, NCO).
Good knowledge in Unix/Linux environments.
We are looking for a highly motivated student.

References
Haigh et al. (2021). GESLA Version 3: A Major Update to the Global Higher-Frequency Sea-Level Dataset. https://eartharxiv.org/repository/view/2828/
Voldoire et al. (2019). Evaluation of CMIP6 DECK experiments with CNRM-CM6-1, Journal of Advances in Modeling Earth Systems, https://doi.org/10.1029/2019MS001683