MSc internship – 4-6 months

"Impact of satellite sampling characteristics on wind and wave climate analysis"

Hosting laboratory

Laboratoire d'Océanographie Physique et Spatiale (LOPS) – IFREMER – Brest, France

Supervision

Guillaume Dodet (researcher at LOPS) – 80%

Pierre Tandéo (lecturer at IMT) – 20%

Required skills

- Scientific background in Data Analysis and/or Physical Oceanography
- Programming skills (Matlab, Pyhton and/or Fortran90)
- Good communication (oral and written) in English

Keywords

Wind and Wave Climate, Satellite Remote Sensing, Undersampling Errors

Context

Wind and wave climates present a strong natural variability over decadal timescales, which requires long-term observation database for their analysis. Earth Observation satellites have been continuously montoring sea states from space at global scale since the early 1990s thanks to radar altimeters, scatterometers and Synthetic Aperture Radar (SAR). Once combined and inter-calibrated, multi-mission satellite products represent unique dataset for climate studies. However, wind storms and the resulting wind sea and swells are transient phenomena that last only a couple of days, and are often missed by satellite observations. Indeed, EO satellites have characteristic sampling patterns in both space and time, and their repeat period is rather large (a few days) in comparisons to the observed signals. In the case of multi-mission products, the sampling may significantly increase as the number of in-orbit satellite increase with time, leading to inacurrate trend estimates (Jiang, 2020).

The objective of this project is to investigate the impact of satellite undersampling on wind and wave climate statistics (means and extremes) derived from multi-mission satellite products. The analysis will concern the significant wave height but also spectral parameters such as wave period and direction. For this purpose, the applicant will use orbit information from the altimeter and SAR missions included in the Sea State Climate Change Initiative dataset (Dodet et al., 2020), as well as model outputs from IFREMER global wave model hindcast (Alday et al., 2021). The undersampling error will be studied by sampling the modelled oceanic wind speed and wave height data using the satellite track information and by comparing the statistics derived from the virtual observations and from the original model outputs. A secondary objective is to define an uncertainty parameter for gridded monthly satellite products, which will take into account the local wind and wave signal characteristics and the sampling information.

Application

CV and cover letter should be sent to guillaume.dodet@ifremer.fr.

Bibliography

Alday, M., et al. 2021. A global wave parameter database for geophysical applications. Part 3: Improved forcing and spectral resolution. Ocean Modelling 166, 101848.

Dodet, G. et al. 2020. The Sea State CCI dataset v1: towards a sea state climate data record based on satellite observations. Earth System Science Data 12, 1929–1951.

Jiang, H., 2020. Evaluation of altimeter undersampling in estimating global wind and wave climate using virtual observation. Remote Sensing of Environment 245, 111840.