Comparison of ECMWF-ERA5 turbulent Air-Sea Fluxes and related environmental variables to data from to the OCARINA wave following platform

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Introduction

The OCARINA wave-following platform was developed by Denis Bourras, researcher at MIO, to study turbulent flows at the air-sea interface, in collaboration with LATMOS, LOCEAN, Ifremer, Météo-France, LOPS, IRPHE, DT-INSU, and LOG. OCARINA has been deployed in various regions of the world since 2011.
The measurements obtained, mainly in swell conditions, provide a new point of view compared to measurements carried out on oceanographic vessels.

Picture of OCARINA

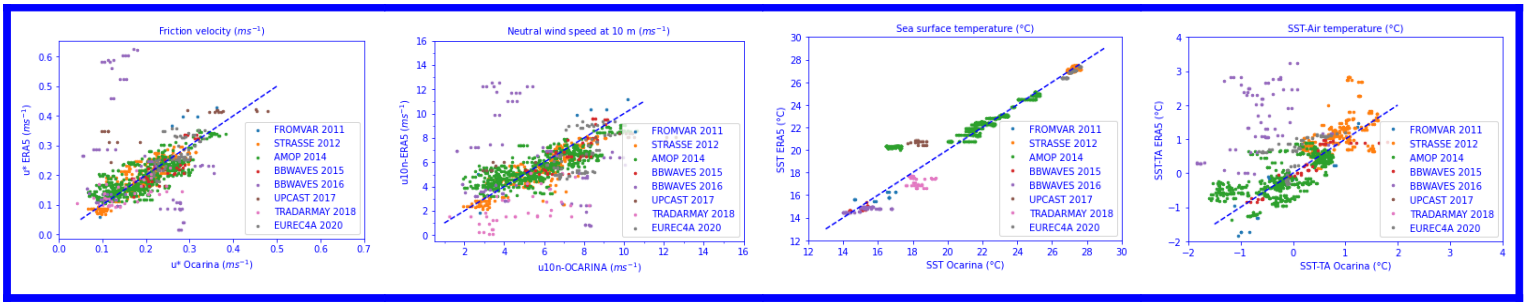
We compare our flows at the air-sea interface, estimated with data collected using **OCARINA**, with data from the European Center for Medium-Range Weather Forecasts (**ECMWF**) - **ERA5** reanalysis that combines physical models and multivariate past observations. We use these **hourly ERA5 estimates** to find the closest ECMWF data in time and space to each available OCARINA data. Several meteorological parameters are compared: u*, un10, SST, TA,..

Method

The principle of this comparison is based on the search for **concomitant points** between the two data (**OCARINA-Era5**) and by imposing a minimal spatial rapprochement, calculate using latitude and longitude, to do this, we have written a **code** which makes this comparison between the various variables and for the different measurement campaigns as well as the calculation of certain flow parameters, which are not explained in the Reanalysis data. In this code we impose a time gap of **±30 min** and for each iteration, we calculate the minimum deviations of latitudes and longitudes, taking into account the mesh of ERA5; 2.5° X 2.5°.

Results

We compared the variables **SST**, **SST-TA**, **u10n** and **u*** come from **OCARINA** and Reanalysis (**Era5**) data, by means of temporary profiles and point cloud representations by calculating, the average deviations, the correlations the standard deviations, the biases, the slopes of linear regressions as well as the medians and the coefficients of polynomial regressions.



Regions of different capganes (Borras and al.) : **2011** Iroise Sea, **2012** Tropical Atlantic, **2014** Chilie-Peru upwelling, **2015** Iroise Sea, **2016** Iroise Sea, **2017** Mediterranean sea, **2018** Mediterranean sea, **2020** Barbados.

Conclusion

Taken as a whole, our results are satisfactory. but we note significant differences are observed near the **coasts**, for certain compaagens of measurements. As a **perspective** to this work we are looking for an explanation of these discrepancies. In particular, taking into account the **surface current** could improve our results. OCAARINA is not equipped with sensors to obtain this data so we assume it is zero. This parameter is also taken as zero in the ERA5 models. The MIO is currently developing an instrument for measuring the surface current.

References

A new platform for the determination of air-sea fluxes (OCARINA): Overview and first results. Journal of Atmospheric and Oceanic Technology, 31(5), 1043–1062. Bourras, D., Branger, H., Reverdin, G., Marié, L., Cambra, R., Baggio, L., and al. 2014.
Air-Sea Turbulent Fluxes From a Wave-Following Platform During Six Experiments at Sea. D. Bourras, R. Cambra, L. Marié, M-N. Bouin, L. Baggio, H. Branger, H. Beghoura, G. Reverdin, B. Dewitte, A. Paulmier, Ch. Maes, F. Ardhuin , I. Pairaud, Ph. Fraunié, Ch. Luneau, D. Hauser. Journal of Geophysical Research: Oceans. 2019.