SWOT data challenge NATL60 – 2020A_SSH_MAPPING_NATL60 User manual

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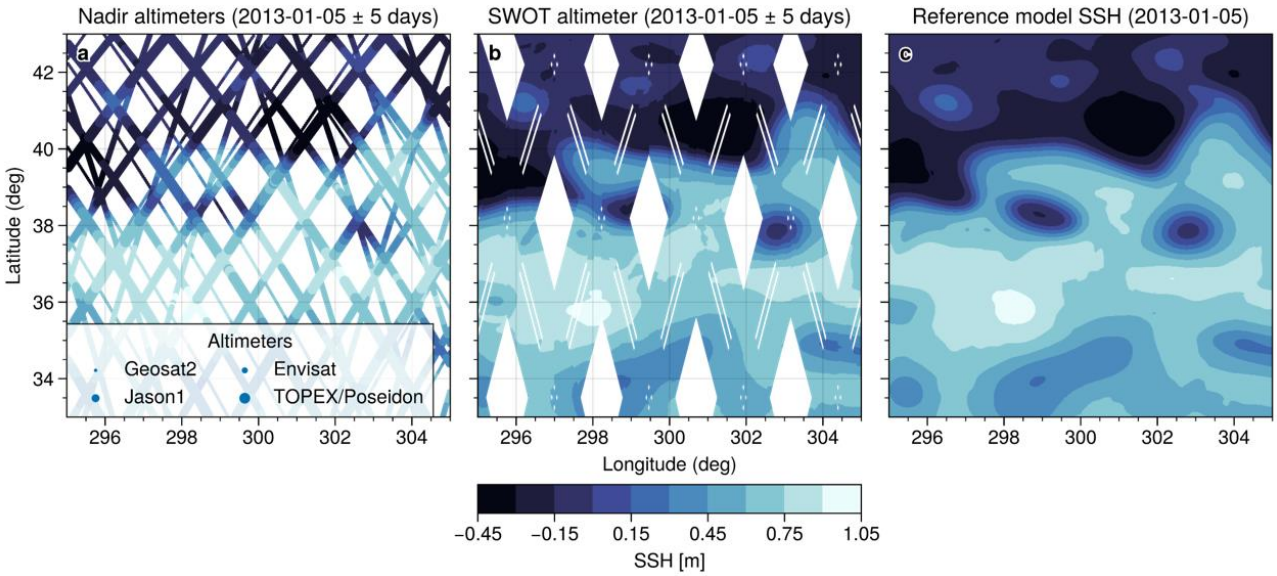

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Contents

1 Introduction

The 2020A_SSH_MAPPING_NATL60 products are model-based sea surface height products. They are designed to carry out Observing System Simulation Experiment for assessing, for example, the performances of altimetric missions not currently in orbit (typically SWOT like mission) and/or for investigating the performance of mapping algorithms with recent and future altimeters constellation. The present document describes each sub-products and variables referenced in 2020A_SSH_MAPPING_NATL60.

These products have been computed in collaboration between CLS and the MEOM Team from IGE within the BOOST-SWOT project (https://meom-group.github.io/projects/boost-swot/) funded by ANR and the MIDAS project funded by CNES for the NASA/CNES SWOT Science Team. The dissemination of those products is part of the CNES Aviso+ project.

Data Policy and conditions of use

The 2020A_SSH_MAPPING_NATL60 products are available free of charge for any project or study.

Citation

Publications should include the following statement in the Acknowledgments: "The data used in this study (doi 10.24400/527896/a01-2020.002) were developed, validated by CLS and MEOM Team from IGE (CNRS-UGA-IRD-G-INP), France and distributed by Aviso+".

2 Products description

2020A_SSH_MAPPING_NATL60 contains sea-surface-height (SSH) data simulated on 1) several along-track altimeter orbits (Jason1, Envisat, Geosat2, Topex/Poseidon interleaved and SWOT-nadir orbits) and 2) the large-swath of SWOT. These SSH data are interpolated onto the orbits thanks to the SWOTSimulator package [Gaultier et al., 2016] [Ocean_SWOTSimulator] from a realistic high-resolution ocean simulation.

The realistic high-resolution simulation is referenced as the NATL60-CMJ165 simulation based on the NEMO ocean model [Madec et al., 2019]. The model has a horizontal grid spacing that ranges from 1.6 km at 26°N to 0.9 km at 65°N which allow to simulate realistic SSH scene that could be observed by SWOT. Further information about the simulation can be found in Ajayi et al. (2020).

The processing for the pseudo-observation production follows the SWOTsimulator. **The along-track nadir pseudo-observations datasets contain noise-free SSH data** (variable ssh_model, which is the direct interpolation of the model SSH onto the nadir track) and **SSH data with simulated noise** (variable ssh_obs). As explained in the SWOTsimulator reference manual, the simulated noise for nadir altimeter follows a spectrum of error consistent with global estimates from the Jason-2 altimeter. The simulation of the wet tropospheric error is not considered here. The along-track point spacing is 6km for Envisat, Jason1, Geosat2 and Topex/Poseidon Interleaved missions, 2km for the SWOT nadir.

The SWOT-like pseudo-observations, contain also **noise-free SSH data** (ssh_model) and **SSH data with simulated noise** (variable ssh_obs). The simulated noise for SWOT swath is based on several instrumental error contributions: timing error, roll error, baseline dilation error, karin error and phase error. The reader can refer to the SWOTsimulator reference manual for the details on the error budget. The simulation of the wet tropospheric error is also not considered here.

The present datasets focus on a 10°x10° area in the GulfStream system.

Products	Mission	Period Coverage	Spatial Coverage
Simulated Along-Track	Topex/Poseidon interleaved	2012/10/01-2013/09/29	65°W-55°W 33°N-43°N
	Jason-1	2012/10/01-2013/09/29	
	Geosat Follow On	2012/10/01-2013/09/14	
	Envisat	2012/10/01-2013/09/30	
	SWOT Nadir	2012/10/02-2013/09/30	
	SWOT Karin	2012/10/01-2013/09/30	
Reference simulation (NATL60-CJM165) Gridded	grid	2012/10/01–2013/09/30	

Table 1. Products' characteristics

3 Parameters description

List of the parameters available in each product.

NetCDF name	Units	Short description
lat	degrees_north	Latitude coordinates of the measurement
lon	degrees_east	Longitude coordinates of the measurement
ncycles	-	Number of days in a cycle
x_al	kilometers	Along track distance from the beginning of the pass
x_ac	kilometers	Across track distance from nadir
lat_nadir	degrees_north	
lon_nadir	degrees_east	
model_index	-	Equivalent model output number in list of file
ssh_obs	meters	Observed SSH (ssh_model + errors)
ssh_model	meters	SSH interpolated from model
timing_err	meters	Timing error
roll_err	meters	Residual roll error
phase_err	meters	Phase error
bd_err - -	meters	Baseline dilation error
karin_err	meters	Karin instrument random error
Nadir_err	meters	Nadir altimeter error
time	seconds since 2012-10-02 18:03:42.401288	

Table 2. *Short description of all parameters available in Netcdf Along track files. The variables in green are only in the SWOT Karin file and the variable in purple are not in the SWOT Karin file.*

NetCDF name	Units	Short description
lat	degrees_north	Latitude coordinates of the measurement
lon	degrees_east	Longitude coordinates of the measurement
sossheig	kilometers	SSH interpolated from NATL60-CJM165 model
time	seconds since 2012-10-02 18:03:42.401288	

Table 3: List of variables in the NetCDF grid product.

4 Accessibility of products

The products are available via the authenticated Aviso+ OpenDAP:

- You first need to register via the Aviso+ web portal and sign the License Agreement: https://www.aviso.altimetry.fr/en/data/data-access/registration-form.html
- Please, choose the product "Ocean data challenge" in the list of products

A login /Password will be provided via email with all the necessary information to access the products.

5 List of acronyms and abbreviations

ESA: European Space Agency

FTP: File Transfer Protocol

NEMO: Nucleus for European Modelling of the Ocean

OSSE: Observing System Simulation Experiment

SLA: Sea Level Anomaly

SSH: Sea Surface Height

SWOT: Surface Water Ocean Topography

6 References

Ajayi A., J. Le Sommer, E. Chassignet, J.-M. Molines, X. Xu, A. Albert, E. Cosme (2020). Spatial and Temporal Variability of the North Atlantic Eddy Field From Two Kilometric-Resolution Ocean Models. *JGR Oceans*, https://doi.org/10.1029/2019JC015827

Gaultier L., C. Ubelmann, and L.-L. Fu (2016), "The challenge of using future SWOT data for oceanic field reconstruction," *J. Atmos. Ocean. Technol.*, vol. 33, pp. 119–126, Jan. 2016, https://doi.org/10.1175/JTECH-D-15-0160.1

Madec G. and NEMO System Team (2019), "NEMO ocean engine", Ocean dynamics, Scientific Notes of Climate Modelling Center (27) – ISSN 1288-1619, Institut Pierre-Simon Laplace (IPSL) http://doi.org/10.5281/zenodo.1464816

Ocean SWOTsimulator reference manual, https://github.com/SWOTsimulator/swotsimulator/blob/master/doc/source/science.rst

Ocean SWOTSimulator https://github.com/SWOTsimulator/swotsimulator

NATL60-CMJ165 simulation https://github.com/meom-configurations/NATL60-CJM165