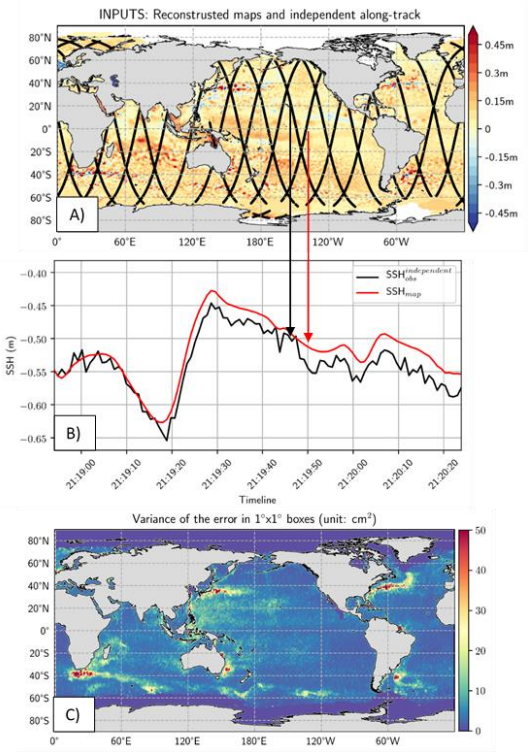
Observing System Experiment data challenge– 2021A_SSH_MAPPING_OSE User manual

DOI: 10.24400/527896/a01-2021.005



SALP-MU-P-EA- 23518-CLS

Issue 1 rev 1 – 01/09/2022

Open/Public

Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	2021/09/25	1st issue from former User Manual
1.1	2022/09/01	Addition of 4DVarNet files

Contents

1 Introduction

The 2021A_SSH_MAPPING_OSE products are altimetry-based sea surface height products. They are designed to carry out Observing System Experiment for assessing, for example, the performance of mapping algorithms with present-day nadir-altimeters constellation. The present document describes each sub-products and variables referenced in 2021A_SSH_MAPPING_OSE.

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 2021A_SSH_MAPPING_OSE 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 (https://doi.org/10.24400/527896/a01-2021.005) were developed, validated by CLS and MEOM Team from IGE (CNRS-UGA-IRD-G-INP), France and distributed by Aviso+".

2 Products description

2021A_SSH_MAPPING_OSE contains sea-surface-height (SSH) data on 1) **several along-track altimeter orbits** (SARAL/Altika, Jason 2, Jason 3, Sentinel 3A, Haiyang-2A and Cryosat-2) and 2) **several gridded products** based on the combinations of the SARAL/Altika, Jason 2, Jason 3, Sentinel 3A, and Haiyang-2A mission (*Cryosat-2 being excluded from the mapping*).

The processing for the along-track observation production follows the same methodology as the along-track products distributed by the SL-TAC in the Copernicus Marine Service (CMEMS) and described in Pujol et al. (2016) and Taburet et al. (2019).

The gridded datasets contain: the mean dynamic topography CNES-CLS13 (Mulet et al., 2013) and spatio-temporal reconstructions of the SSH based on several mapping techniques such as a "**BASELINE**" optimal interpolation (as described in the github data-challenge repository https://github.com/ocean-data-challenges/2021a_SSH_mapping_OSE), a **DUACS-DT2018** optimal interpolation (Taburet et al., 2019), a dynamic (**DYMOST**) interpolation method (Ubelmann et al, 2015, 2016; Ballarotta et al. 2020), a multiscale (**MIOST**) mapping approach (Ubelmann et al., 2021a, 2021b), a method based on Back-and-Forth Nudging (**BFN**) a One-Layer Quasigeostrophic Model (Le Guillou et al. 2021) and a learning-based interpolation method (**4DVarNet**) (Beauchamp et al. 2020).

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

Products	Mission	Period Coverage	Spatial Coverage
Along-Track	SARAL/Altika	2016/12/01-2018/01/31	75°W-45°W 23°N-53°N
	Jason-2	2016/12/01-2017/09/14	
	Jason-3	2016/12/01-2018/01/31	
	Sentinel-3A	2016/12/01-2018/01/31	
	Haiyang-2A	2016/12/01-2018/01/31	
	Cryosat-2	2016/12/01-2018/01/31	
Mean dynamic Topography (CNES-CLS13)	grid	-	65°W-55°W 33°N-43°N
BASELINE mapping gridded SSH	grid	2017/01/01-2017/12/31	
DUACS mapping gridded SSH	grid	2017/01/01-2017/12/31	
DYMOST mapping gridded SSH	grid	2017/01/01-2017/12/31	
MIOST mapping gridded SSH	grid	2017/01/01-2017/12/31	
BFN mapping gridded SSH	grid	2017/01/01-2017/12/31	
4DVarNet mapping gridded SSH	grid	2017/01/01-2017/12/31	
4DVarNet v2022 mapping gridded SSH	grid	2017/01/01-2017/12/31	

Table 1. Products' characteristics

3 Parameters description

List of the parameters available in each product.

NetCDF name	Units	Short description
latitude	degrees_north	Latitude coordinates of the measurement
longitude	degrees_east	Longitude coordinates of the measurement
cycle	-	Cycle the measurement belongs to
track	-	Track in cycle the measurement belongs to
dac	meters	Dynamic Atmospheric Correction
lwe	meters	Long wavelength error
mdt	meters	Mean dynamic topography
ocean_tide	meters	Ocean tide model
sla_filtered	meters	Sea level anomaly filtered not-subsampled with dac, ocean_tide and lwe correction applied
sla_unfiltered	meters	Sea level anomaly not-filtered not-subsampled with dac, ocean_tide and lwe correction applied
time	seconds since 2016-12-01	Time coordinates of the measurement

Table 2. *Short description of all parameters available in Netcdf Along track files.*

NetCDF name	Units	Short description
lat	degrees_north	Latitude coordinates of the reconstruction
lon	degrees_east	Longitude coordinates of the reconstruction
ssh	meters	Reconstruction SSH
time	days since 2017-01-01 00:00:00	Date of the reconstruction

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

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

FTP: File Transfer Protocol

OSE: Observing System Experiment

SLA: Sea Level Anomaly

SSH: Sea Surface Height

BFN: Back-and-Forth Nudging

DUACS: Data Unification and Altimeter Combination System

CMEMS: Copernicus Marine and Environment Monitoring Service

6 References

Ballarotta, M., and et al. , 2020: Dynamic mapping of along-track ocean altimetry: Performance from real observations. *J. Atmos. Oceanic Technol.*, **37**, 1593–1601, https://doi.org/10.1175/JTECH-D-20-0030.1.

Beauchamp M, Fablet R, Ubelmann C, Ballarotta M, Chapron B. Intercomparison of Data-Driven and Learning-Based Interpolations of Along-Track Nadir and Wide-Swath SWOT Altimetry Observations. Remote Sensing. 2020; 12(22):3806. https://doi.org/10.3390/rs12223806

Le Guillou, F, and et al. , 2021: Mapping Altimetry in the Forthcoming SWOT Era by Back-and-Forth Nudging a One-Layer Quasigeostrophic Model, *J. Atmos. Oceanic Technol.*, **38**, 697-710, https://doi.org/10.1175/JTECH-D-20-0104.1

Mulet, S., Rio, M. H., Greiner, E., Picot, N., and Pascual, A.: New global Mean Dynamic Topography from a GOCE geoid model, altimeter measurements and oceanographic in-situ data, OSTST Boulder USA 2013, available at: http://www.aviso.altimetry.fr/fileadmin/documents/OSTST/2013/oral/mulet_MDT_CNES_CLS13.pdf (last access: 31 August 2016), 2013.

Taburet, G., Sanchez-Roman, A., Ballarotta, M., Pujol, M.-I., Legeais, J.-F., Fournier, F., Faugere, Y., and Dibarboure, G.: DUACS DT-2018: 25 years of reprocessed sea level altimeter products, Ocean Sci. , https://www.ocean-sci.net/15/1207/2019/,2019

Pujol, M.-I., Faugère, Y., Taburet, G., Dupuy, S., Pelloquin, C., Ablain, M., and Picot, N.: DUACS DT2014: the new multi-mission altimeter data set reprocessed over 20 years, Ocean Sci., 12, 1067-1090, doi:10.5194/os-12-1067-2016, 2016.

Ubelmann, C., P. Klein, and L. Fu, 2015: Dynamic interpolation of sea surface height and potential applications for future high-resolution altimetry mapping. *J. Atmos. Oceanic Technol.*, 32, 177–184, https://doi.org/10.1175/JTECH-D-14-00152.1.

Ubelmann, C., B. Cornuelle, and L. Fu, 2016: Dynamic mapping of along-track ocean altimetry: Method and performance from observing system simulation experiments. *J. Atmos. Oceanic Technol.*, 33, 1691–1699, https://doi.org/10.1175/JTECH-D-15-0163.1.

Ubelmann, C., Dibarboure, G., Gaultier, L., Ponte, A., Ardhuin, F., Ballarotta, M., and Faugère, Y.: Reconstructing Ocean Surface Current Combining Altimetry and Future Spaceborne Doppler Data, Journal of Geophysical Research: Oceans, 126, e2020JC016 560, https://doi.org/https://doi.org/10.1029/2020JC016560, e2020JC016560 2020JC016560, 2021a

Ubelmann, C., Carrere, L., Durand, C., Dibarboure, G., Faugère, Y., Ballarotta, M., Briol, F., and Lyard, F.: Simultaneous estimation of Ocean mesoscale and coherent internal tide Sea Surface Height signatures from the global Altimetry record, Ocean Sci. Discuss. [preprint], https://doi.org/10.5194/os-2021-80, in review, 2021b.