A New High-Resolution Sea Surface Salinity Product for the Southern Ocean

We are pleased to announce the publication of the new dedicated **Level-4 SMOS Sea Surface Salinity (SSS) product** (and its uncertainty) **for the Southern Ocean** with an unprecedented **6.25 km resolution**. This new development was carried out within the framework of the H2020 EU **CRiceS project** (AO/1 –10461/20/ I–NB, grant no. 101003826).

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The new product has the following specifications:

Geographical coverage	180◦ W − 180◦ E; 30◦ S − 90◦ S
Temporal coverage	2011-02-01 to 2023-03-31
Spatial resolution	6.25km x 6.25km
Coordinates reference	EASE-SL 6.25km
Temporal resolution	Daily
DOI	https://doi.org/10.20350/digitalCSIC/17709

What is this new product?

The product is created by **fusing**:

- **SMOS SOFRESH Level-3 SSS data** (https://doi.org/10.20350/digitalCSIC/15493)
- **MUR SST** daily fields

This multiscale fusion method allows us to resolve much finer ocean structures than SMOS alone following the methodology described in Umbert et al. [2014] and Olmedo et al. [2016].

The MUR SST product (Chin et al. [2017]) from the JPL MUR MEaSUREs Project is used for the template in the fusion algorithm. This product provides a Level-4 Global Foundation Sea Surface Temperature Analysis. This SST product is originally provided at a resolution of 0.01º × 0.01º . Therefore, before applying the fusion algorithm, we performed a regridding to the final EASE grid at 6.25 km × 6.25 km.

Validation assessment

Validation has been performed against many in situ datasets by using the Pi-MEP platform. The statistics reveal clear differences in performance across the various in situ platforms. Argo exhibits the lowest dispersion (Std = 0.18 psu, RMS = 0.18 psu) and the highest R^2 (0.40), confirming it as the most consistent reference for SMOS, with negligible median and mean differences. Marine mammals show similarly small biases (Median = 0.00 psu), but slightly higher dispersion (Std = 0.25 psu) and lower correlation (R^2= 0.08), reflecting their operation in dynamically active frontal regions. See figures 1 and 2 below.

Why does it matter?

The Southern Ocean plays a key role in global climate, ocean circulation, and atmosphere— ocean exchanges. High-resolution SSS helps to:

- Identify freshwater inputs and mixing
- Improve ocean and climate model validation
- Resolve small-scale fronts and filaments

The new **L4 SSS Southern Ocean product** represents an important step forward in observing salinity at high resolution in a region where data are scarce. It will support research on ocean dynamics, sea-ice interactions, and climate processes.Data is freely available at BEC Data system and open to users in secure ftp (sftp) service in bec.icm.csic.es/data-access-ftp/.

Figure 1: Validation statistics against ARGO floats data

Figure 2: Validation statistics against Marine Mammals CTD measurements