New release of the SMOS SSS product for the Arctic region

We are pleased to announce the publication of the **new** dedicated **Arctic Ocean SMOS Sea Surface Salinity (SSS)** products produced at BEC (DOI: https://doi.org/10.20350/digitalCSIC/16251). This new SMOS **(v4)** data set has been created under the **ESA ARCTIC+SSS CCN project** (contract Nº 4000125590/18/I-BG).

The retrieval of satellite SSS in polar regions is challenging due to several technical difficulties, such as the low sensitivity of L-band radiometry to salinity on cold waters, the contamination of the radiometric signal close to sea ice and the scarcity of in-situ measurements, which limits the validation of the new products .

In this context, we have developed algorithm improvements from the level 0 to level 3 for the generation of this dedicated SSS product. The main improvements are:

- to use the Nodal Sampling technique (González-Gambau et al., 2016) to avoid contamination close to ice edges (allowing the reduction of the radiometric errors very significantly),
- modification of the Debiased non-Bayesian retrieval method (Olmedo et al., 2017) to correct systematic biases as a function of the distance to sea ice, and
- the annual reference has been modified to WOA2023.

This product has been extensively validated through the comparison to in-situ measurements from Argo, drifters, ICES data, marine mamals, thermosalinographs on board opportunity ships and other in situ measurements available in the Pi-MEP platform (Salinity Pilot-Mission Exploitation Platform). The validation of BEC ARCTIC v4 SSS results in: (i) the spatial and temporal variability is consistent with those of in situ

datasets with an RMS between 0.3 and 0.7 psu depending on the region, (ii) there is an improvement on RMS (of about 20-25%) and correlation versus the previous version (BEC ARCTIC v3.1) , being more significant nearer than 100 km from ice edges and coast, (iii) there is a significant increase (about 30-40%) on the number of retrievals near the ice edges, (iv) the product describes more properly the freshwaters from rivers runoff.

This product has been shown to be suitable for understanding rapid changes in the last years in the Arctic and to compute the freshwater content and fluxes in the region.

Please, be aware we will keep the former version in our sFTP for 3 months, then it will be discontinued and available on request to smos-bec@icm.csic.es.

Temporal extension of the current global BEC L3 and L4 SSS products

We are pleased to release the **temporal extension** of the **current global BEC L3 and L4 SSS products** for the period **January 2020 to May 2021**. This new release has been created as part of the European Marine Observation and Data Network Physics (EMODnet Physics) project – EASME/EMFF/2020/3.1.11/Lot4/SI2.838612.

The new time series comprises almost 11 years (2011- mid 2021). A detailed explanation of the algorithm can be found in Olmedo et al. 2021. The performance of the new products for the years 2020 and 2021 when compared with Argo floats are included in the updated BEC Global SSS Products Description .

Please, do not hesitate to contact us in case you have any question or comment at smos-bec@icm.csic.es. Your feedback is most welcome!

Enjoy the products!

The BEC team
http://bec.icm.csic.es

New Black Sea SMOS Sea Surface Salinity products

We are pleased to announce the publication of the first dedicated SMOS Sea Surface Salinity (SSS) products for the Black Sea produced at BEC. These new SMOS Sea Surface Salinity products specific for the Black Sea region have been created under the funded ESA project ITT Earth Observation data for Science and Innovation in the Black Sea (EO4SIBS) (contract 4000127237/19/I-EF).

SMAP SSS provided by REMSS: v1.0 vs v2.0

Experimental SMOS Mediterranean SSS products now available at CP34-BEC

Preliminary SMOS SSS in the Mediterranean

Using Argo to validate remote sensing missions

With its more than 3500 automatic profilers, the Argo array is one of the most important component of the Global in-situ Ocean Observing System. The array provides measurements of temperature and salinity profiles down to 2000 m. These data are rapidly expanding the historical database of the ocean sub-surface (specially in the case of ocean salinity) and are providing novel information about the ocean's vertical structure and its variability. Moreover, these data allow real-time monitoring, model-constraining and contribute to calibration and verification efforts.

Figure 1: Number of Argo profiles from January 2005 to

December 2014: Shown are the total number of profiles, the delayed mode profiles as for April 27, and the number of delayed mode profiles with salinity.

The Euro-Argo (www.euro-argo.eu) research infrastructure, designed to coordinate the European contribution to Argo, is part of the European Strategy Forum on Research Infrastructures (ESFRI). Euro-Argo is expected to provide additional 50 floats per year and support about the 25% of the Argo array.

Members of the Euro-Argo Improvements for the GMEX/Copernicus Marine Service (E-AIMS) project have been working since January 2013 to help design the new phase of Argo by implementing and validating new float technologies. Moreover, the activities developed in E-AIMS have allowed to better understand the ability of the observations recovered by this array of automatic profilers to constrain numerical models and to validate remote sensing missions.

A recent contribution entitled "*Assessment of the Impact of Argo in ocean models and satellite validation from E-AIMS project*" provides a summary of the main results provided by E-AIMS so far. It illustrates how Observing System Evaluations and Observing System Simulation Experiments have been conducted to quantify the contribution of Argo to constrain global and regional monitoring and forecasting centers and validate satellite observations. Recommendations for the new phase of Argo are also elaborated.

In the particular context of SMOS, the the Argo array continues to be the only observing system able to provide global measurements of salinity, allowing validation of the retrieval algorithms in different geophysical scenarios (sea surface temperature, surface wind speed and distance to the coast).

Comparison of Argo near surface salinity data with satellite SSS products generated by the SMOS Barcelona Expert Centre

(http://cp34-bec.cmima.csic.es) have demonstrated this high potential of Argo. It has been noticed that the number of available Delayed Mode profiles has been decreasing during the validation period (2011-2013). If in January 2011 more than 6000 Argo salinity profiles are available, by December 2013, less than 1000 Argo salinity profiles are available (Figure 1). This is due to the time required for the Argo data delayed mode quality control but it would be very important to reduce this time delay and/or to produce intermediate data sets where surface observations are validated. The results indicate that robust estimates of the difference between SMOS and Delayed Argo have been found. The standard deviation of the differences are of the order of 0.29 and 0.23 (in the practical salinity scale) depending if the comparison is done in the latitudinal band of 60S-60N or 30S-30N respectively.

Le Traon, P.Y., E. Remy, and J. Ballabrera-Poy, 2015: Assessment of the impact of Argo in ocean models and satellite validation from E-AIMS project. Mercator Ocean – Coriolis Quarterly Newsletter, 52, 11-15. The whole manuscript can be found here.

Barcelona World Race 2014-2015

New study on the detection of cold-core rings in the Gulf Stream area using remote sensing platforms

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SMOS in a Massive Open Online Course