

Baltic+ Salinity



Baltic+
Salinity
Dynamics

First SMOS Sea Surface Salinity dedicated products over the Baltic Sea

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Barcelona Expert Center
ICM IEEC
CSIC UPM

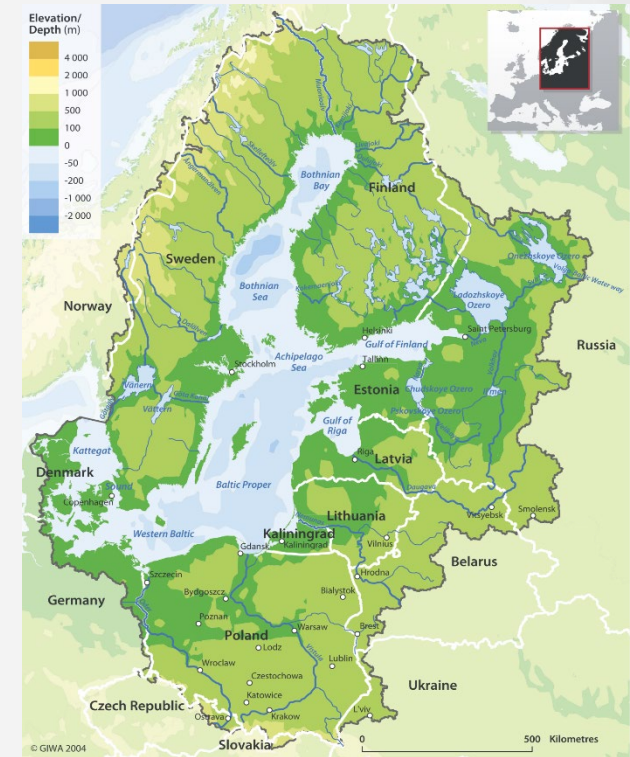


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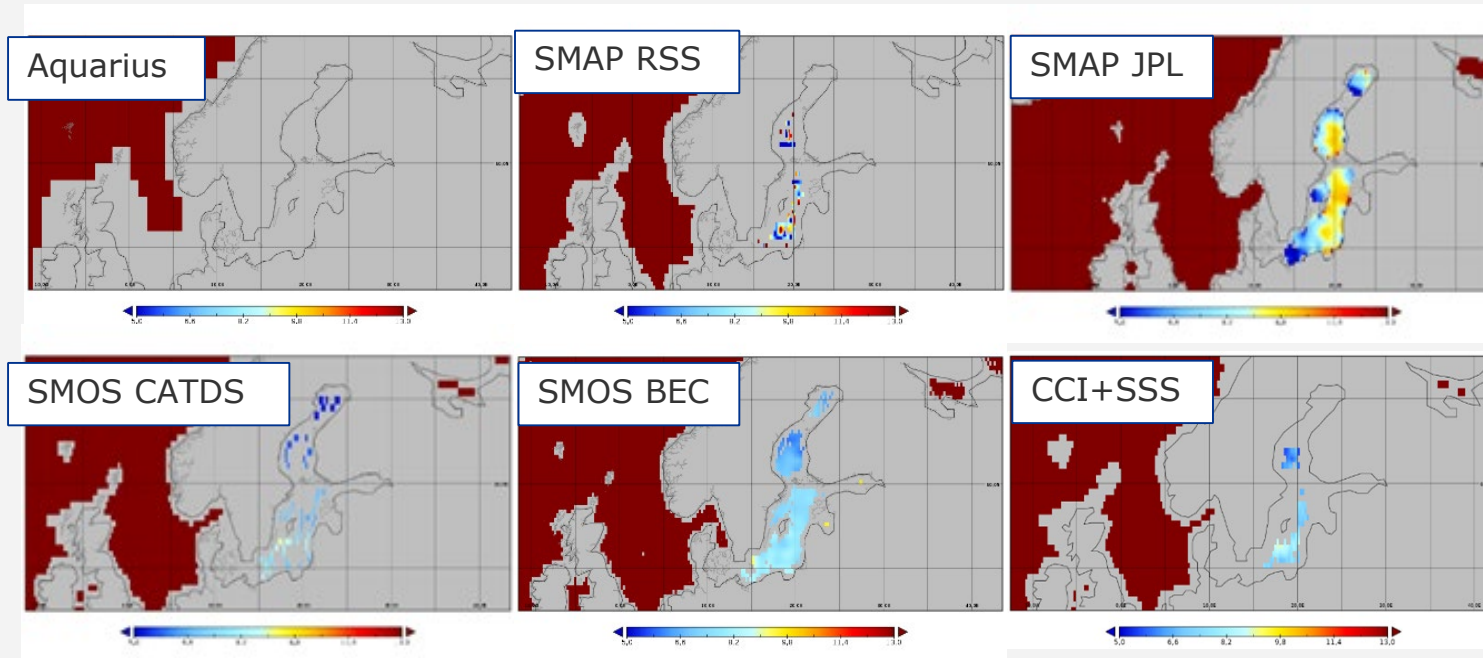
Potential scientific applications identified a-priori, linked to the main challenges of **Baltic Earth** WG on salinity dynamics:

- **Monitorization of long-term SSS changes** in the different sub-basins (determination of salinity inter annual trends).
- **Detection of frontal areas** where SSS gradients are stronger (river run-offs, ice formation and melting processes, etc.).
- Study of **inflow and outflow dynamics** through the determination of **anomalous salinity periods**.
- Using satellite-based SSS measurements as **initial fields and validation data to numerical models**.
- **Complement** temporally and spatially the **sparse in situ measurements** in the region.
- Analysis of the **circulation patterns as derived from salinity** in the basin.



Retrieving SSS over this region is a **great challenge** because of several technical issues.

L-band SSS global products provided by 3 missions: Aquarius, SMOS and SMAP



Need of a dedicated SSS product over the Baltic Sea

Aquarius: version 4

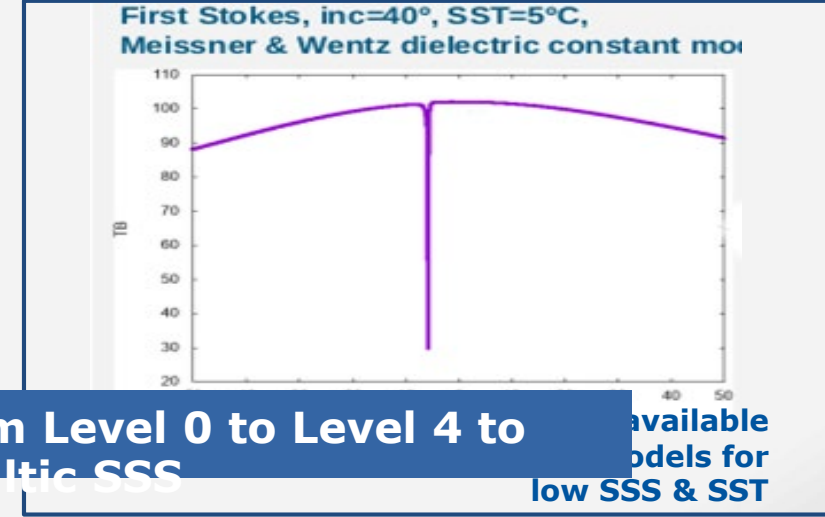
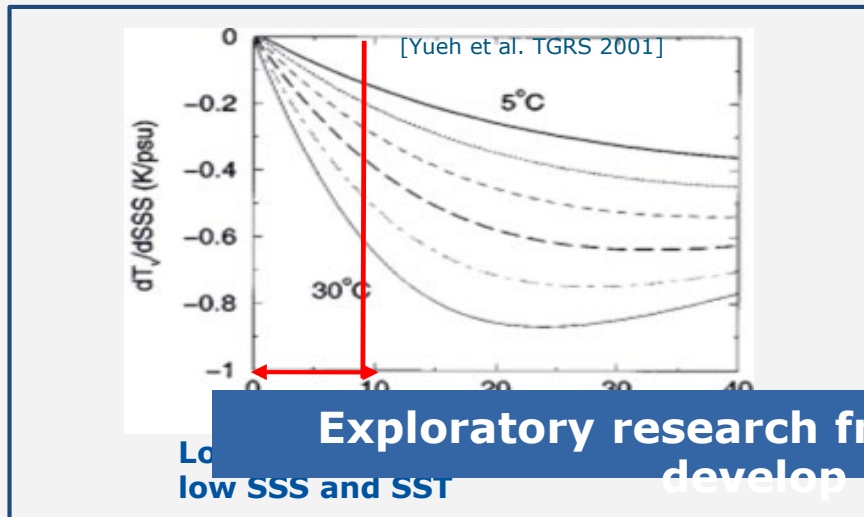
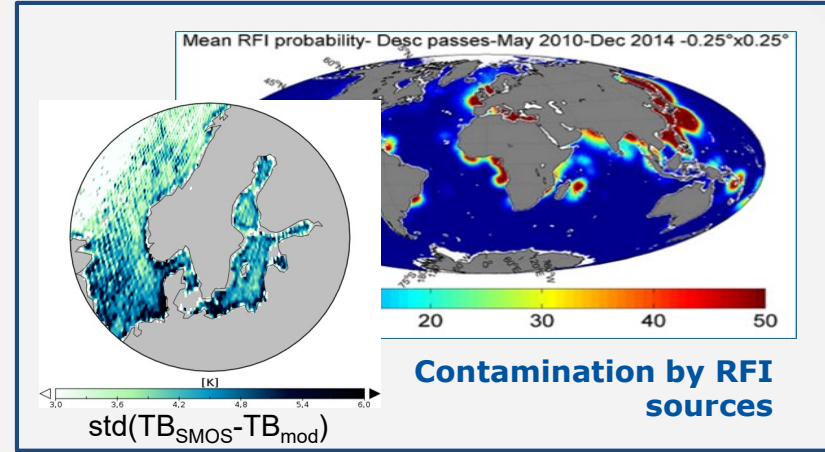
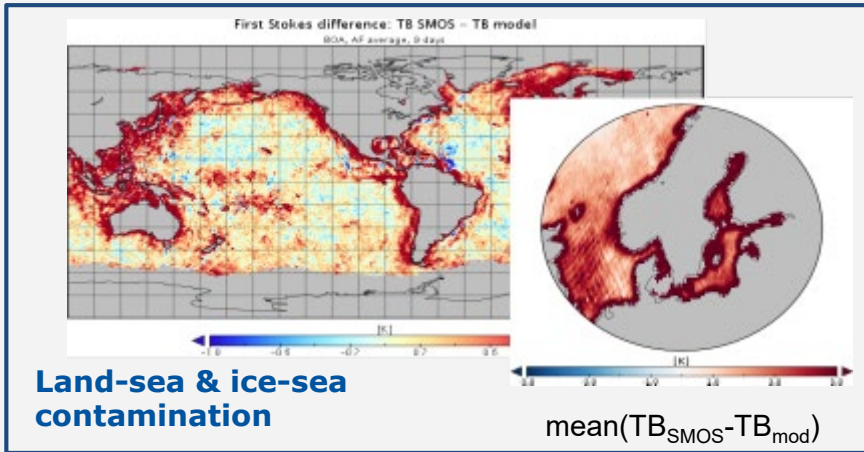
SMAP JPL: version 4.2

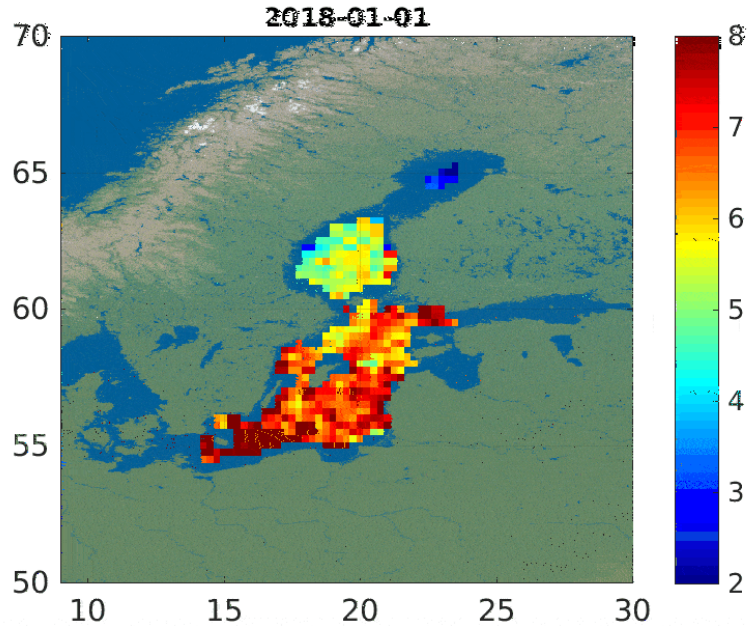
debiased non-Bayesian, version 1

SMOS LOCEAN: L3 debiased version 3

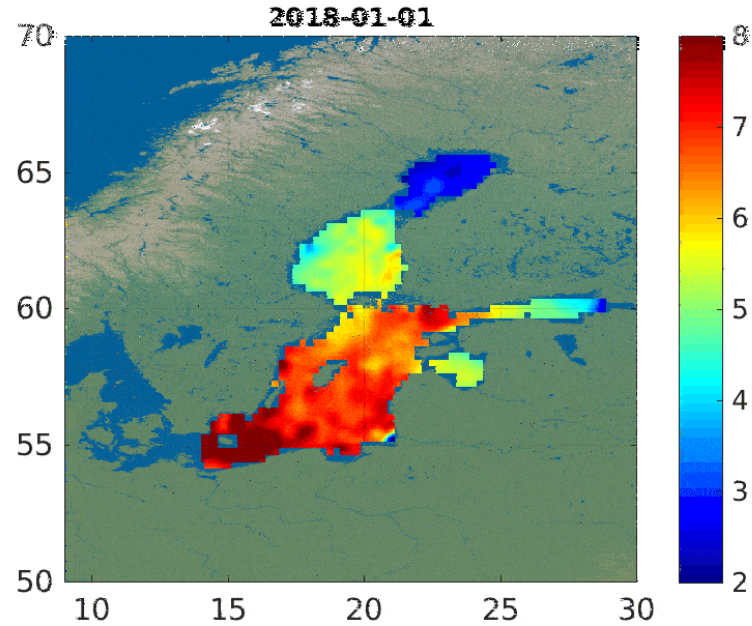
CCI+ Salinity product: version 01.7

SMOS BEC: L3





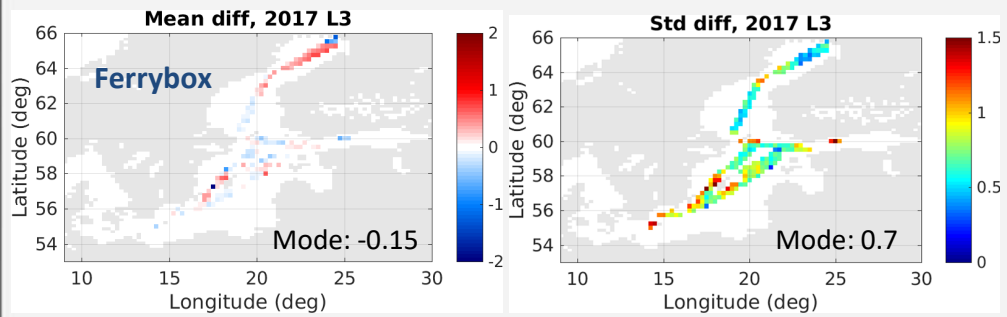
Baltic+ L3 SSS



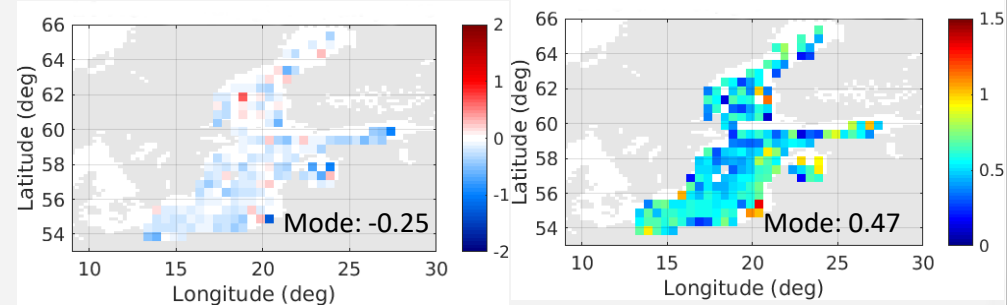
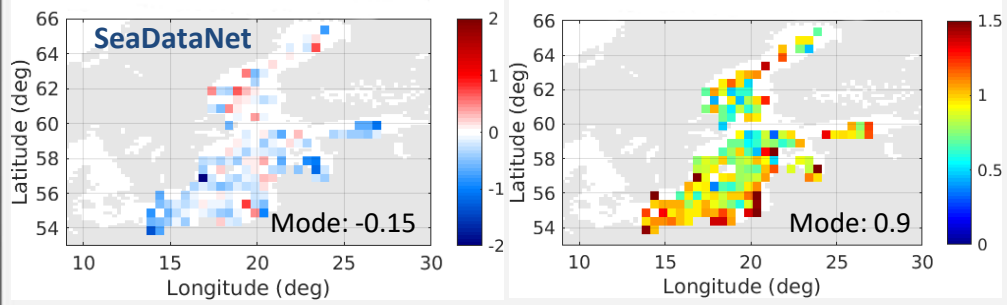
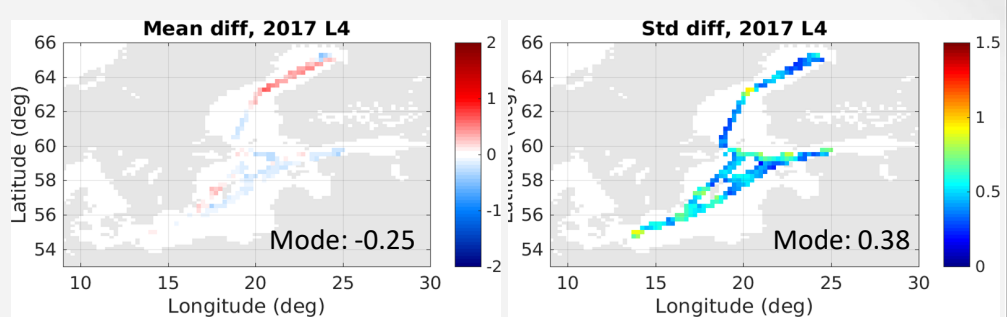
Baltic+ L4 SSS

Level	Temporal coverage	Temporal resolution	Spatial resolution	BEC FTP: sftp://becftp.icm.csic.es
L3	Feb. 2011-2019	9 days	0.25 deg.	/becftpdata/OCEAN/SSS/SMOS/Baltic/v1.0/L3/9days
L4	Feb. 2011-2019	daily	0.05 deg.	/becftpdata/OCEAN/SSS/SMOS/Baltic/v1.0/L4/daily

Baltic+ L3 SSS

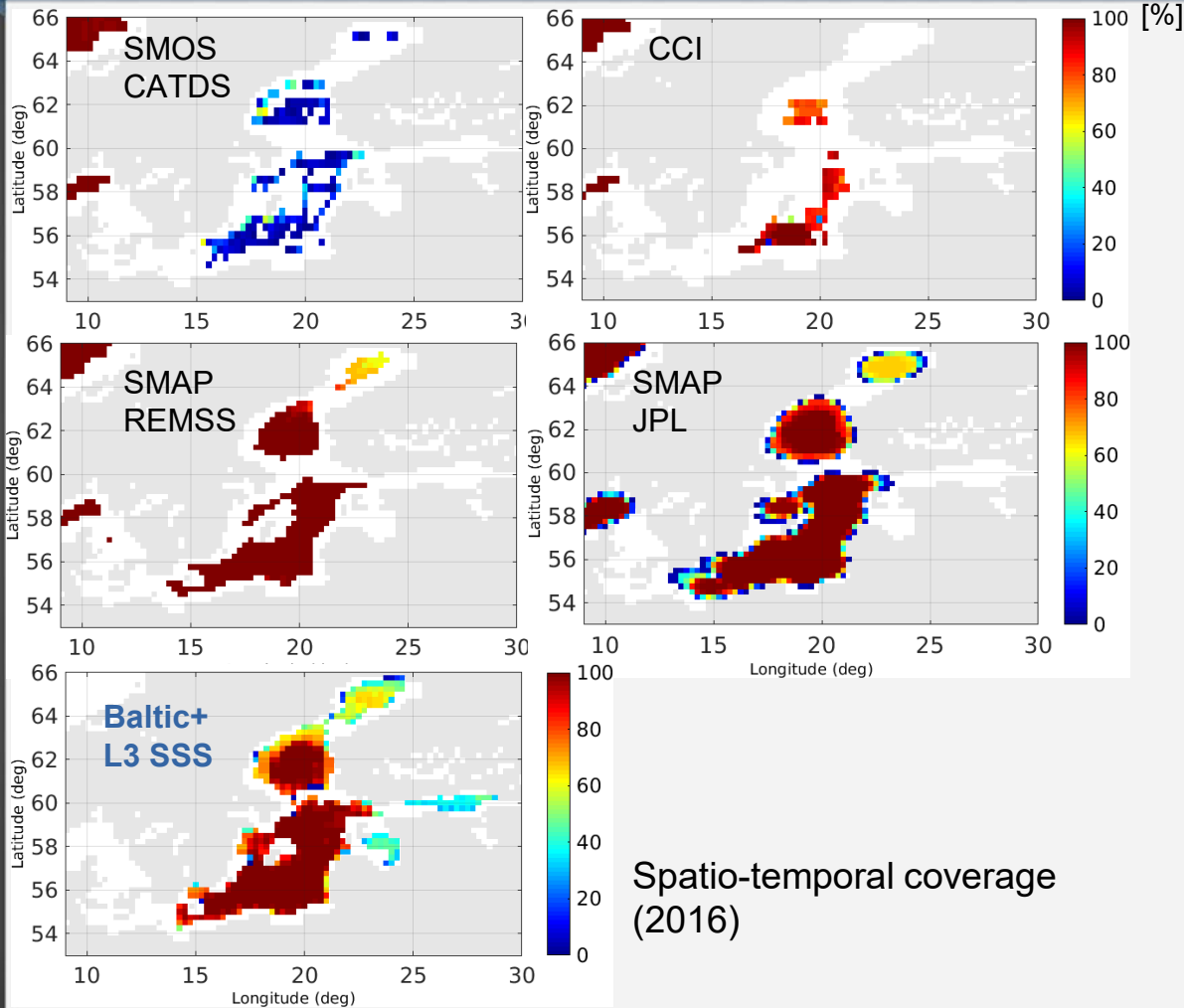


Baltic+ L4 SSS

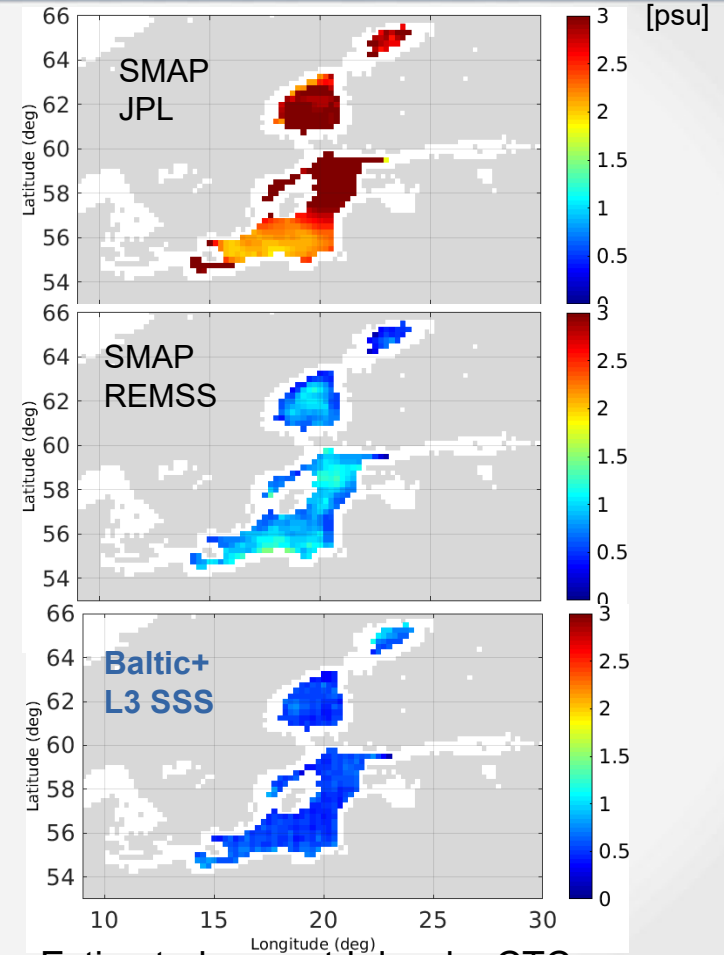


- Standard deviations of L4 SSS are very significantly reduced with respect to the L3 product.
- The accuracy of the L3 SSS is $\sim[0.7-0.8]$ psu and for the L4 is ~ 0.4 psu.
- Higher standard deviation values are located in cells closer to coast/ice edges, Arkona and Bornholm basins.

Comparison to other EO SSS datasets: coverage and uncertainty



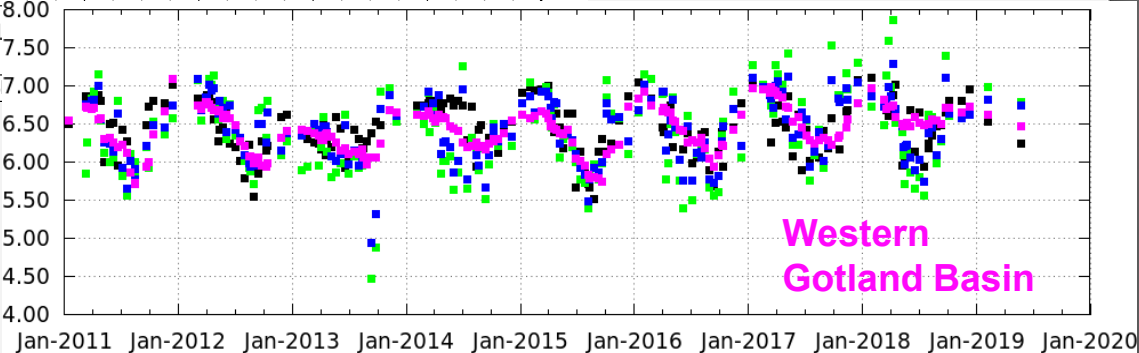
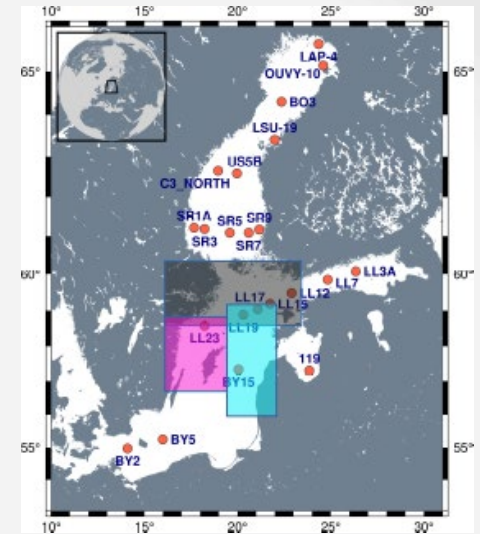
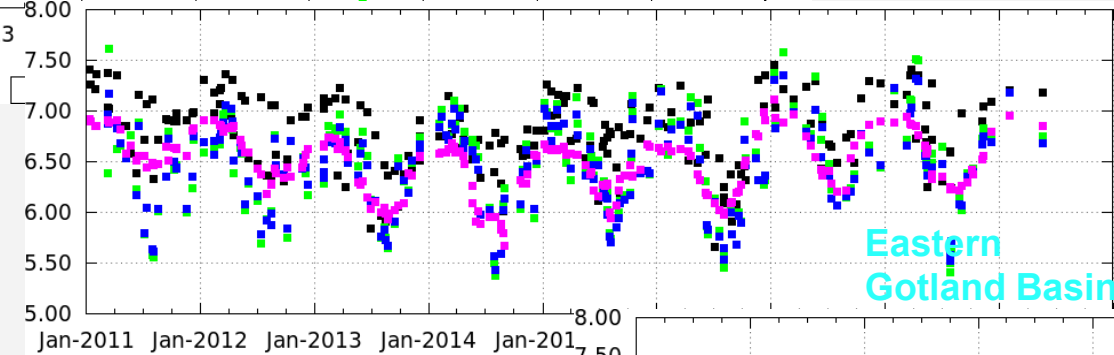
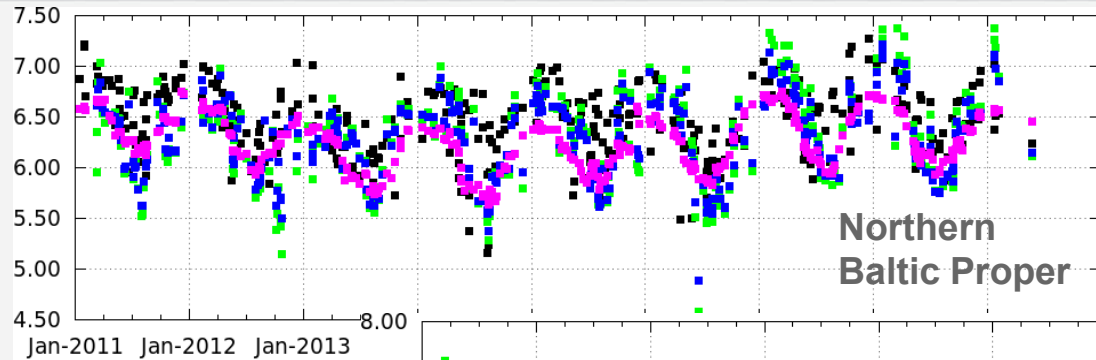
Spatio-temporal coverage
(2016)



Estimated error std.dev. by CTC

[Gonzalez-Gambau et al, RS, 2020]

Baltic+ L3 and L4 SSS: Added-value wrt in situ and reanalysis

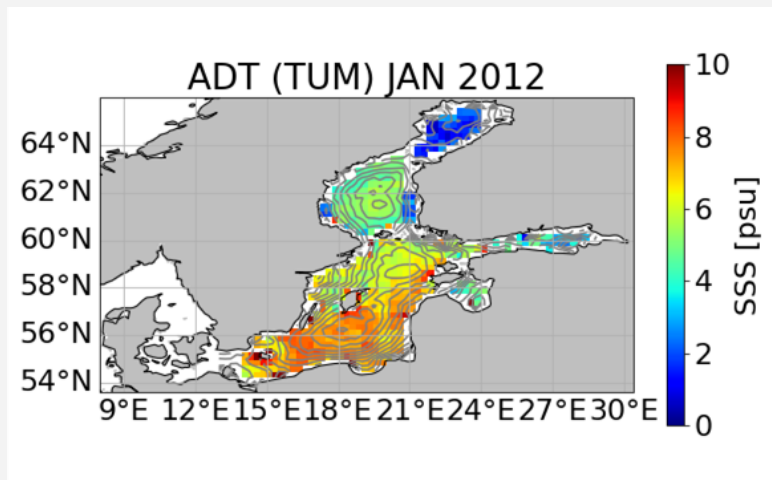


- Overall agreement in the described dynamics between satellite, reanalysis and in situ.
- The variability shown by the satellite reflects the variability captured by the in situ measurements better than the reanalysis (very stable in some regions).

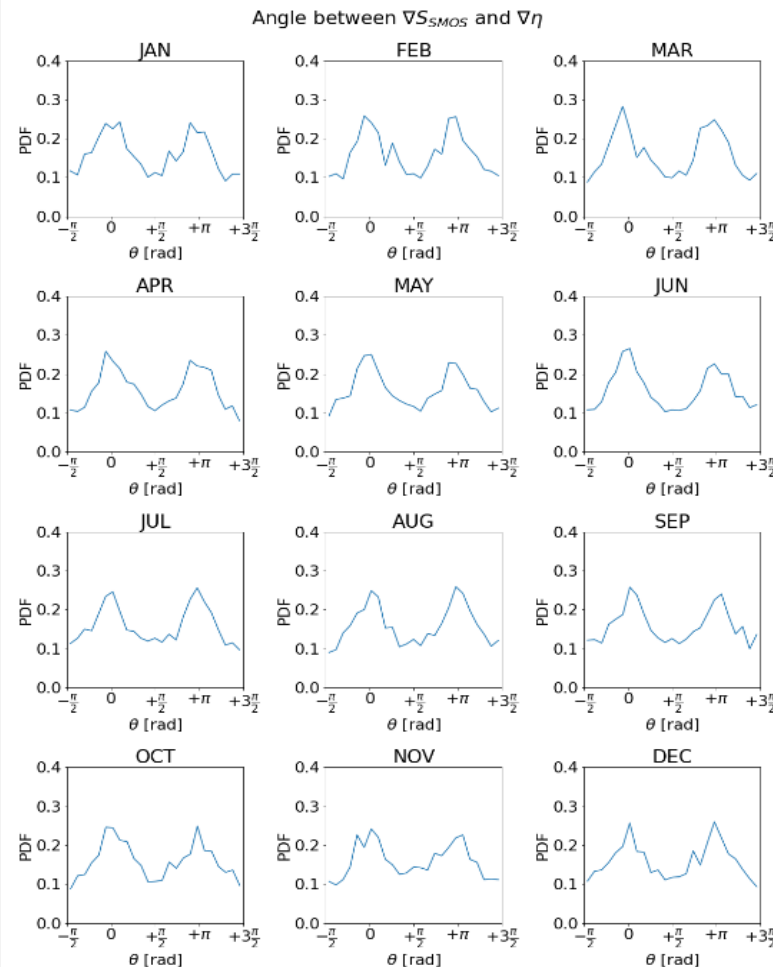
in situ ■ SMOS-L3 ■ SMOS-L4 ■ MODEL ■

Collaboration with Baltic+ SEAL

Analysis of the consistency between the structures detected in the Baltic+ SSS products and the circulation patterns derived from altimetric maps.



Analysis of the alignment between the gradients of DOT and SSS at a monthly scale: oceanic structures present in SSS and DOT are coherent and aligned.



Study of the tolerance of different species to SSS changes



Long time-series of SSS would allow to study the correlation between the SSS variability and the extreme events of different species. HELCOM is analyzing the feasibility of including seasonal averaged Baltic+ L4 SSS maps for the generation of Helcom driver indicators.

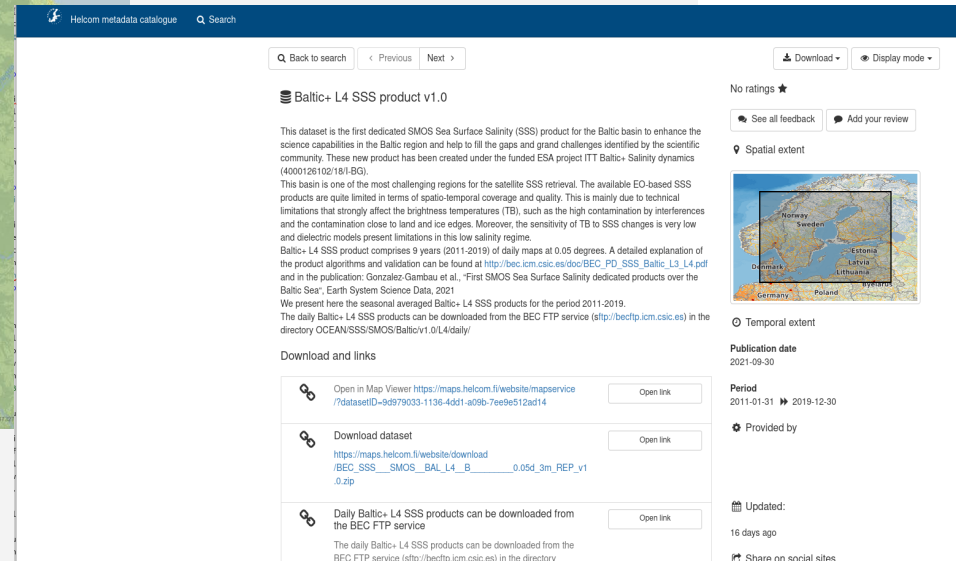
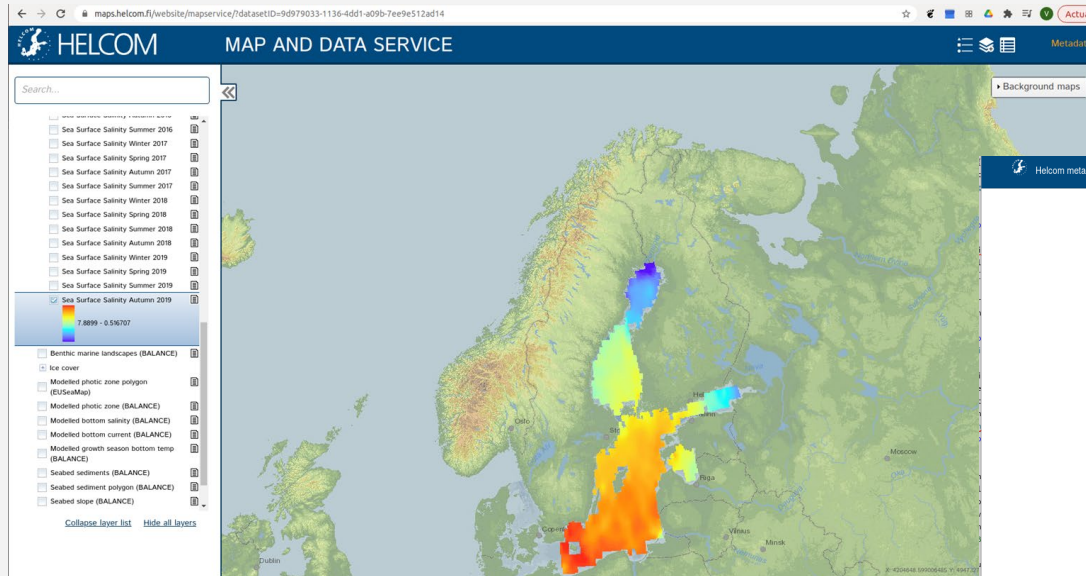
Determination of SSS annual trends (further developments)

Surface salinity trends of about -0.2 [psu/decade] has been computed from observational data over the recent 30 years. The available Baltic+ SSS series do not allow to perform analysis of climate variability, but are enough to analyze shorter term changes.

Study of the inflow and outflow dynamics (further developments)

There is a need of monitoring the salinity in the straits connecting the Baltic Sea with the North Sea. Baltic+ SSS maps could help in the determination of periods with anomalous SSS.

Regional data provider



Baltic+ L4 SSS product v1.0

This dataset is the first dedicated SMOS Sea Surface Salinity (SSS) product for the Baltic basin to enhance the science capabilities in the Baltic region and help to fill the gaps and grand challenges identified by the scientific community. These new products have been created under the funded ESA project ITT Baltic+ Salinity dynamics (40001261021811.BG).

This basin is one of the most challenging regions for the satellite SSS retrieval. The available EO-based SSS products are quite limited in terms of spatio-temporal coverage and quality. This is mainly due to technical limitations that strongly affect the brightness temperatures (TB), such as the high contamination by interferences and the contamination close to land and ice edges. Moreover, the sensitivity of TB to SSS changes is very low and dielectric models present limitations in this low salinity regime.

Baltic+ L4 SSS product comprises 9 years (2011-2019) of daily maps at 0.05 degrees. A detailed explanation of the product algorithms and validation can be found at http://bec.icm.csic.es/doc/BEC_PD_SSS_Baltic_L3_L4.pdf and in the publication: Gonzalez-Gambau et al., "First SMOS Sea Surface Salinity dedicated products over the Baltic Sea", Earth System Science Data, 2021

We present here the seasonal averaged Baltic+ L4 SSS products for the period 2011-2019.

The daily Baltic+ L4 SSS products can be downloaded from the BEC FTP service (<ftp://becftp.icm.csic.es>) in the directory OCEAN/SSS/SMOS/Baltic/v1.0/L4/daily/

Download and links

- Open in Map Viewer <https://maps.helcom.fi/website/mapservice/?datasetID=9d979033-1136-4dd1-a09b-7ee9e512ad14> [Open link](#)
- Download dataset https://maps.helcom.fi/website/download/BEC_SSS_SMOS_BAL_L4_B_____.05d_3m_REP_v1.0.zip [Open link](#)
- Daily Baltic+ L4 SSS products can be downloaded from the BEC FTP service [Open link](#)
The daily Baltic+ L4 SSS products can be downloaded from the BEC FTP service (<ftp://becftp.icm.csic.es>) in the directory

Temporal extent
2011-01-31 to 2019-12-30

Publication date
2021-09-30

Provided by
Updated: 16 days ago

Share on social sites

Baltic+ L4 seasonal averaged SSS maps

<https://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/9d979033-1136-4dd1-a09b-7ee9e512ad14>

- Several **technical improvements** required for the development of Baltic+ SSS products have a **significant impact on other regional initiatives** (such as EO4SIBS).
- Baltic+ SSS products have a **good spatio-temporal coverage with an accuracy of 0.7-0.8 psu for the L3 product** (9-day, 0.25 deg.) and **0.4 psu for the L4 product** (daily, 0.05 deg.). Regions with higher errors and limited coverage: Arkona and Bornholm basins and Gulfs of Finland and Riga.
- They provide valuable information about the changes in the **salinity gradients** and show **geophysically consistent seasonal variability in surface salinity** from the melting of sea ice in spring and increased run-off from land when snow cover melts after the winter.
- Baltic+ SSS data **complement the temporally and spatially very sparse in situ** measurements, covering **data gaps** in the region and can be **useful for the validation of numerical models**, particularly in areas where in situ are sparse. Also the location of the gradients and their variability are valuable in evaluating models performance and provide possibility to assimilate SSS fields.
- **Several scientific studies with Baltic+ SSS data** are currently in progress. Interactions with the scientific community have allowed to identify some other **potential scientific applications that would benefit from further technical developments**.
- All these **applications would benefit of Baltic+ SSS time-series as long as possible**.

Baltic+ Salinity



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Dynamics

First SMOS Sea Surface Salinity dedicated products over the Baltic Sea

<https://balticsalinity.argans.co.uk/>

A screenshot of the Barcelona Expert Center (BEC) website. The header includes navigation links: Home, BEC Products, About BEC, Projects, Contact. The main content area features a news article titled "New Baltic SMOS Sea Surface Salinity products" by Cristina Gonzalez, dated 29 Oct 2021. The article text states: "We are pleased to announce the publication of the first dedicated SMOS Sea Surface Salinity (SSS) products for the Baltic basin produced at BEC. These new SMOS Sea Surface Salinity products specific for the Baltic region have been created under the funded ESA project ITT Baltic+ Salinity dynamics (400012602/18/1-BG). This basin is one of the most challenging regions for the satellite SSS retrieval. The available EO-based SSS products are quite limited in terms of spatio-temporal coverage and quality. This is mainly due to technical limitations that strongly affect the brightness temperatures (TB), such as the high contamination by interferences and the contamination close to land and ice edges. Moreover, the sensitivity of TB to SSS changes is very low and dielectric models present limitations in this low salinity regime." Below the text is a map of the Baltic Sea region with a color-coded salinity distribution. The right sidebar contains a "FTP Data Service" section with links for downloading data, registration, password reset, and account deletion. Below that is an "Our Products" section listing available products, data access, maps, and a singularity analysis service. At the bottom of the sidebar are "Tweets by @BECICMRS" and a PhD offer notice from ICM.

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