

Oceanographic added-value of the first regional SMOS Sea Surface Salinity products over the Baltic Sea



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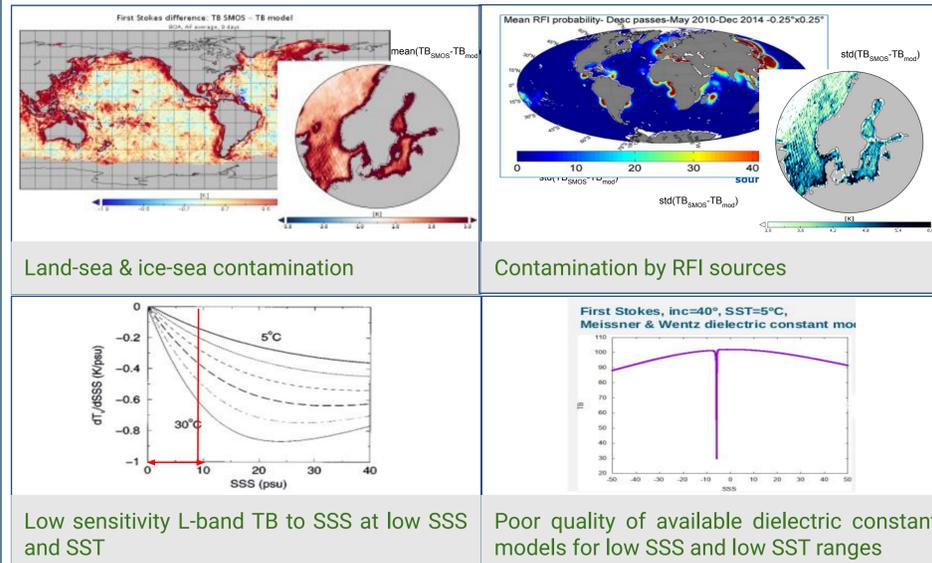


Motivation

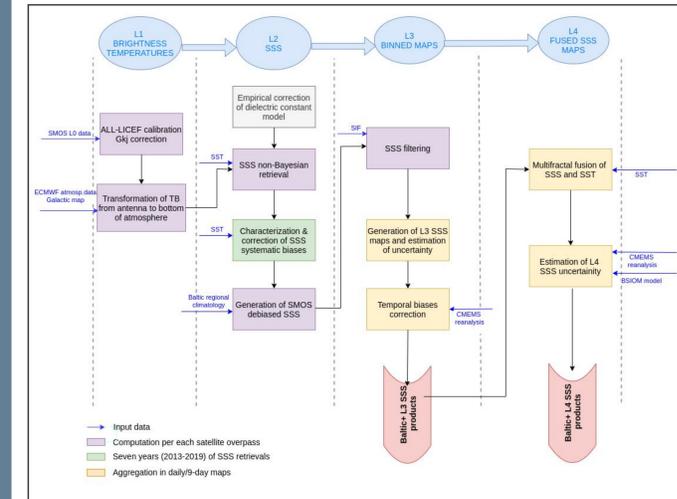
Satellite-based measurements can help in **understanding salinity dynamics** in the Baltic Sea:

- Monitorize **long-term SSS changes** in the different sub-basins (determination of salinity inter annual trends).
- **Detect 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.
- Use 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.
- Analyze **circulation patterns as derived from salinity** in the basin.

Challenges in retrieving SMOS SSS over Baltic



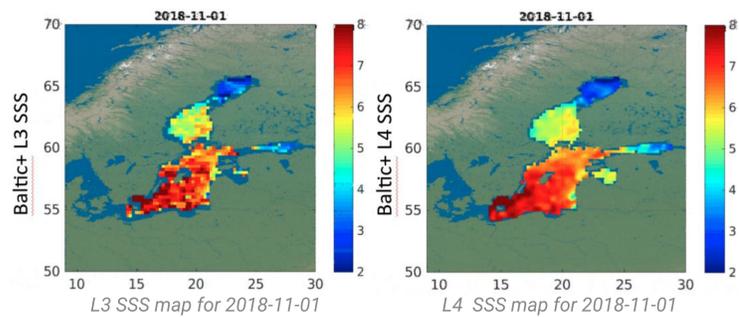
Exploratory research from L0 to L4



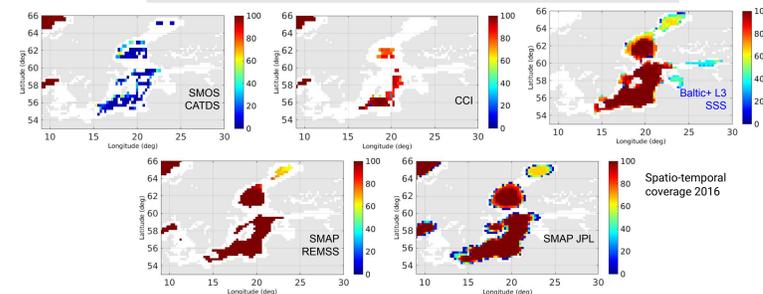
Main processing changes:

- (1) ALL-LICEF+Gkj correction to reduce land-sea and ice-sea contaminations.
- (2) Empirical correction of the dielectric constant model for the low SSS regimes
- (3) Characterization and correction of SSS systematic errors, depending not only on the acquisition conditions, but also on the SST.

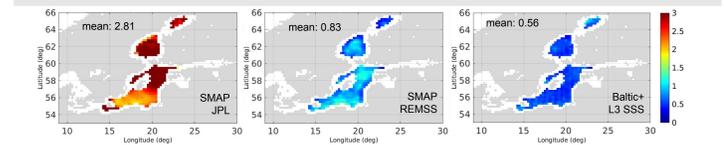
Baltic+ L3 and L4 SSS products



Comparison with other EO datasets: coverage

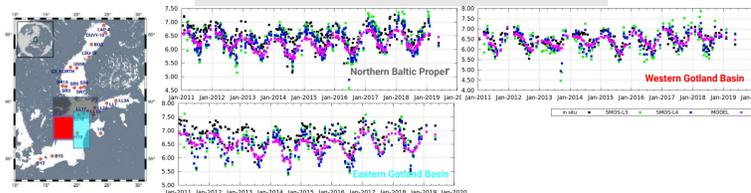


Comparison with other EO datasets: uncertainty (estimated by CTC)



- The Baltic+ L3 SSS is the EO product with the best performance in terms of coverage.
- The Baltic+ L3 SSS product has the smallest error in the whole basin, except in some grid points of the Bothnian Bay.

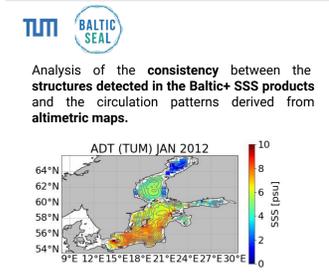
Added-value wrt in situ and reanalysis



- The variability shown by the satellite reflects the variability captured by in situ better than the reanalysis.
- Baltic+ SSS products can be very useful to validate the models in areas, where in situ data are sparse. Also, the location of gradients is very useful.

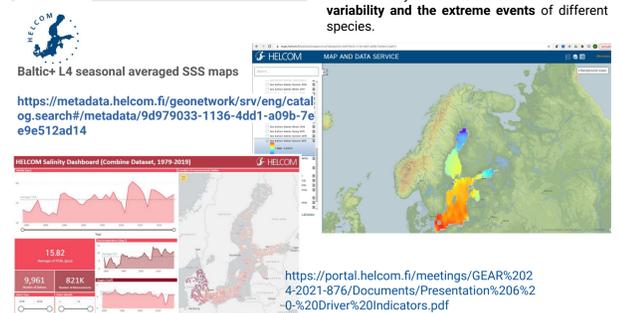
Scientific cases with Baltic+ SSS products

Collaboration with Baltic+ SEAL



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.

Collaboration with Helcom



Conclusions

- Several **technical improvements** required for Baltic+ SSS products have a **significant impact on other regional initiatives** (such as EO4SIBS, in the Black Sea).
- 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°) and **0.4 psu for the L4 product** (daily, 0.05°).
- 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.
- Baltic+ SSS data **complement the temporally and spatially very sparse in situ measurements** and can be **useful for the validation of numerical models**, particularly where in situ are sparse.
- **Several scientific studies** are in progress. Interactions with the scientific community have allowed to identify **potential applications that would benefit from further technical developments** (e.g. determination of annual trends, monitoring the salinity in the straits connecting the Baltic Sea with the North Sea).
- **All these applications would benefit of Baltic+ SSS time-series as long as possible.**