

CIREG-SWOT – Project CONVEST-DYCO

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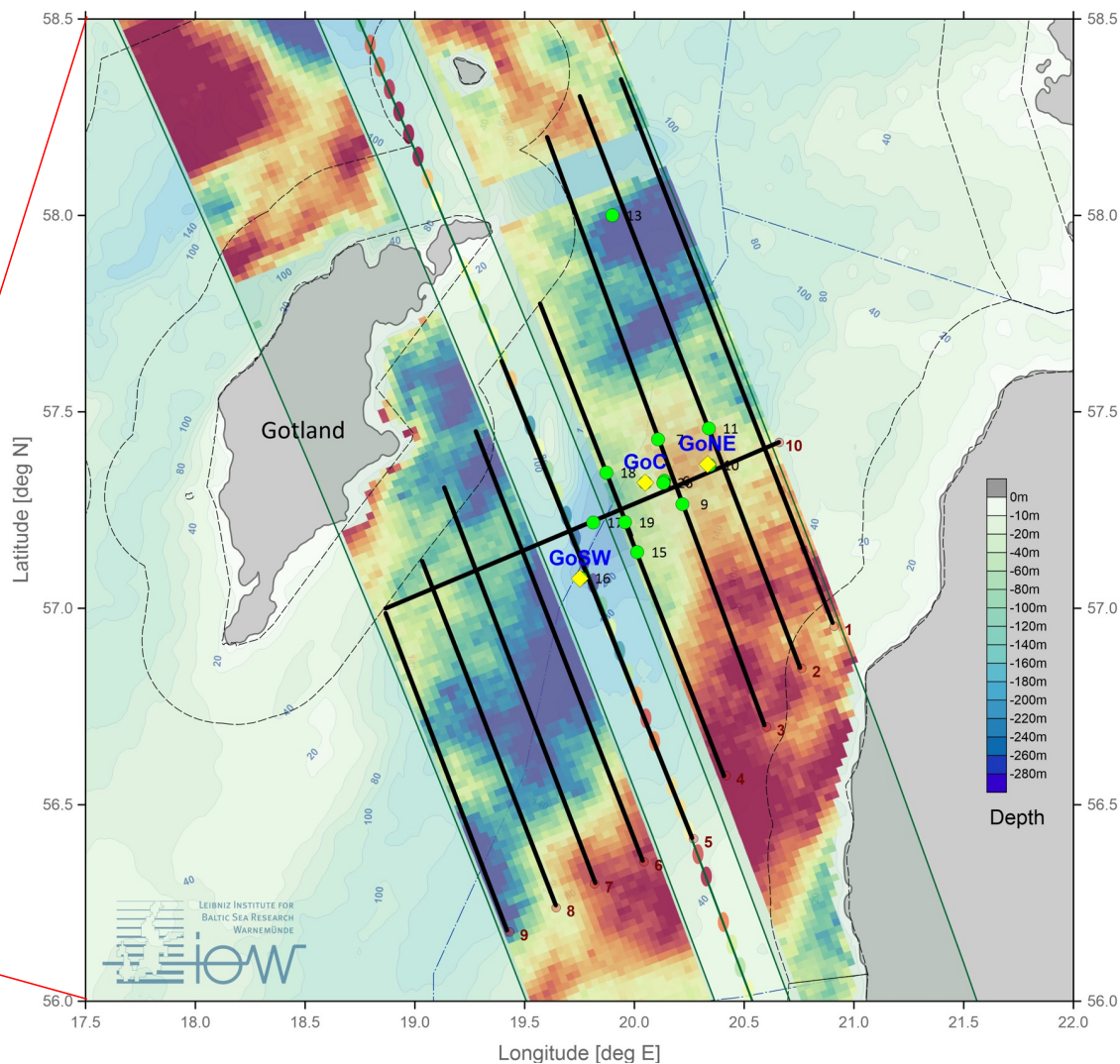
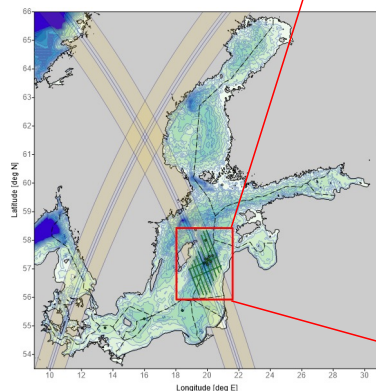
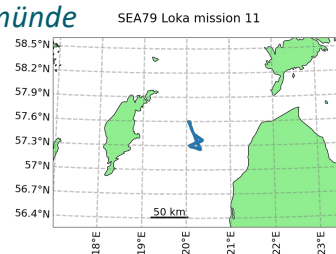
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Circulation and Mesoscale Dynamics
of the Eastern Gotland Basin
RV Elisabeth Mann-Borgese (EMB316)
17th – 28th April 2023

Central Baltic

- Grid of 10 **ScanFish** tracks in the swath of SWOT satellite. Distance 6 to 7 n.m. AT resolution 0.5 to 1.0-n.m. length transects 50-90 n.m.
- **vessel mounted ADCP**, mounted in the moon pool of the ship.
- **CTD casts** at the mooring positions and at some stations below 140m
- Underway measurements with the ships **thermosalinograph**
- 1 gliders April-May 2023



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Scientific objects

- The cruise IOW CIREG-SWOT EMB316 aimed to gather a high-resolution 3D snapshot of hydrographic conditions for the better understanding of the circulation in the EGB, and the closing of the Baltic overturn circulation.
- The gathered 3D in-situ data will be used to test whether the SWOT SSH data can deliver appropriate information on the general EGB circulation and its meso and sub-mesoscale patterns.
- The three-month cal/val phase of SWOT delivers daily information about the circulation patterns for period April to July. The existing long-term moorings in the EGB were equipped with bottom pressure sensors for the cal/val phase of SWOT to gather independent SSH data in the satellite swath for calibration of SWOT data.
- The 3D hydrographic snapshot and the SWOT SSH time series will be applied to determine, which part of the spatial variability of the EGB circulation can be estimated from the SWOT SSH data and the time series observations at the long-term moorings.
- Additionally, all gathered data will be integrated and used in the Baltic Long-Term Observation program of IOW for improve the temporal and spatial coverage the data.

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Measurements done

- Grid of 10 **ScanFish** tracks in the swath of SWOT satellite. Distance between adjacent transects of 6 to 7 nautical miles. Along track resolution of about 0.5 to 1.0 nautical miles. The length of the particular transects varied between 50 and 90n.m.
- ocean current measurements with a **vessel mounted ADCP**, mounted in the moon pool of the ship.
- **CTD casts** at the mooring positions and at some stations in the EGB were performed to cover the deep-water layer below 140m that is not covered by the ScanFish, and to deliver data for calibration of ScanFish data and time series data of the moorings.
- Underway measurements with the ships **thermosalinograph**, to obtain high resolution SST/SSS data along the ScanFish grid.
- 1 glidars April-May 2023

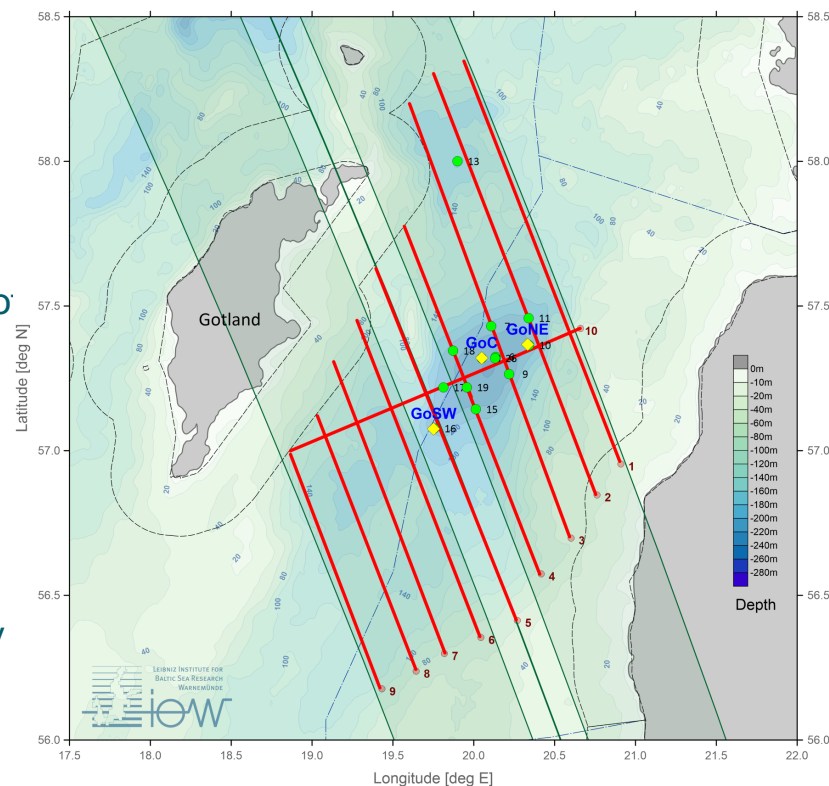


Fig. 1 CONWEST-DYCO CIREG-SWOT IOW Cruise
Red lines – ScanFish Transects
Yellow – Mooring positions
Green dots – CTD casts

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Preliminary results

Fig. 2 Temperature, Salinity and Oxygen concentration of ScanFish transect 4

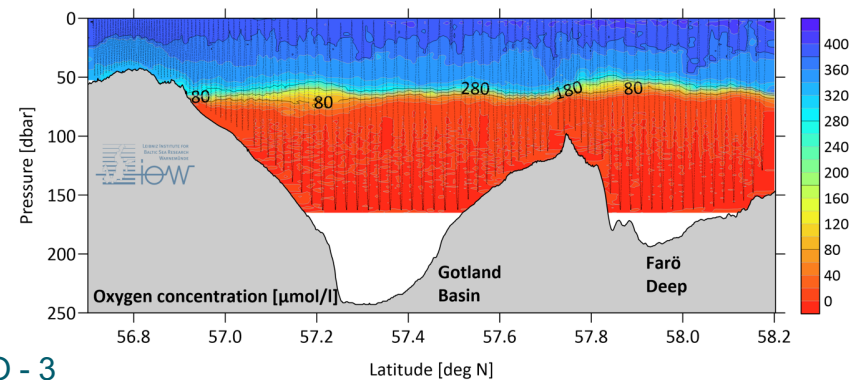
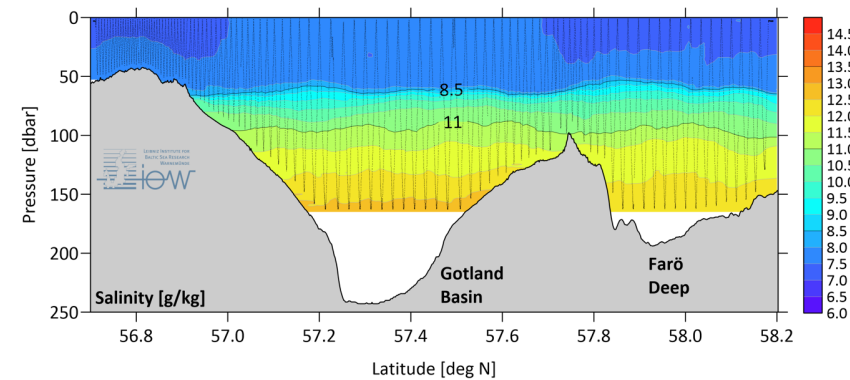
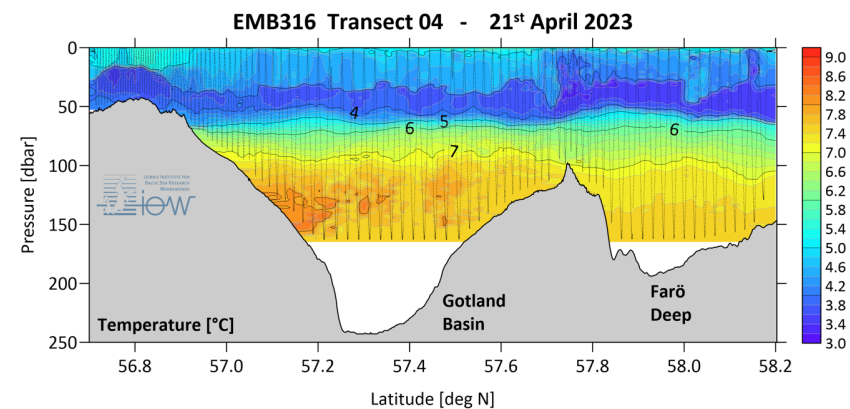
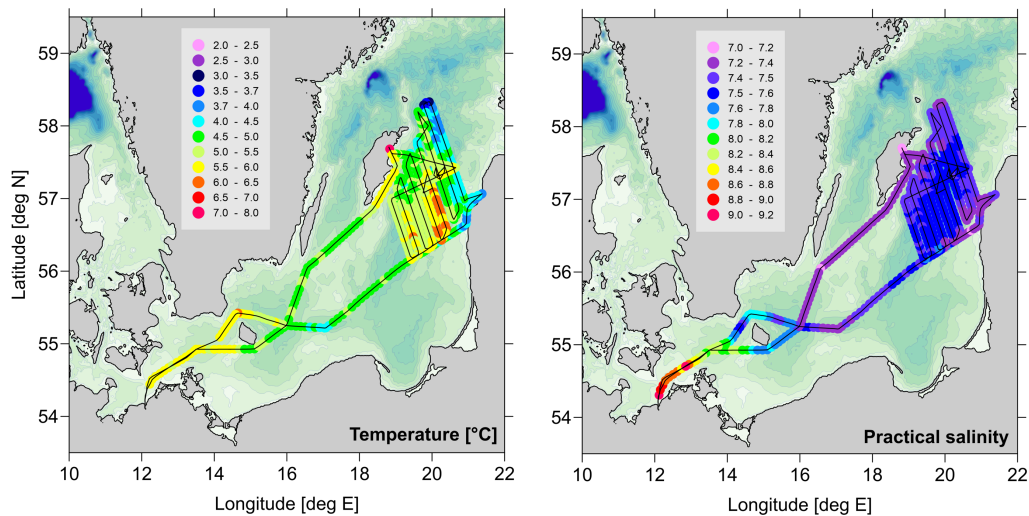


Fig. 3 Surface temperature and Salinity along the cruise track



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Preliminary results nadir-altimetry S3+S6

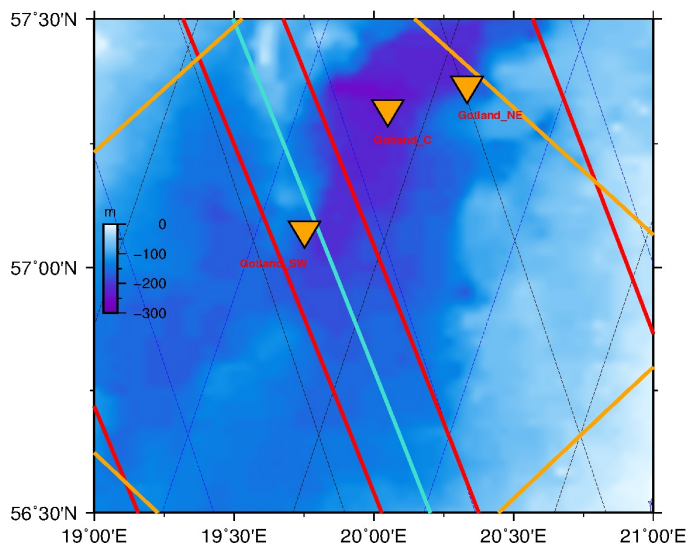


Fig. 4 3 moorings GotlandSW, GotlandC and GotlandNE

Corr 0.87 between Sentinel-3A Pass 711 sea level anomalies and pressure from mooring GONE in 2020-2021

Corr. 0.65 between Sentinel-6 Pass 42 and pressure from mooring GOCE in 2022-2023.

Similar plans are included in SWOT cal/val activities.

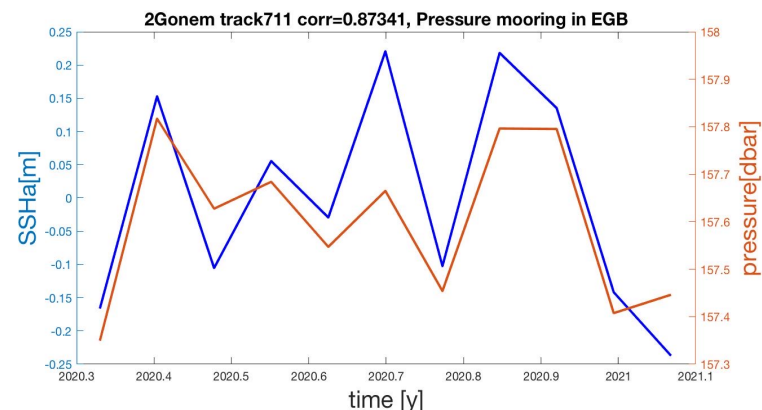


Fig. 5 Sentinel-3A Pass 711 sea level anomalies and pressure from mooring GONE in 2020-2021

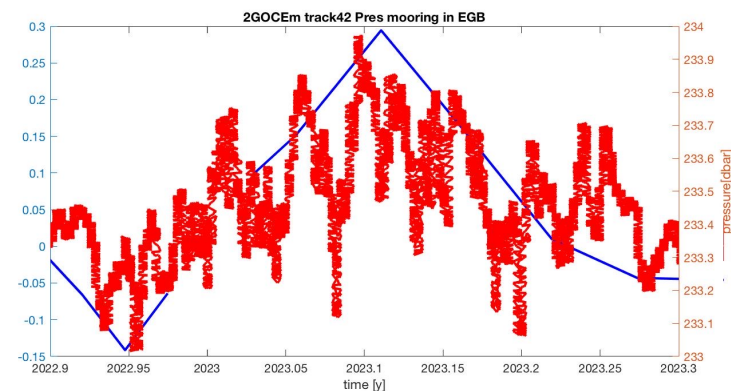


Fig. 6 Sentinel-6 Pass 42 and pressure from mooring GOCE in 2022-2023.

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Preliminary results SWOT

ssh_L3_541_014

ssh_L2_541_014_20230603T223835_

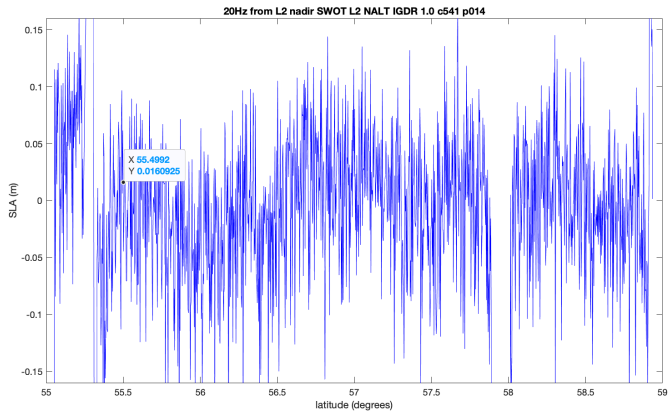
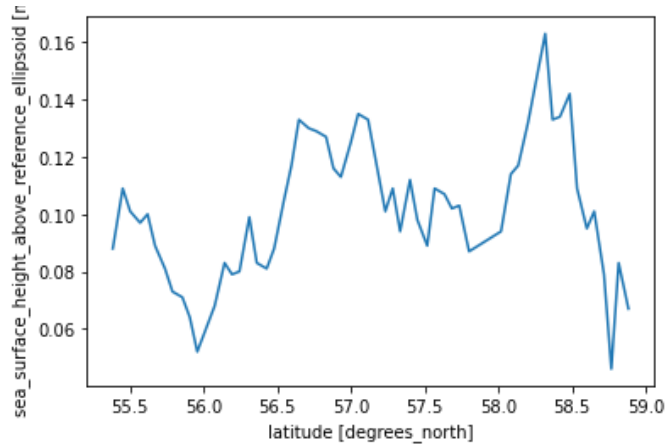


Fig. 7 SWOT along nadir from L3 (above) and L2 (below) CIREG-SWOT / CONVST-DYCO - 5

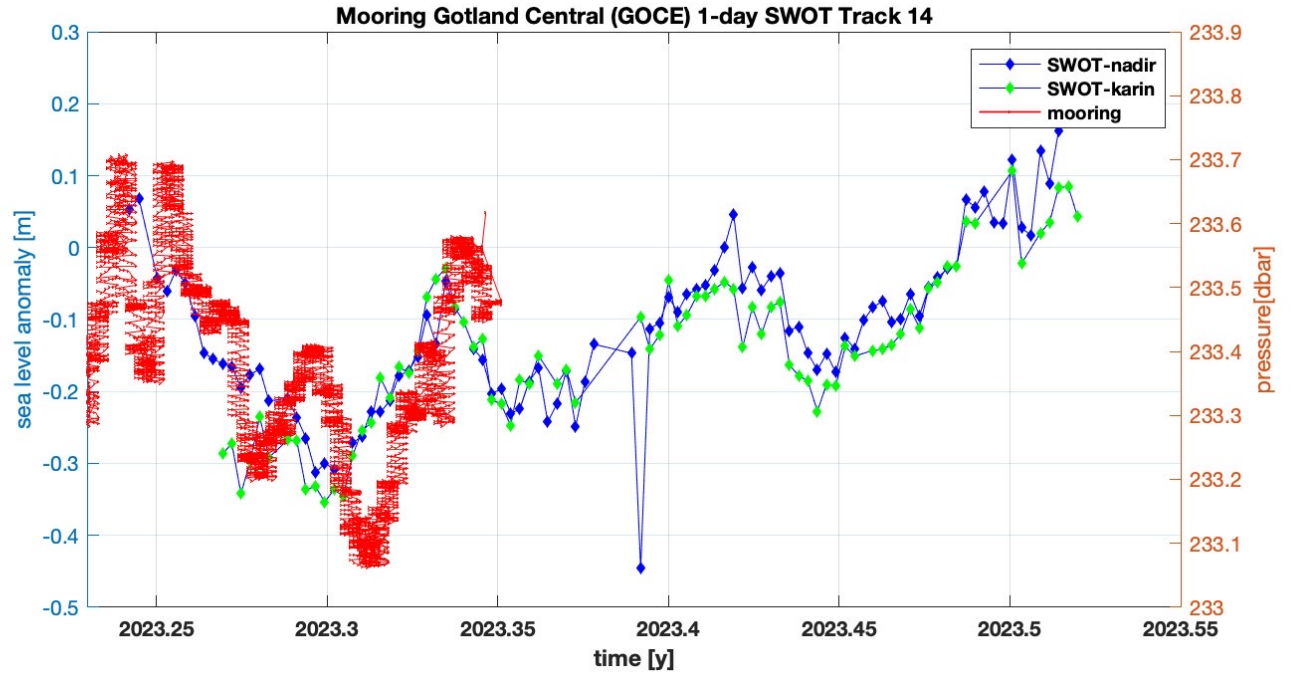


Fig. 8 SWOT-nadir (blue) and SWOT-karin (green) with pressure mooring GOCE with all corrections applied except ocean tide and DAC.

Karin SWOT L2 LR

Preliminary results

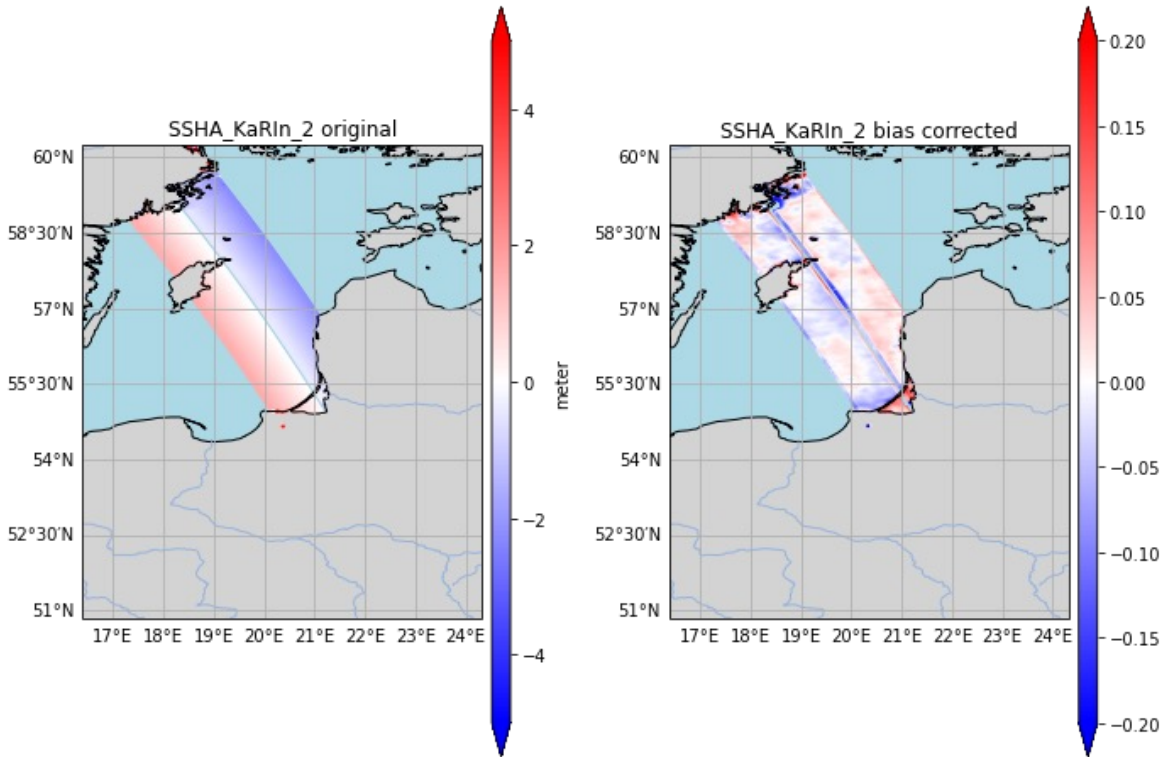


Fig. 9 SWOT-Karin June 2023. Effect of SWOT. heightcorxover correction

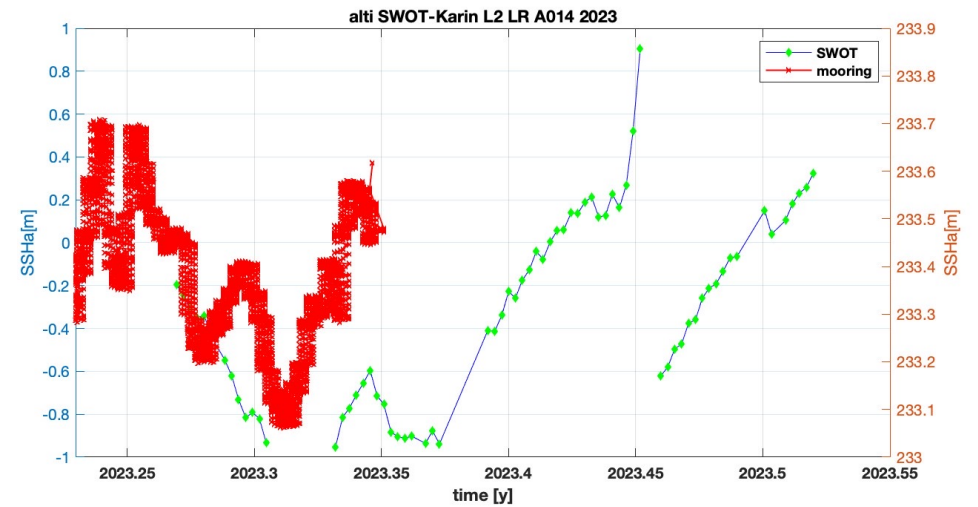


Fig. 10 SWOT-Karin L2 (green) with pressure (red) without application of the SWOT.heightcorxover correction

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Preliminary results SWOT-nadir

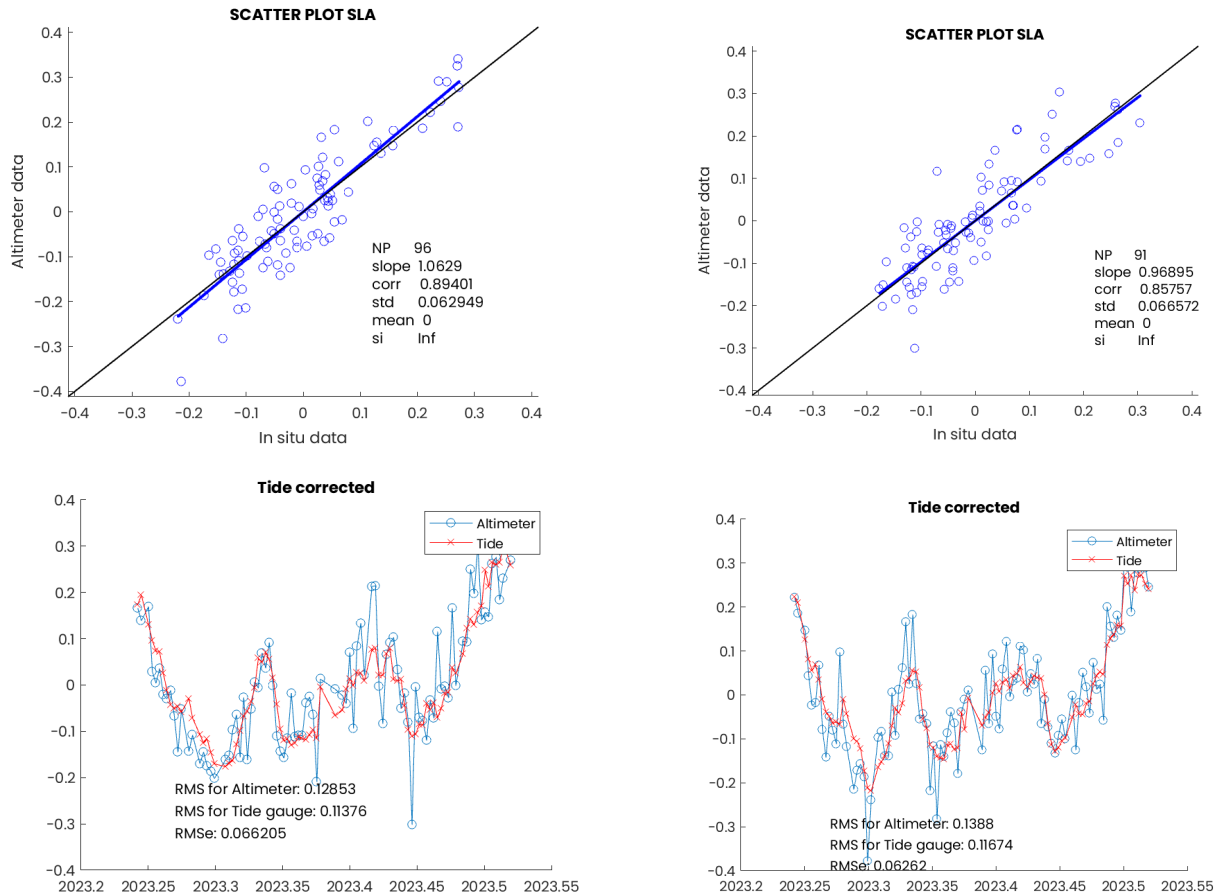


Fig. 11 SWOT-nadir against gauges Landsort-Norre and Visby at distance of 5 km to coast

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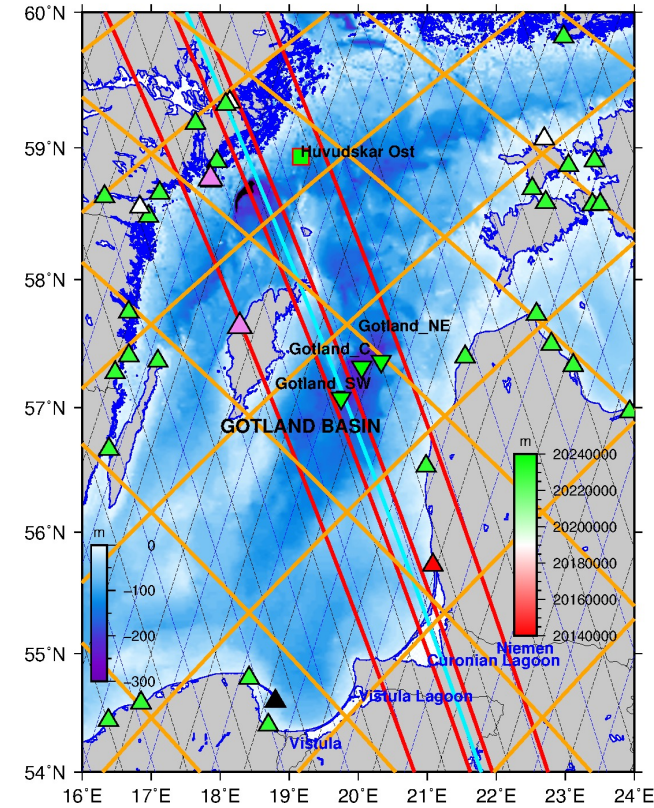


Fig. 12 Calval for SWOT with in-situ in Central Baltic

STDD 8 cm @5km from coast at Landsort-Norre and Visby with SWOT-nadir, as expected from nadir altimeters retracker

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Conclusions and Future perspectives

- The mooring data in cal/val phase were available from Nov. 2022-30 May 2023
- First analysis of SWOT L2 and L3 data against SWOT nadir and with in-situ mooring and gauges shows good agreement of water level (5 cm STDD)
- CTD data of the cruise are validated.
- ScanFish data validation is ongoing and will be finished in November (T, S)
- VOTO glider data will be calibrated with the ScanFish data afterwards
- New mooring data available June 2023-Nov. 2023. or later in February 2024 due to retrieval.



Feedback

- The Gotland Basin is a good region to check corrections in altimeters due to the small sea level variability
- Detection of internal tide in the region to be investigated
- Steric height and sea level change comparison as next step
- Surface roughness, related to tidal fronts to be investigated
- Check if GNSS on ship is possible
- Check possible planning of IOW campaign in 21-day SWOT science phase, synchronizing with Sentinel-3 and Sentinel-6 track configuration

