CMEMS Next-gen polar sea level products

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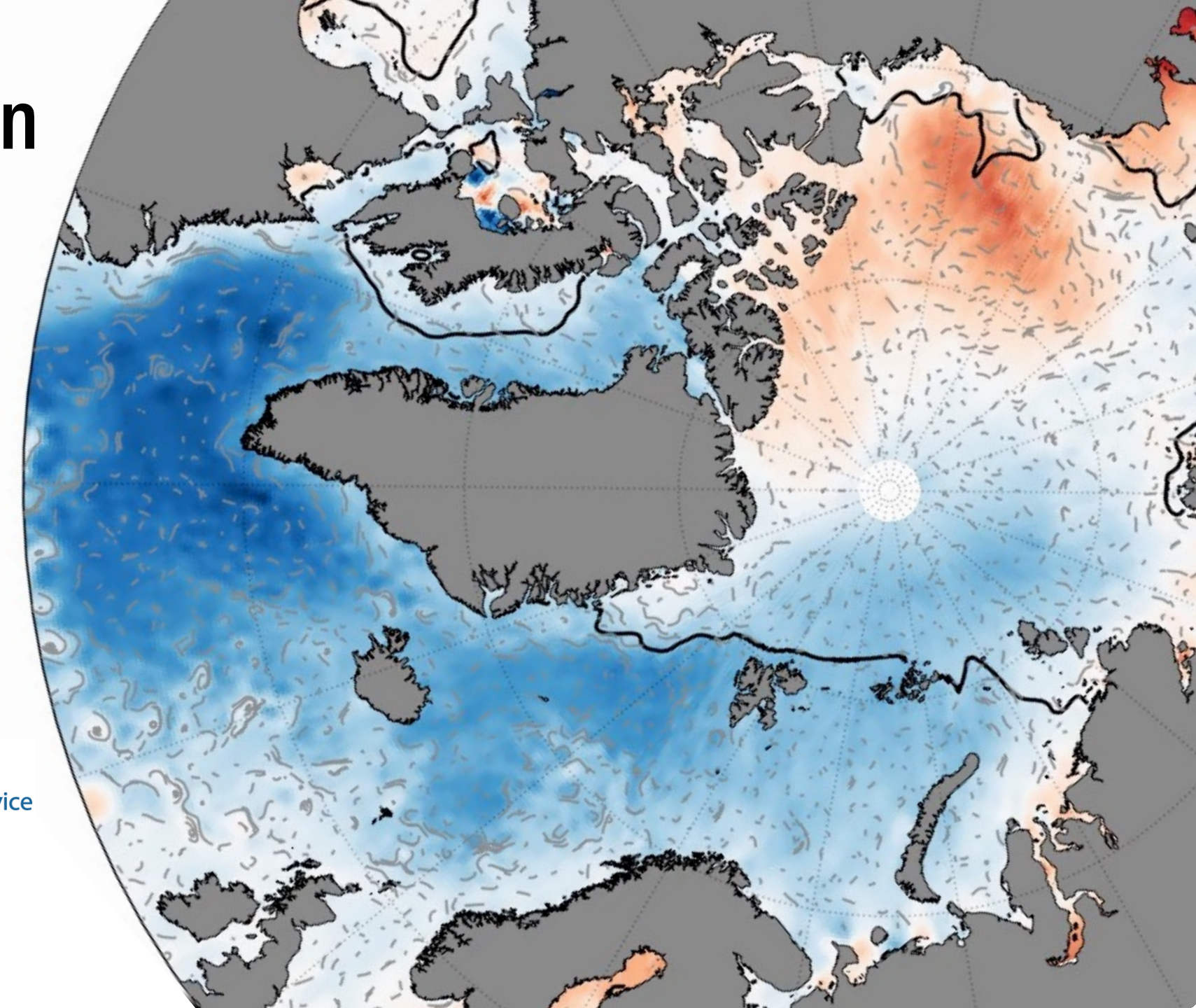


Polar Sea level products recap

1994 ERS-1 ground processor (Laxon)

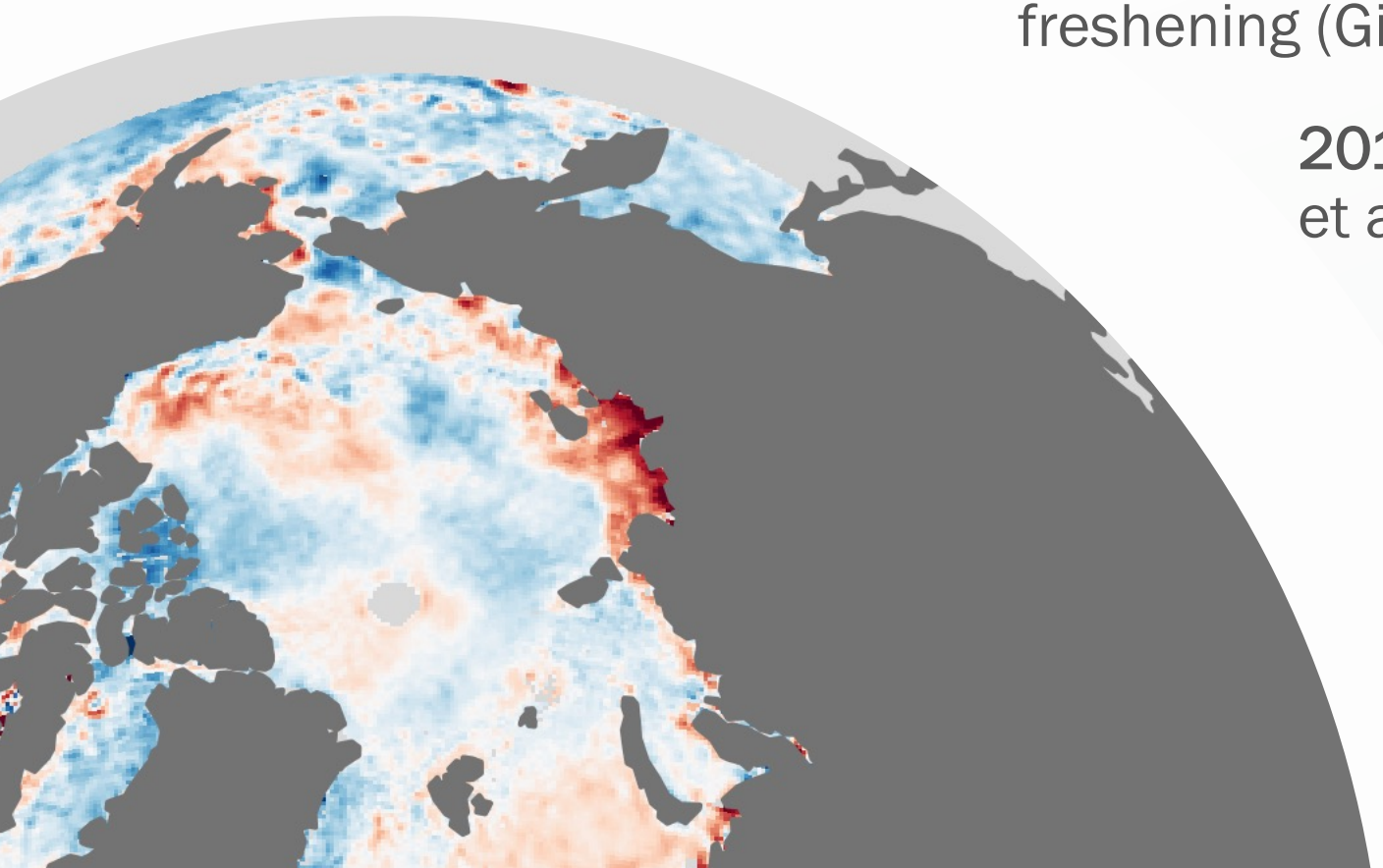
2004 map of Arctic sea level variance (Peacock and Laxon)

2012 altimetry observes the Beaufort Gyre freshening (Giles et al.)

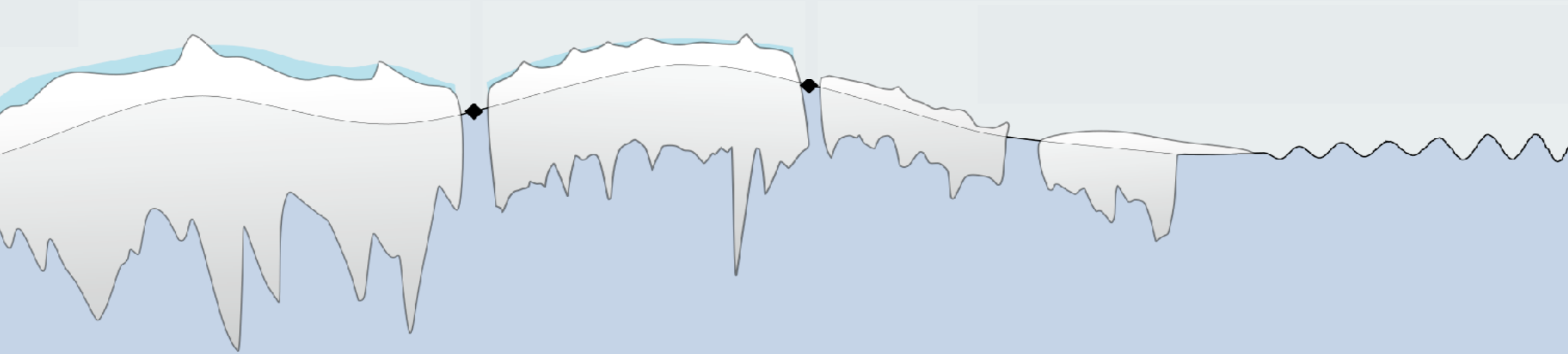
2016 CPOM dataset published (Armitage et al.)

2019 DTU processes the full record (Rose et al.)

2021 new polar sea level products based on the combination of 3 altimeters (*Auger et al, Prandi et al.*)



Sea level retrieval in polar oceans

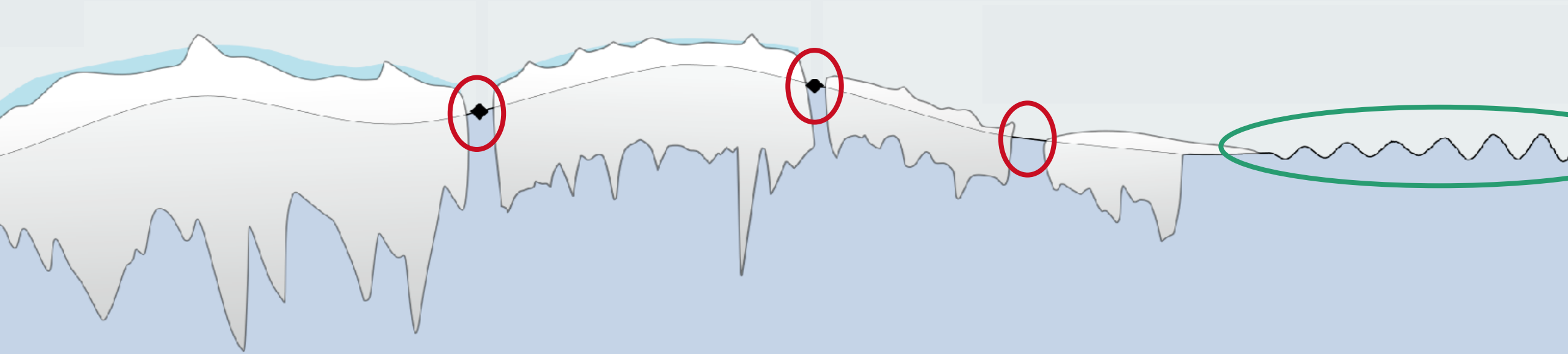


From Quartly et al., 2019

Sea level retrieval in polar oceans

Classification to select leads and ocean

- Neural Net based (Poisson et al., 2018, Longépé et al., 2019)

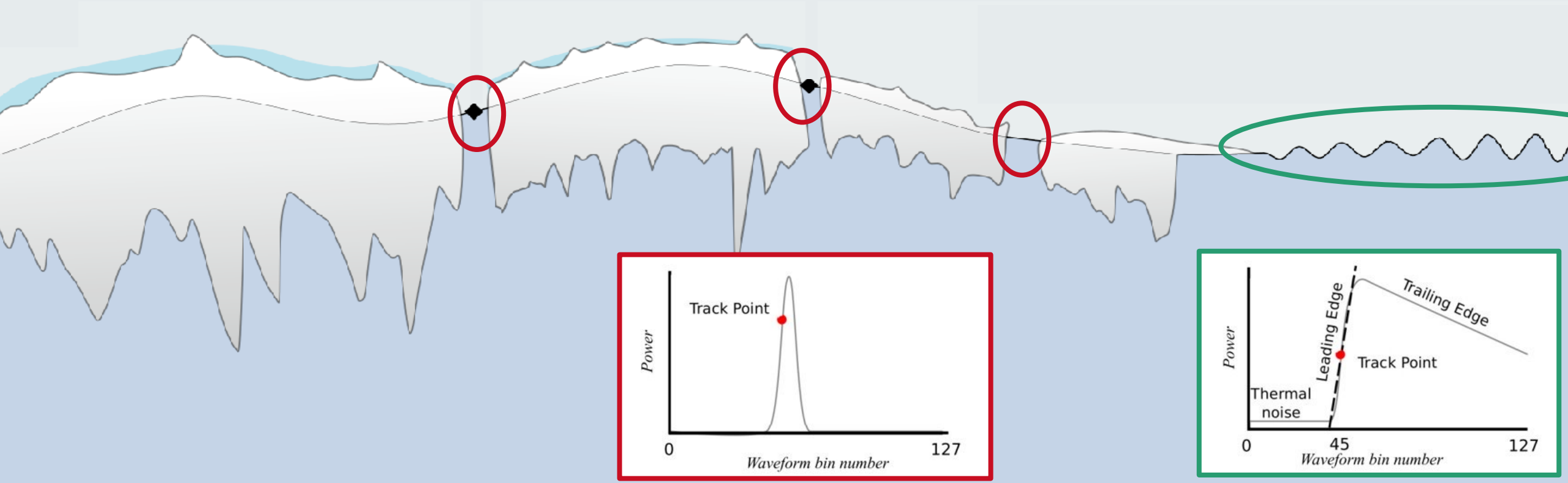


From Quartly et al., 2019

Sea level retrieval in polar oceans

Range estimation through retracking

- Adaptive retracker (Poisson et al., 2018) on LRM able to process **both** specular and diffuse echoes,
- Empirical TFMRA retracker on SARM for specular echoes



From Quartly et al., 2019

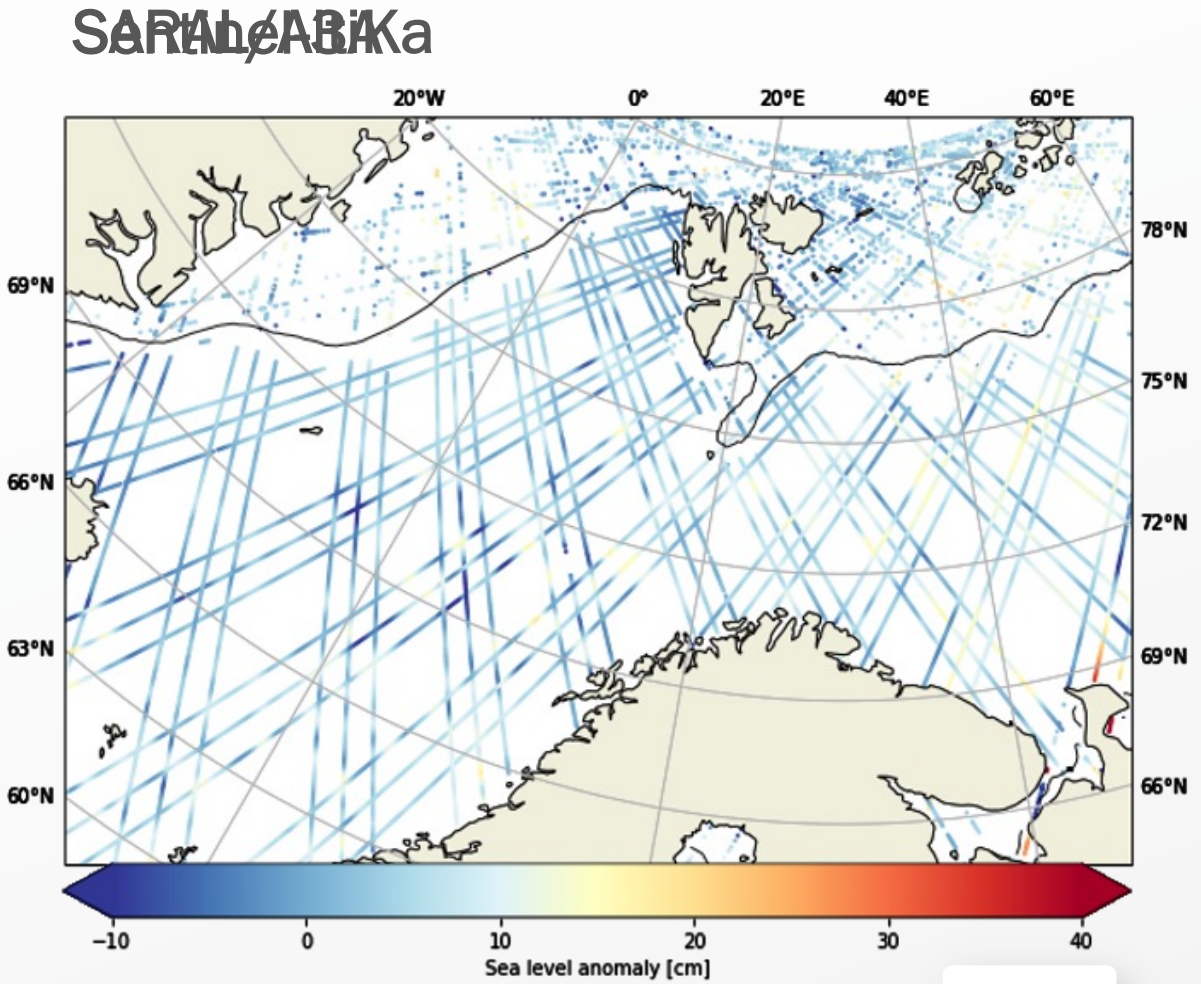
Processing continuity is a must have

Most polar ocean products process leads and open ocean echoes differently,

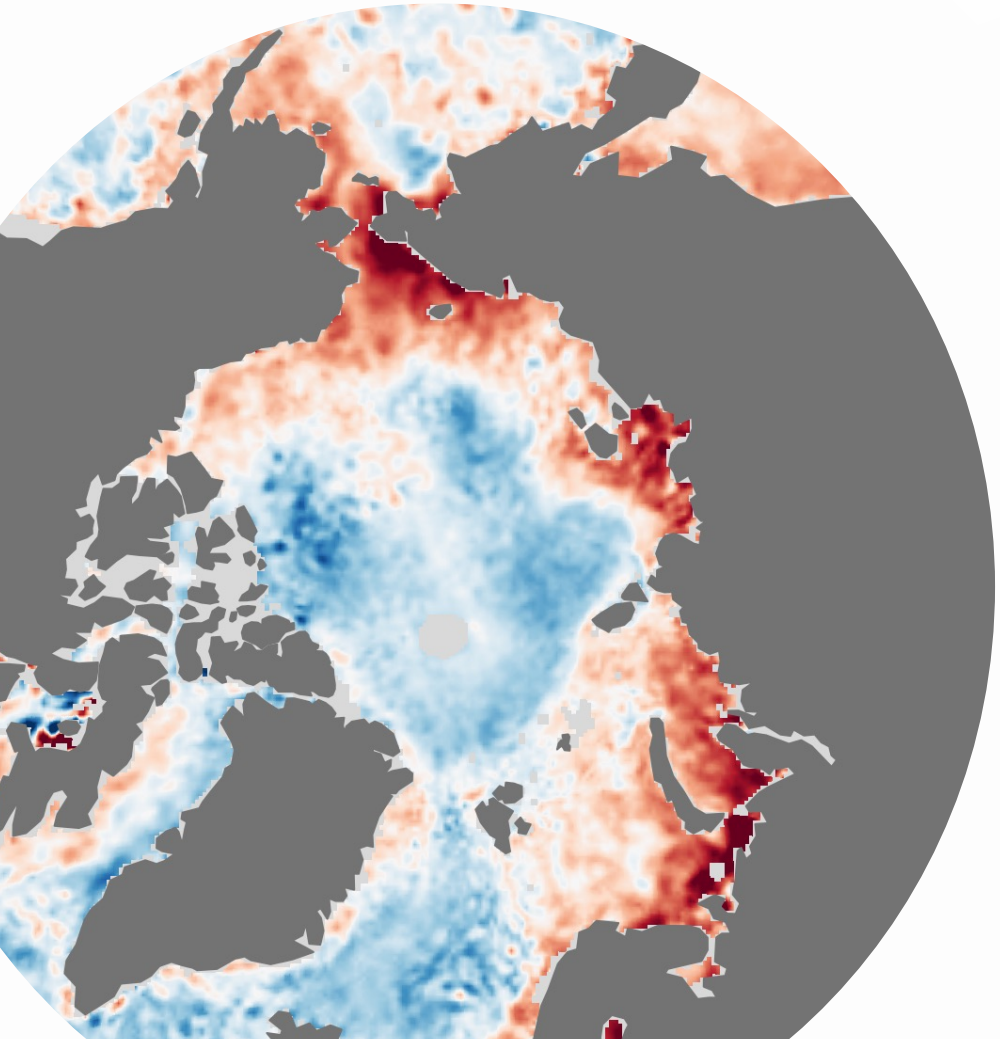
Empirical bias estimation is required,

This bias is **highly uncertain**,

Here SARAL/AltiKa with the adaptive retracking provides a continuous baseline



Key features



Combining CryoSat-2, Sentinel-3A and SARAL/AltiKa provides a much better sampling

Processing continuity on SARAL/AltiKa provides a reference for cross-calibration

Optimal interpolation scheme maps along-track data to 3 day/25 km grid

Looks nice, but how good is it really ?

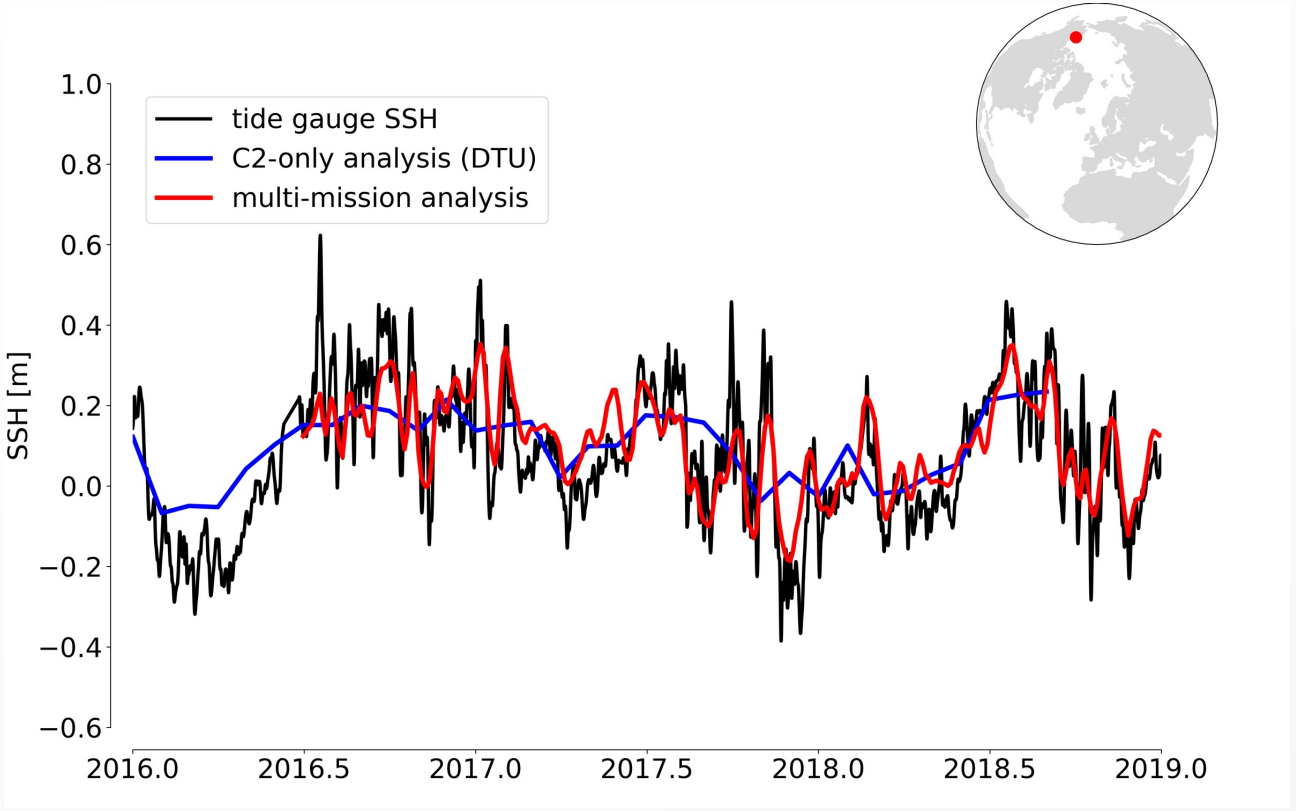
Comparisons to in-situ measurements

In situ measurements are scarce in polar oceans,

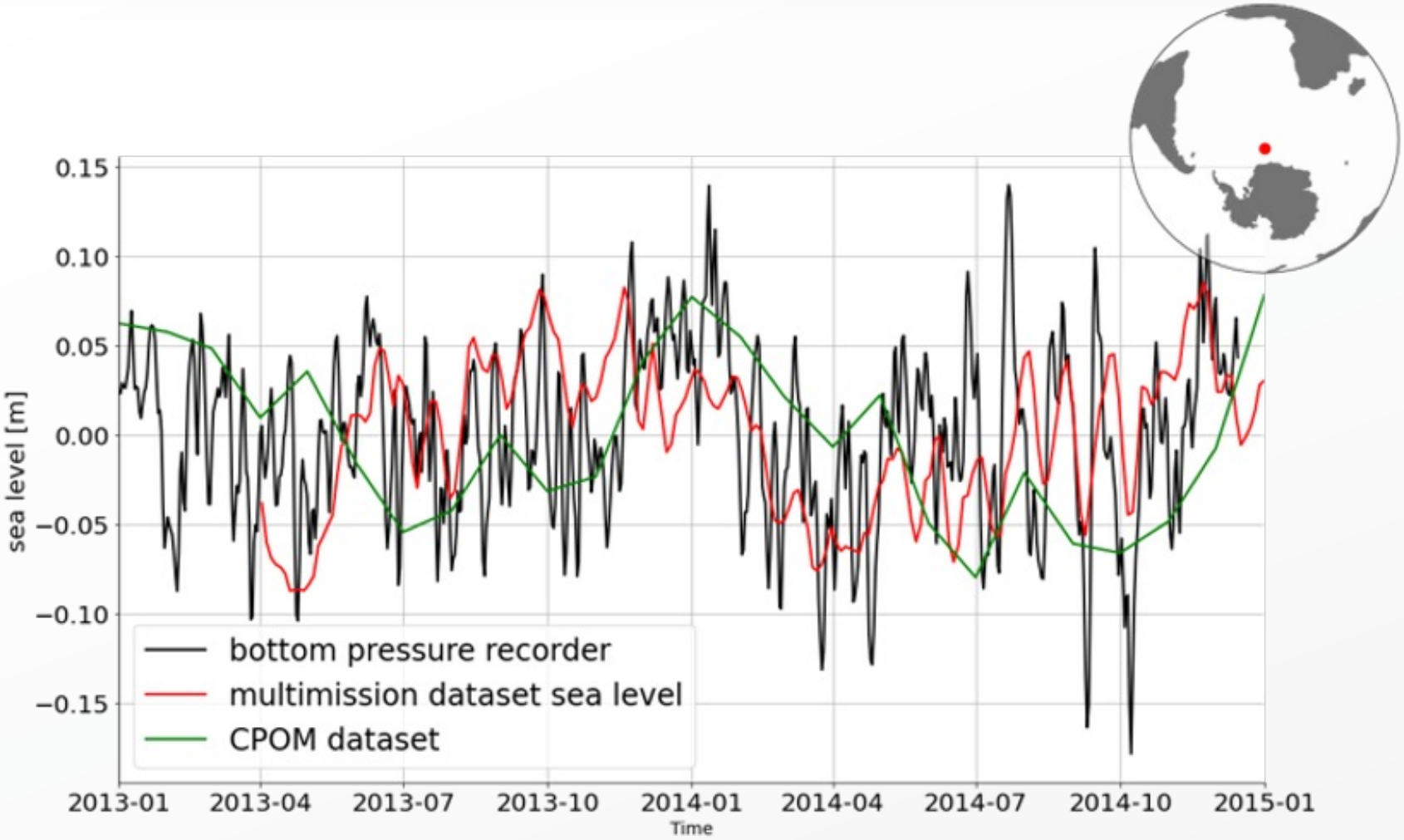
Prudhoe Bay area is seasonally ice-covered

One mission alone can not represent high frequency sea level signals

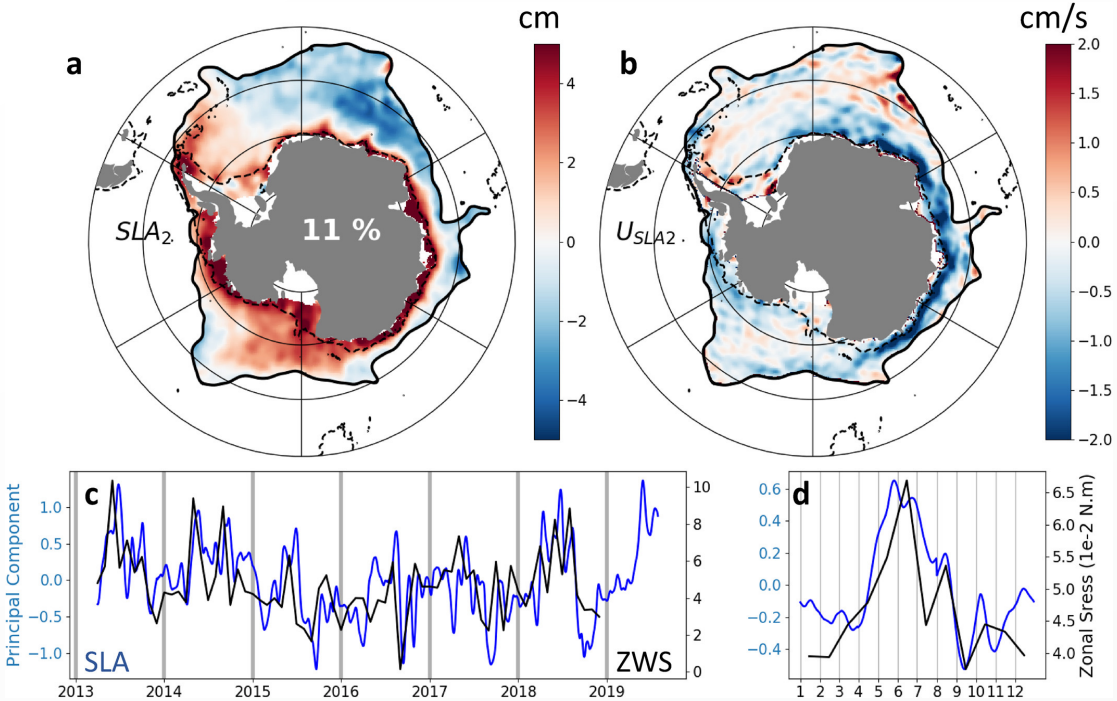
Better agreement with our multi-mission dataset



Another example with a BPR in the Southern Ocean



Linking to ocean circulation patterns



Auger et al. (2022) link observed SL variability to atmospheric forcings,

They find that SL/currents patterns are explained by wind forcings through wind stress curl,

The variability observed is consistent with seasonal to inter-annual wind stress effects,

JGR Oceans

Research Article | Open Access

Subpolar Southern Ocean Seasonal Variability of the Geostrophic Circulation From Multi-Mission Satellite Altimetry

Matthis Auger, Jean-Baptiste Sallée, Pierre Prandi, Alberto C. Naveira Garabato

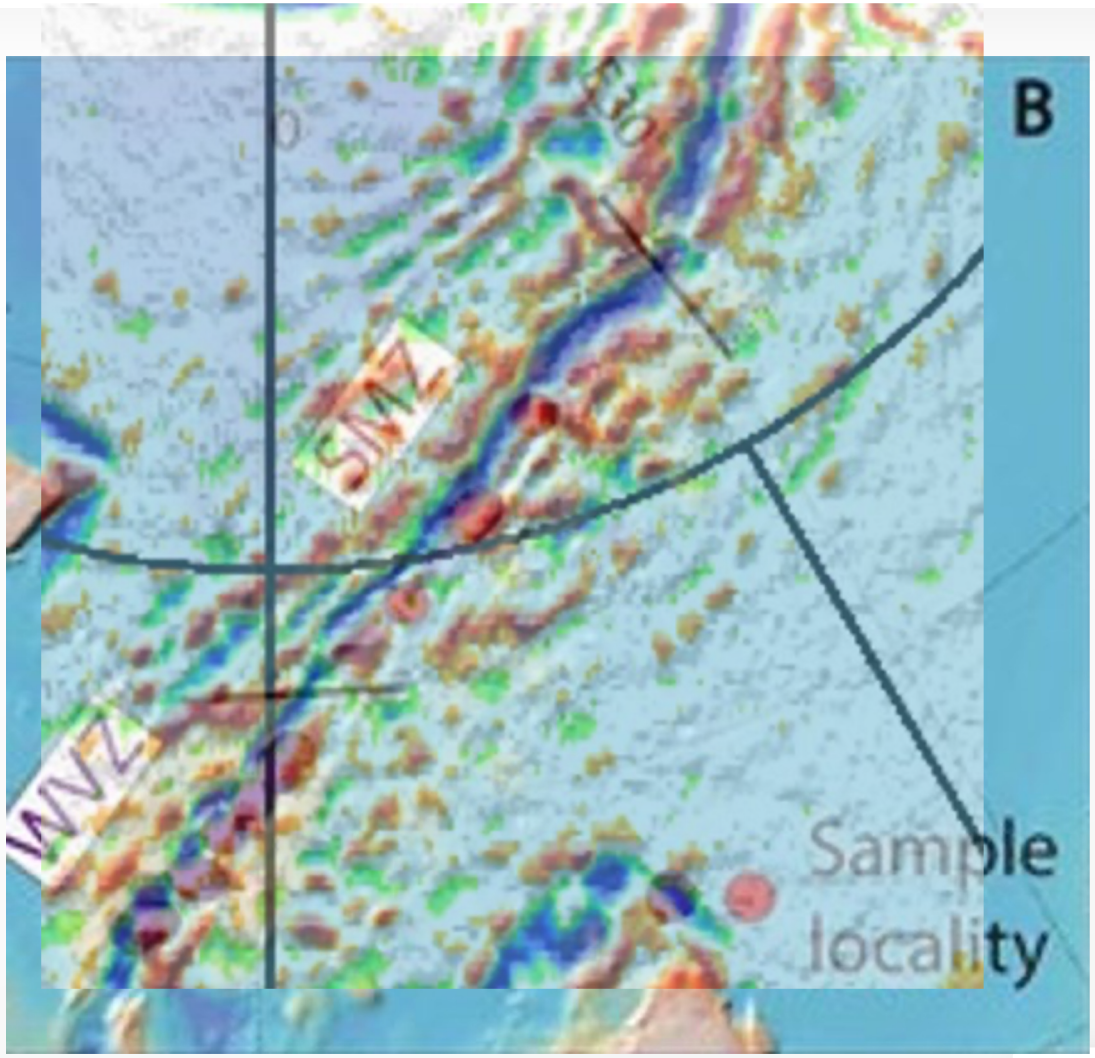
First published: 01 June 2022 | https://doi.org/10.1029/2021JC018096

Inclusion of leads measurement in MSS solution

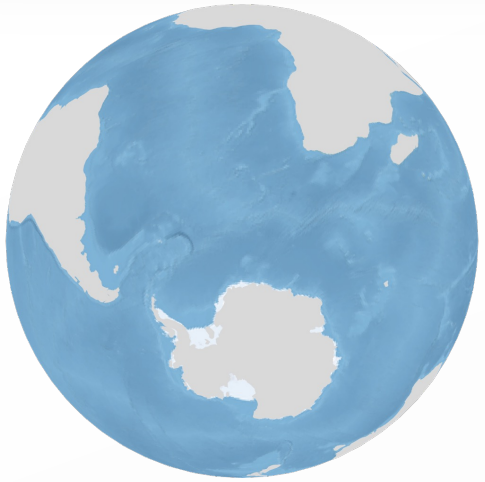
Leads measurements were included in the CNES/CLS22 MSS model,

Revealing new features, unobserved by the CNES/CLS15 model,

Consistent with local seafloor topography



Product wrap-up – all available on AVISO



From April 2013 to July 2019
All latitudes below 50°S
Up to 3 missions
Gridded

From July 2016 to July 2020
All latitudes above 50°N
Up to 3 missions
Gridded **and along-track**

Both products to be updated by
Dec22/Jan23 over 2013 to 2021
With new tide and MSS/MDT models

Talk by A. Bonaduce today@5:30 about using these products for DA

Conclusions

We've built polar sea level products based on measurements from three satellite atimetry missions,

These products have higher temporal and spatial resolution than previsouly existing ones,

We are still validating and welcome feedbacks from the user community.

One key performance asset is (at least) **one reference mission with a processing continuity from open ocean to leads**,

These are prototypes, prefiguring future CMEMS operational products,

To meet CMEMS constraints, upstream data sources with **ad-hoc processing and validation** are required, for current and future missions

Perspectives

Leverage upcoming processings improvements

- New classification and retracking methods, especially for SAR mode,
- FES22 tidal models, updated mean sea surface solution, mapping method
- Extend product backward using Envisat reprocessed data

Encourage the use of leads data

- Feed data to improve MSS and tide models in polar areas,
- Support science users & modelers