



NoR Sponsorship

Improving Polar Ocean sea level studies

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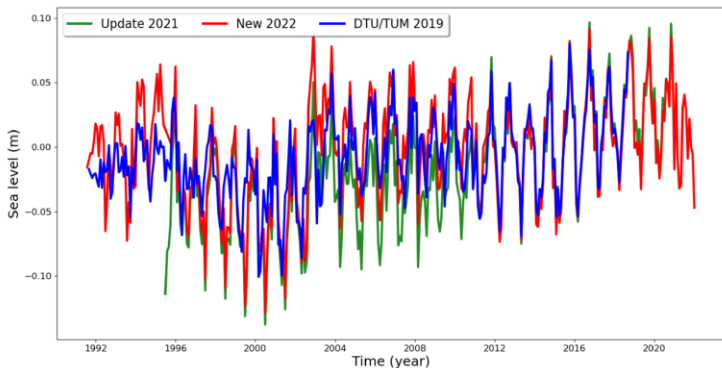
Objective

- Extent the Polar Oceans time series by 13 months
- Continue the complete Arctic Ocean sea level record (<https://www.mdpi.com/2072-4292/11/14/1672>) from 1991-2021
- Make a new sea level record from the Southern Ocean
- Need for the best processing of CryoSat-2 data to understand
 - Antarctic sea ice and sea level and their connection. inter-compare and validate multiple approaches to sea surface height and sea ice thickness retrieval on Antarctic sea ice. The mechanism of the Southern Ocean is far from understood, and we need the best data processing to study these mechanisms (*CryoSat+ Antarctica*).
 - Tidal analysis in Polar regions. Its high signal-to-noise ratio makes it useful in making tidal analysis (*ALBATROS*)
 - Challenges with Summer data in sea level studies
 - Ice margin studies



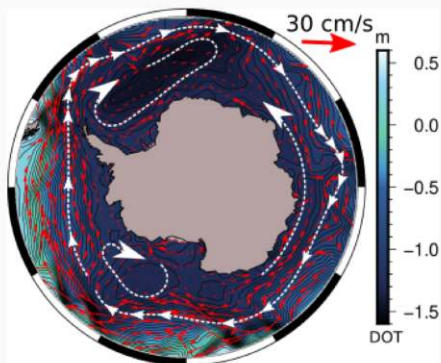
Comparing old (Rose et al., 2019) and new (2022) data set

The state of the art processing gotten from the NoR Sponsorship helped to extend the Arctic Oceans time series by 13 months



Geostrophic Circulation (Antarctic)

- The NoR Sponsorship helped to extend the Southern Oceans time series by 13 months
- Below, Geostrophic currents calculated from the DOT (red) show the large circulation patterns



Data are made freely available. The newest versions are available here:

ARCTIC OCEAN: <https://figshare.com/s/3f63dc55276155c0d693>

SOUTH POLAR OCEAN:

<https://figshare.com/s/36cd2ee8c8696ae0bc91>



FINAL RESULTS

- The NoR Sponsorship have helped to extent the Polar Oceans time series with a state of the art processing
- The first reults from the Arctic Ocean was presented at the OSTST meeting November, 2022 in Venice
- The Antarctic data has been used in the ESA project CryoSat+ Antarctica as a data delivery
- Part of delivery of the ESA project ALBATROS in form of tidal analysis
- The first versions of the data set have already been distributed to users from different user groups as in put to their ocean science modeling or validation.

ON-GOING WORK

- Research paper of the Arctic Ocean data set
- Research paper of the Southern Ocean data set
- Student project in better estimating sea levels in Summer
- Reach out through ESA projects and research conferences to foster collaborative research and interdisciplinary studies

Benefits for society

- Foster collaborative research and interdisciplinary networking actions
- Improve knowledge about bathymetry and ocean tides in the Arctic Ocean and the Southern Ocean
- The knowledge about ocean tides is at the crossroads of many scientific fields, especially in the Polar regions, as it has significant impact on ocean circulation modelling and the understanding of the coupled dynamical response of the ocean, sea ice and ice shelves system, the quality and accuracy of sea surface height and sea ice parameter estimates from satellite altimetry, or the understanding of ice-shelf dynamics.
- The continuation of the Polar Ocean sea level and Sea Ice freeboard measurements in the satellite altimetry community. Help understanding the processes of the Polar Oceans and the impact of climate change.
- Sea level studies are fundamental in studies of Polar Ocean oceanography and sea ice freeboard estimates



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Thank You!

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- Ole Baltazar Andersen
- Sara Fleury
- Salvatore Dinardo
- Michel Tsamados
- and many more ...

Ref:

S. K. Rose, O. B. Andersen, M. Passaro, C. Ankjær, and C. Schwatke. Arctic Ocean Sea Level Record from the Complete Radar Altimetry Era : 1991-2018. *Remote Sensing*, 11:1672, 2019. doi: 10.3390.

