

living planet symposium | BONN 23–27 May 2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE

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Commission and ESA venturing together science challenges in Southern Ocean

Author:

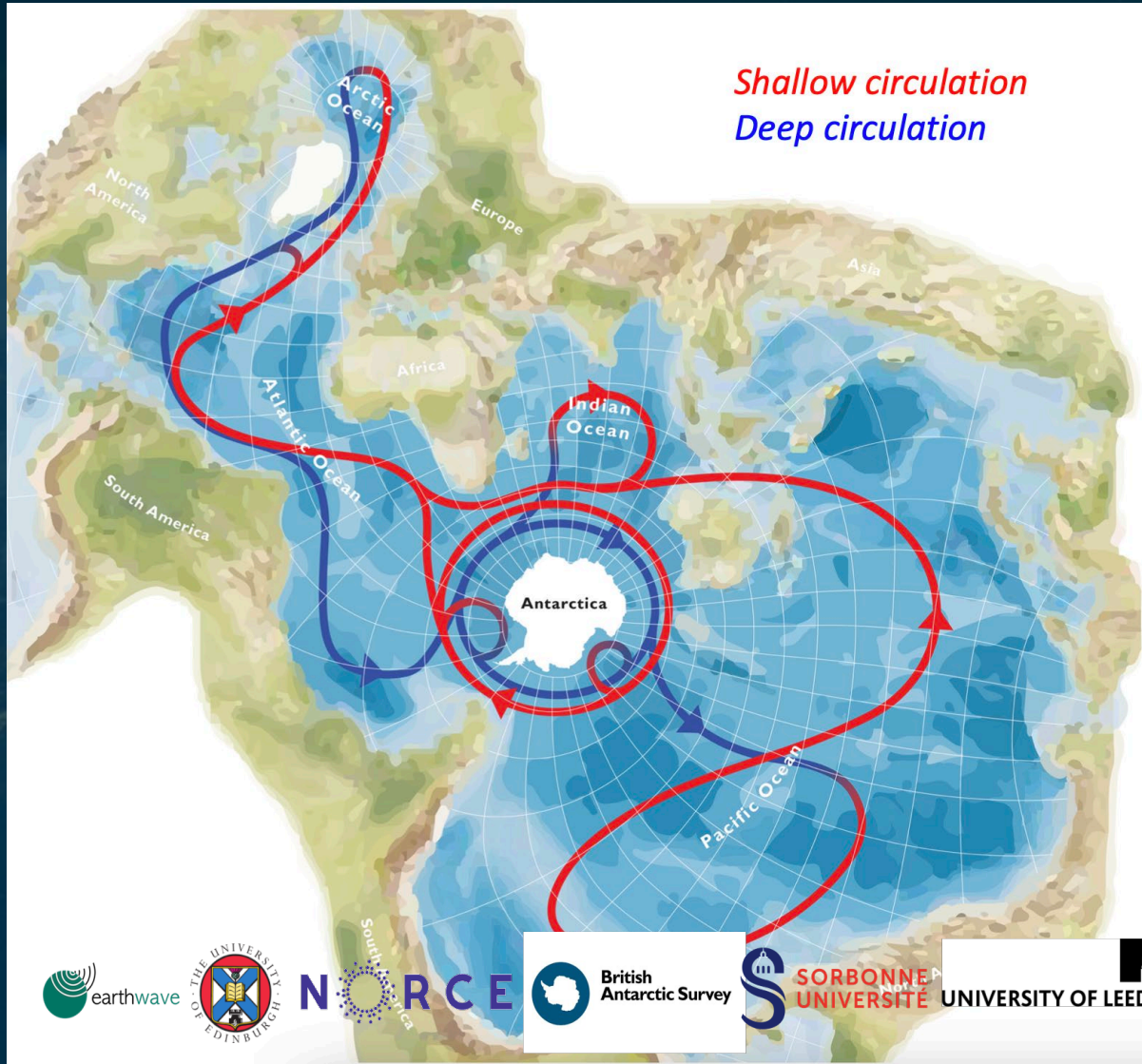
Rafael Catany (1,2), Anna Hogg (3), Alberto Naveira Garabato (4), Antonio Turiel (5)

Date 25/05/2022

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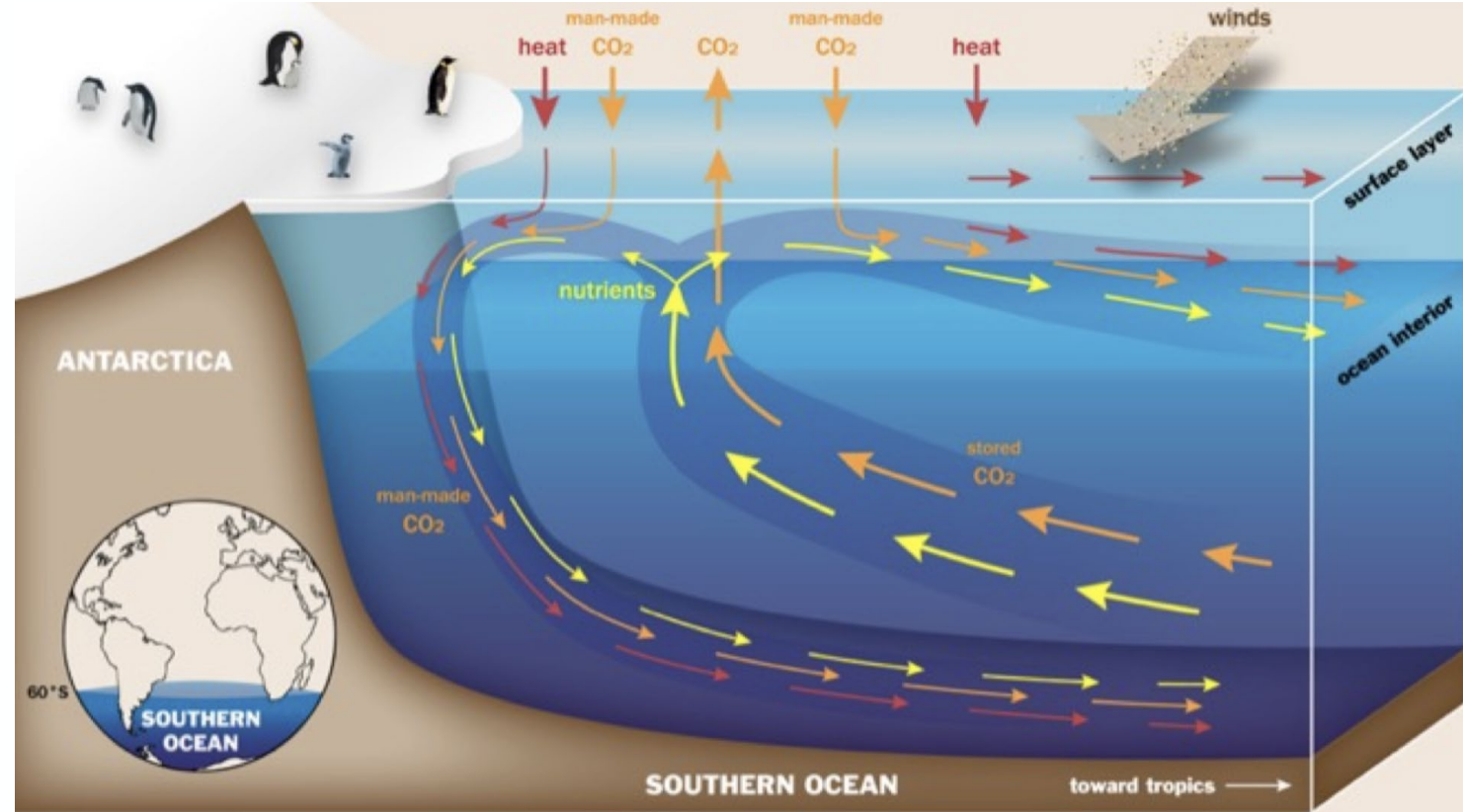
The Importance of the Southern Ocean



- Connectivity of the ocean gives the remotest regions a global reach
- The circumpolar flow of the Southern Ocean is key for enabling this connectivity
- But the importance of the Southern Ocean transcends even this...

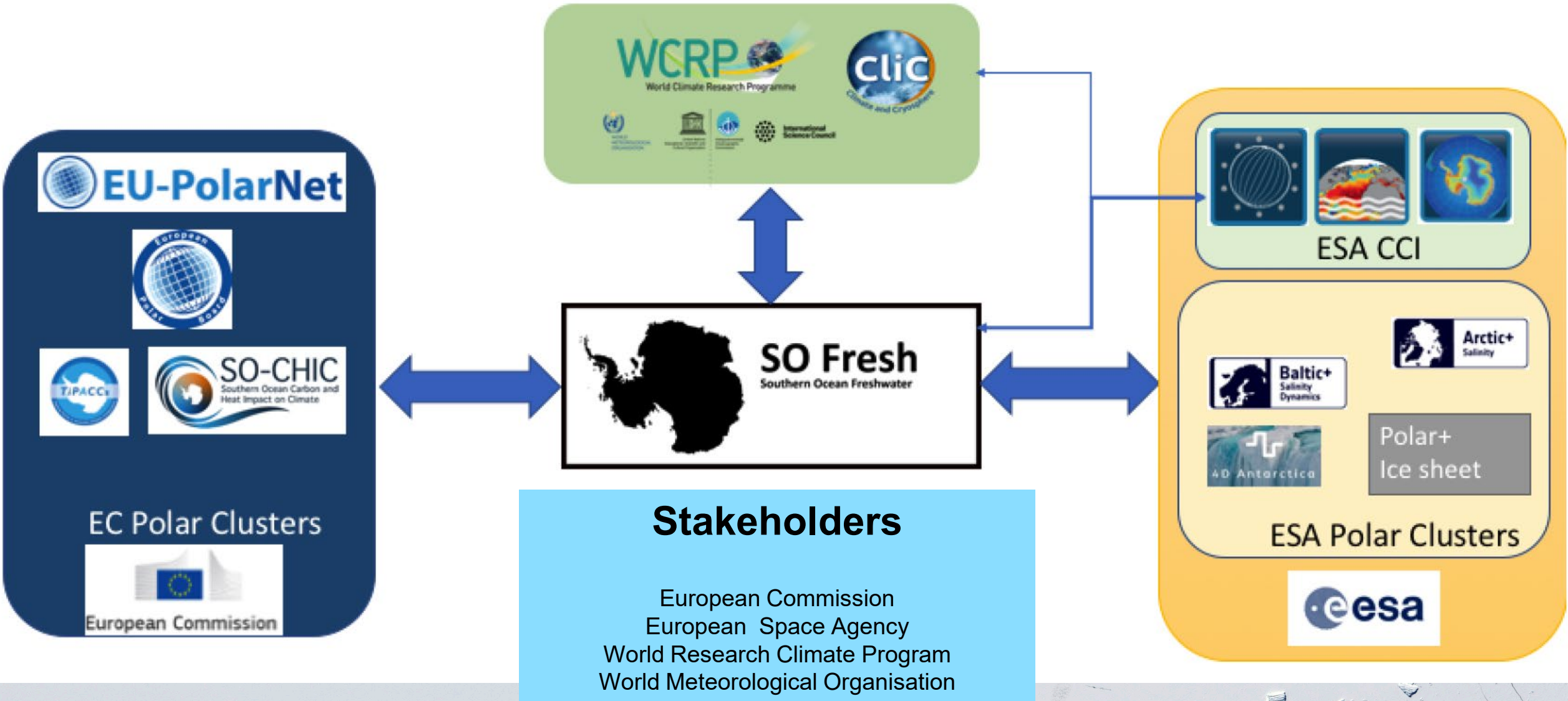
SO-Fresh and SO-Ice aligned with SO-CHIC goals

- 1) What is the role of freshwater fluxes in shaping the Southern Ocean overturning?
- 2) Will melting of the Antarctic Ice Sheet increase in the future?
- 3) What is the role of Antarctic polynyas in the climate system?



ESA Polar Science cluster projects will provide pivotal contributions to answer SO CHIC science questions

Identified Stakeholders



Southern Ocean Carbon and Heat Impact on Climate



November 2019 -2023
16 partners



Southern Ocean Freshwater SO-Fresh



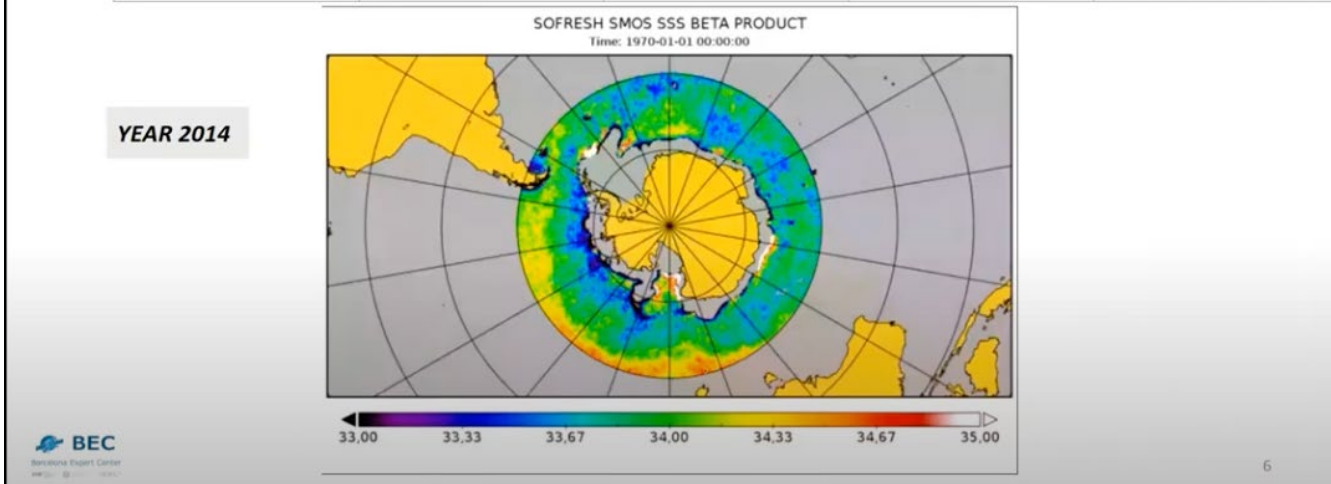
May 2021 -2023
3 partners

- SO-Fresh is providing a multi-year record of Sea Surface Salinity (SSS) data that will enhance the research of 4 SO-CHIC WPs (WP1-WP4) – **ESA Polar Science Workshop Requirement June 2020** (<https://eo4society.esa.int/>)
- SO-CHIC is acquiring in situ high-resolution, high-quality near-surface salinity data in freshwater-stratified Southern Ocean regions that is guiding the interpretation of SSS observations

- Generation of temporal series (2011 to date) of a dedicated SSS product
- Community networking efforts by bringing together international scientist from different stakeholders – Science Advisory Group (SAG)
- To enable community using the satellite retrieved SSS and other EO products (SST, SSD and SSC).
- Draw a common roadmap with the stakeholders that will implement ESA-EC System Science Initiative and in particular of the Flagship on Polar Changes and Global impacts.

Specifications

Level of Processing	Spatial Coverage	Spatial Resolution	Temporal coverage	Temporal Resolution
Level 3 maps	90°S-50°S	25km (EASE SL grid)	2014-2016 complete 2017-2018 partial	9-day generated daily



SO Fresh generated the SSS beta product 4th April 2022 (for internal and SAG use only)

Update SO Fresh version (with SAG feedback) to be expected in Q4

SAG enrolment is open via SO Fresh website

<https://sofresh.argans.co.uk/#contact>

SO-CHIC & SO-ICE: Links & synergies

Southern Ocean Carbon
and
Heat Impact on Climate



November 2019 -2023
16 partners



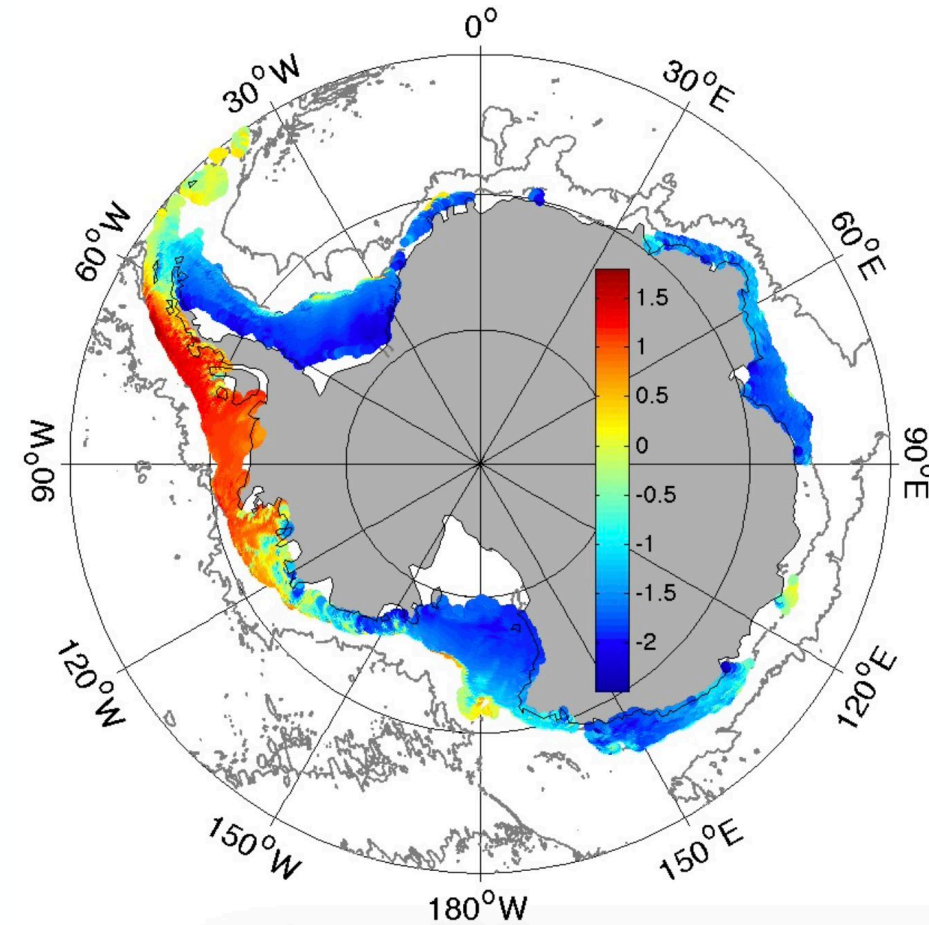
Southern Ocean Ice-Ocean
Interactions
SO-ICE



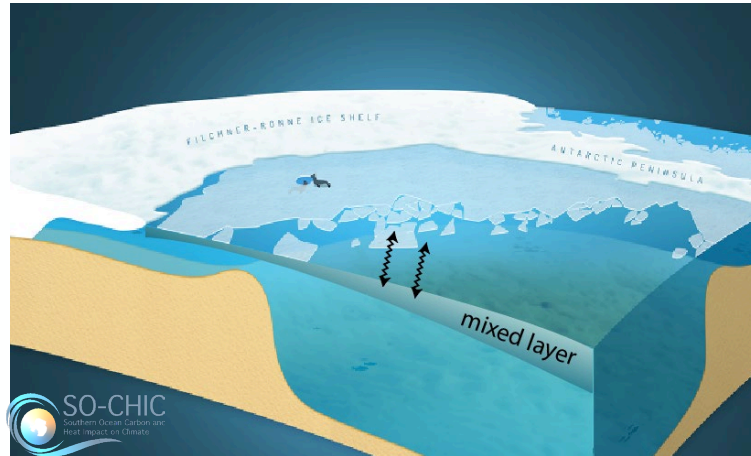
Sept 2021 -2023
6 partners

- SO-ICE is investigating ice-ocean interactions in the Weddell Sea using datasets produced in the ESA Polar+ Ice Shelves project, and combining this with oceanography expertise and datasets from SO-CHIC
- SO-CHIC is acquiring in situ high-resolution, high-quality ocean temperature and salinity data and modelling in the Weddell Sea Southern Ocean region

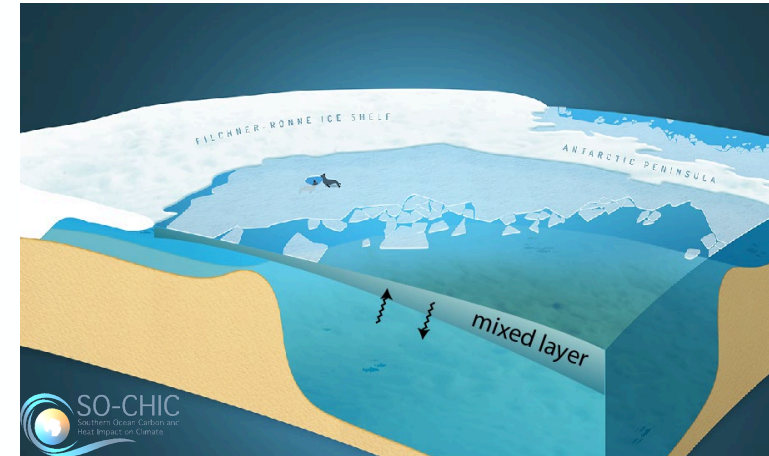
- To study Ice shelves links between warm ocean water and grounded ice sheet
- To monitor ice loss is due to ice dynamics – ice shelves are an important controller, the oceans are the likely forcing mechanism
- To improve our understanding of ice-ocean interactions in Antarctica by combining EO data produced by the ESA Polar+ Ice Shelves project and ocean datasets developed in the EC SO-CHIC project,
- To further the understanding of the impact of ice melt on the Southern ocean by combining EO data of ice dynamic change with modelled and observed ocean temperature measurements will help us to understand ice dynamics



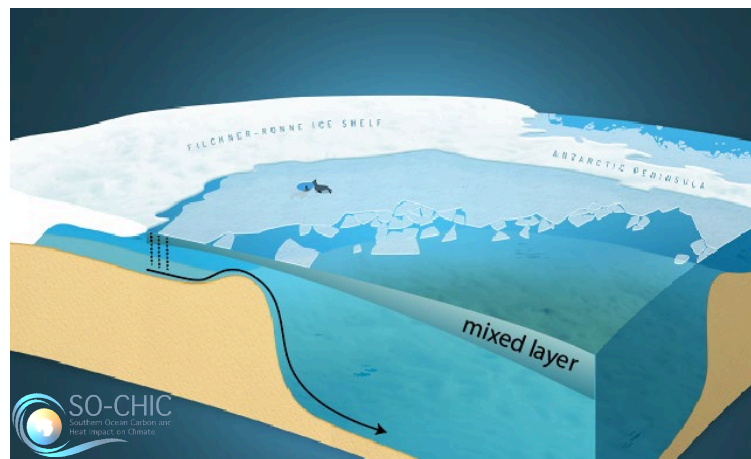
Air-sea fluxes (WP1)



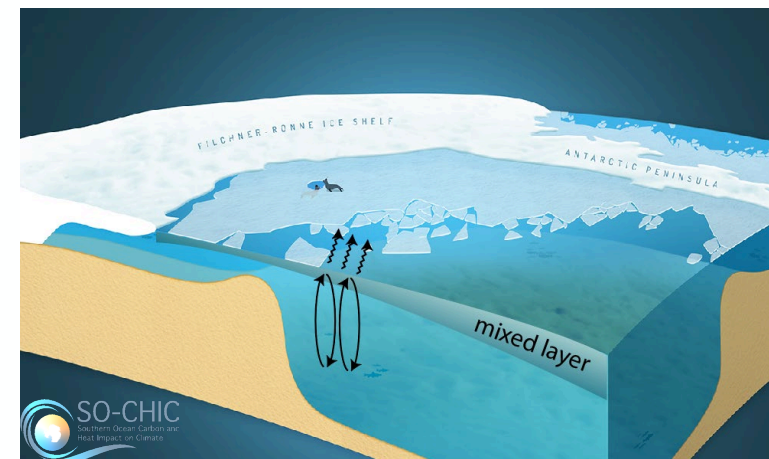
Upper Ocean ventilation (WP2)



Bottom Ocean ventilation (WP3)



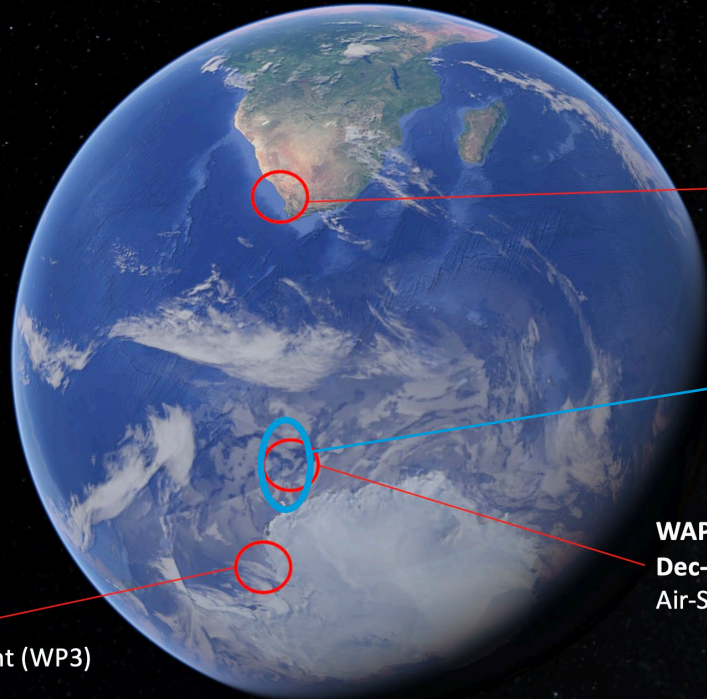
Abrupt shortcut events (WP4)



SO CHIC overarching goal is to Understand and quantify variability of heat and carbon budgets in the Southern Ocean (I.e. four work packages)

SO-CHIC Field work plan (deployment of in situ instrumentation)

sa



BENEFLUX cruise (Agola)
 Dec 2021
 Air-Sea process (skin effect) (WP1)

SOCHIC-2
 Dec-Jan 2022-2023
 Mooring recovery/deployment + Air-Sea (WP1-2-4)

WAPITI cruise (Agulhas II)
 Dec-Jan 2021-2022
 Air-Sea + MLD + Maud Rise (WP1-2-4)

COSMUS cruise (Polarstern)
 Jan-Mar 2021
 Mooring recovery/deployment (WP3)



1. Both ESA and EC projects are aligned in terms of science goals and at aiming to answering similar challenges at the Polar Regions --> **Collaboration is natural**
2. ESA projects primary goal is to improve EO capabilities to contribute to answer EC Polar Cluster challenges. However by joining efforts with the EC project, might benefit of using first hand in situ observations (e.g. EO validation, develop EO + in situ state of art data fusions, etc.) --> **good ground to support and complement each other goals.**
3. ESA-EC Science Polar Cluster will benefit from a dynamic communication between EO and regional Polar science experts --> **ideal communication field to enable dynamic work spaces (e.g. Workshops, paper contributions, etc.)**
4. EC and ESA projects have substantial difference in terms of funding and project duration --> **These differences may handicap future collaborations between EC and ESA projects**

Thank you to Polar Science Clusters Projects



Thank you for your attention



