

Southern Ocean Carbon and Heat Impact on Climate — SO-CHIC

ERC H2020

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Four years, starting Nov 2019



SO-CHIC Objectives

“**The overall objective** of [REDACTED] is to understand and quantify variability of heat and carbon budgets in the Southern Ocean through an investigation of the key processes controlling exchanges between the atmosphere, ocean and sea ice using a combination of observational and modelling approaches”

“**Programme Objective:** Advance our understanding of, and capability to predict, the Southern Ocean’s impact on climate change via its uptake and storage of heat and carbon.”



Participating institutes

- 1 Sorbonne Université (SU) France
- 2 University of Southampton (Southampton) UK**
- 3 The university of Reading (UREAD) UK**
- 4 UK Research and Innovation (UKRI) (BAS + NOC) UK**
- 5 Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) Germany
- 6 Uni Research AS (UniRes) Norway
- 7 Eidgenössische Technische Hochschule Zürich (ETHZ) Switzerland
- 8 Göteborgs Universitet (UGOT) Sweden
- 9 The Chancellor, Masters and Scholars of the University of Oxford (UOXF) UK**
- 10 Helmholtz-Zentrum für Ozeanforschung Kiel (GEOMAR) Germany
- 11 ETT SPA (ETT SPA) Italy
- 12 European Polar Board (EPB) Netherlands
- 13 Council for Scientific and Industrial Research (CSIR) South Africa
- 14 National University of Ireland Galway (NUIG) Ireland
- 15 Ecosystem, Climate and Ocean Analysis (ECOCEANA) France

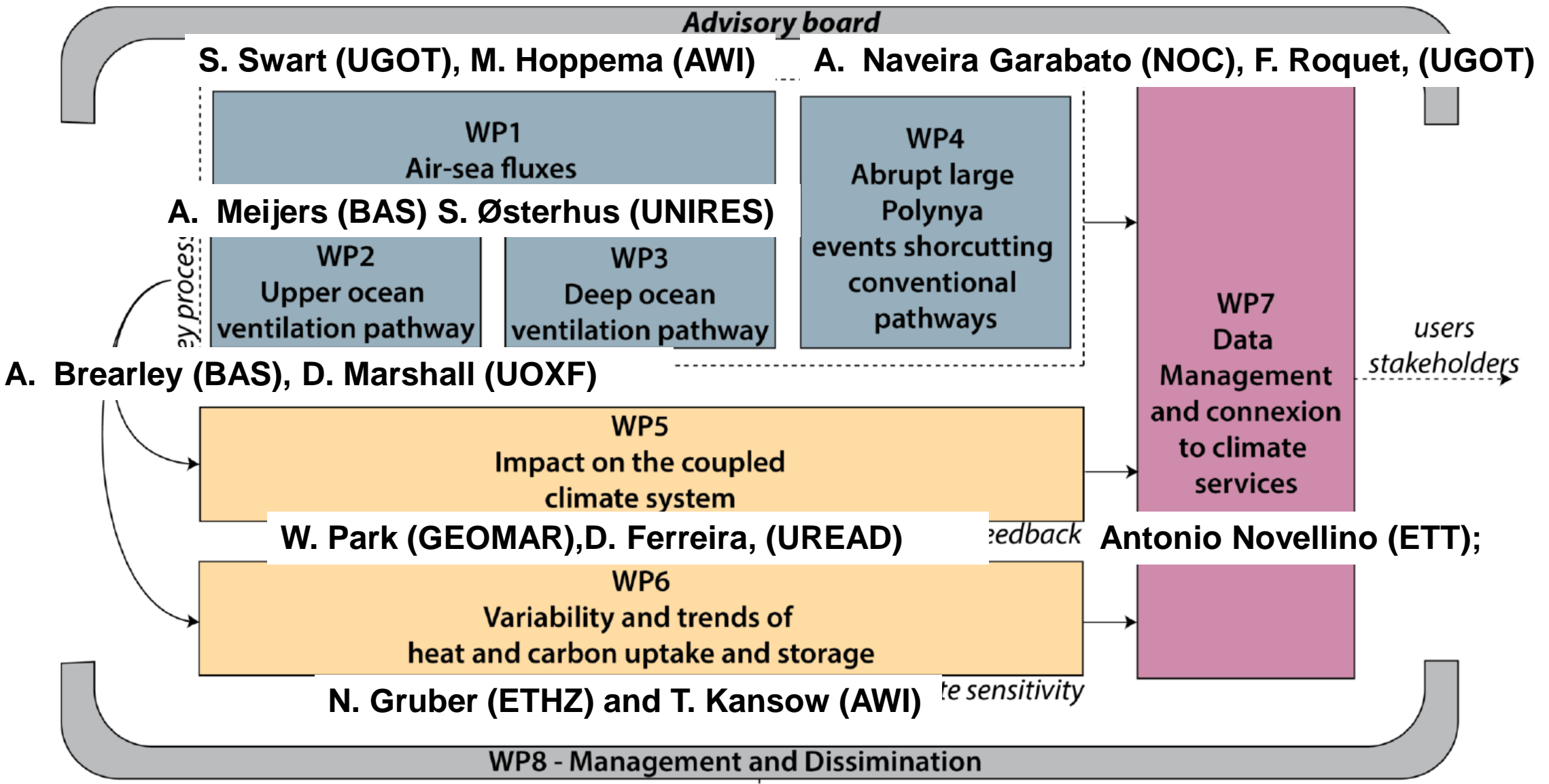


Specific objectives

- O1. To quantify fluxes at the air-sea-ice interface and estimate interannual variability of heat and carbon storage in the Southern Ocean.
- O2. To understand heat and carbon exchanges between the atmosphere and the deep ocean, focusing on the ocean mixed-layer, its relation to sea ice distribution, and on assessing what has caused the opening of the open-ocean Weddell Polynya in 2016 and 2017.
- O3. To improve understanding of the formation and export of bottom waters, and to propose new strategies to represent such key processes.
- O4. To identify critical sensitivities in the Southern Ocean climate system that must be correctly represented in models in order to significantly reduce uncertainties in future projections.
- O5. To enable free and open access to all data and to maximise impact on the climate report (IPCC), climate services, and climate-model groups.



Programme structure



Observational programme (Apr, Nov 2021)

Ship hydro.

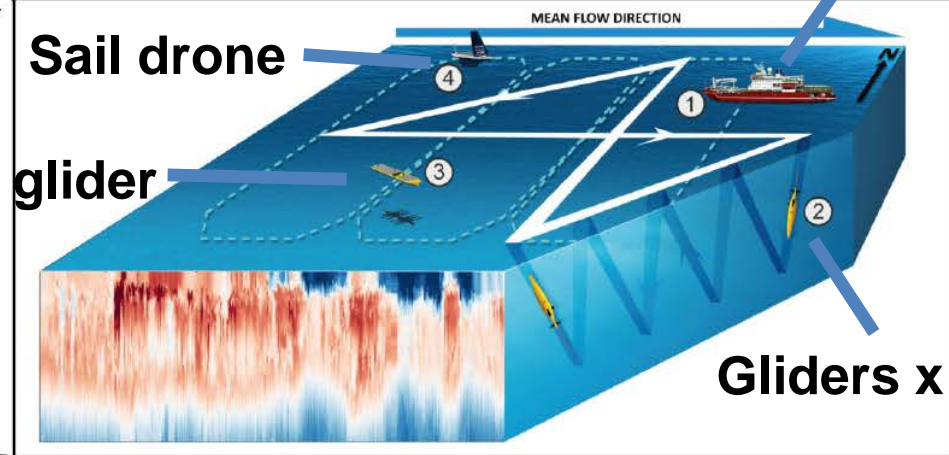
Existing Argo,
SOCCOM & seals

BAS OP moorings

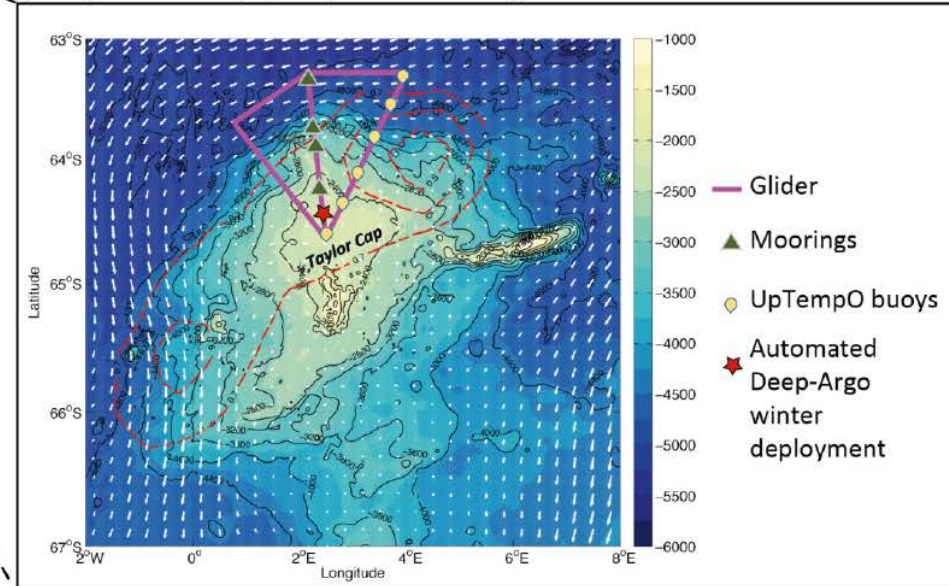
AWI slope
moorings

URES, SU, BAS moorings

(Site 1) Mixed-layer and air-sea flux experiment - led by WP1 & WP2

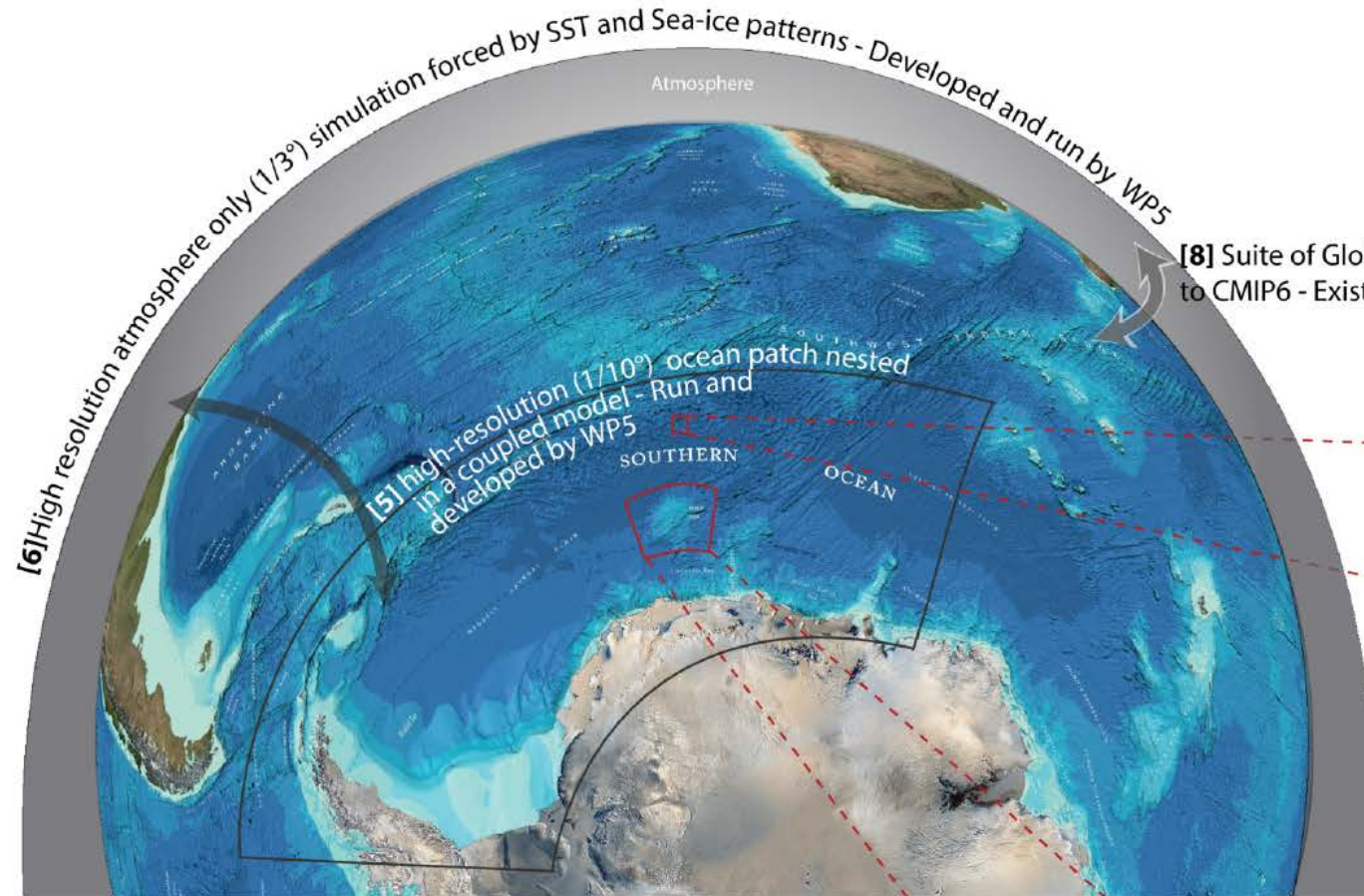


(Site 2) Weddell Polynya Experiment - led by WP4



Modelling programme

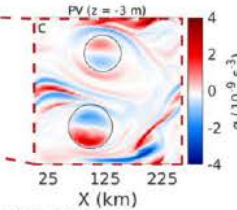
- [1] Global assimilated simulation at high resolution ($1/12^\circ$) - Existing: used by WP1,2,3,4,5
- [2] Regional assimilated simulation at intermediate resolution ($1/6^\circ$) - Developed and run by WP6



[6] High resolution atmosphere only ($1/3^\circ$) simulation forced by SST and Sea-ice patterns - Developed and run by WP5

[5] high-resolution ($1/10^\circ$) ocean patch nested in a coupled model - Run and developed by WP5

[8] Suite of Global Earth System Models participating to CMIP6 - Existing: used by WP6



[3] 250 km squared patch of idealised simulation of the surface mixed-layer Developed and run by WP2

[7] Global simulation at coarse resolution (1°) - Developed and run by WP3



[4] Very high resolution ($1/48$) simulation of Maud Rise region - Developed and run by WP4

