SO Fresh

Southern Ocean Freshwater

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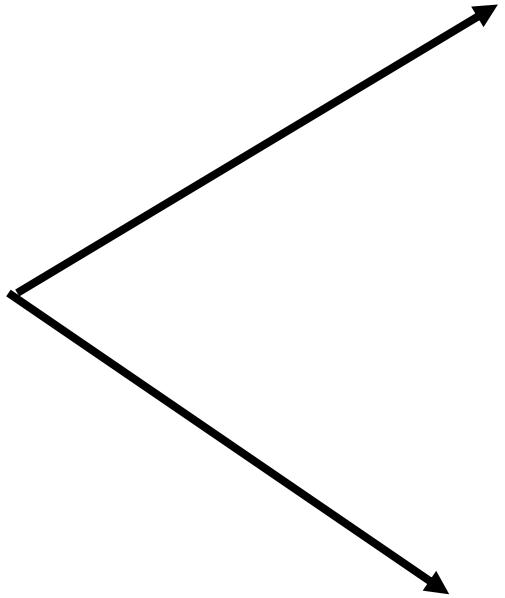
SO-Fresh

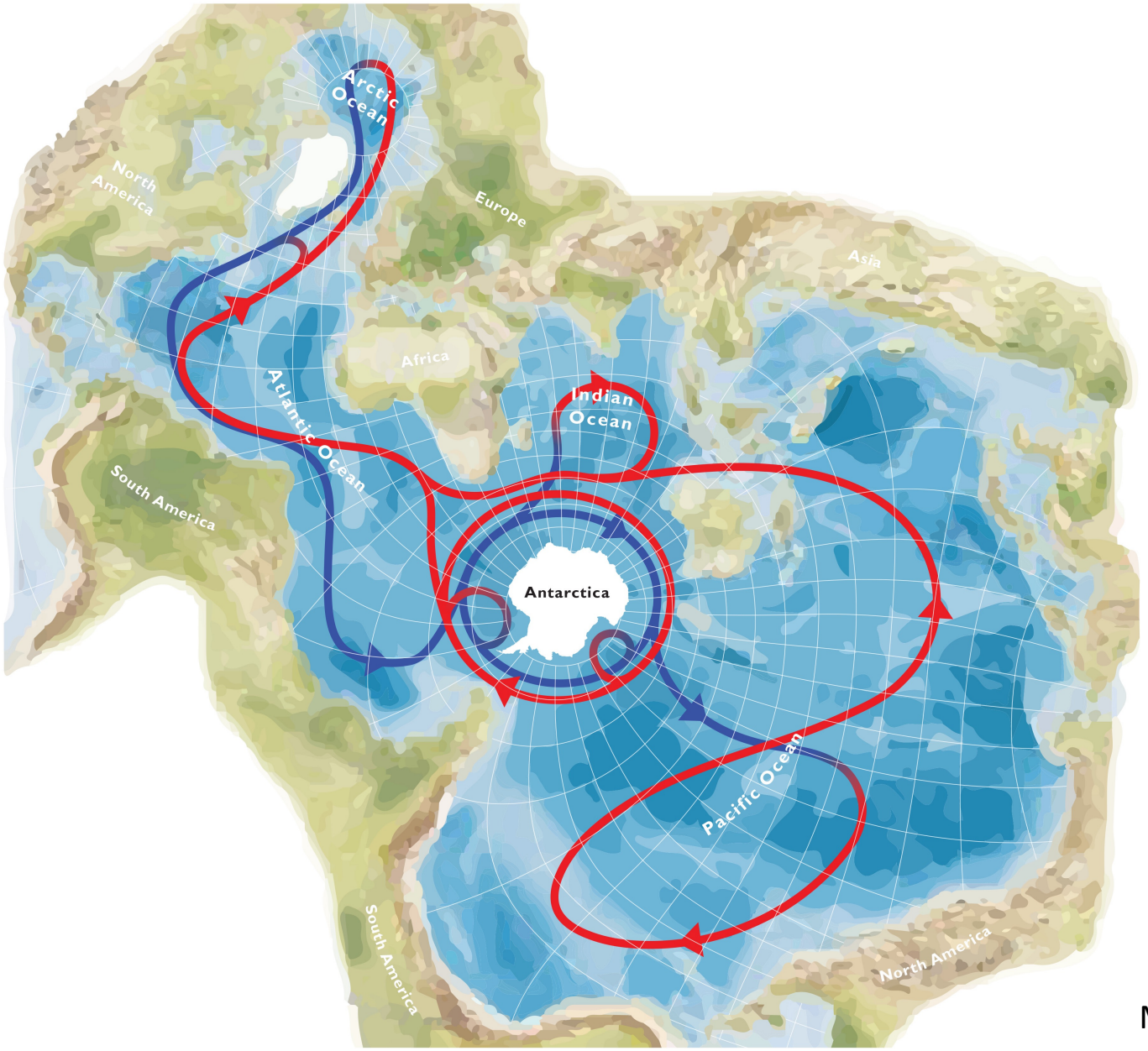


Improved satellite-derived Sea Surface Salinity (SSS) product (2011-present)

please fill the “user requirements”
(contact: a.silvano@soton.ac.uk)

4 science studies
(using SSS and other datasets)

Southern Ocean

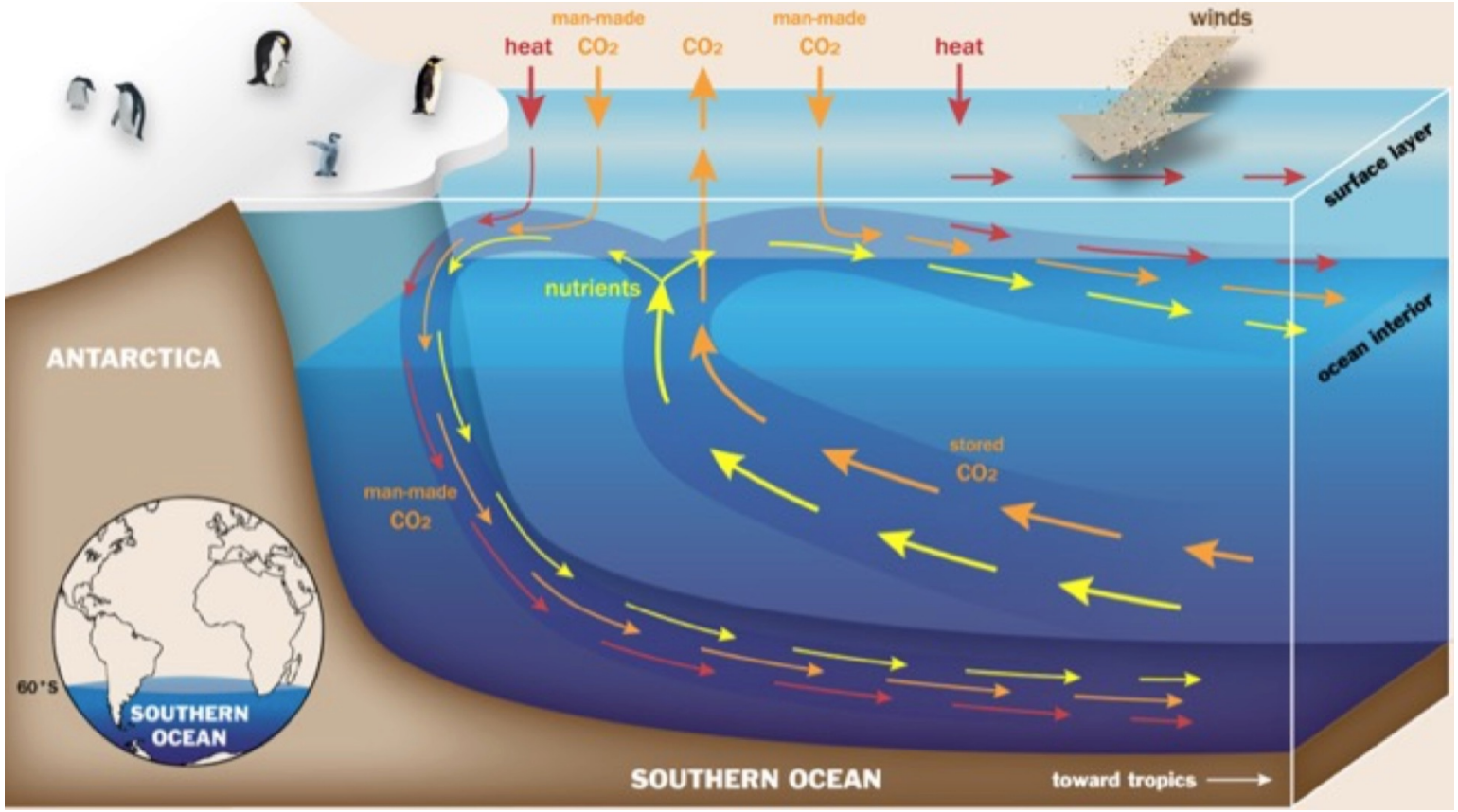


The Southern is the center of the global ocean circulation

Meredith, 2019

Southern Ocean Overturning

(43% of total ocean anthropogenic carbon and 75 % of heat uptake, Frolicher et al. 2015)



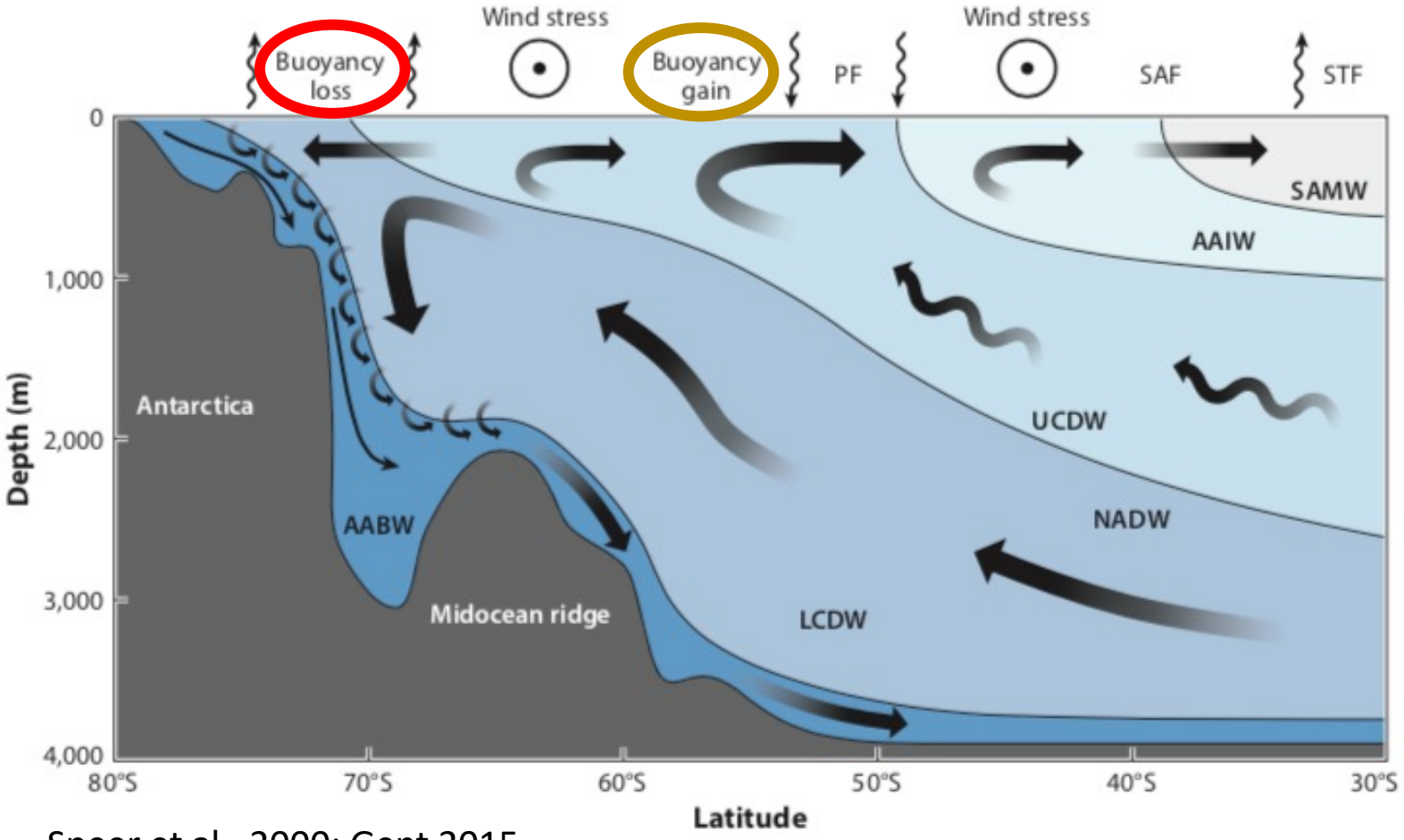
The upper cell regulates interannual to decadal oceanic uptake

The lower cell regulates centennial to millennial oceanic uptake

BAS

The role of buoyancy

Buoyancy is added to the ocean by heating or by fresh water input.



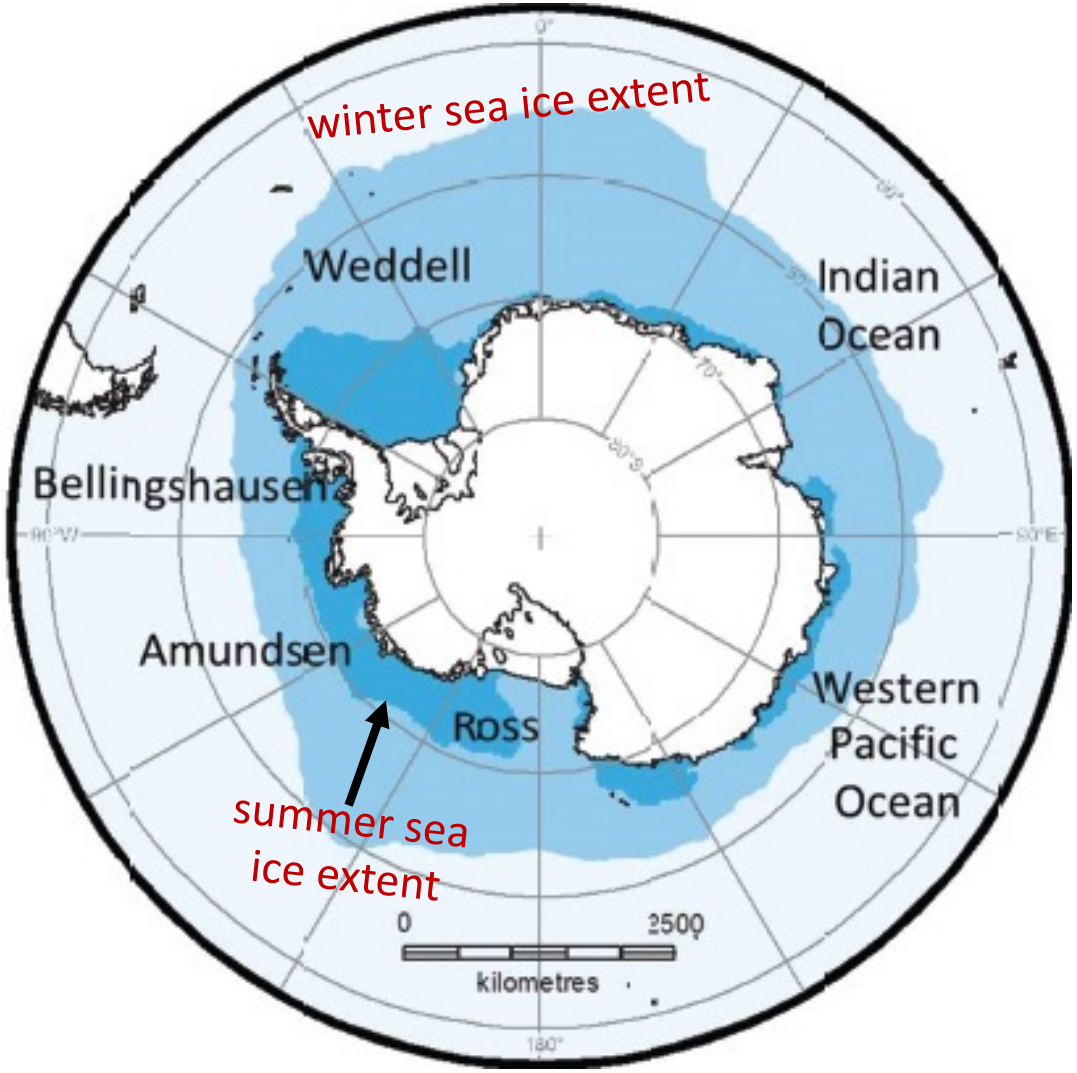
light "intermediate and mode waters"

wind-driven upwelling of waters originated in basins to the north

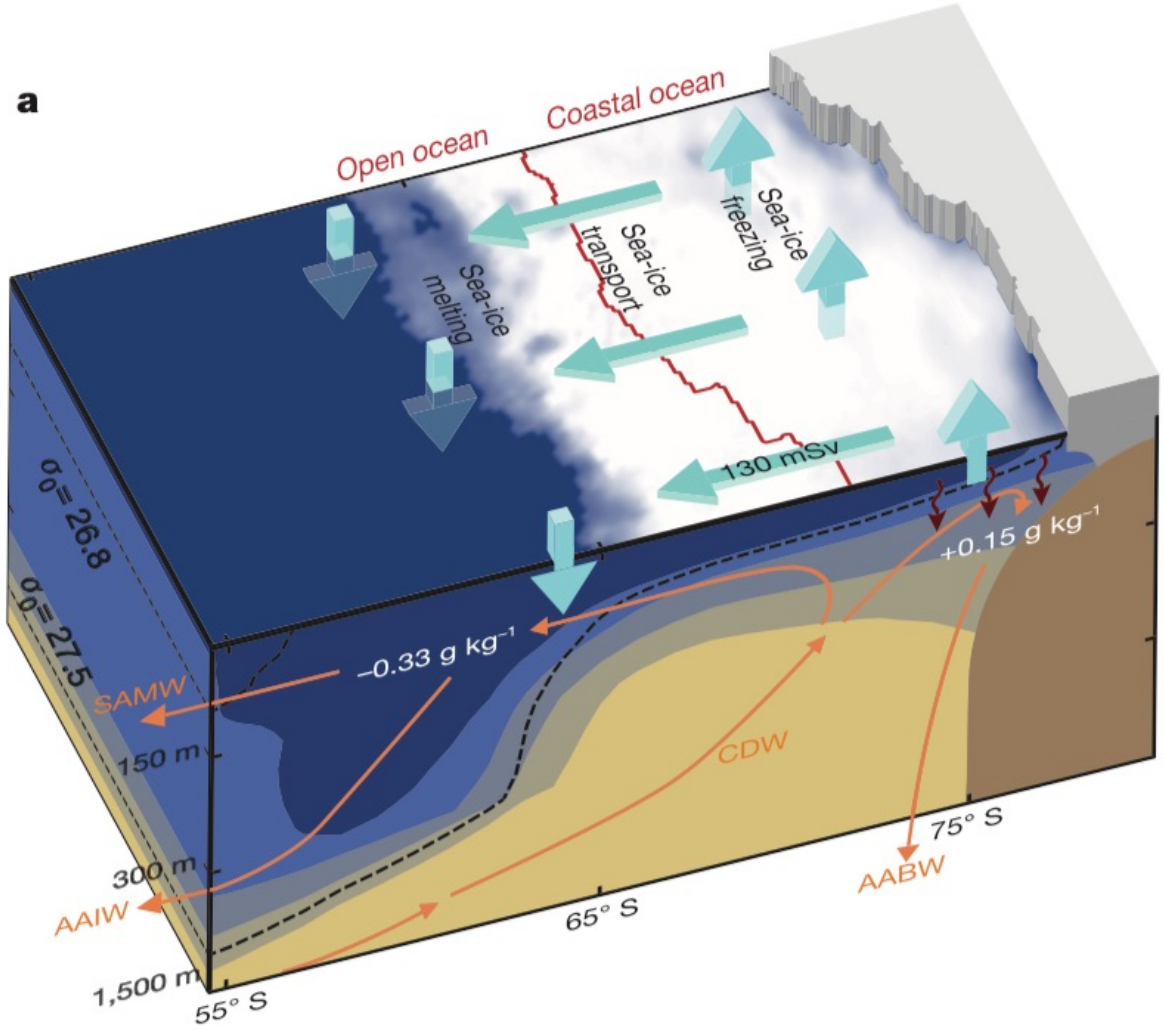
dense abyssal waters

Speer et al., 2000; Gent 2015

Sea ice plays a key role



Abram et al., 2013



Haumann et al., 2016

STUDY 1) Enhance understanding of the observed changes in sea ice occurred during the last decade

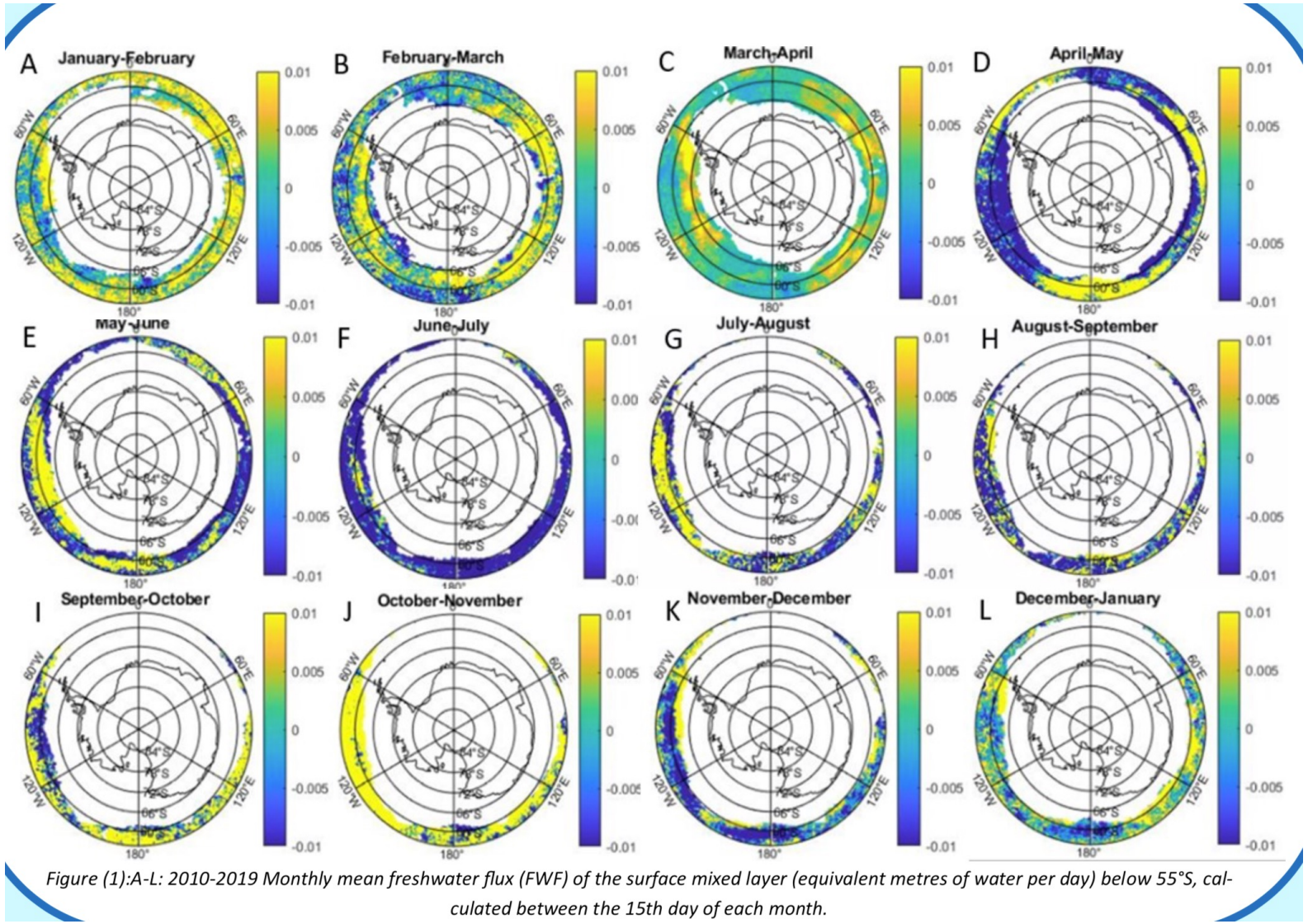


Figure (1):A-L: 2010-2019 Monthly mean freshwater flux (FWF) of the surface mixed layer (equivalent metres of water per day) below 55°S, calculated between the 15th day of each month.

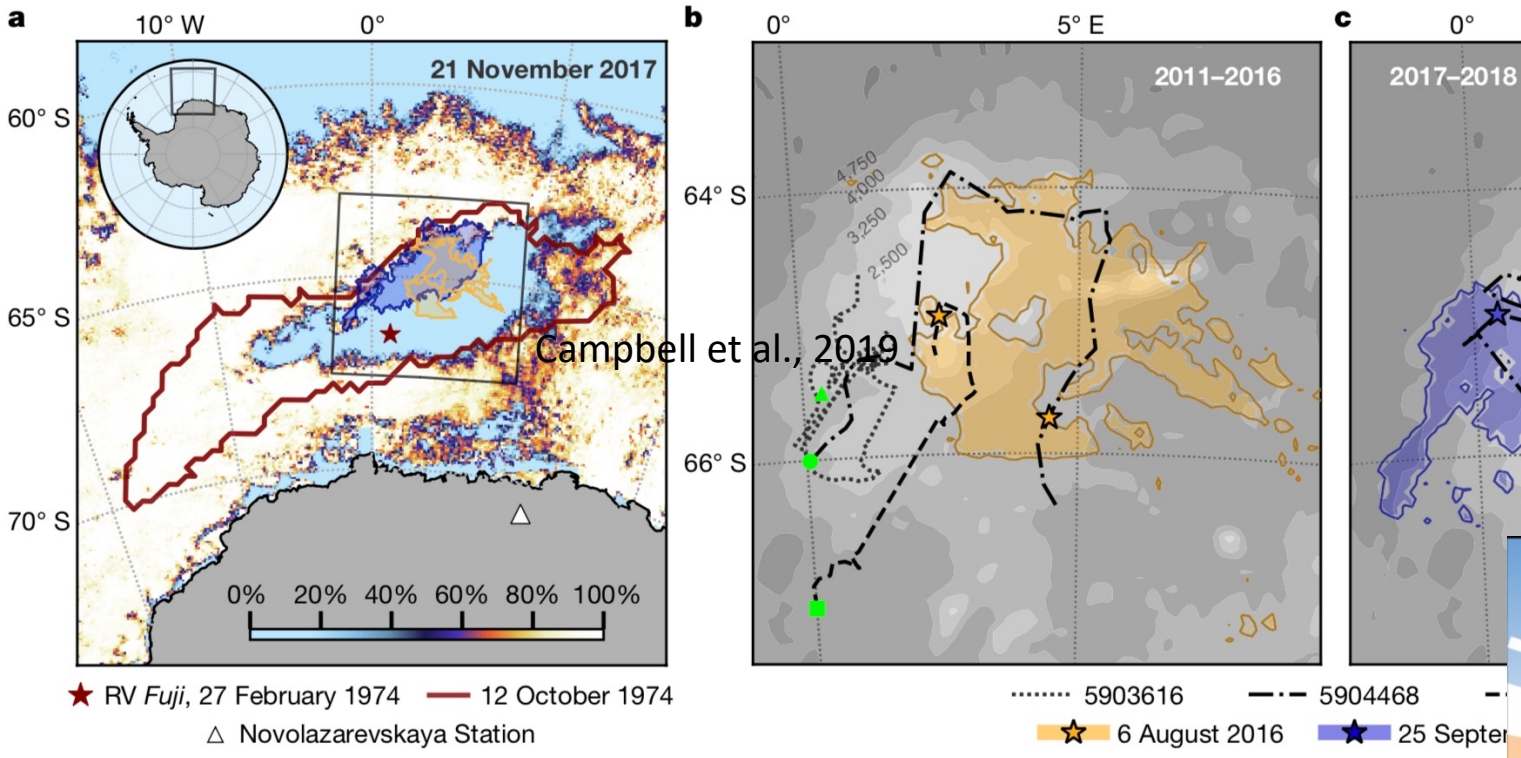
Credit: T. Holgate (University of Southampton)

Freshwater flux using SSS and argo (mixed later depth)

- precipitation and evaporation (ERA5, EMCWF)
- Sea ice fluxes: satellite derived products and data assimilation models (Haumann et al., 2016)
- Argo observations of the upper ocean

→ impact of sea ice changes on the upper cell

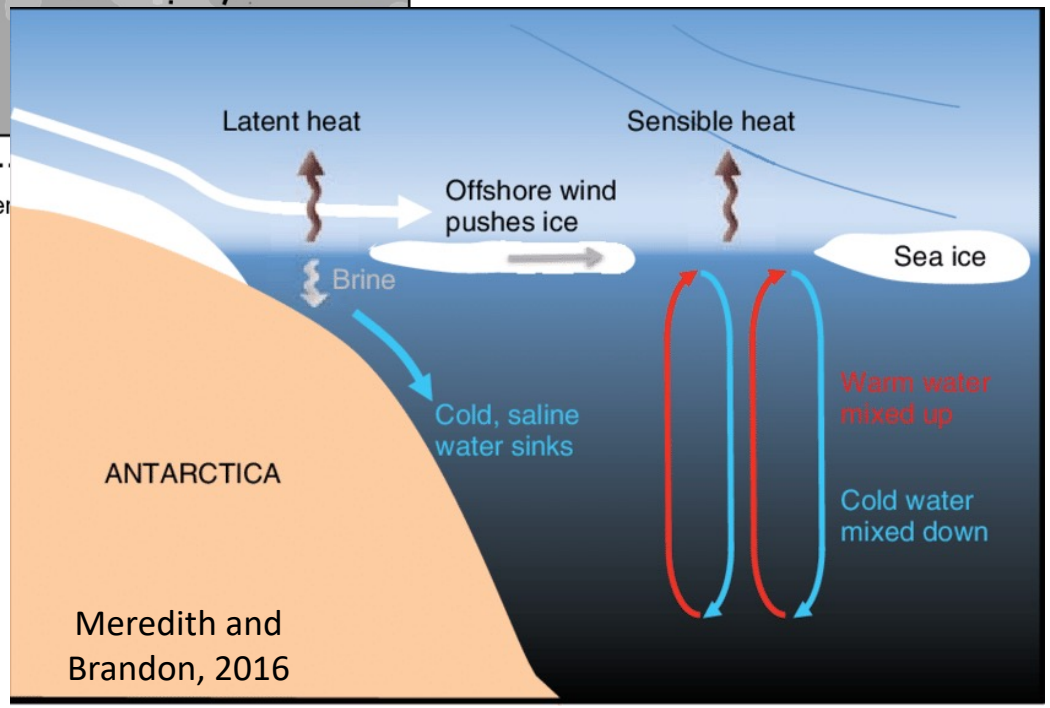
STUDY 2) Elucidate drivers/consequences of the Weddell Polynya



Campbell et al., 2019

2016-2017

SO-CHIC collaboration



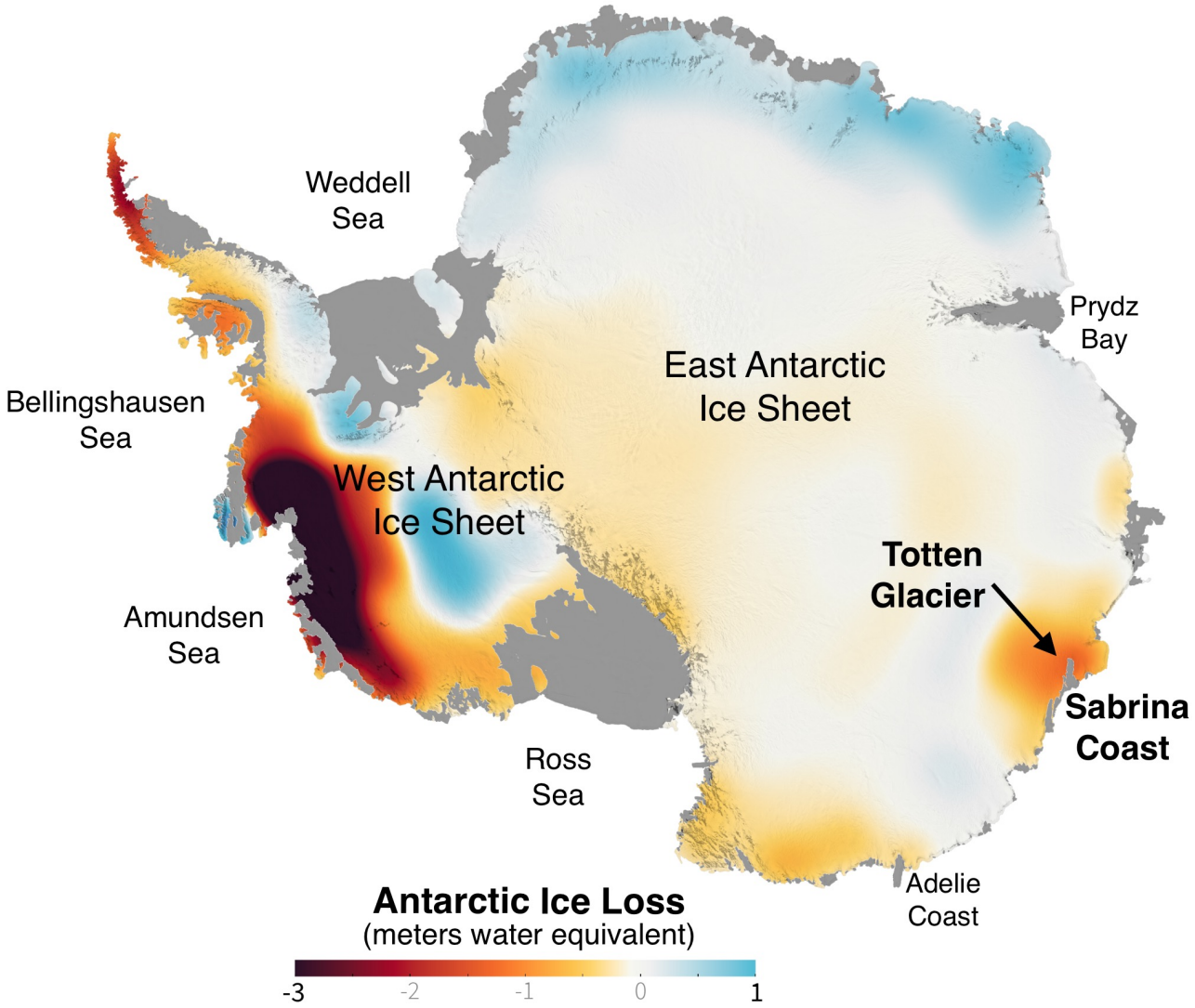
Meredith and Brandon, 2016

SSS
Argo
SST
SIC

→ within the polynya

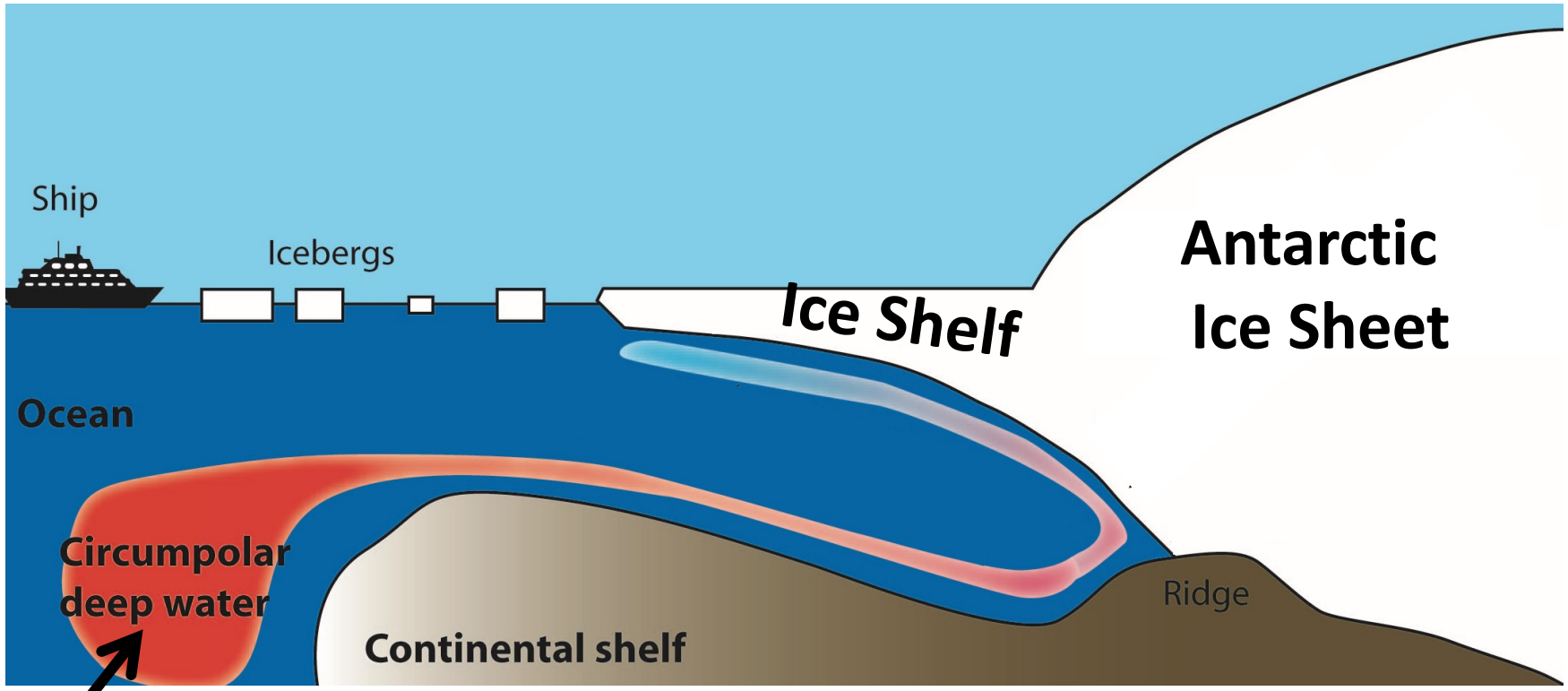
→ in the Weddell Sea (SSS for summer conditions)

Antarctic Ice sheet melting causes sea level rise (about 10% of the total)



credit: NASA

Ocean-driven melting



Modified from *www.AntarcticGlaciers.org*

Warm water from the Southern Ocean

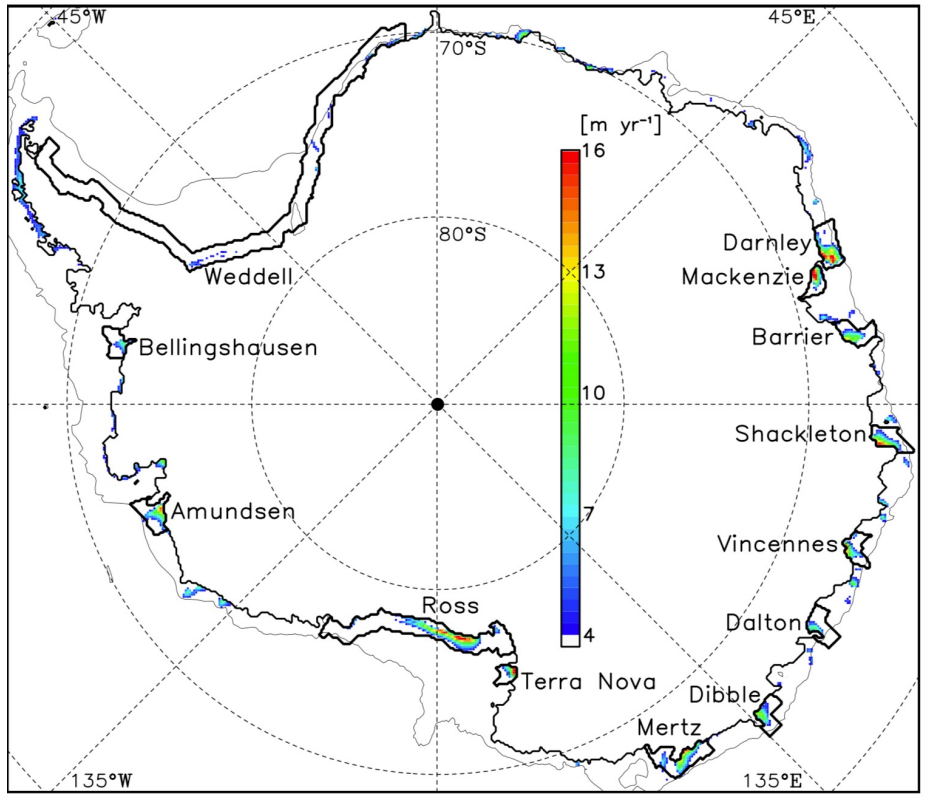
Ocean density is determined by salinity at high latitudes.

→ Salinity is key to study how warm waters can reach the Antarctic Ice Sheet

→ increased meltwater from the Antarctic Ice Sheet can affect the Southern Ocean circulation

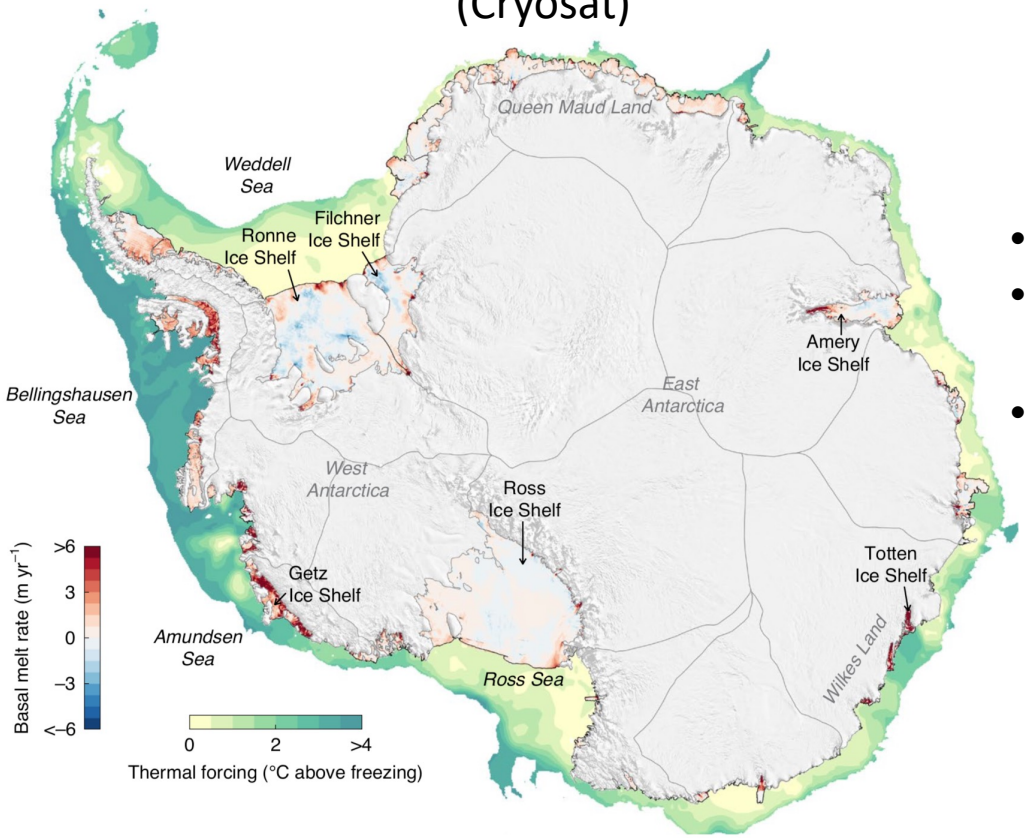
STUDY 3) Investigate oceanic coastal changes and their impact on ice sheet melting

Satellite-derived (SSM/I) sea ice formation in polynyas



Tamura et al., 2016

Ice shelf basal melting (Cryosat)



Adusumilli et al., 2020

- SSS
- in situ data (ship, argo, seals)
- Altimeter (Cryosat) to study ocean currents

STUDY 4) Assessment of water mass formation using EO variables

- Water mass transformation using sea surface density changes (from SSS and SST)

- Antarctic Mode and Intermediate waters

Thank you!

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Totten Glacier by *Esmee van Wijk*