



PPGOGQG

TE: Oceanos e Clima

Aula 8 – Oceano Austral e o Modo Anular do Sul

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Laboratório de Estudos dos Oceanos e Clima
(LEOC)

1º SEM. 2016

Terça-feira – 14:00/16:00h, sala 2119

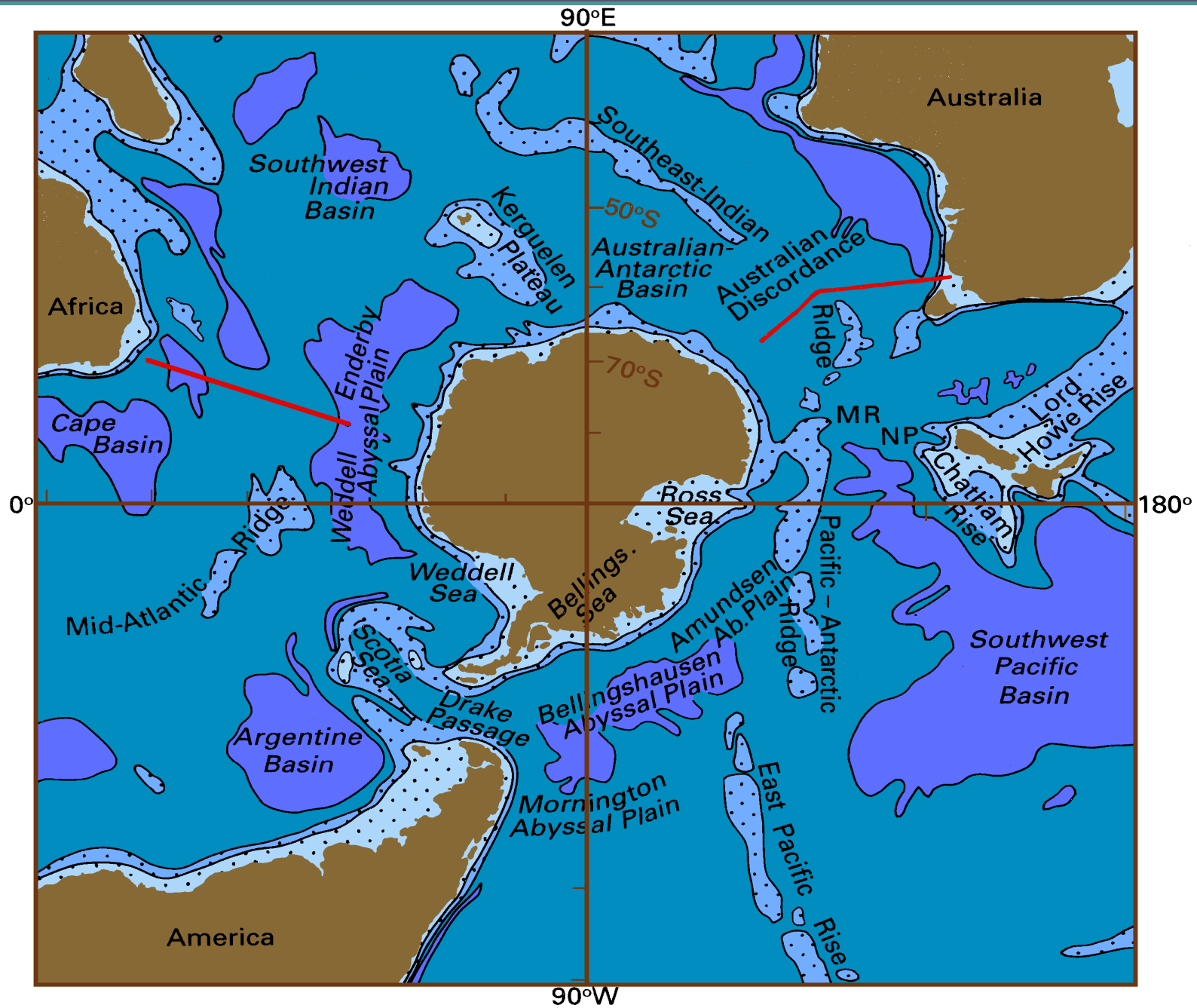


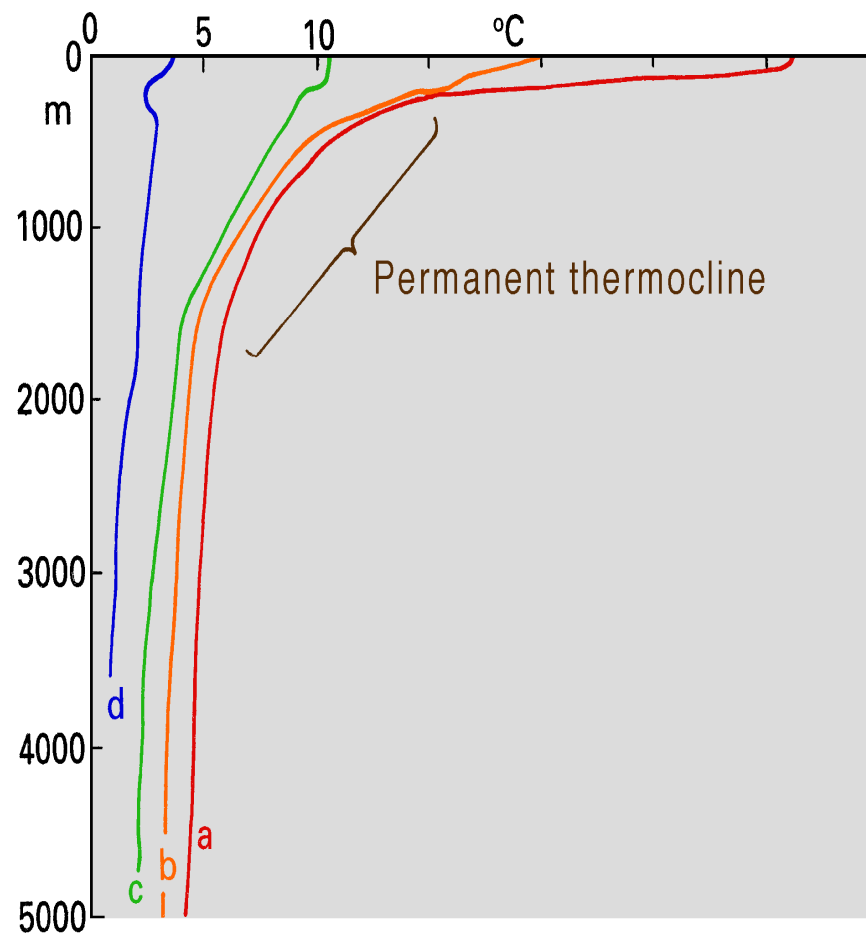
FURG



Oceanografia Antártica

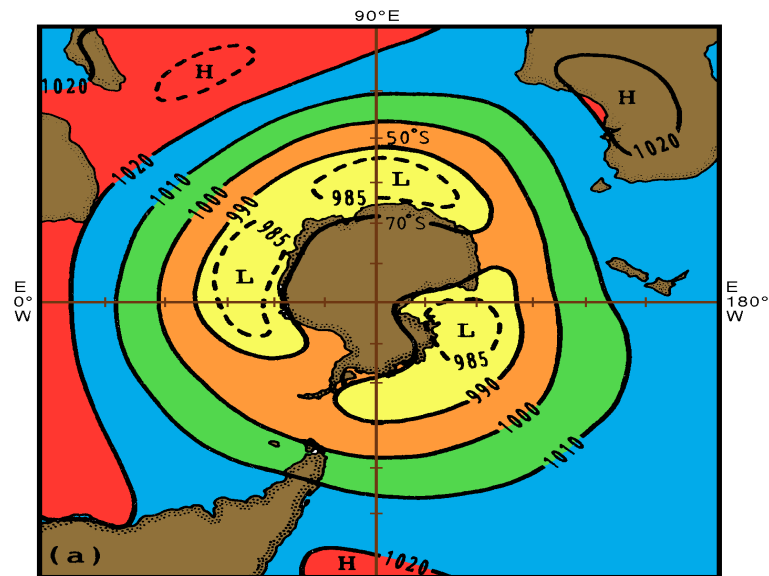
- O Oceano Austral tem vários aspectos singulares:
 - O fluxo de água pode circular praticamente sem barreiras ao redor do Globo.
 - A termoclina permanente chega à superfície em torno de 40S, portanto, esta feição não está presente no Oceano Austral.
 - Raramente as temperaturas chegam a valores superiores que 5C
 - Comunicação com todas as bacias oceânicas



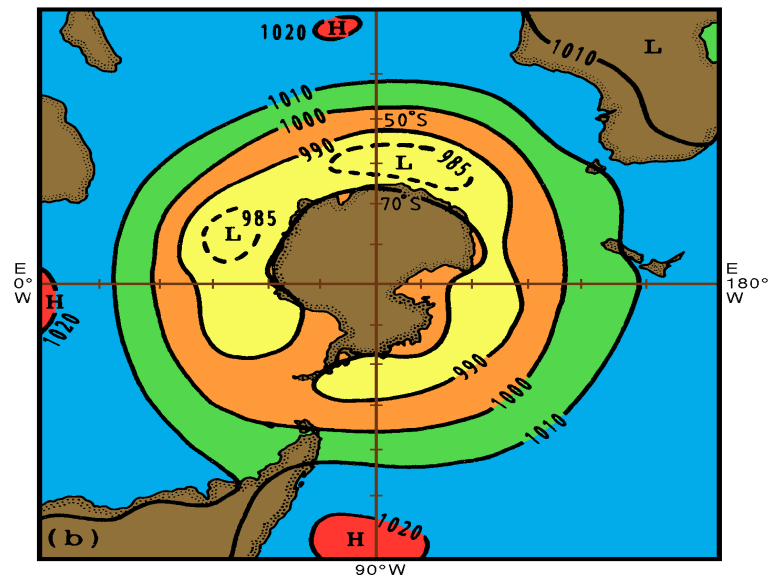


Temperature profiles for different climatic regions near 150°W (Pacific Ocean). (a) tropical (5°S), (b) subtropical (35°S), (c) subpolar (50°S), (d) polar (55°S). The temperature scale is correct for the polar profile; other profiles are shifted successively by 1°C. Note the shallowness of the warm surface layer and the absence of the permanent thermocline in the polar region. Data from Osborne *et al.* (1991).

Campo de Pressão

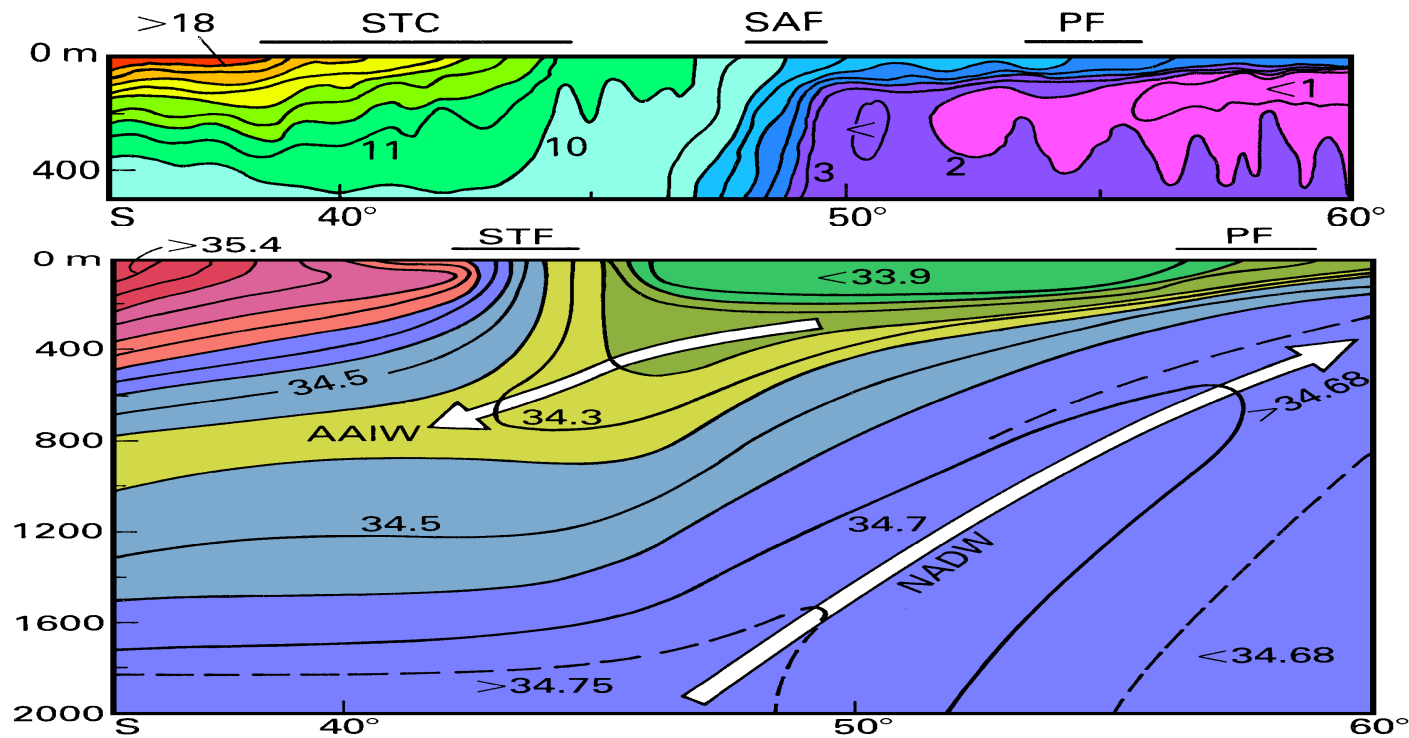
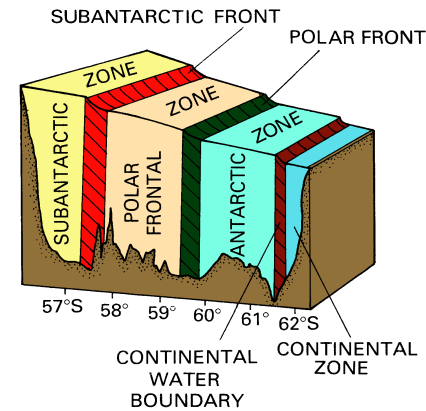
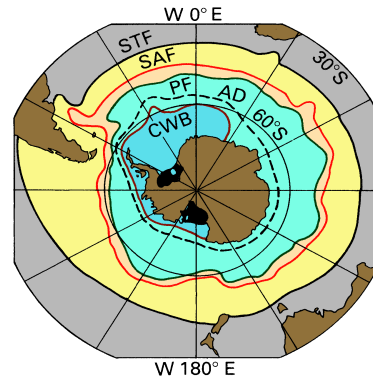


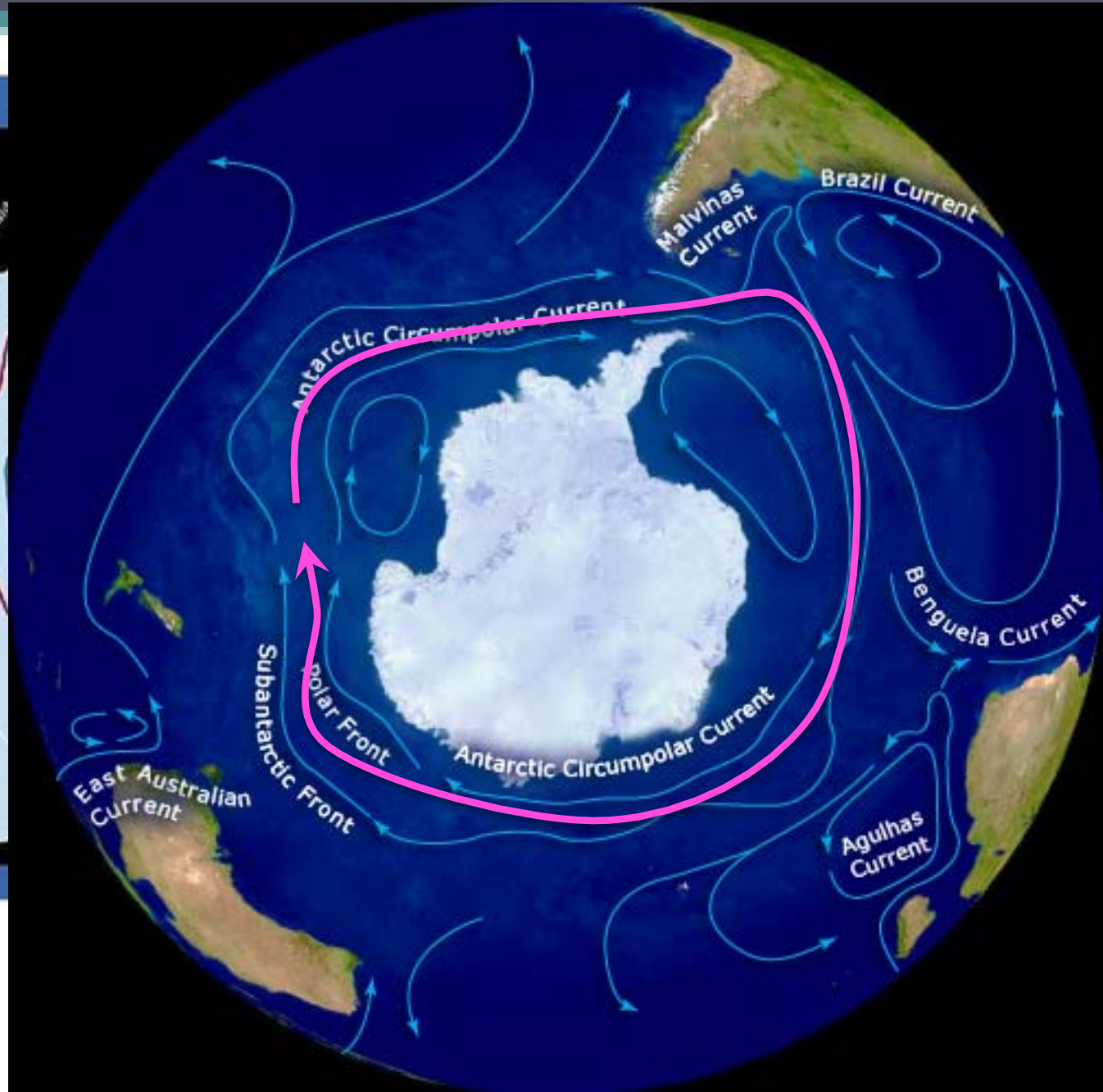
Julho



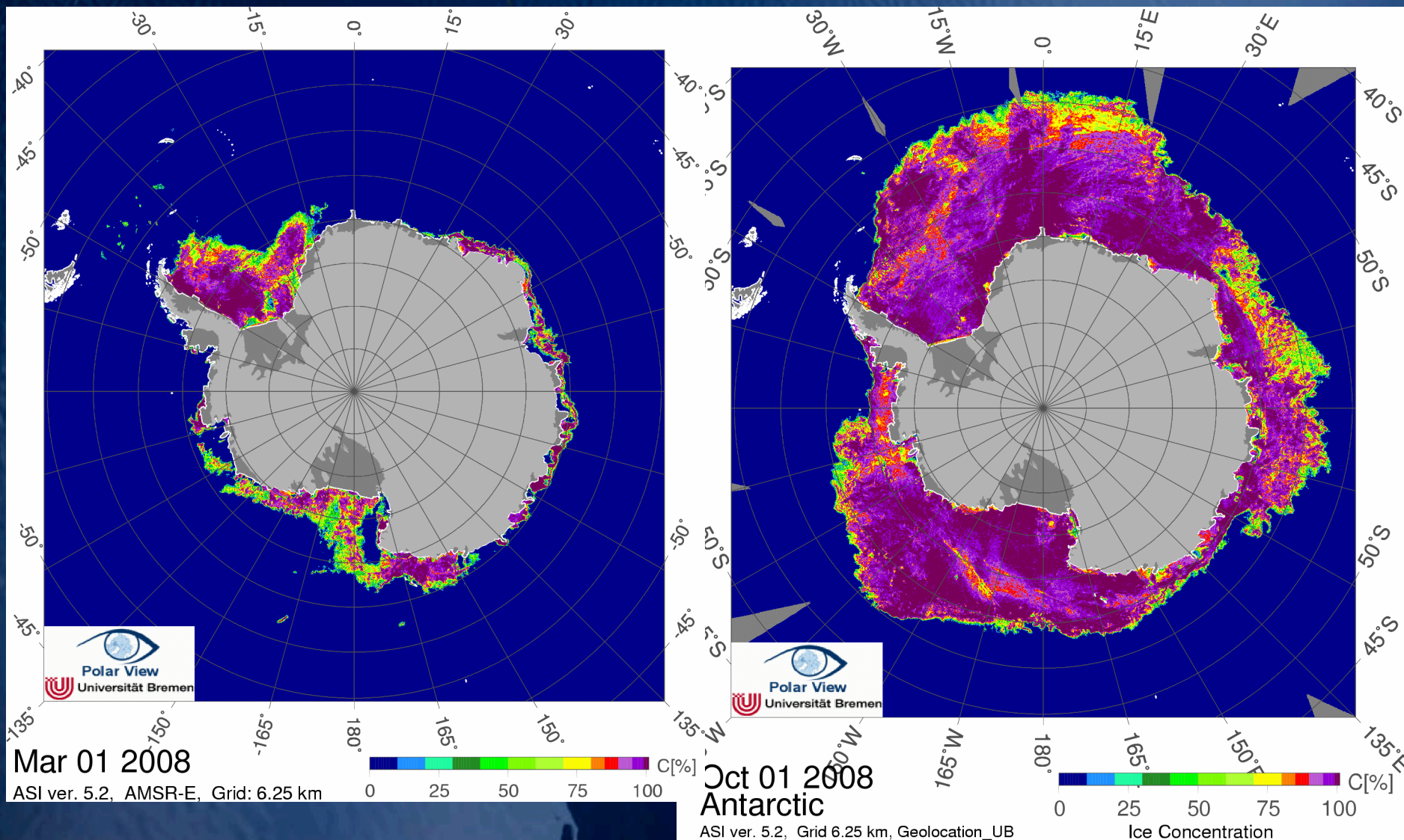
Janeiro

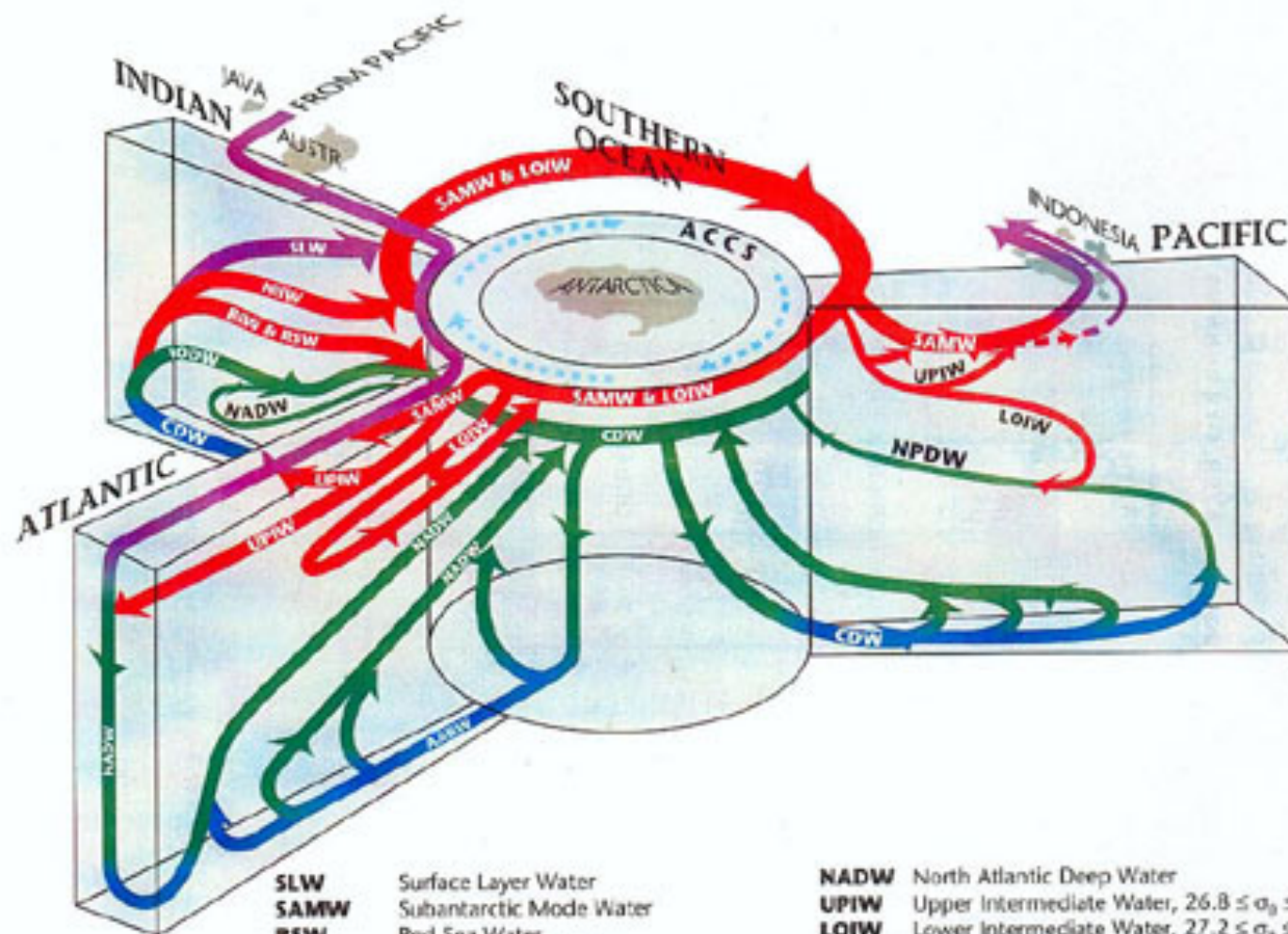
Frentes, Convergências e Divergências





Gelo Marinho Antártico: 19 milhões km² no inverno

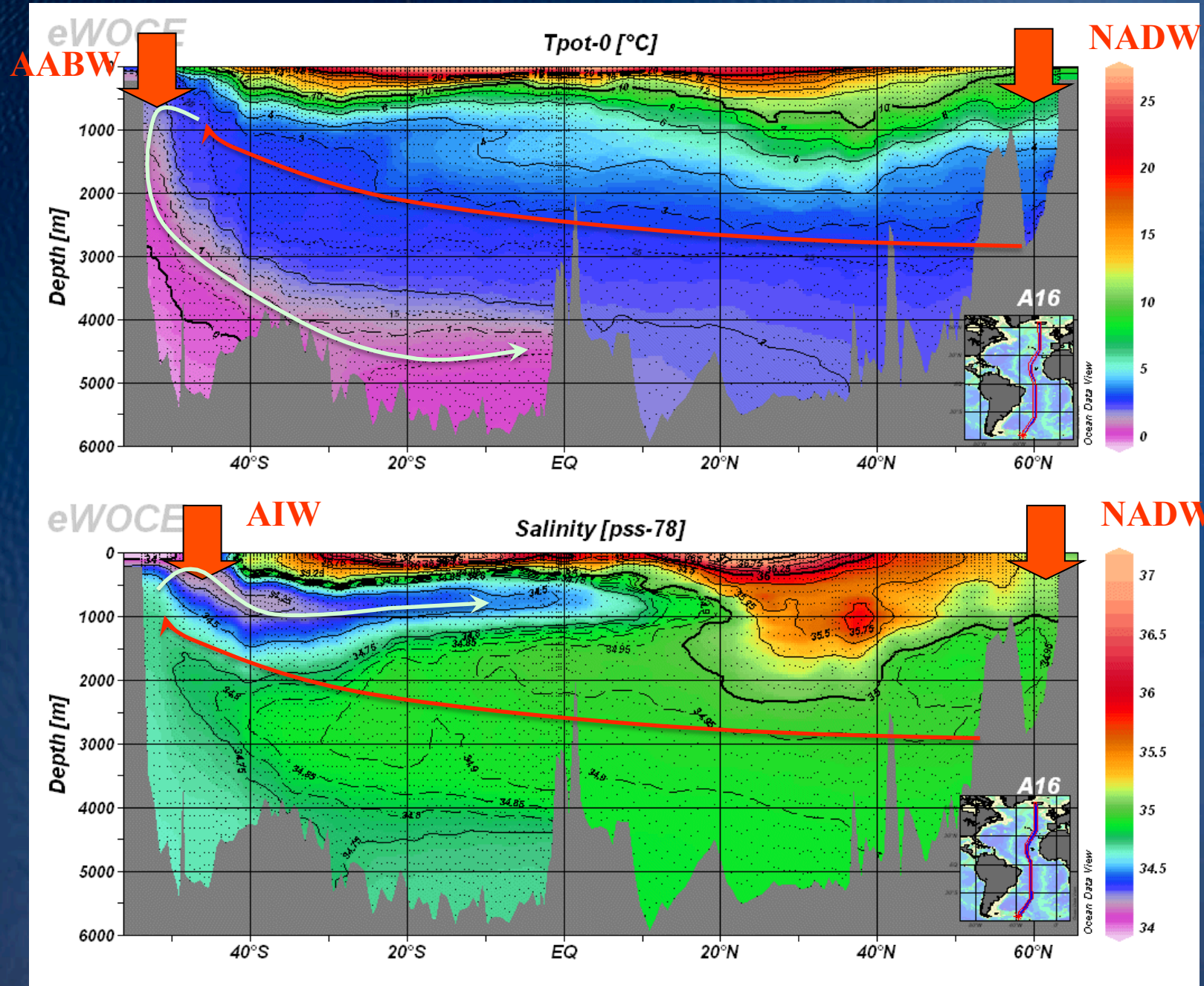


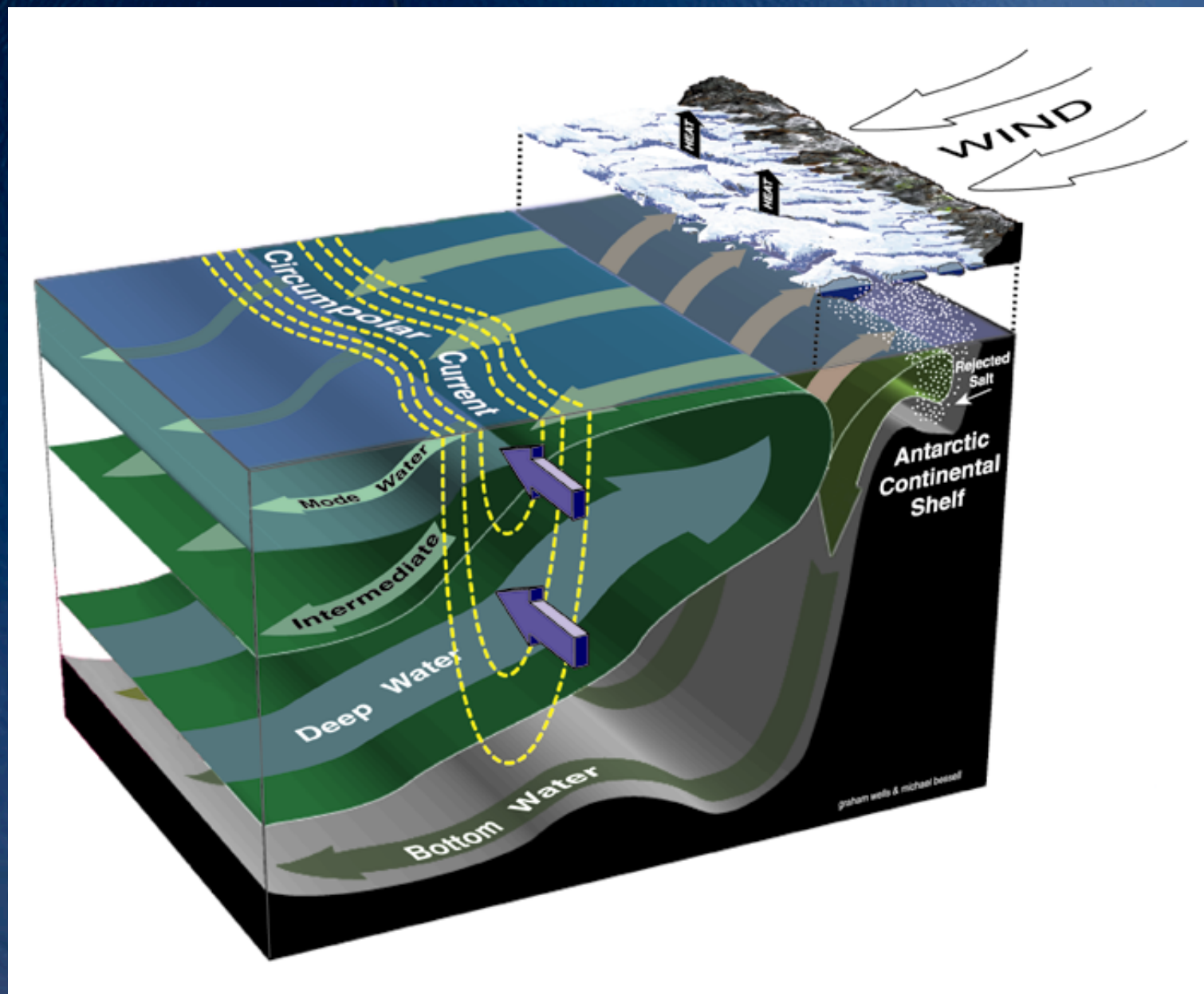


SLW Surface Layer Water
SAMW Subantarctic Mode Water
RSW Red Sea Water
AABW Antarctic Bottom Water
NPDW North Pacific Deep Water
ACCS Antarctic Circumpolar Current System
CDW Circumpolar Deep Water

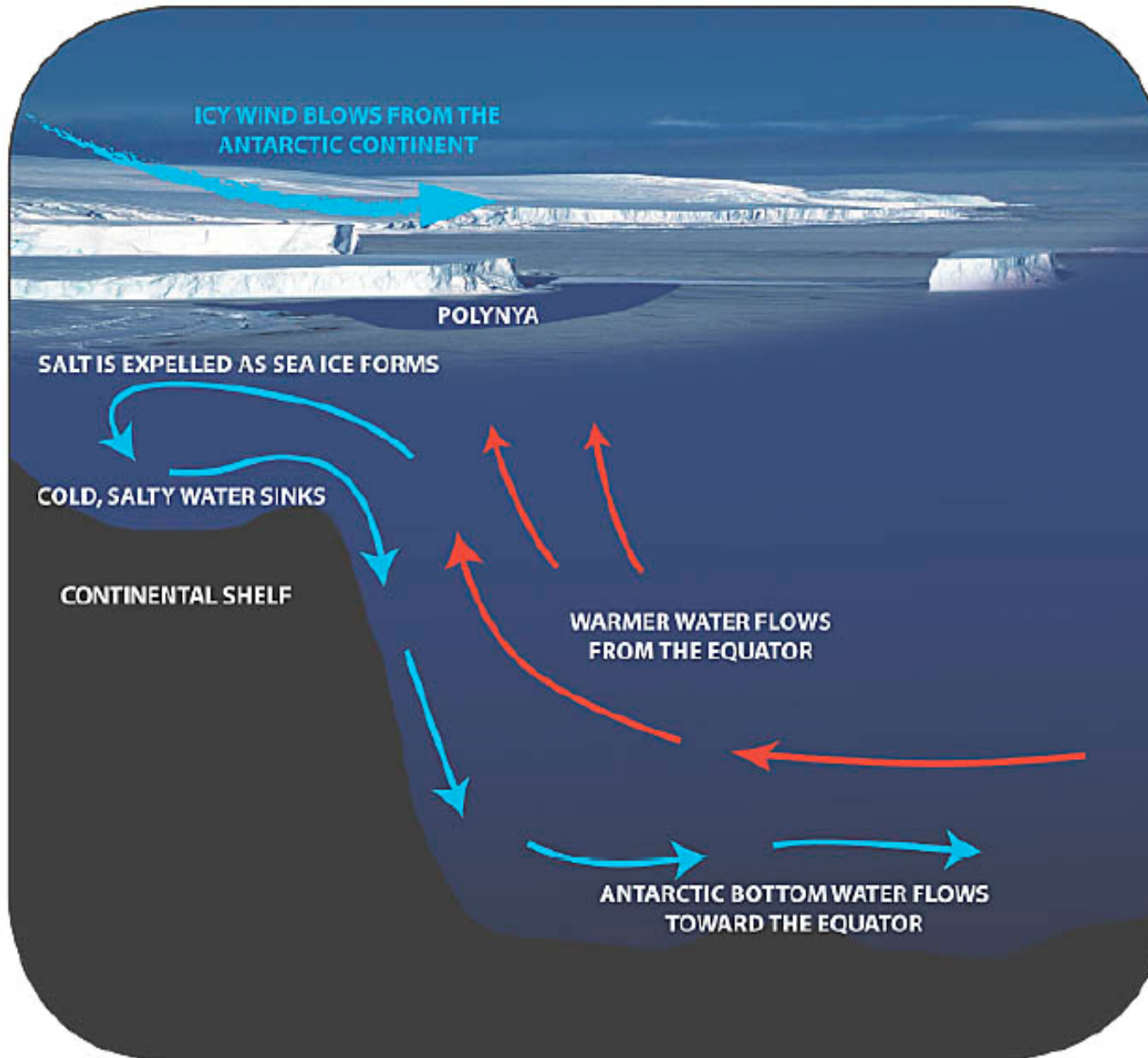
NADW North Atlantic Deep Water
UPIW Upper Intermediate Water, $26.8 \leq \sigma_\theta \leq 27.2$
LOIW Lower Intermediate Water, $27.2 \leq \sigma_\theta \leq 27.5$
IODW Indian Ocean Deep Water
BIW Banda Intermediate Water
NIW Northwest Indian Intermediate Water

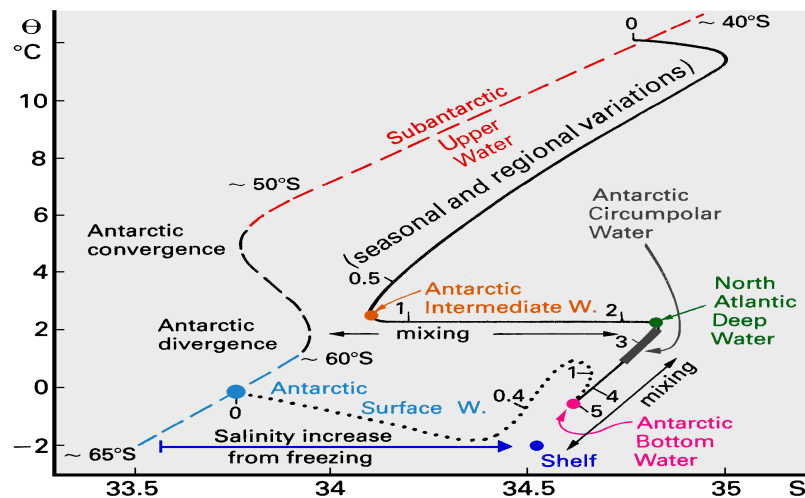
Atlantic WOCE – Transect A16



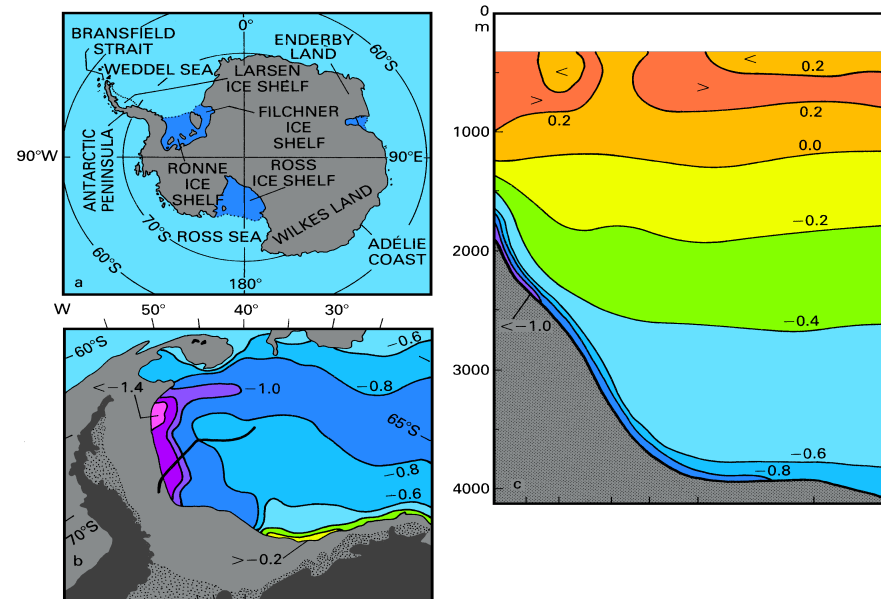


Antarctic Bottom Water



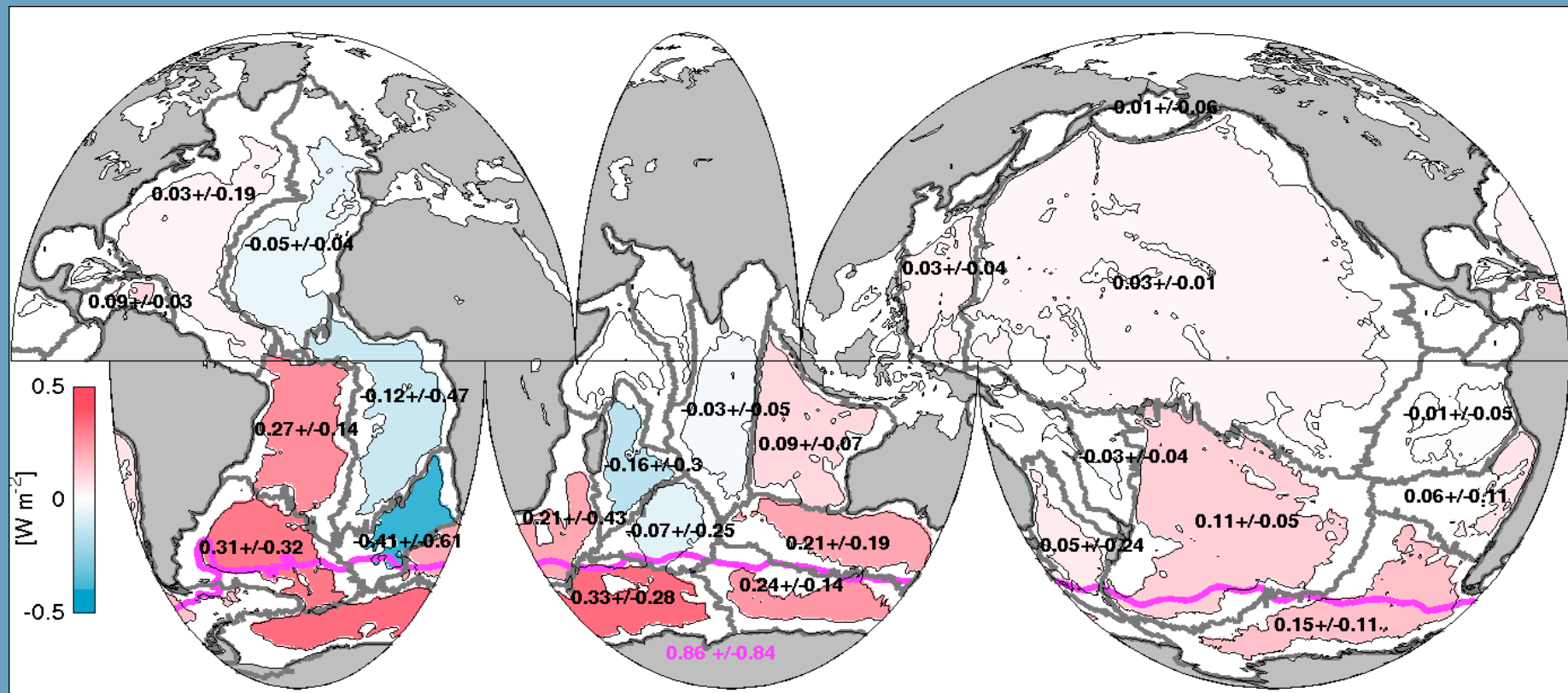


A T-S diagram for a station in the Subantarctic (full line) and in the Antarctic zone (dotted line), and a T-S diagram from surface observations along crossings of the Antarctic Polar Front and Divergence (dashed line). Depth on the vertical T-S profiles is indicated in km.



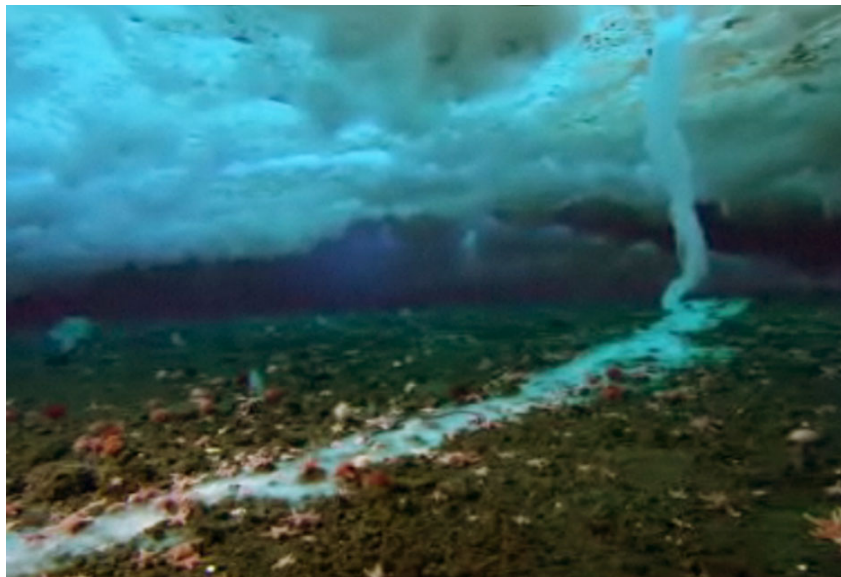
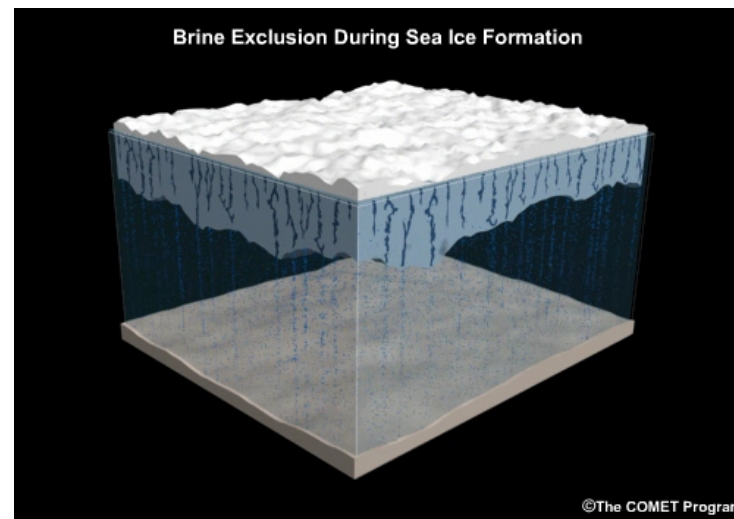
Formation of Antarctic Bottom Water. (a) Locality map, including the regions where deep convection occurs, (b) bottom potential temperature ($^{\circ}\text{C}$) in the Weddell Sea - the stippled area indicates ice shelf, and the edge of the shaded region is the approximate 3000 m contour, (c) a vertical section of potential temperature ($^{\circ}\text{C}$) in the Weddell Sea. The position of the section is shown by the heavy line in (b). From Warren (1981a)

O Aquecimento também está evidente na camada de fundo.



Purkey and Johnson, 2010

Gelo marinho



Pluma dos canais de Brine

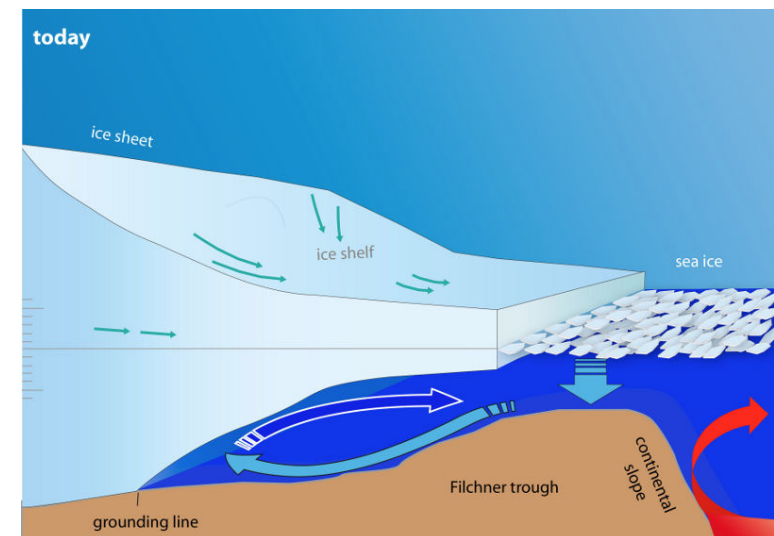
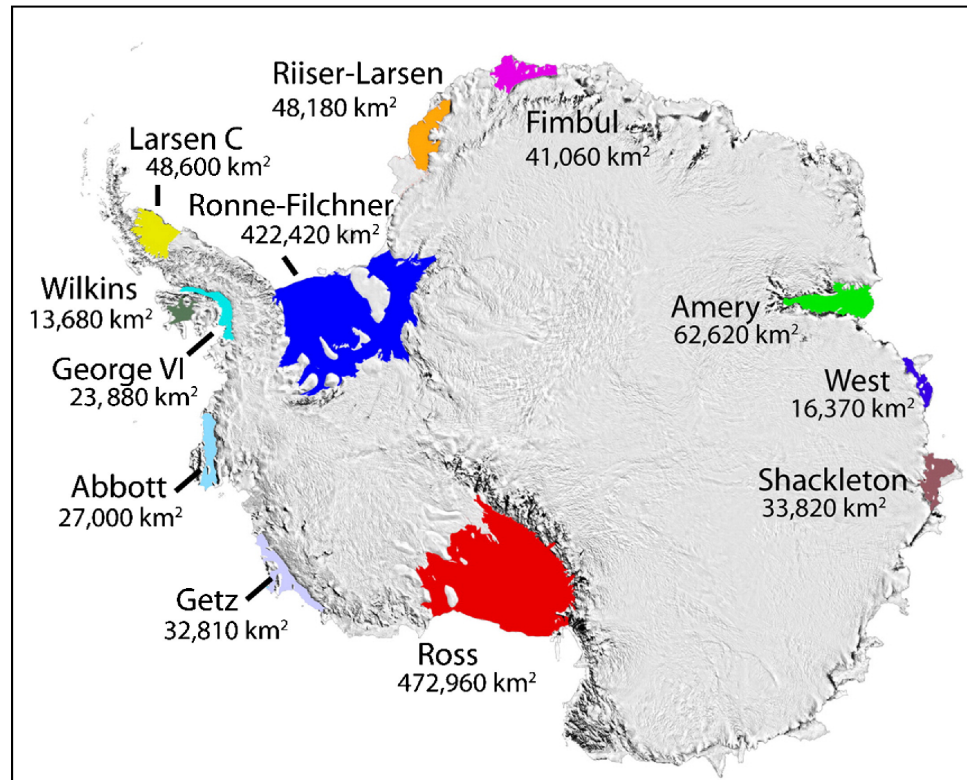


Frost flowers

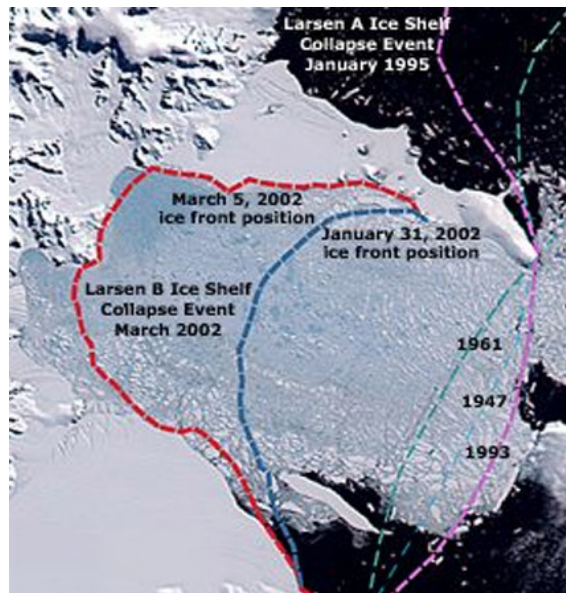




Plataformas de gelo



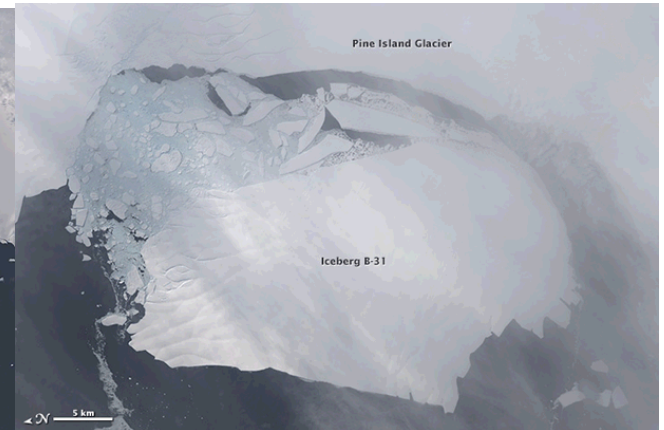
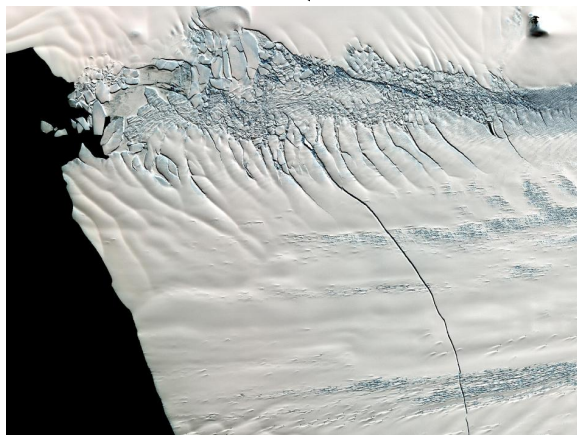
Plataformas de gelo (Larsen B)



Pine Island (mid OCT/2013)

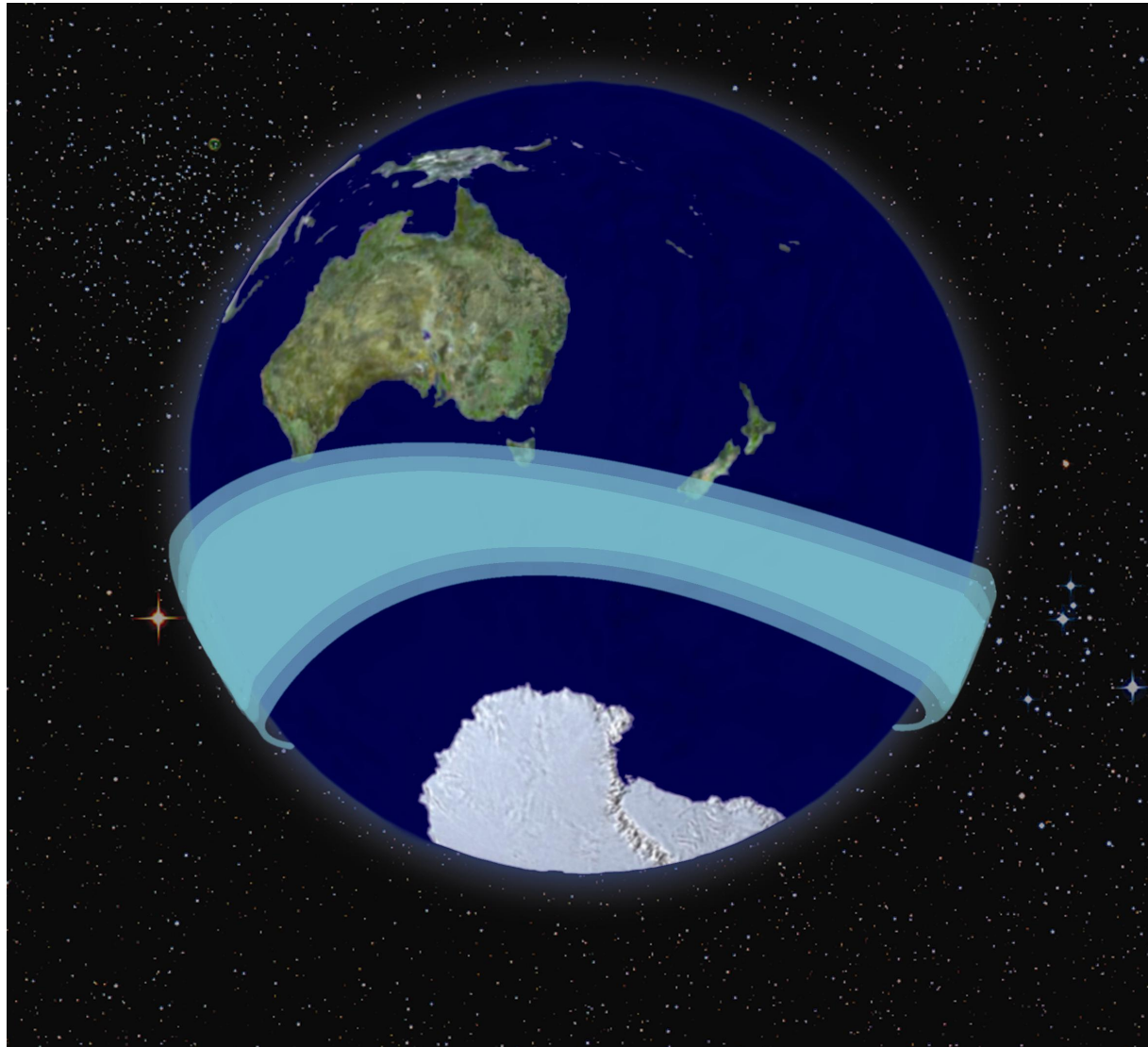
28-OCT2013

13-NOV2013



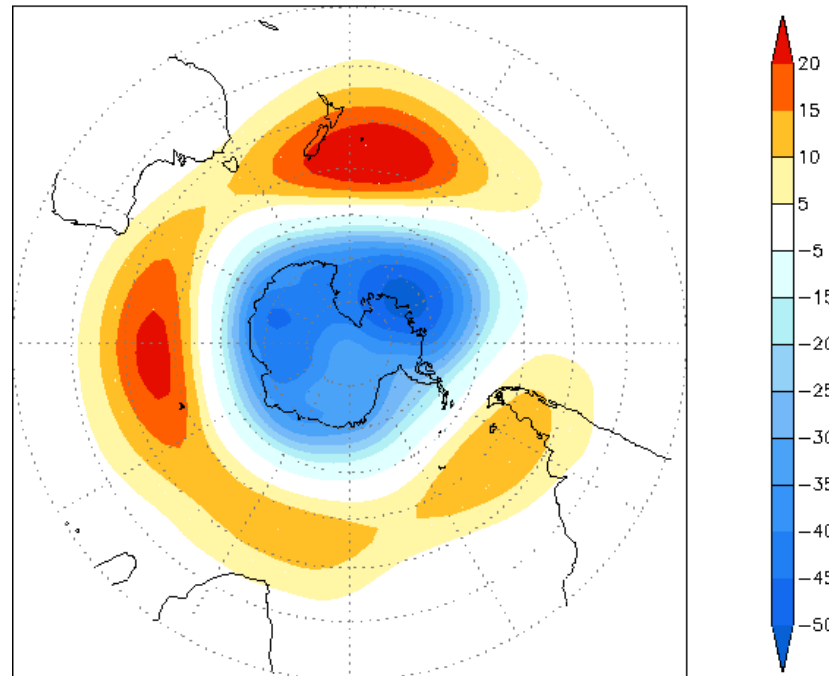
O Modo Anular do Sul (SAM)

(*Oscilação Antártica)



O Modo Anular do Sul (SAM)

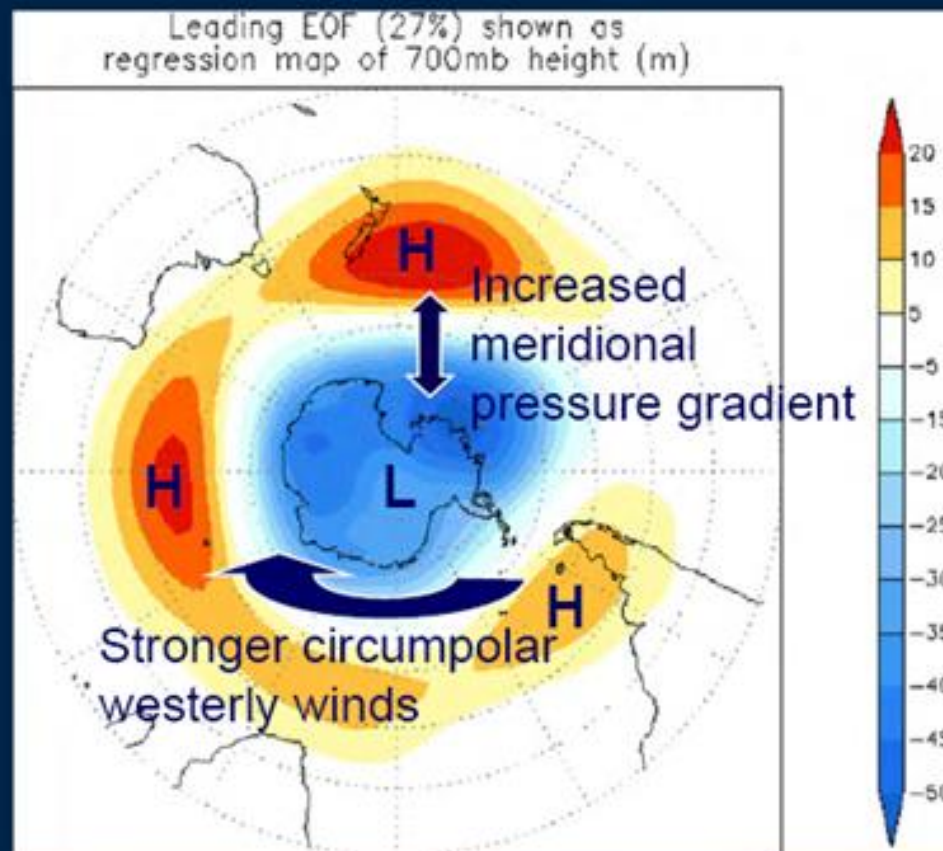
Leading EOF (27%) shown as
regression map of 700mb height (m)



Proporcional à diferença normalizada entre as pressões atmosféricas de 40oS e 65oS.

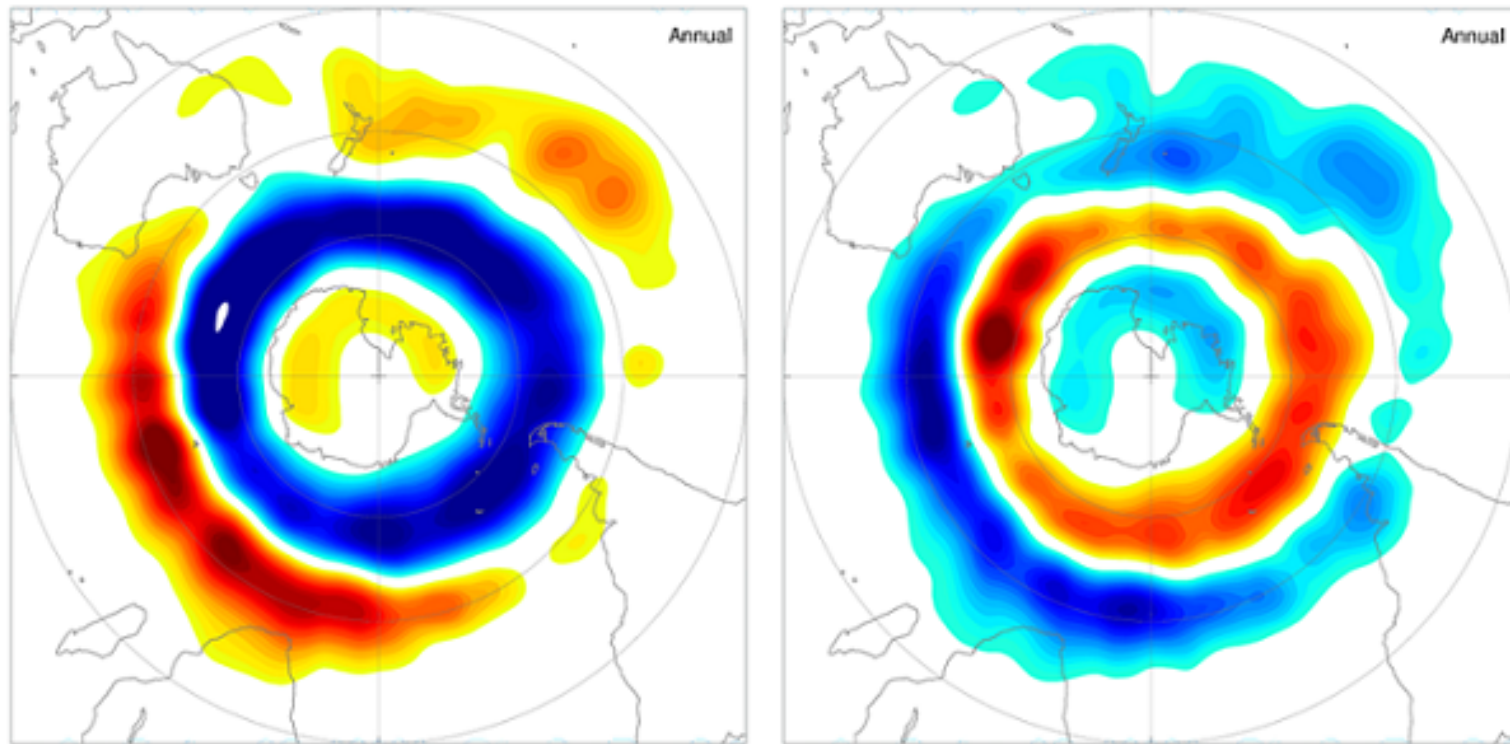
Ref: Thompson, D. W. J., and J. M. Wallace, 2000: Annular modes in the extratropical circulation. Part I: Month-to-month variability. J. Climate, 13, 1000-1016.

The Southern Annular Mode (SAM)



SAM positive phase

Storm Tracks



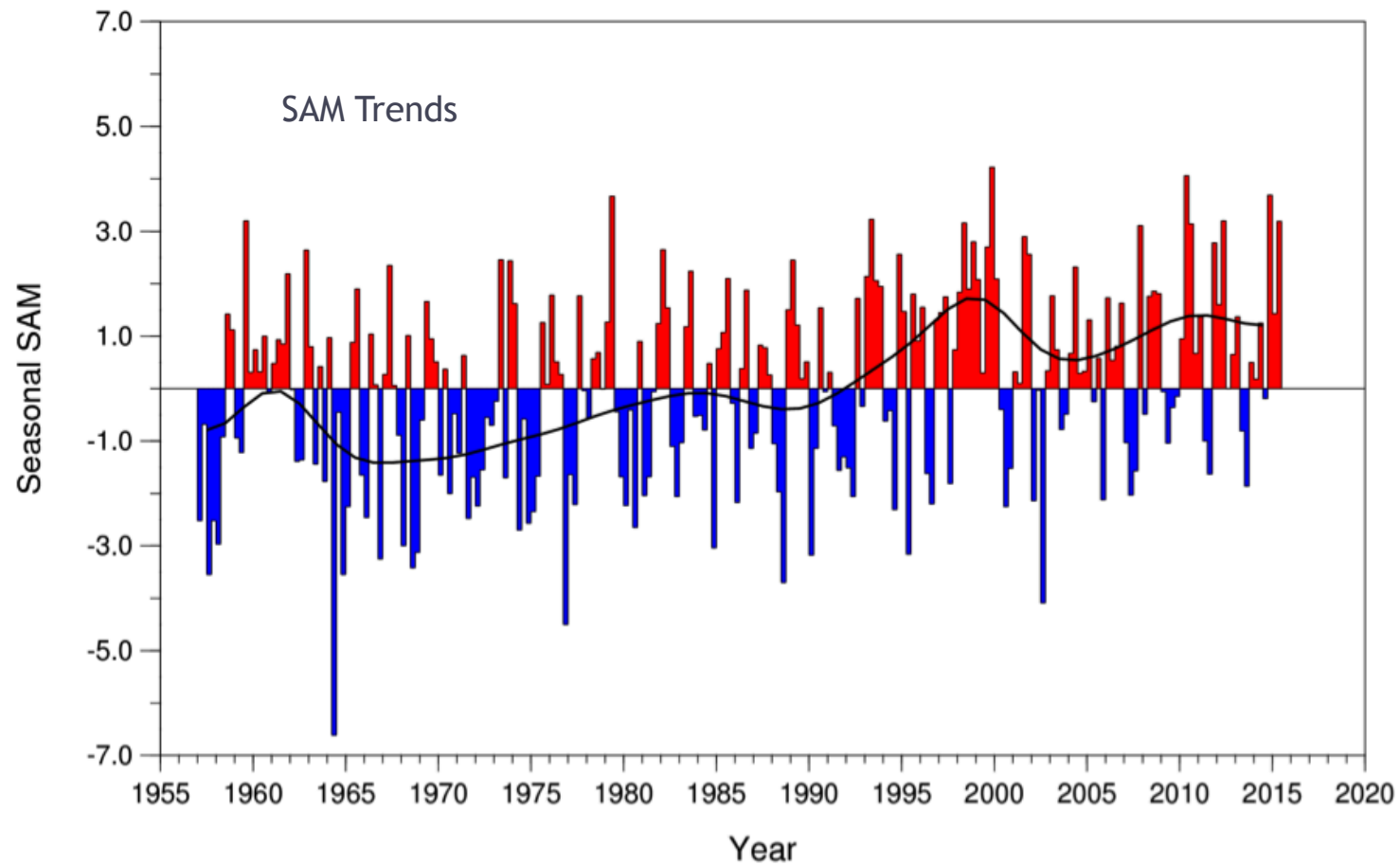
SAM (-)

SAM (+); próximas à Antártica



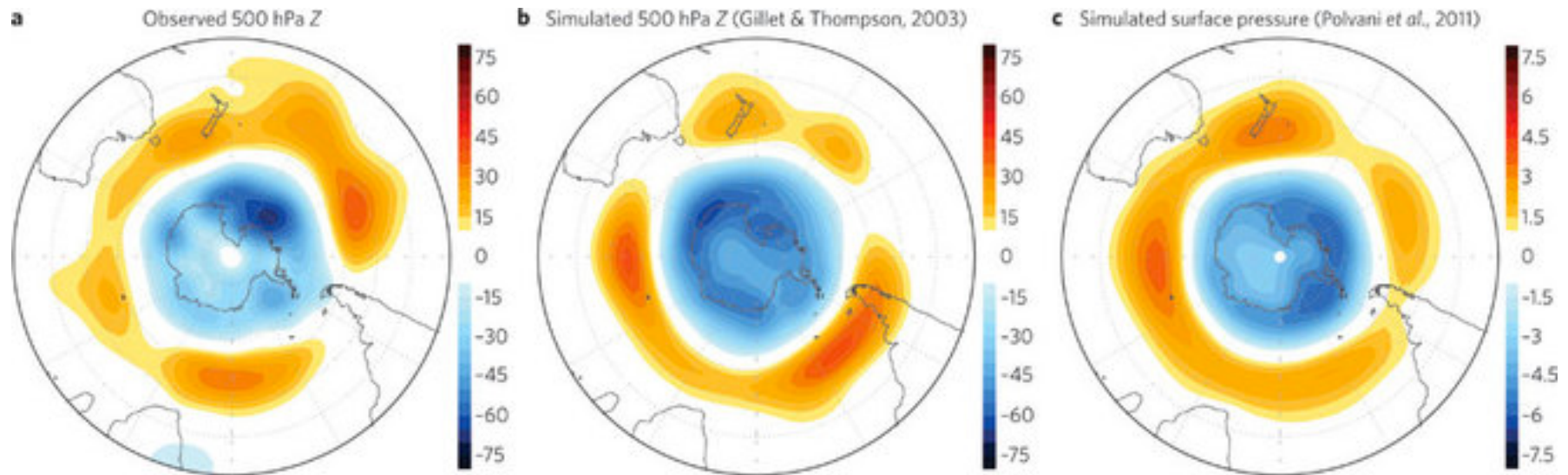
SAM Movie !



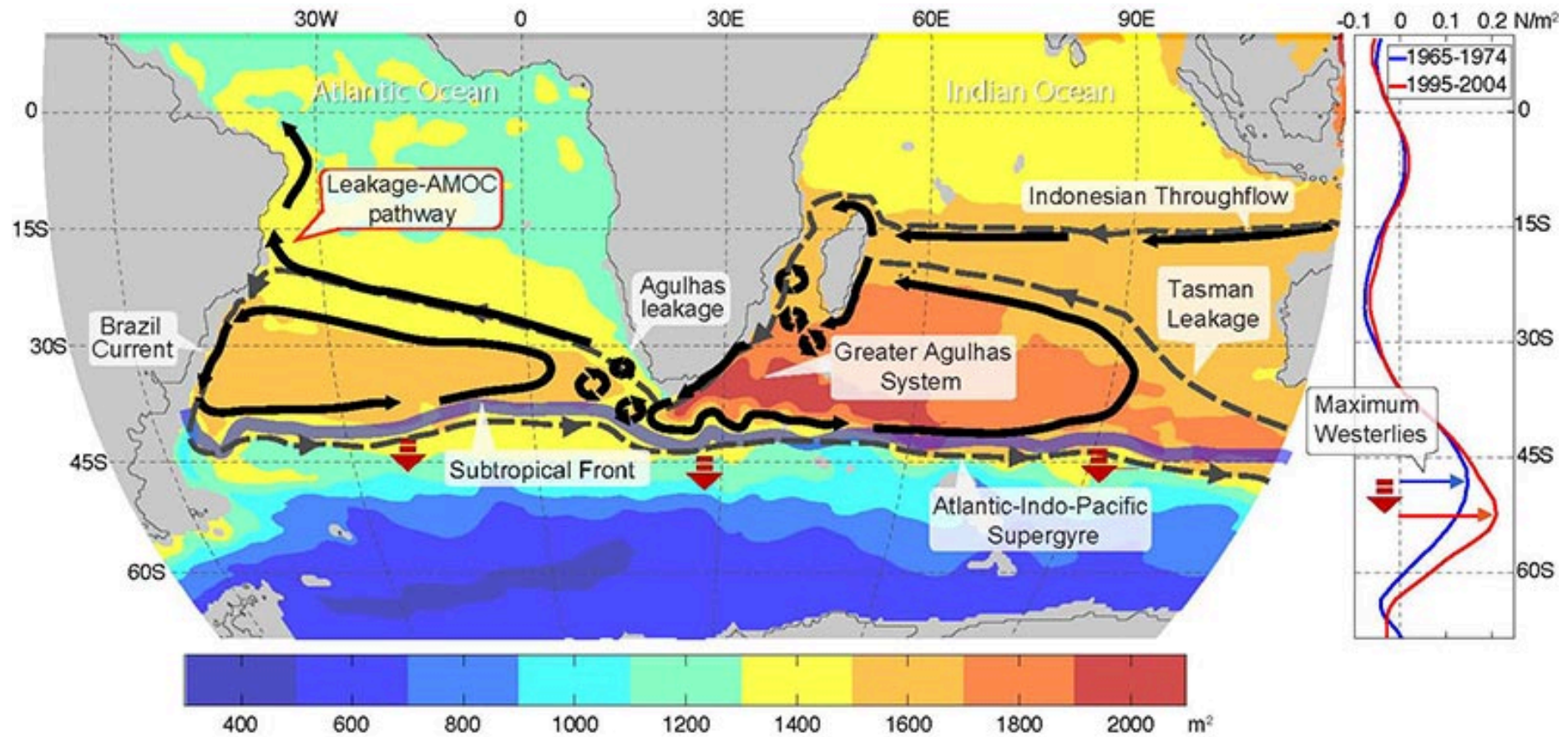


GJ Marshall
Journal of Climate 16 (24), 4134-4143, 2003

SAM e Ozone hole

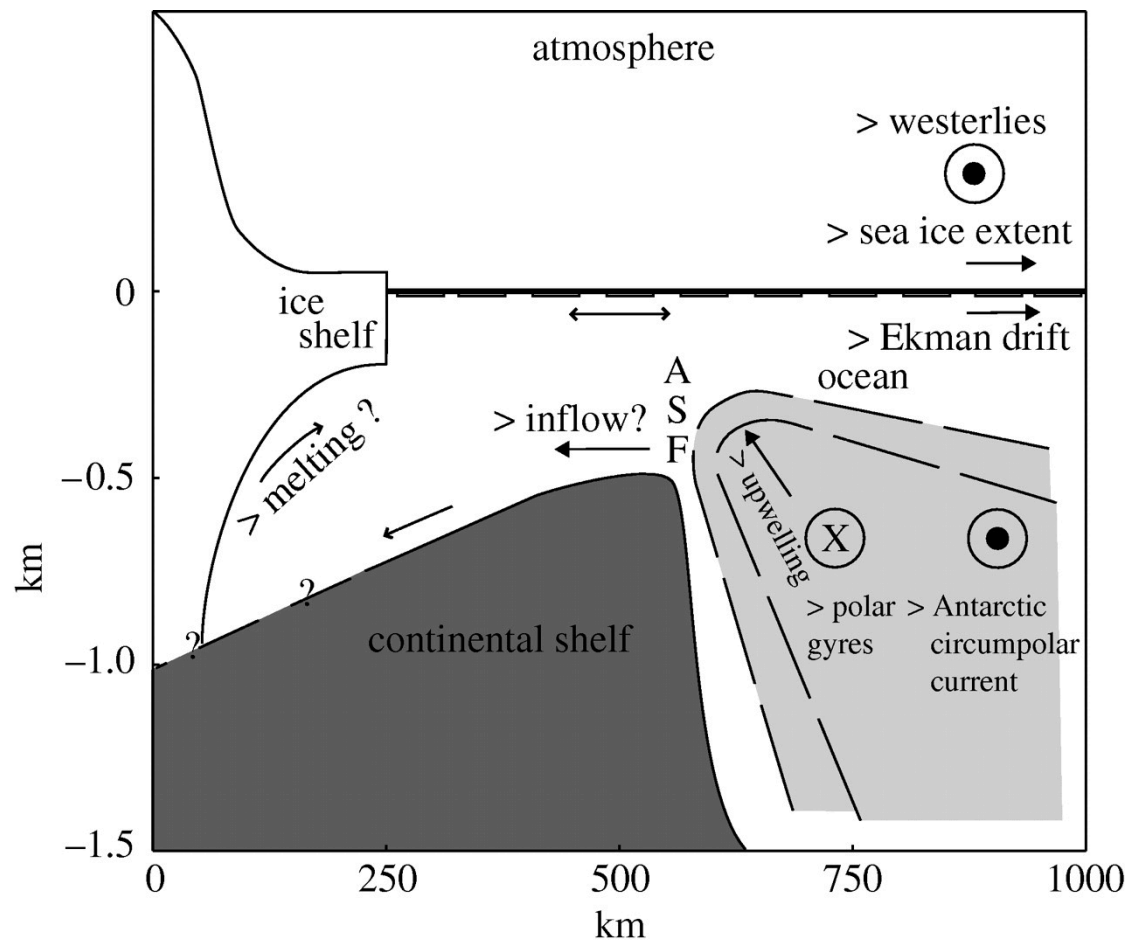


SAM e Agulhas Leakage



Beal et al, Nature

SAM + Ekman na Antarctic Margin



Stan Jacobs

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