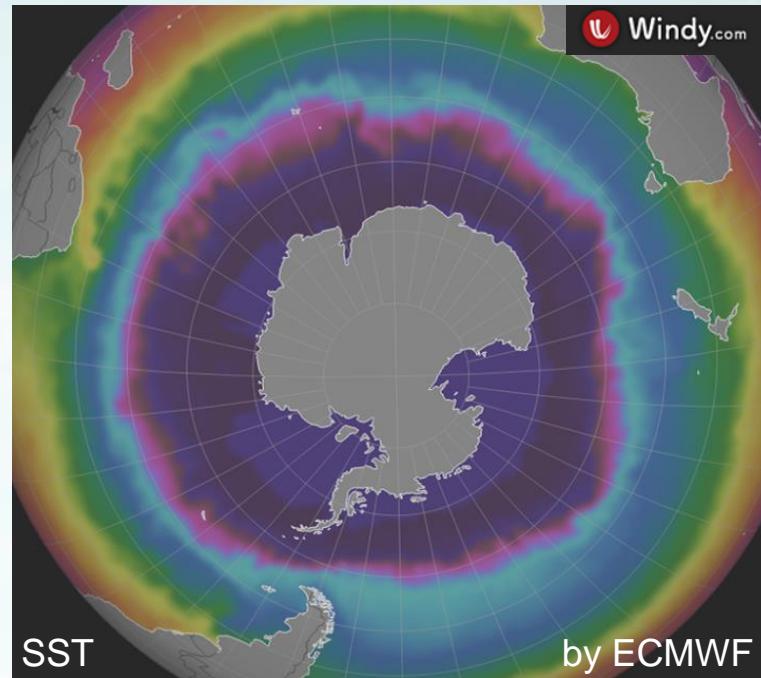


temperature (surface)

on Nov 11th



SST

by ECMWF

Absolute velocity field of the Antarctic Slope Current and topographically constrained gyre-like structures, in East Antarctica.

Kaihe Yamazaki ^{1,2}, Shigeru Aoki ¹, Keishi Shimada ³, Yujiro Kitade ³

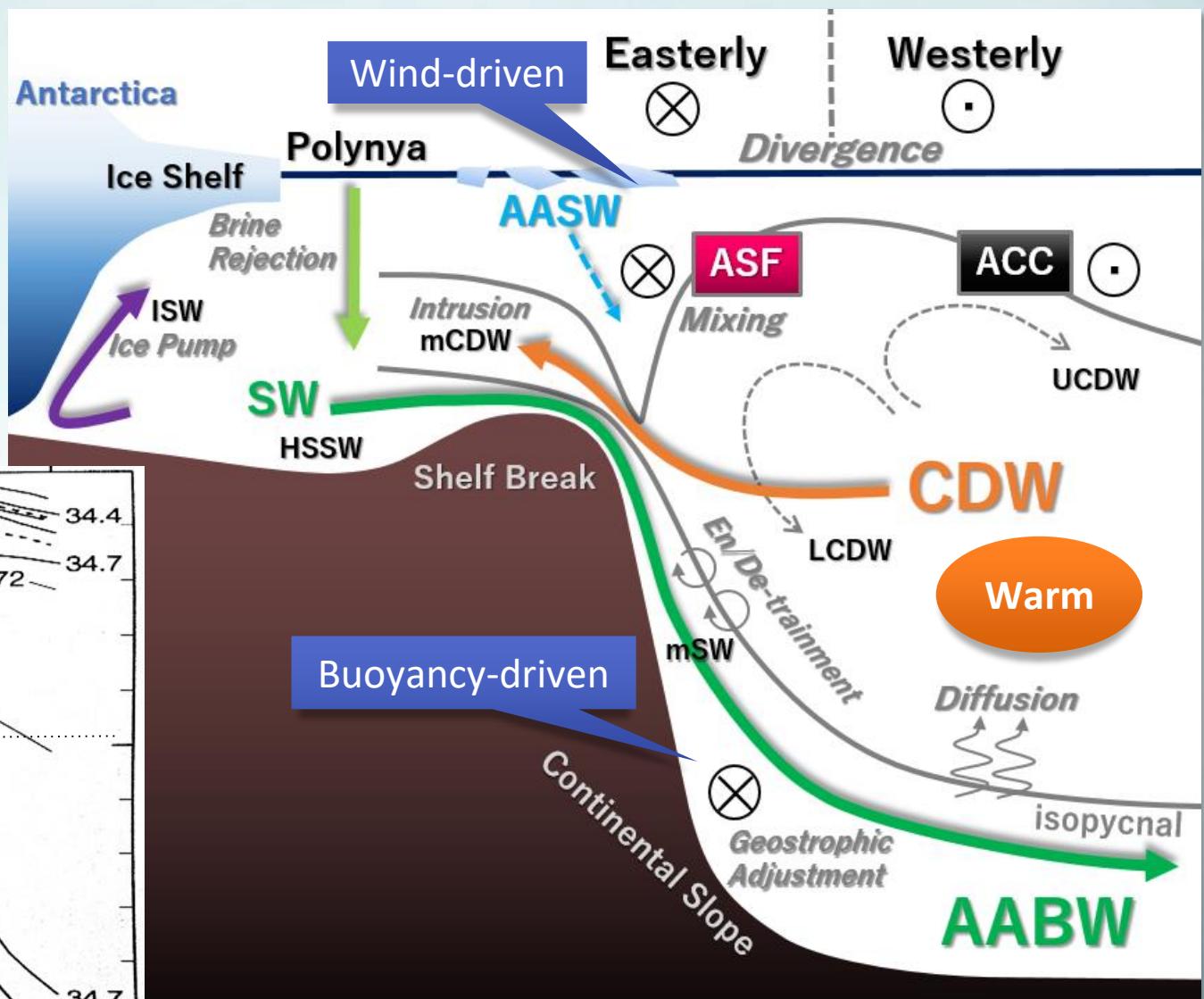
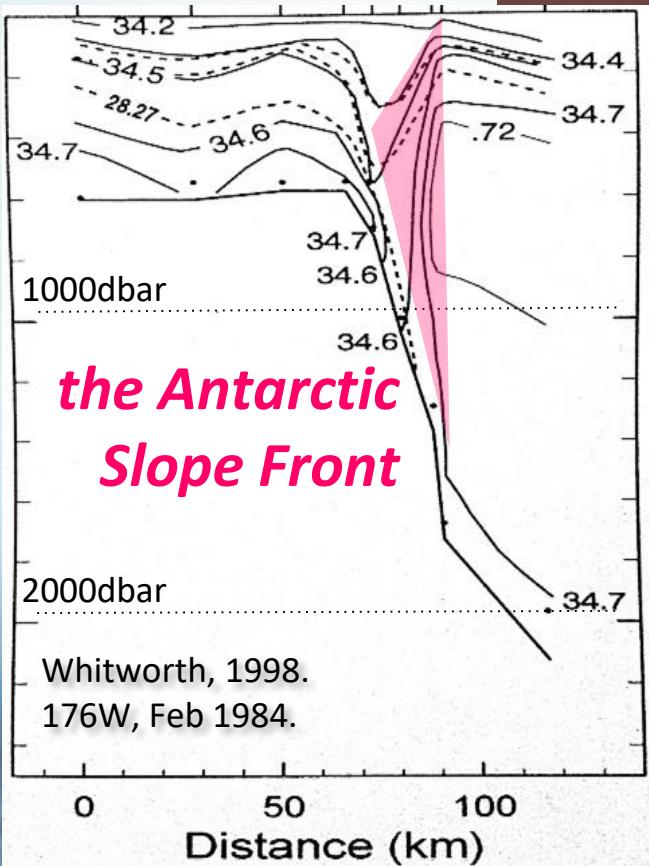
¹ Institute of Low Temperature Science, Hokkaido University,

² Graduate School of Environmental Science, Hokkaido University,

³ Tokyo University of Marine Science and Technology.

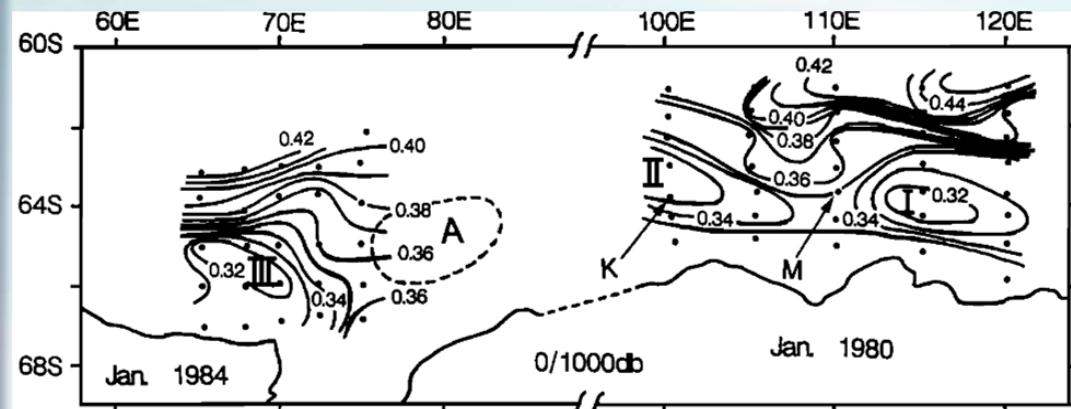
Introduction

Dynamical process in the Antarctic continental margin



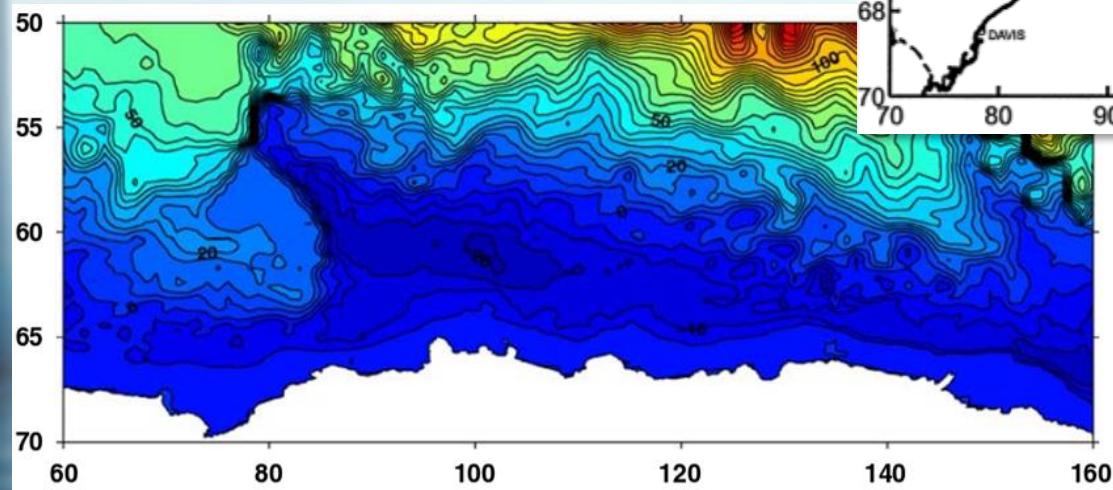
Cross slope/shelf exchange?

Topographically constrained circulation

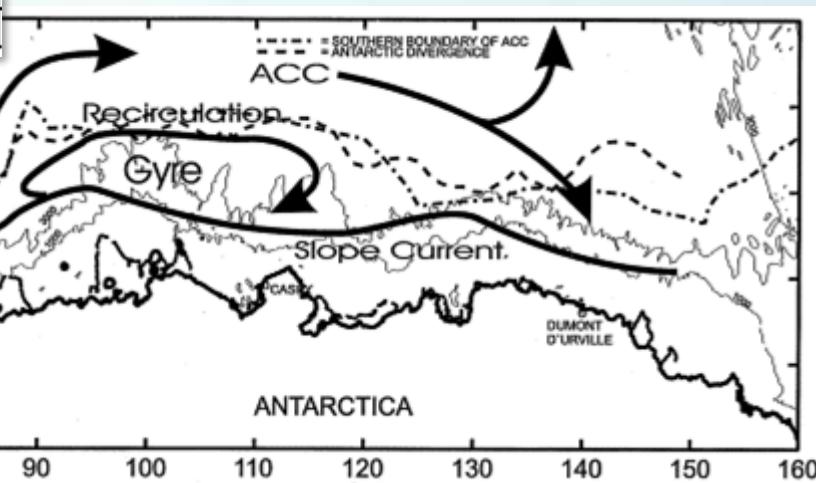


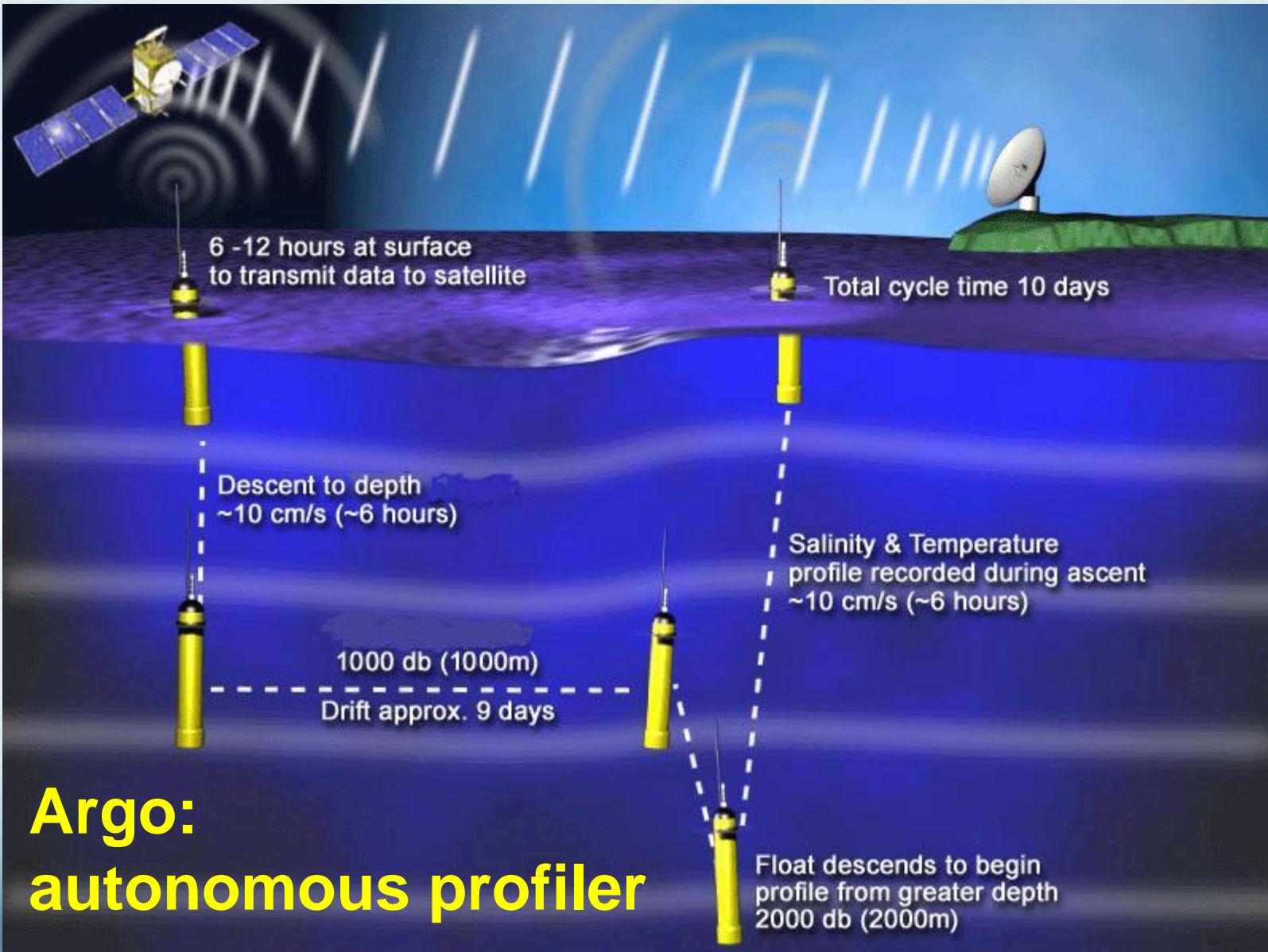
Wakatsuchi et al., 1994
Dynamic topography
(0/1000dbar)

Bindoff et al., 2000
BROKE survey



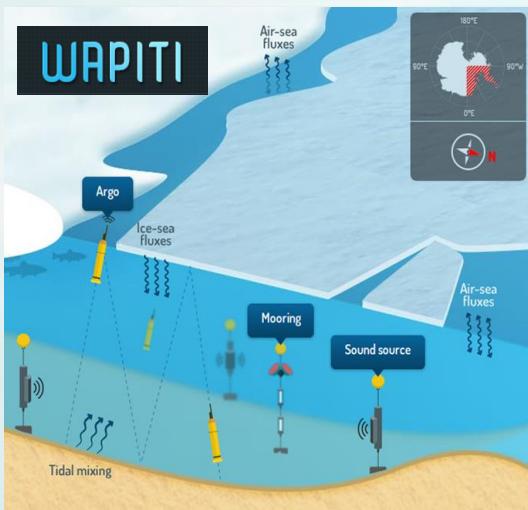
Aoki et al., 2010
Barotropic streamfunction
derived from OFES





Argo:
autonomous profiler

Utilization of under-ice Argo floats



Trial of sound positioning system ongoing...

- Impossible to cover whole region
- Have already acquired 7,000 casts under ice in the E. Ant sector (0-180E, -60S)

Here I introduce a new way to utilize them

Data and method

Trajectory of Argo

Data domain:

	Year	Month	Day	North	
START:	2005	01	01	-60	East
END:	2017	08	21	-70	South
West	0	180			

well-positioned: 37,595 casts

mal-positioned: 7,165 casts

- Somehow interpolate lacked positions
- Estimate the error of interpolation by tests using well-positioned data

Assumption of f/h contour

For geophysical fluids, the streamfunction tends to coincide with ambient f/h contours.

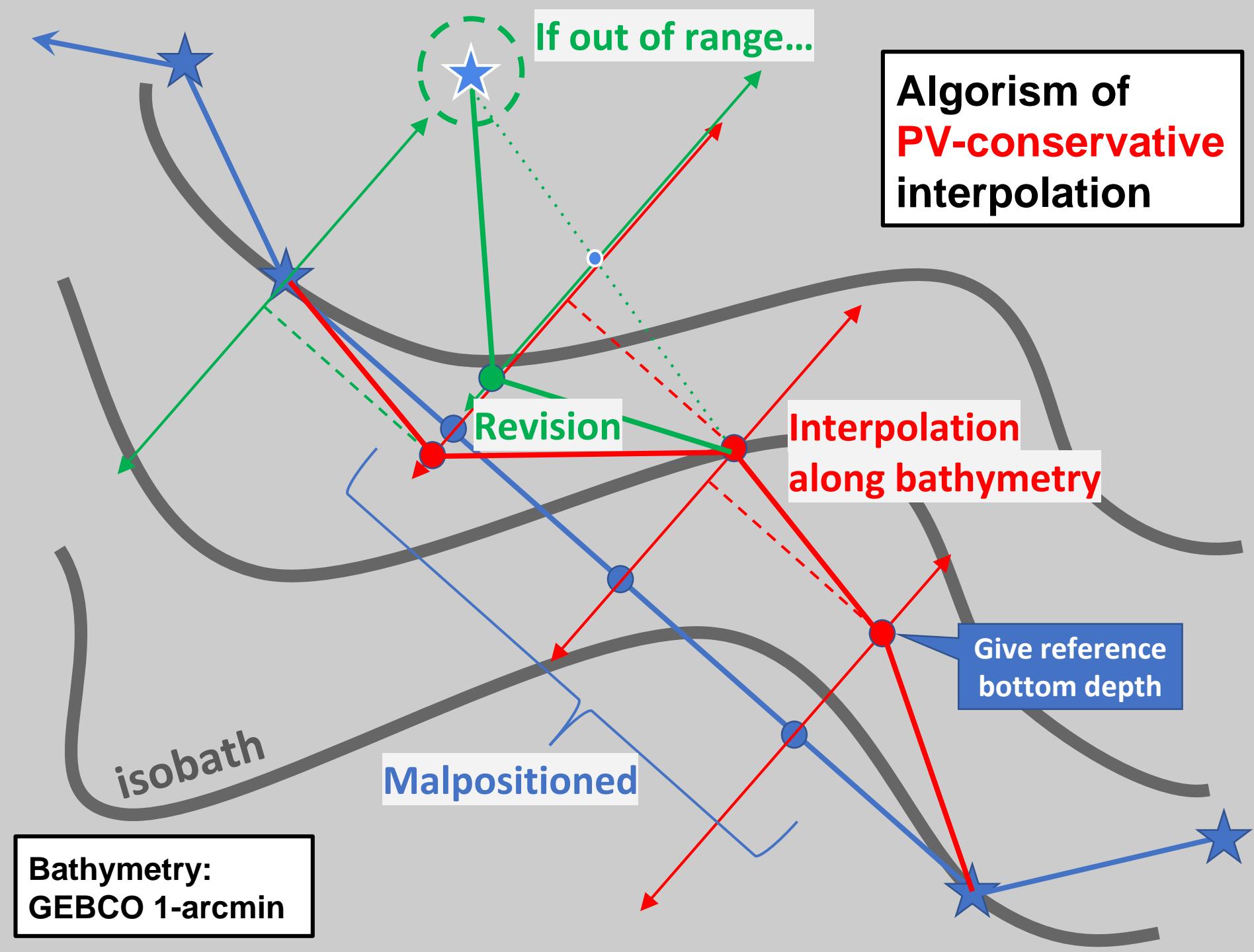
by conservation of angular momentum

(f: Coriolis parameter, h: layer thickness)

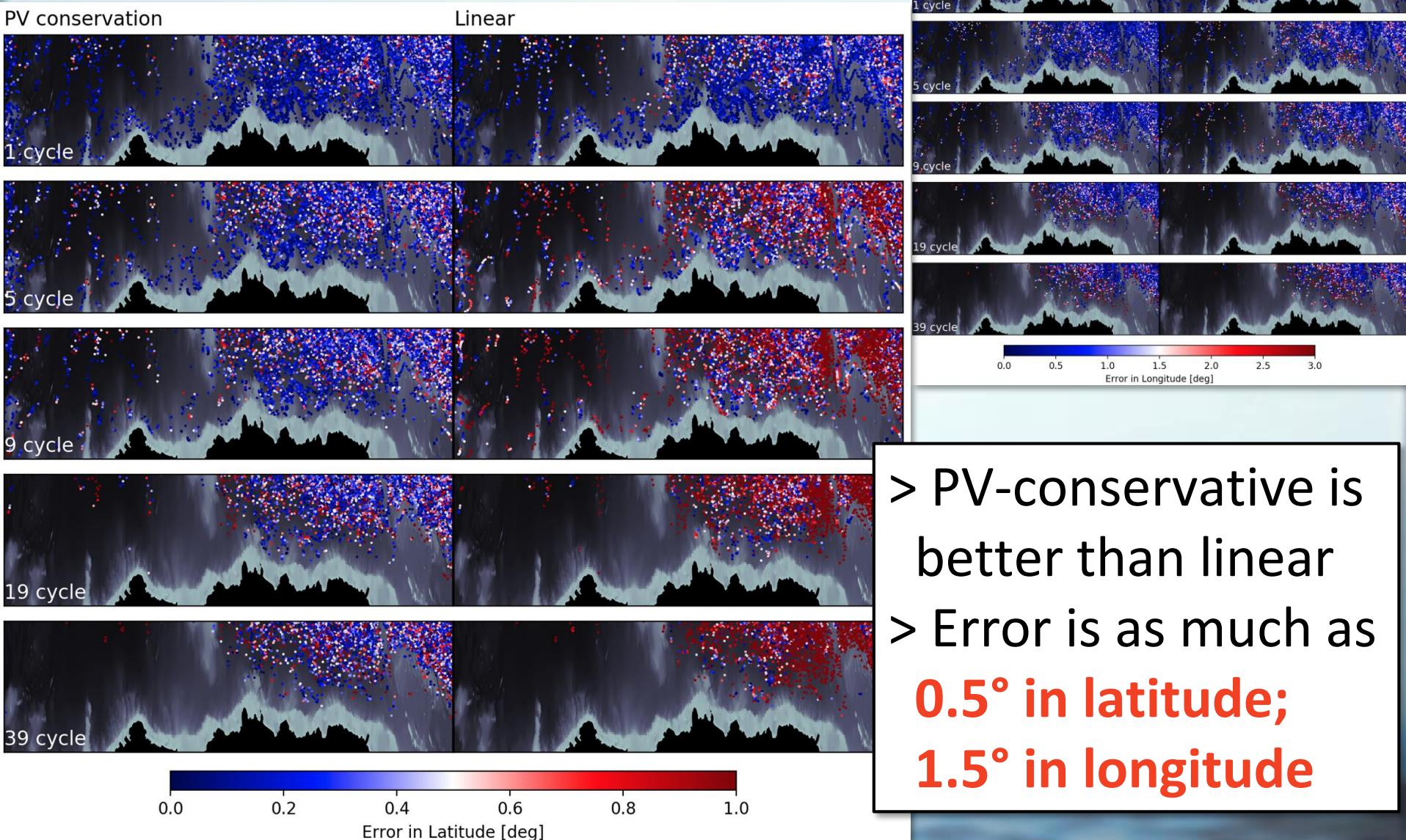
as Δf is small...

Estimate positions of Argo *along isobath* and compare to the case of linear interpolation.

Algorithm of PV-conservative interpolation

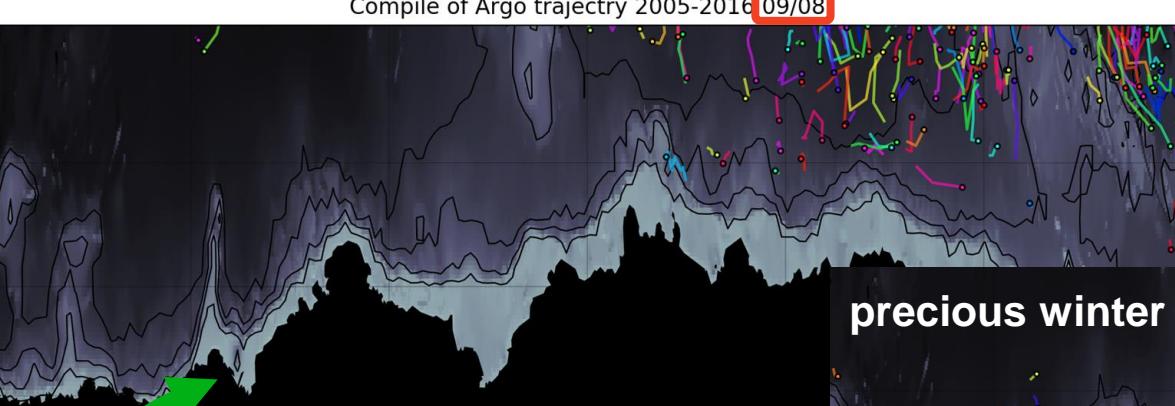


Error tests (=positioned-estimated)

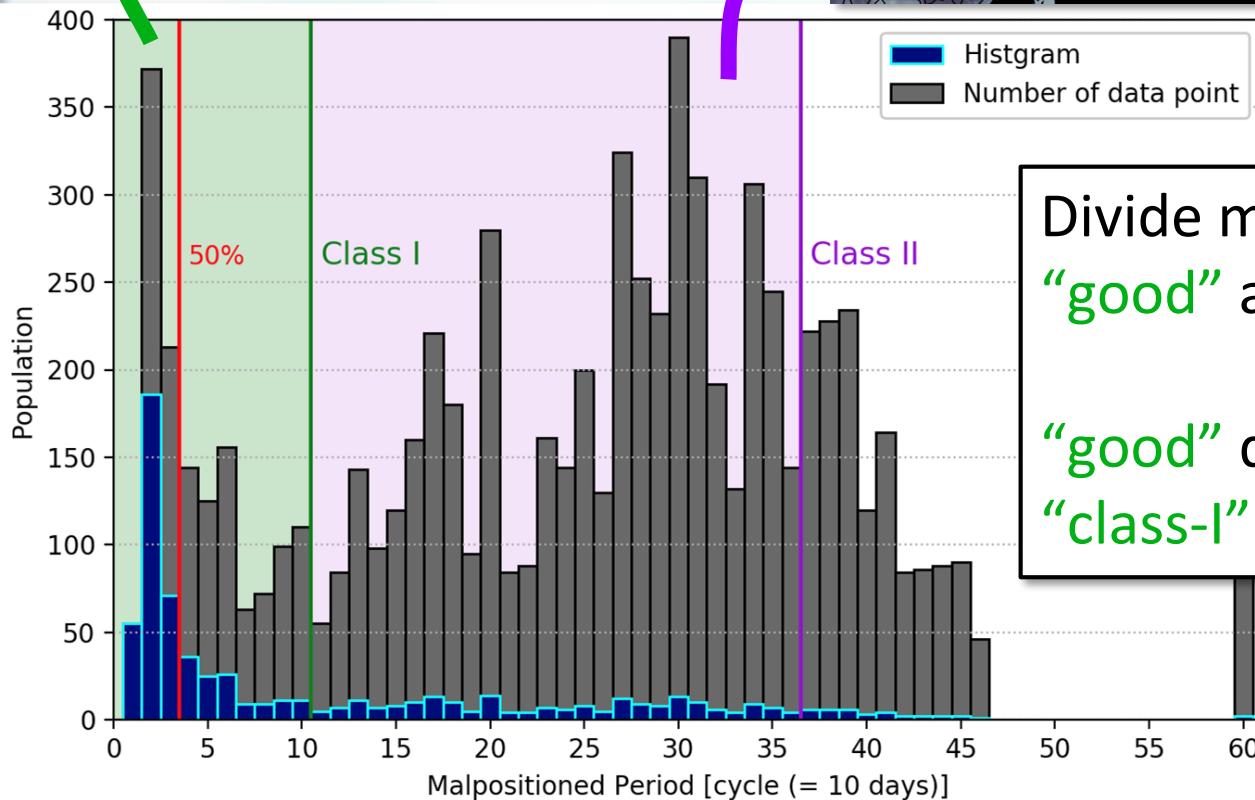
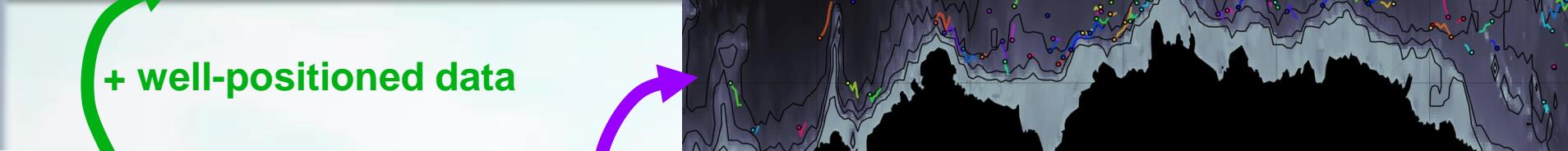


> PV-conservative is better than linear
> Error is as much as **0.5° in latitude;**
1.5° in longitude

Execute interpolation



precious winter data!



Divide mal-positioned data into
“good” and “rough estimate”

“good” data are classified as
“class-I” with positioned data

Climatological dataset to derive fronts

Creation of a Gridded Dataset for the Southern Ocean with a Topographic Constraint Scheme

KEISHI SHIMADA

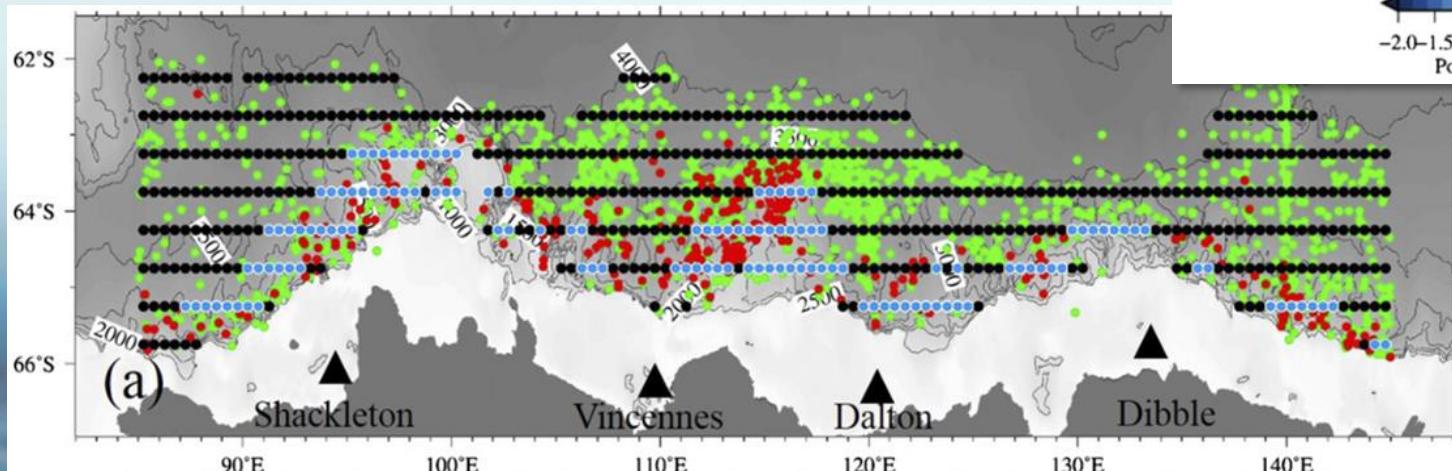
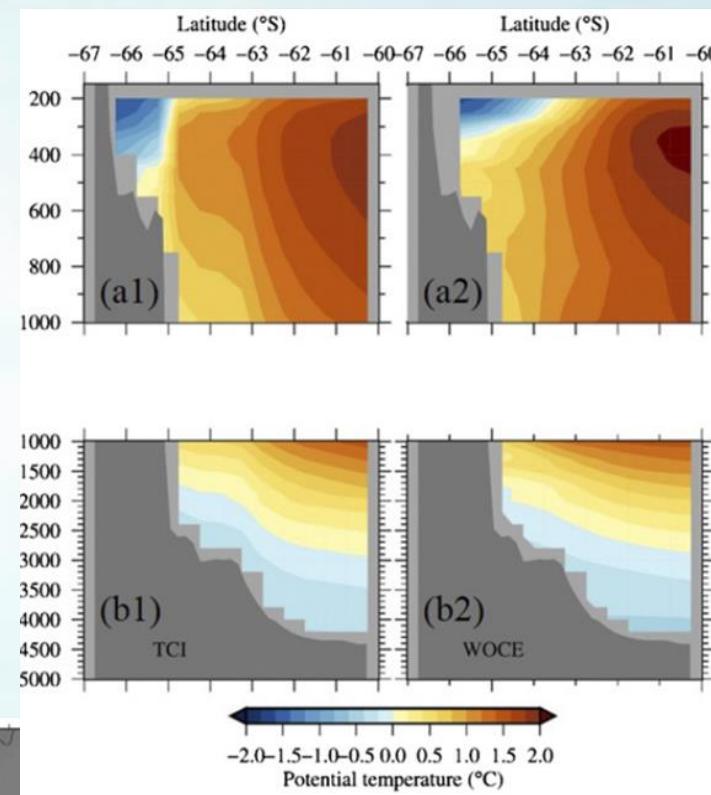
Tokyo University of Marine Science and Technology, Tokyo, Japan

SHIGERU AOKI AND KAY I. OHSHIMA

Institute of Low Temperature Science, Hokkaido University, Hokkaido, Japan

(Manuscript received 4 April 2016, in final form 22 November 2016)

JTECH, 2017

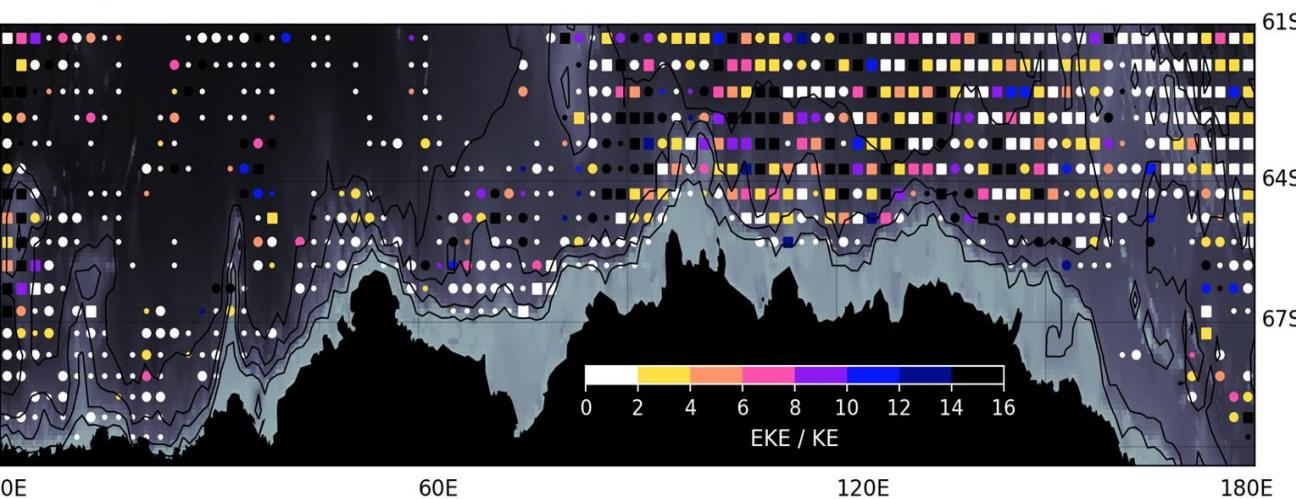
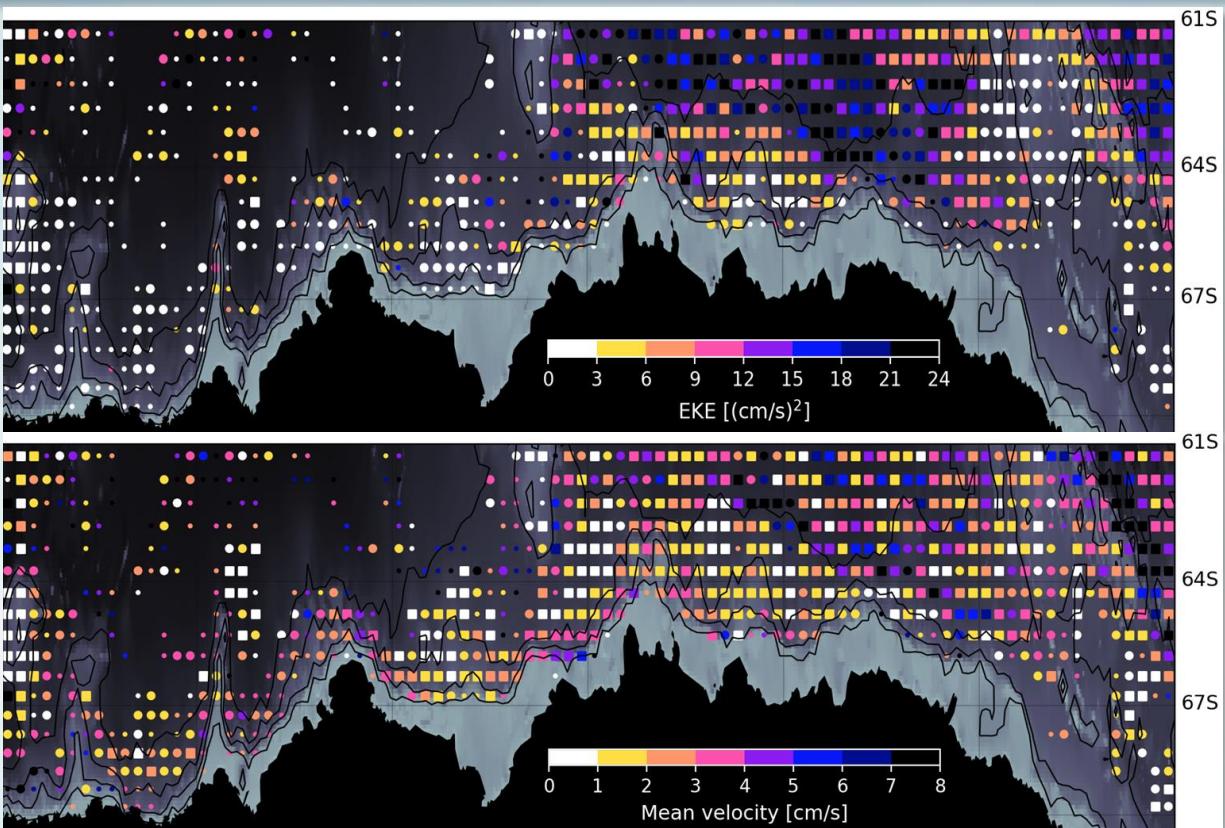


Results

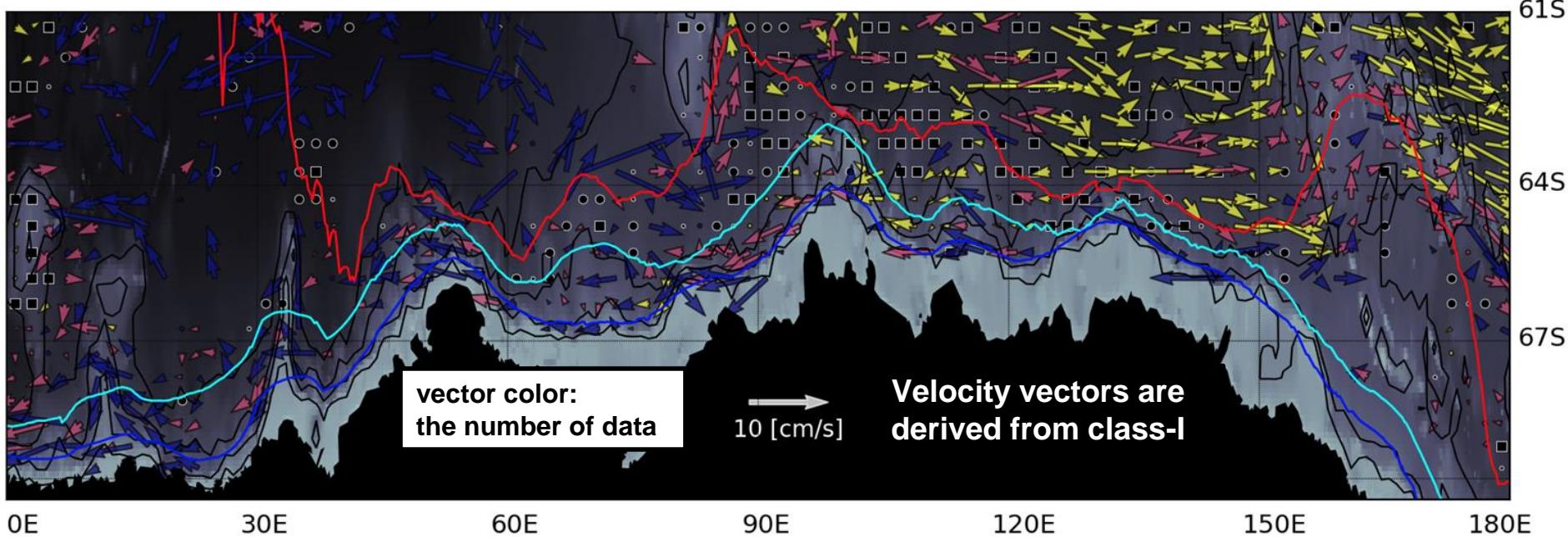
Estimate EKE

$$EKE = \frac{1}{2} (u'^2 + v'^2),$$
$$u' \equiv u_{\text{class I}} - \bar{u}_{\text{class I+II}}$$

← shape of marker indicates
the number of class-I data



Scaling by MKE tells
turbulence-dominant
region, existing in the
neighborhood of the
Antarctic Divergence.

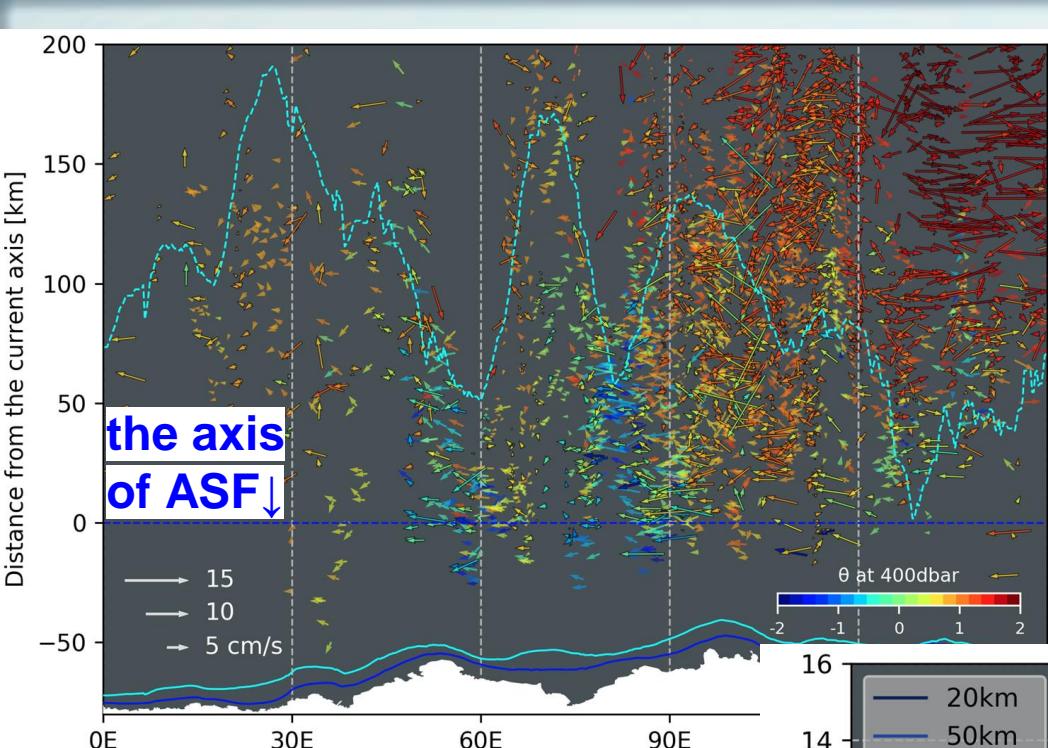


High EKE region, prevailing flows, and fronts.

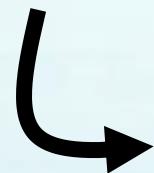
Climatology of fronts:

**the Southern Boundary of ACC,
0 degC @ 400dbar and @ 200dbar for ASF**

- Assume the current axis and northern limb of ASF
- The high EKE region seems to locate between ASF and SB, and specifically be **affected by topography**

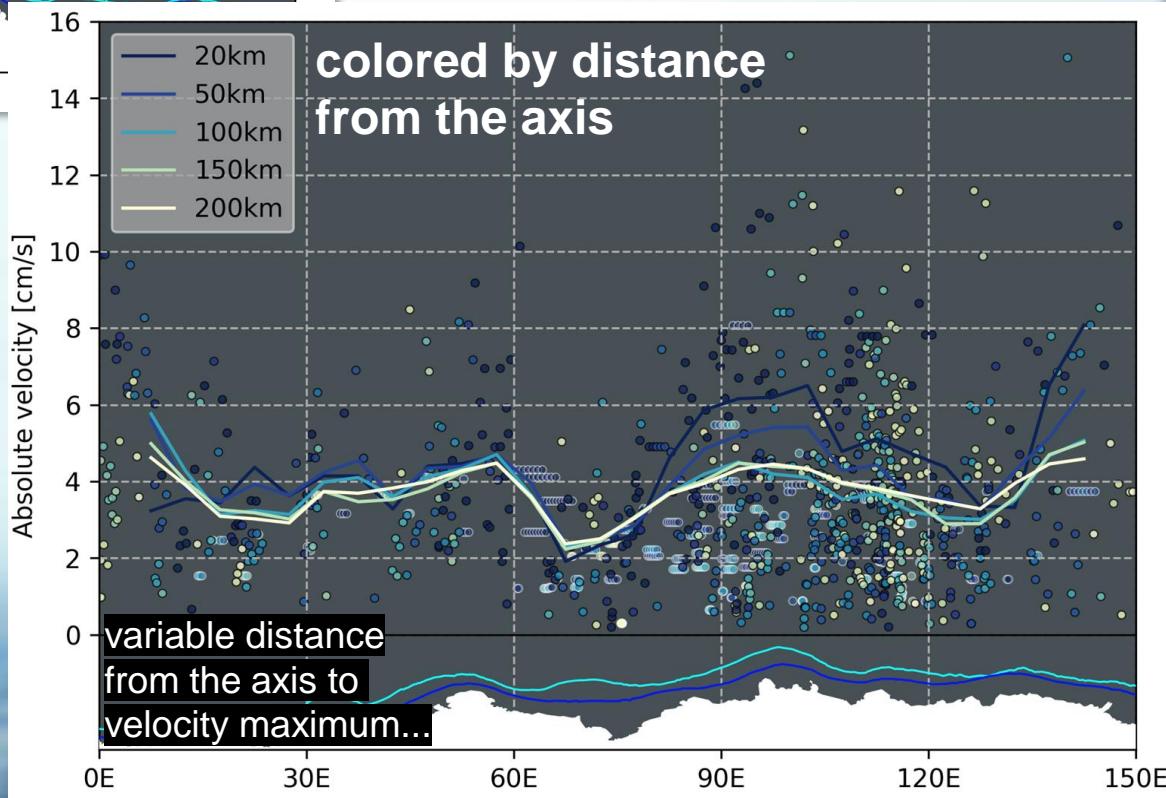


vectors: velocity @ 1000 dbar

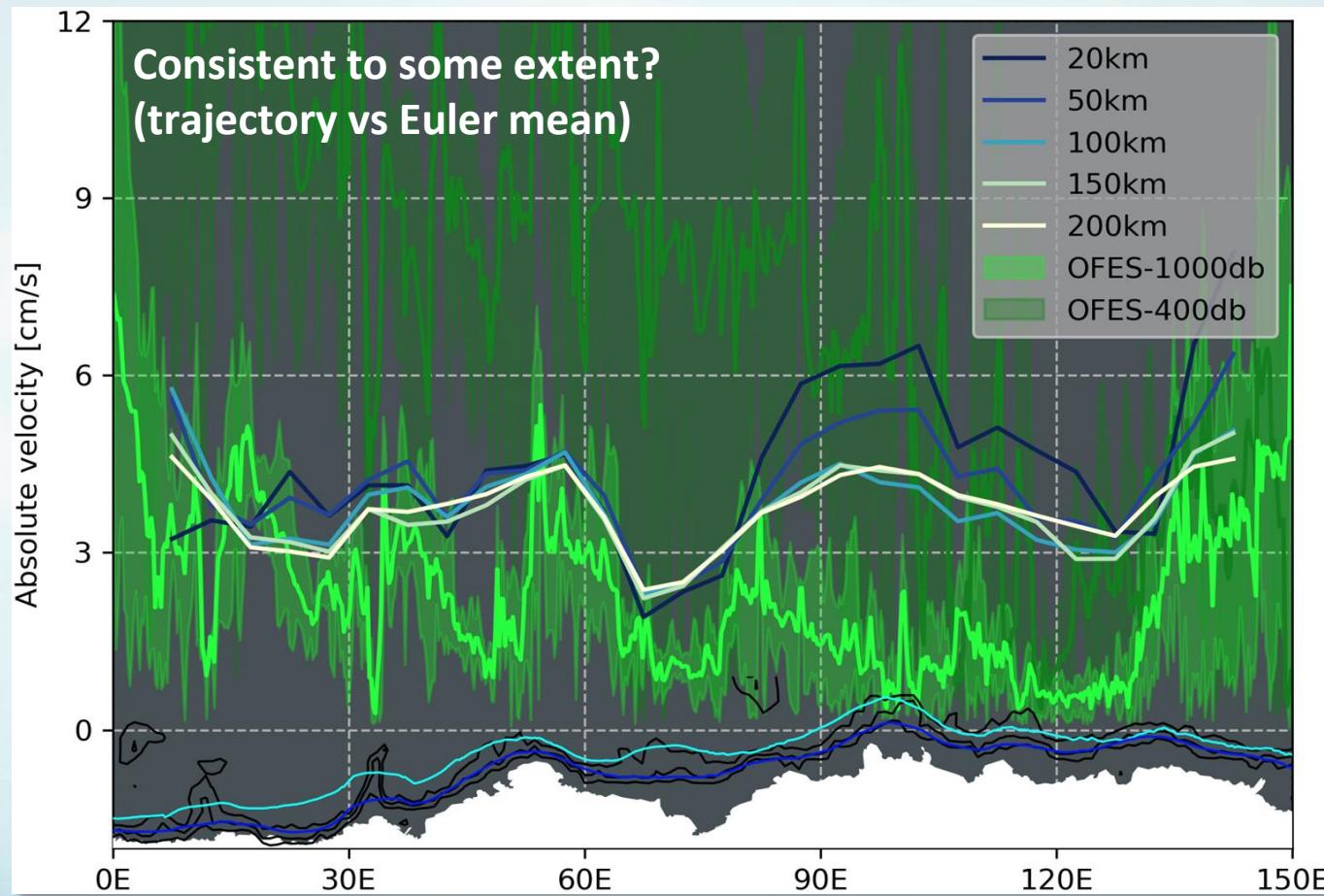


for vectors crossing with ASF at an angle within 45°

Along-axis variability of velocity in ASF

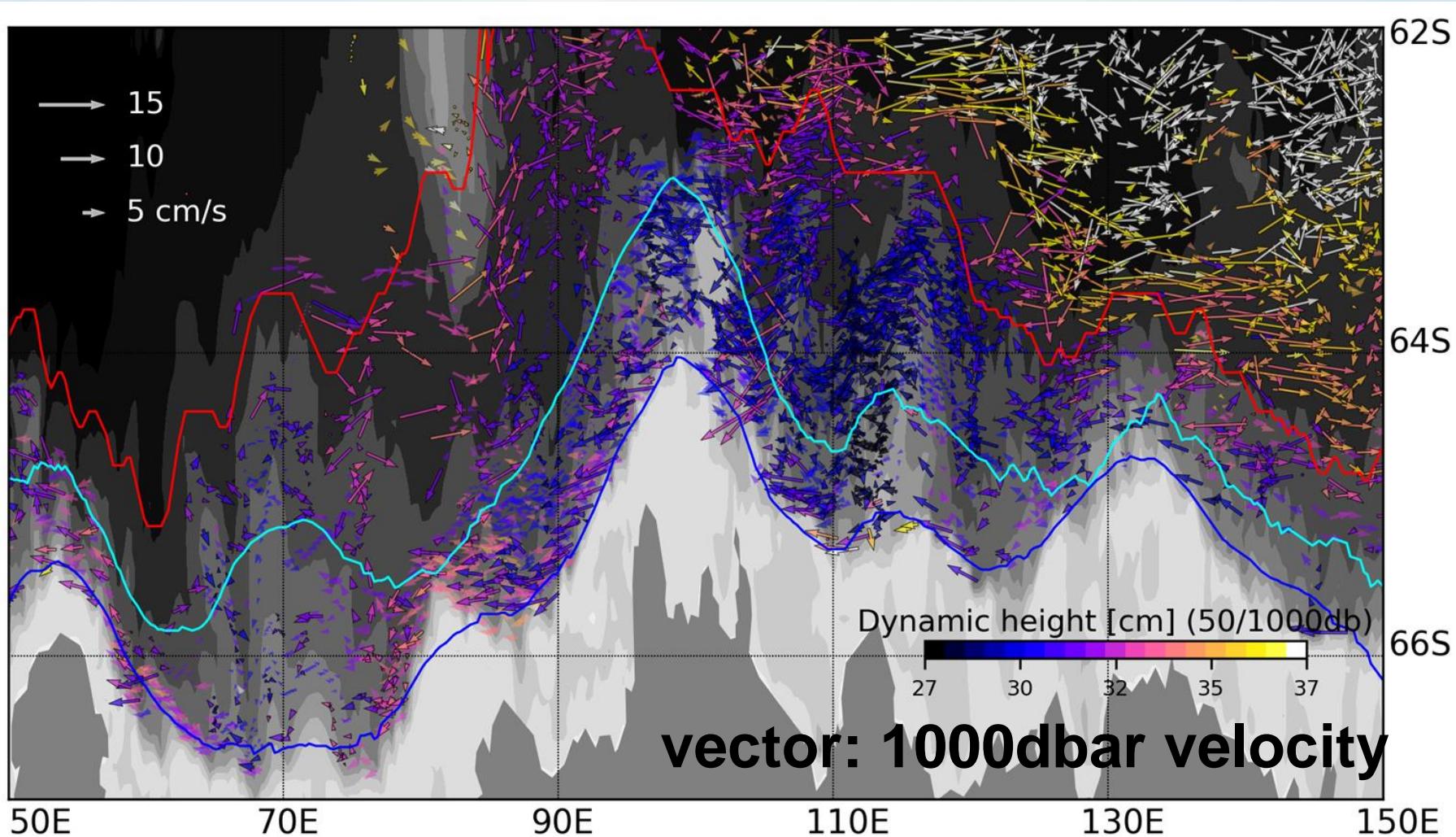


Comparison to OGCM (OFES)



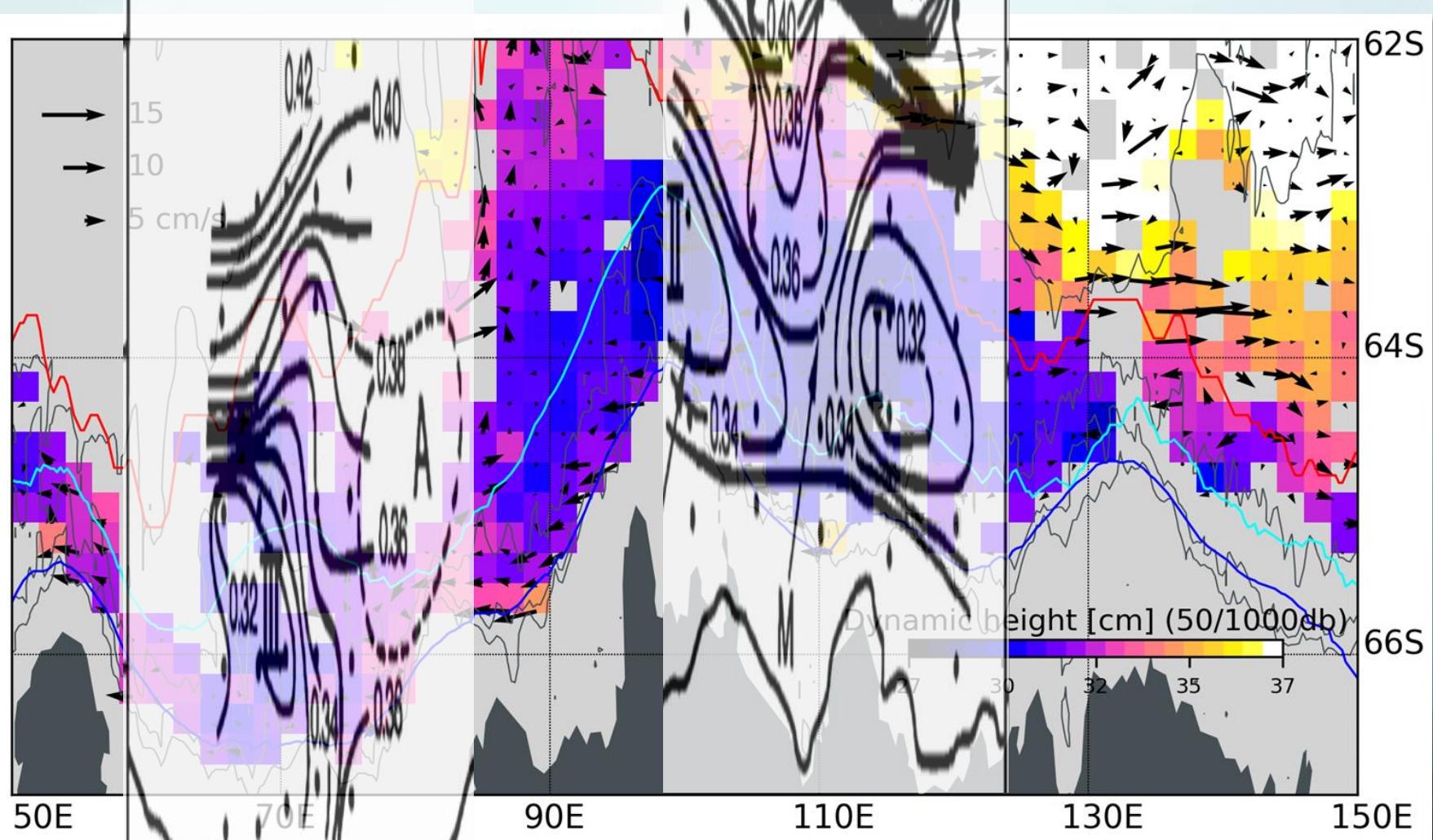
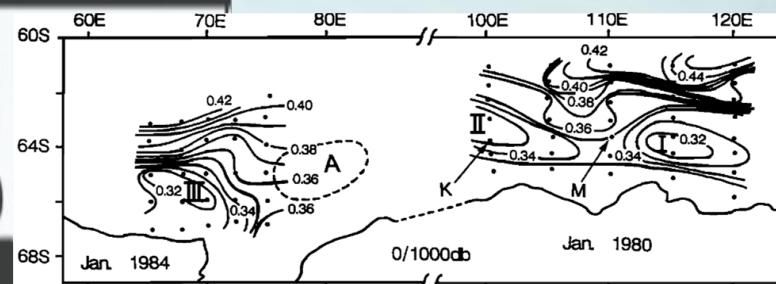
- > Variability may reflect compression of streamlines
- > OFES velocity is highly barotropic in 120-150E

Dynamic height ; gyre-like structure

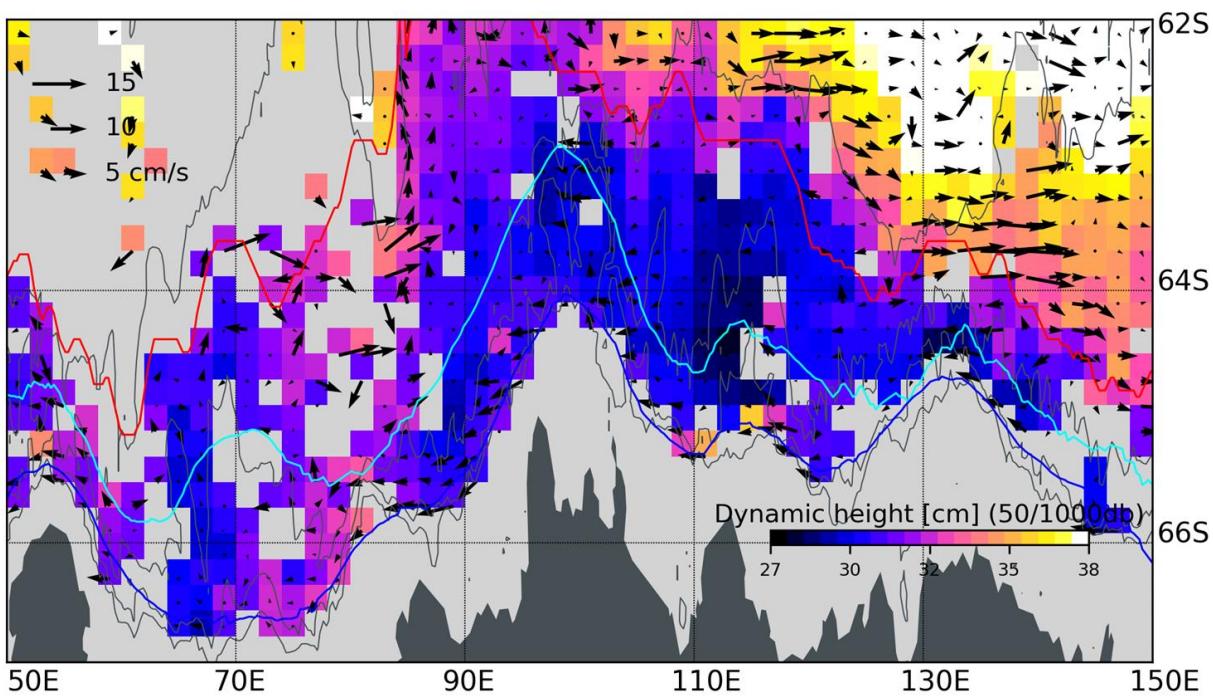


Darker vector: heavier and thinner

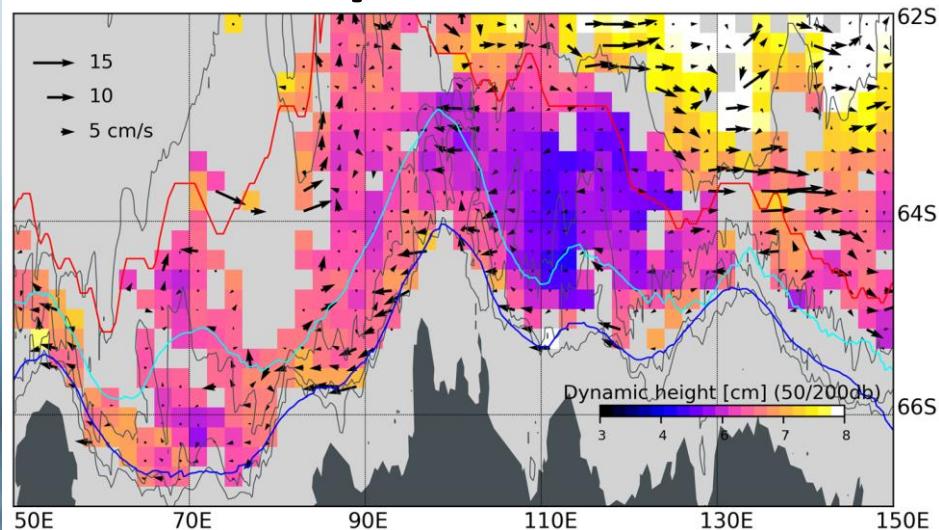
vs. 0/1000m dynamic height from Wakatsuchi et al., 1994



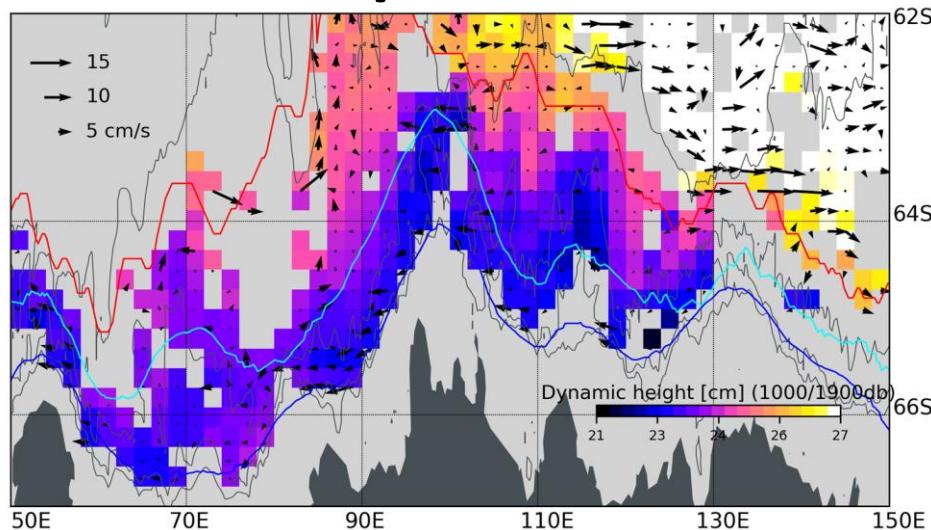
50/1000dbar
Class-I data only



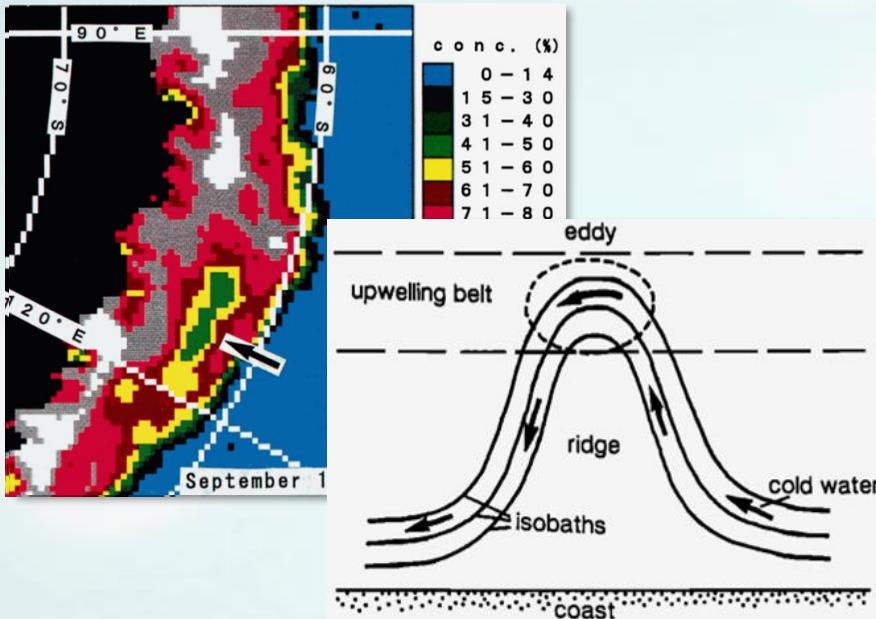
50/200dbar



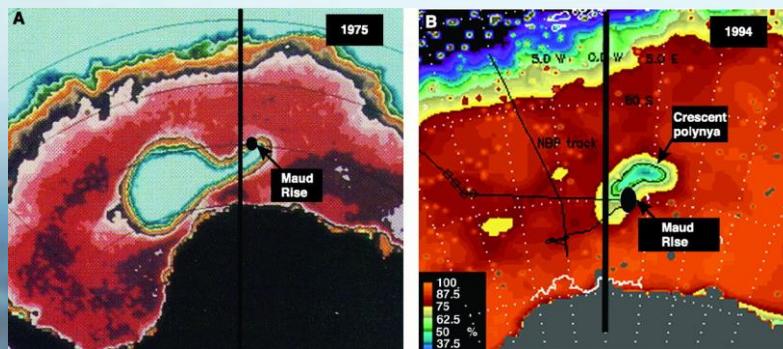
1000/1900dbar



Upwelling and topography

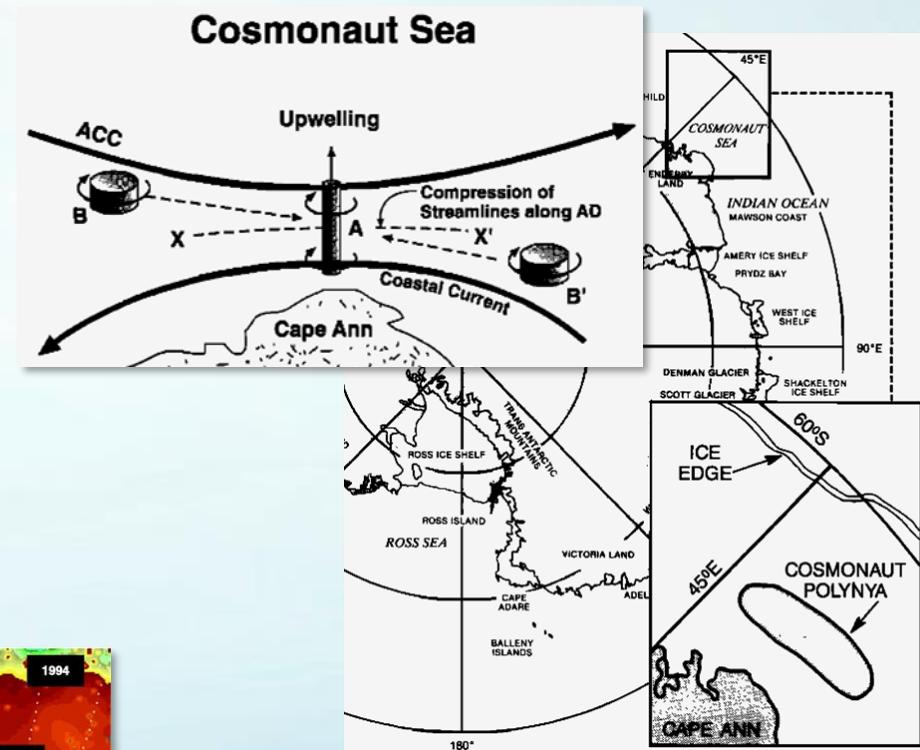


Wakatsuchi et al., 1994

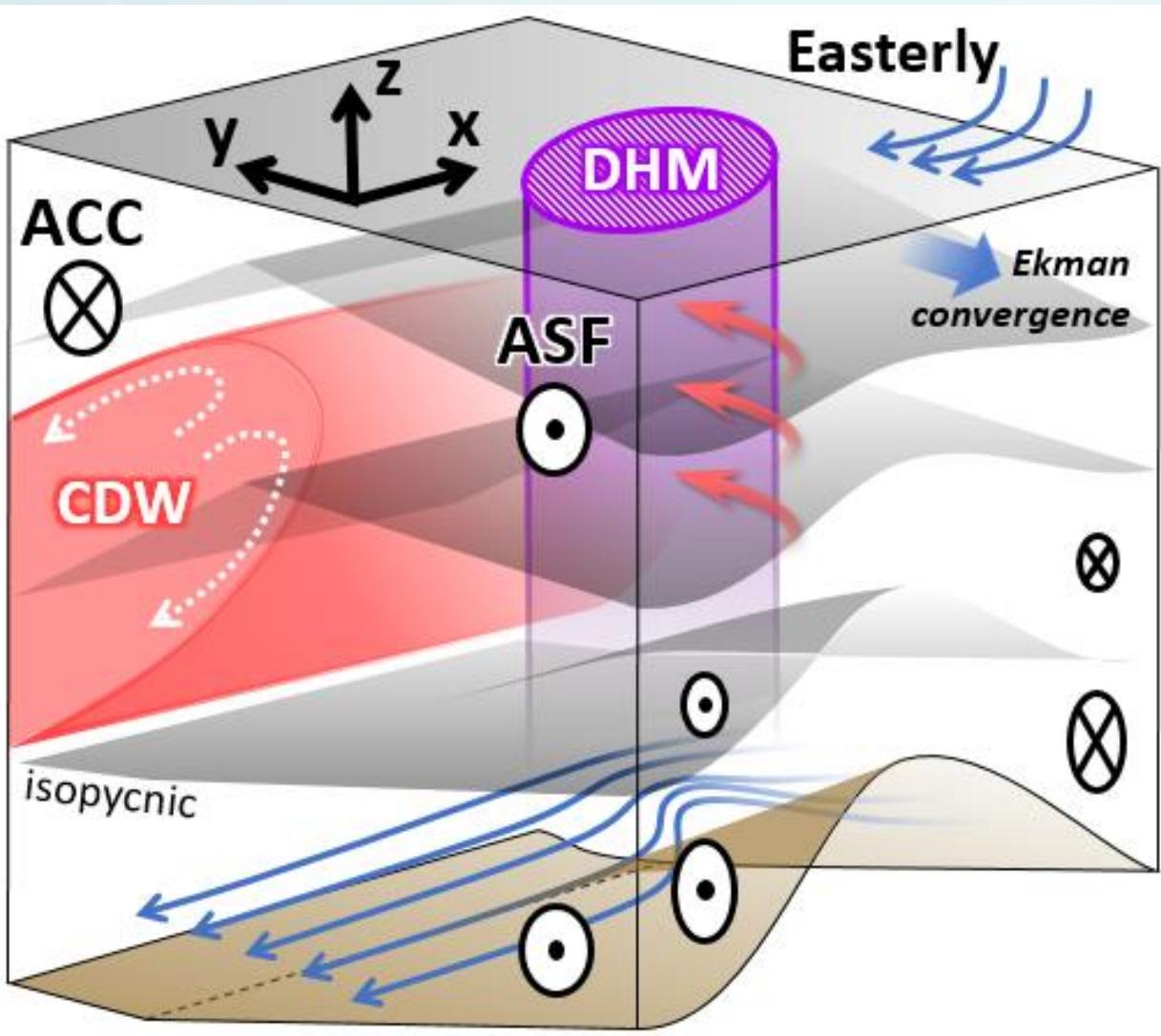


Holland, 2001

Comiso & Gordon, 1996

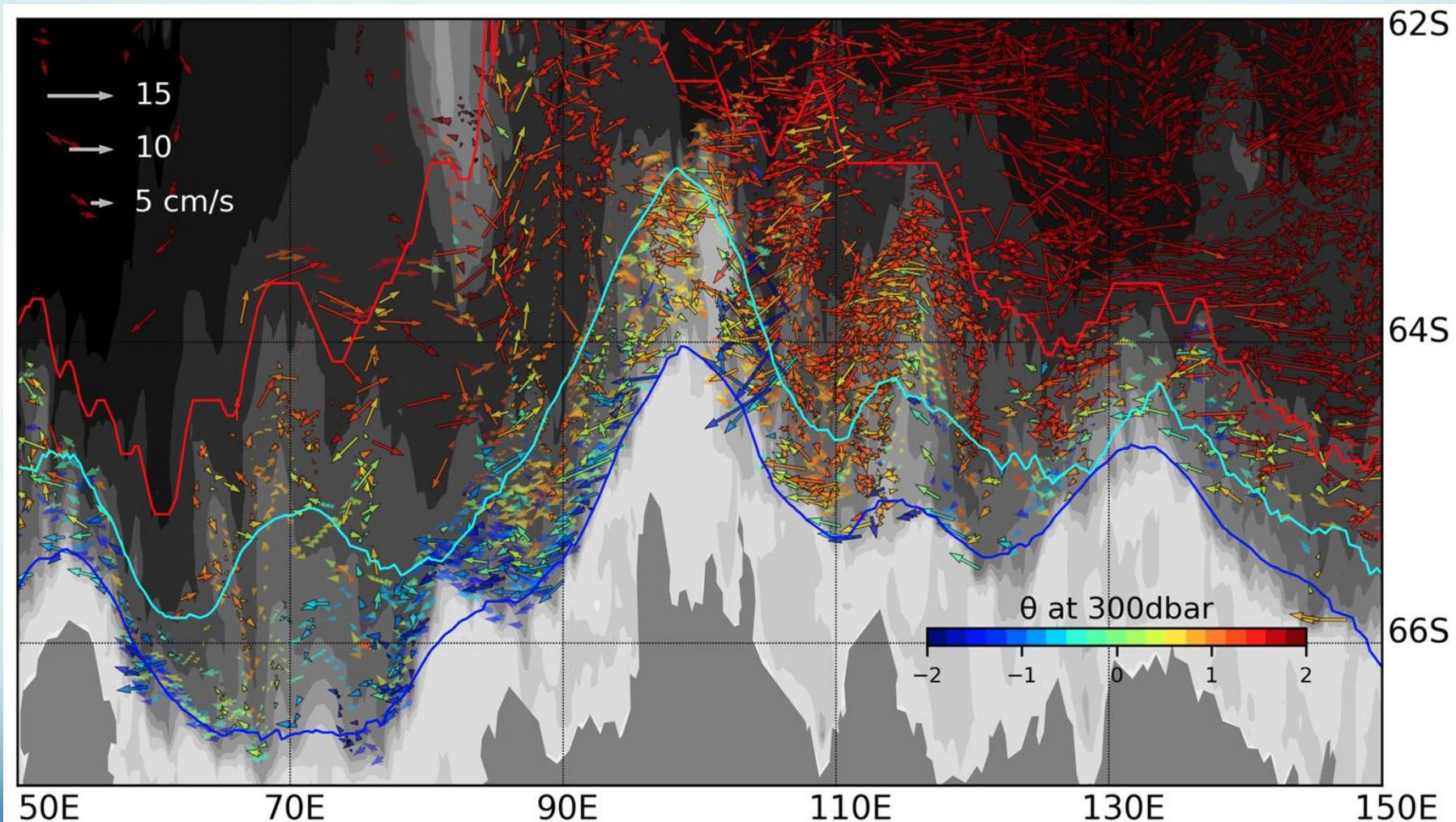


Speculation *DHM supports exchange?*

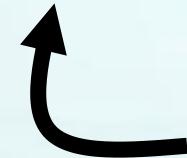
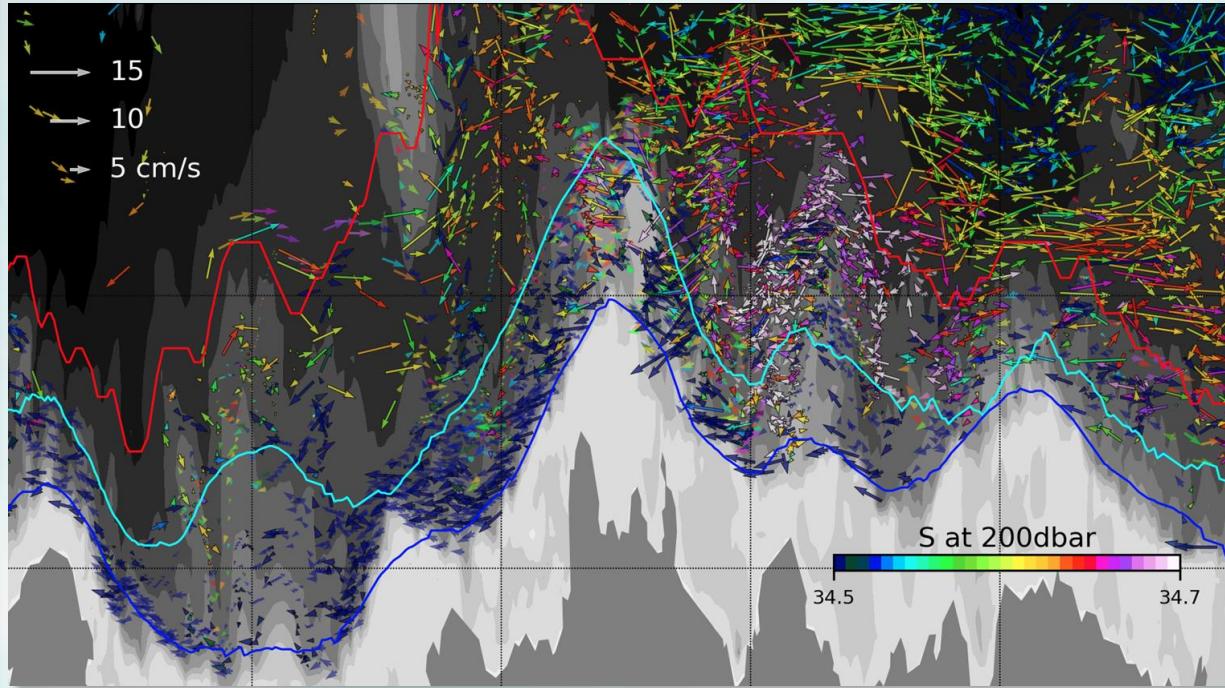


Possible processes are...
surface shoreward
Ekman flow
&
isopycnal lifting
by a ridge
plus,
streamline compression

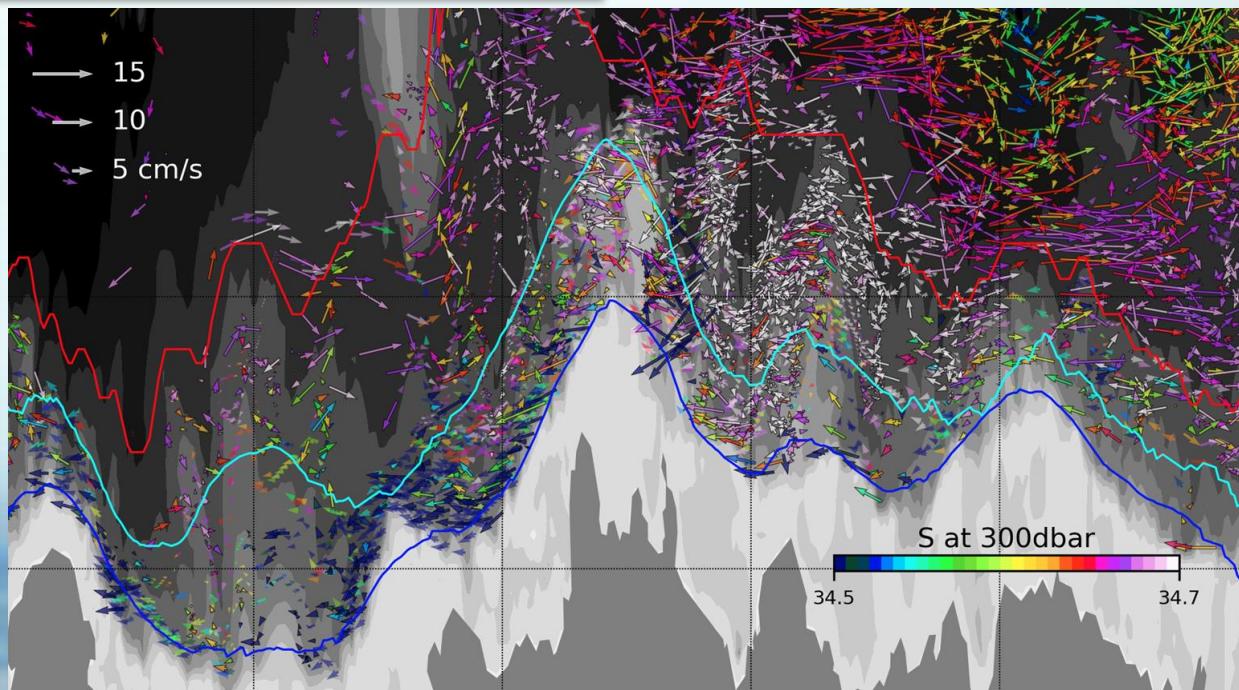
Thermal preconditioning on the shelf break



Salinity



saline
upwelling signal



Summary

- Introduced a method to utilize Argo data under ice
- By taking a ratio of EKE to MKE, forecasted turbulence-dominant region locates between SB and ASF
- Gave rough estimation of ASF velocity on 1000dbar
- Inferred the existence of the gyre-like structure by plotting dynamic height and velocities