Upper ocean circulation in the northwestern South Atlantic

Domingos Urbano
INPE -Brazil

AGU Meeting of the Americas

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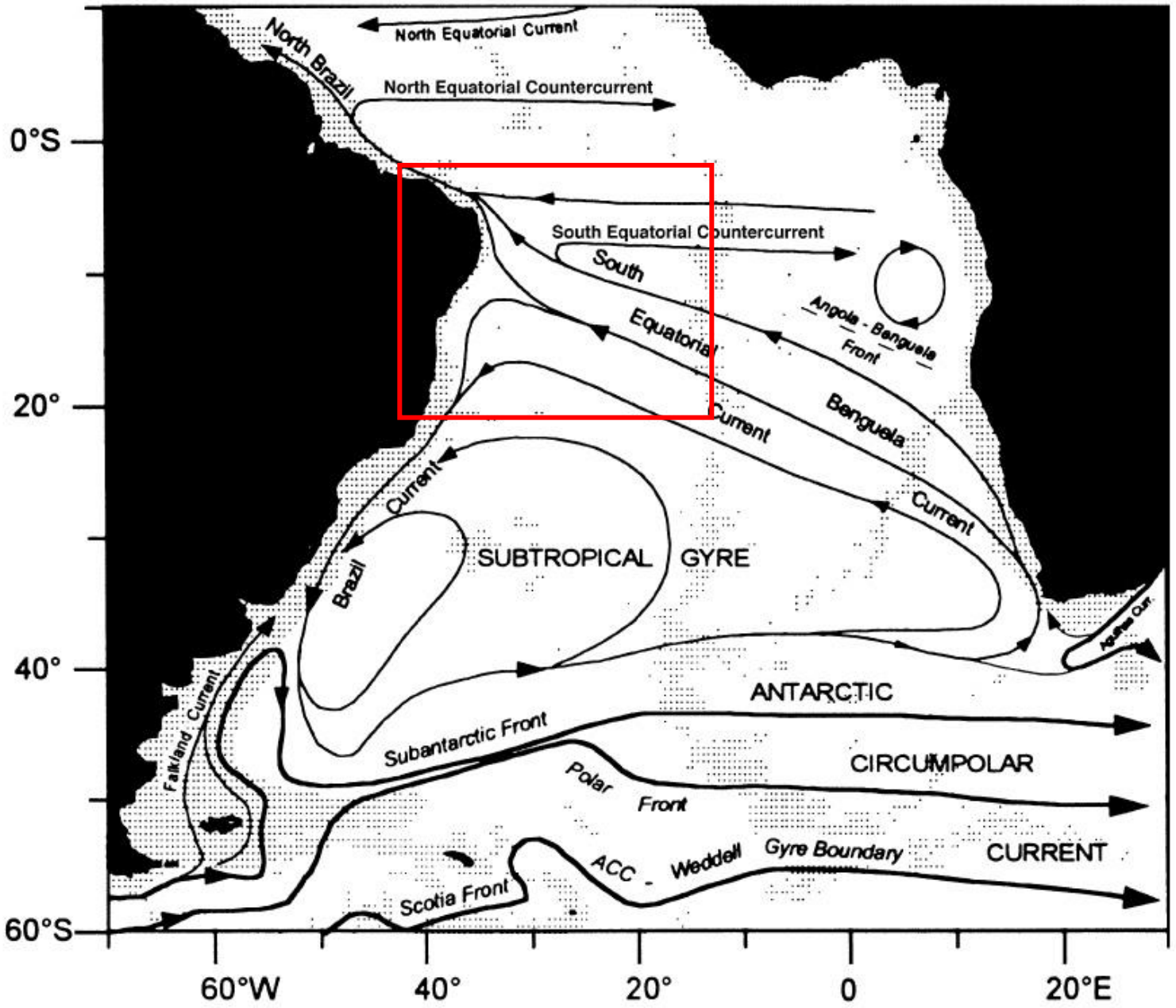
Introduction and motivation

- Most of the knowledge about the ocean circulation in the NW South Atlantic is based on schematic figures derived from geostrophic maps using sparse T/S data (Peterson & Stramma, 1991; Stramma and Schott, 1999)

- Uncertainties on the linkage and variability still remains (mainly south of 11S)

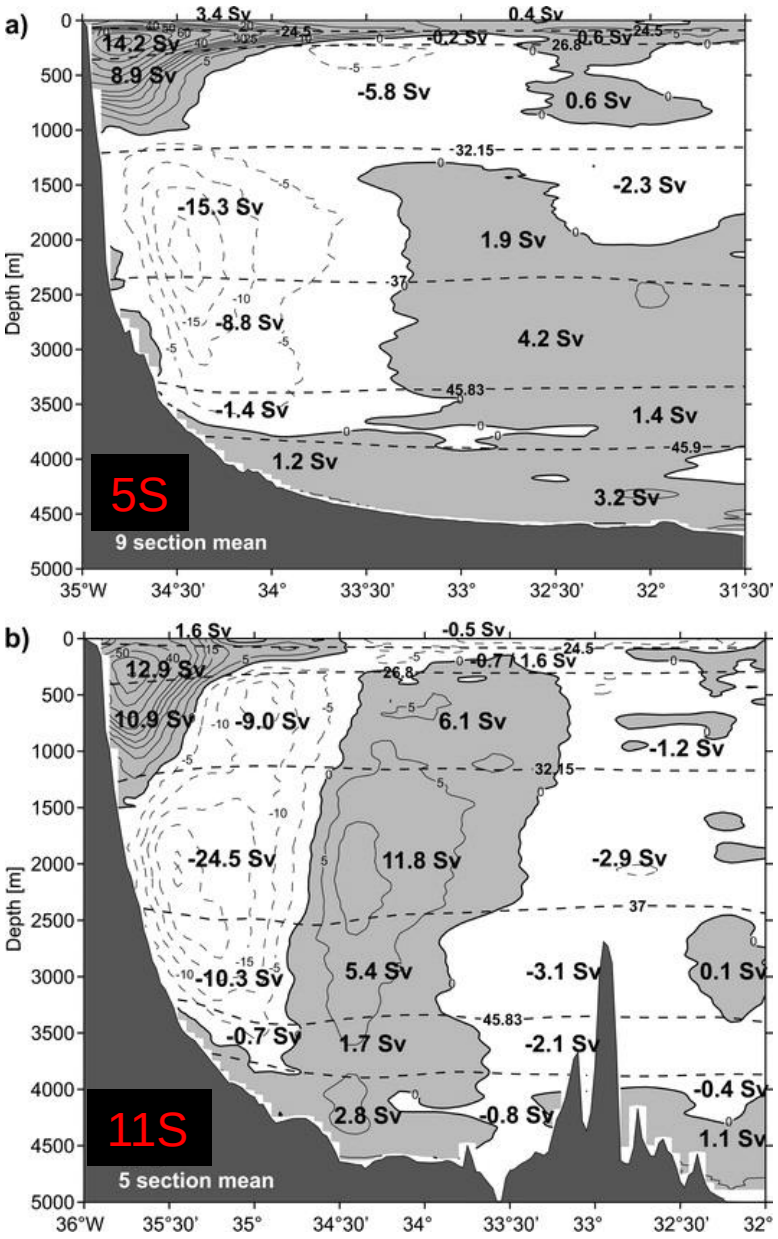
- Direct velocity data from the upper ocean and lower atmosphere is now being collected in the region as part of the PIRATA Program

Peterson & Stramma, 1991



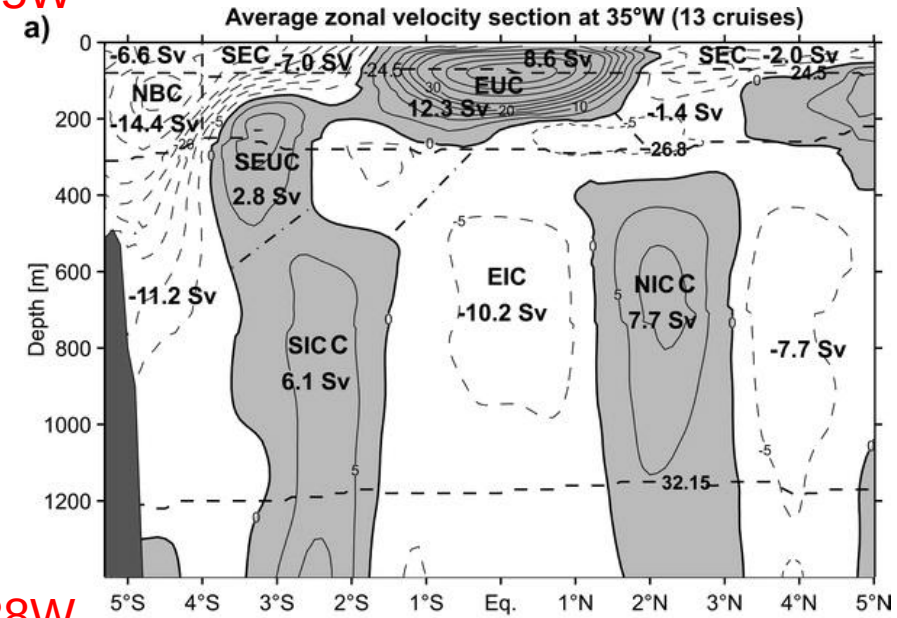
Exception: Schott et al. 2005 [JPO 35(11)]

MERIDIONAL SECTIONS

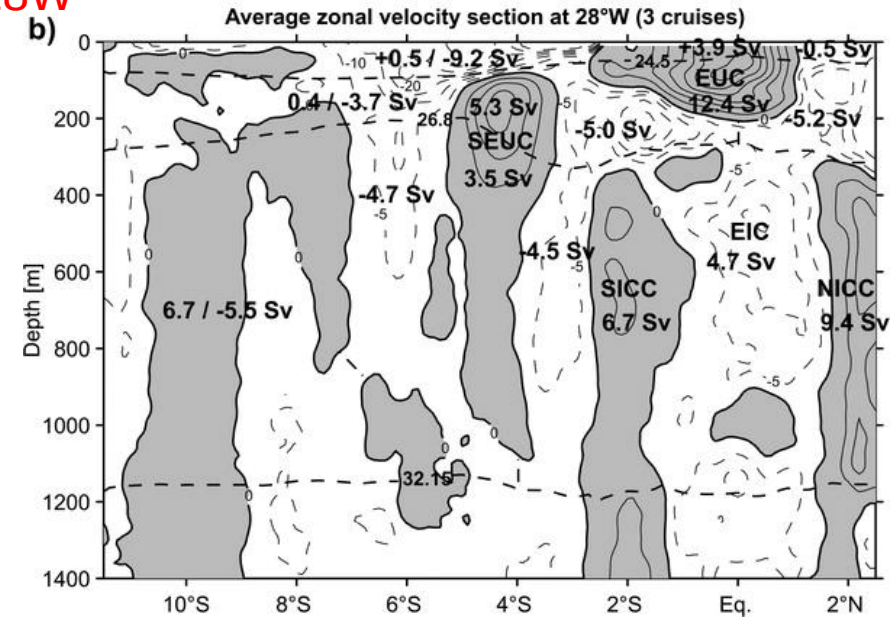


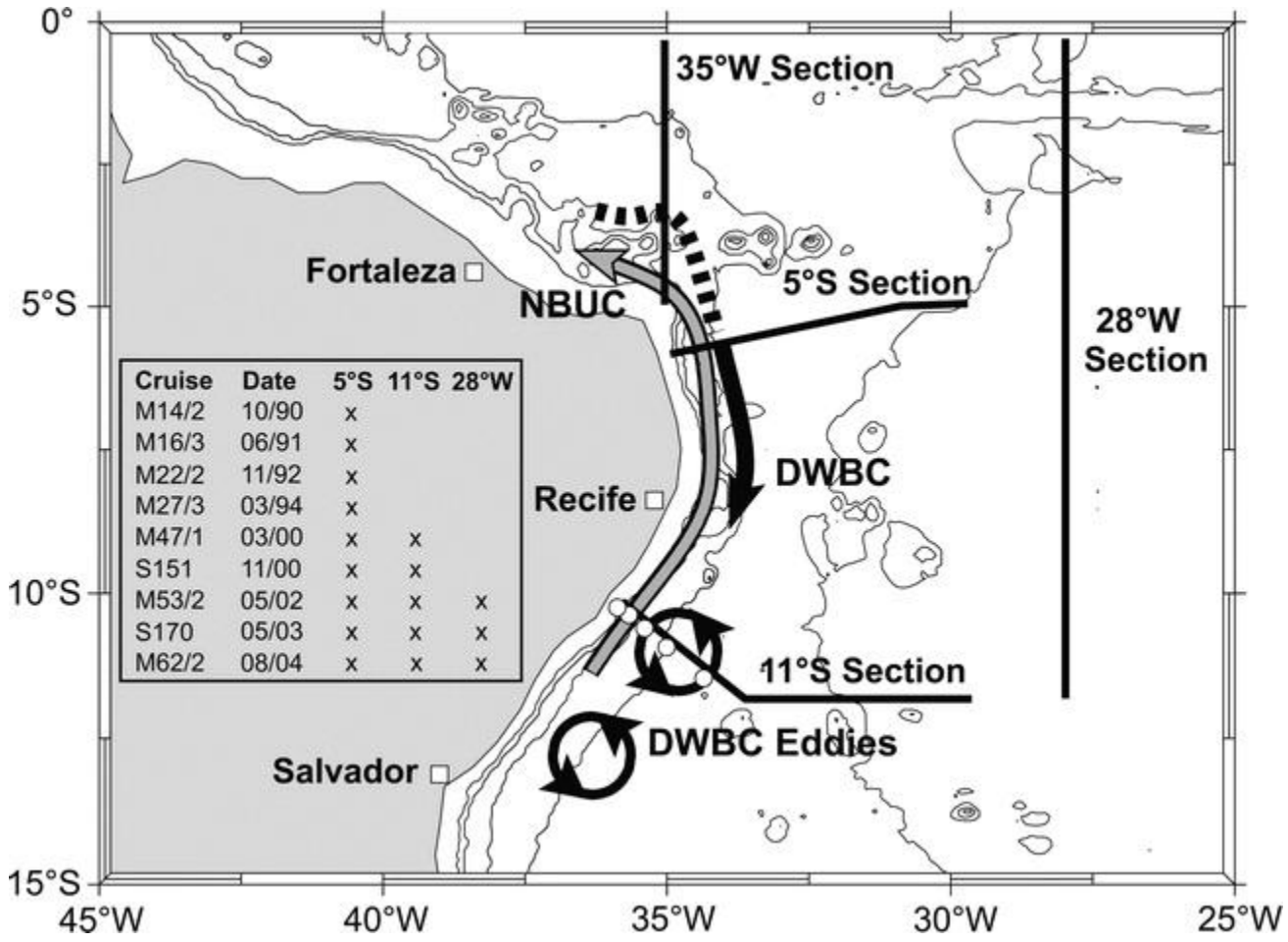
ZONAL SECTIONS

35W



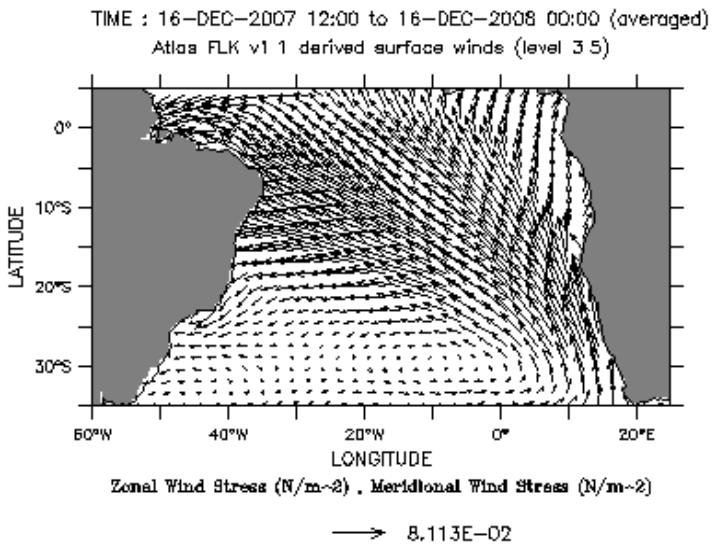
28W

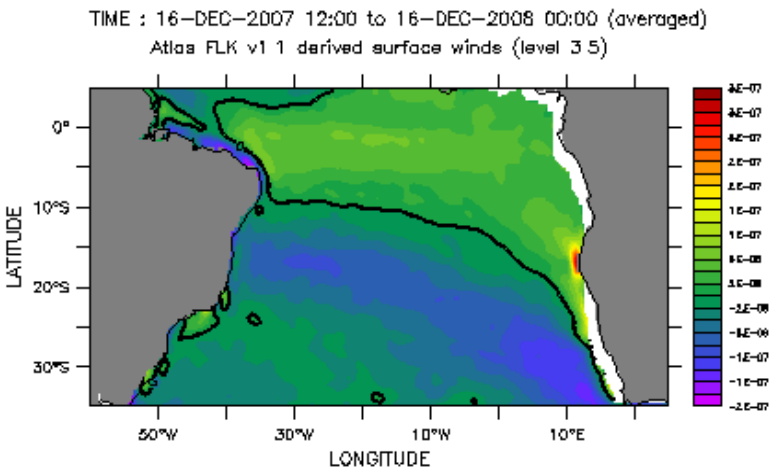


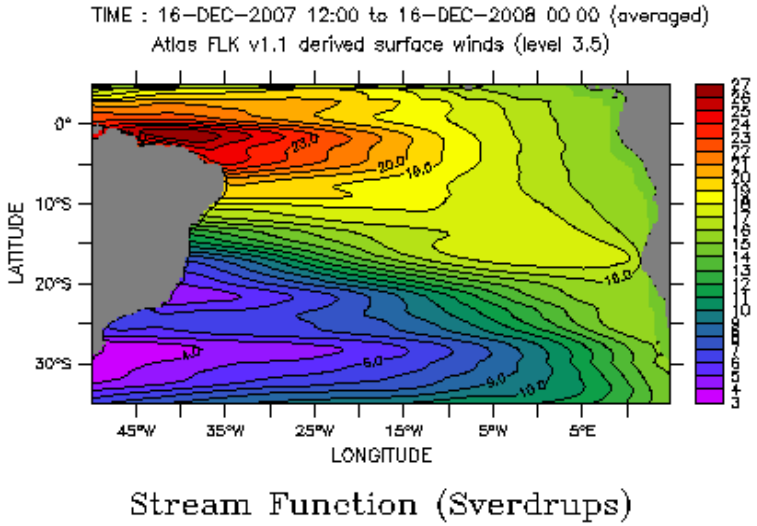


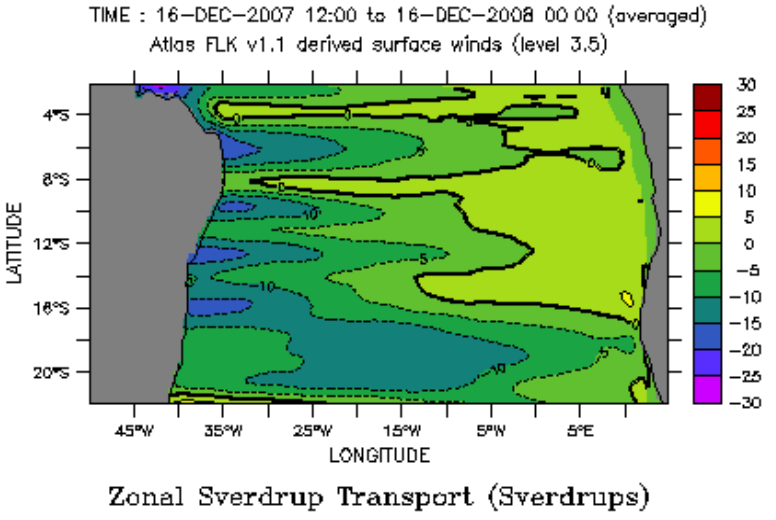
Limited to 11S
No seasonal cycle

Wind Data (CCMP)



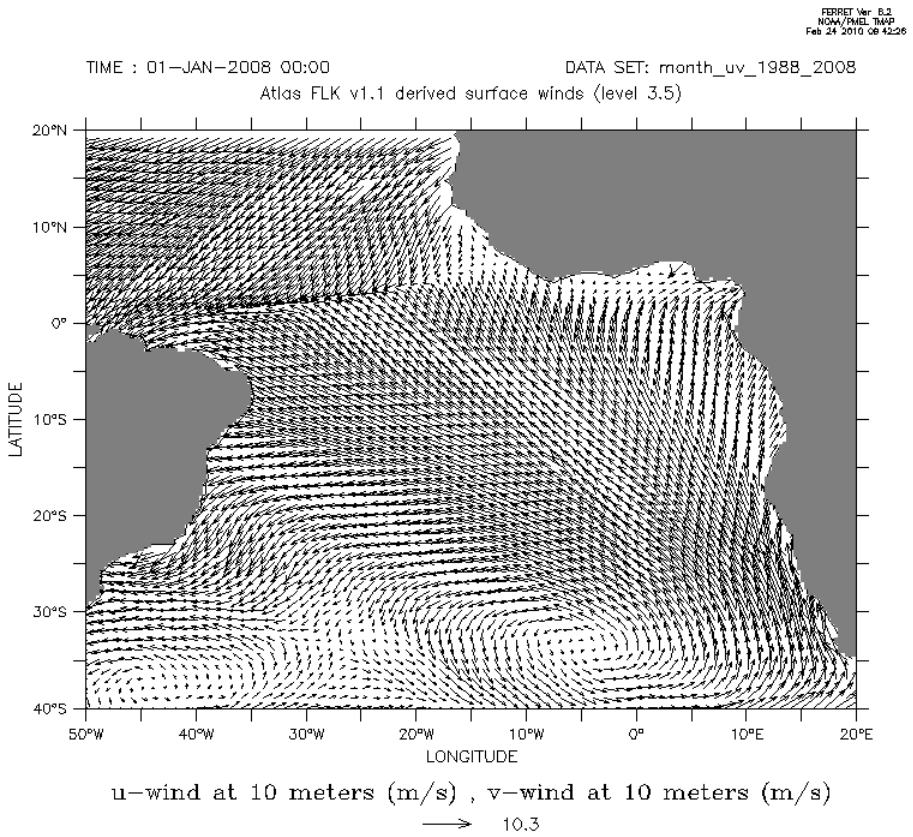


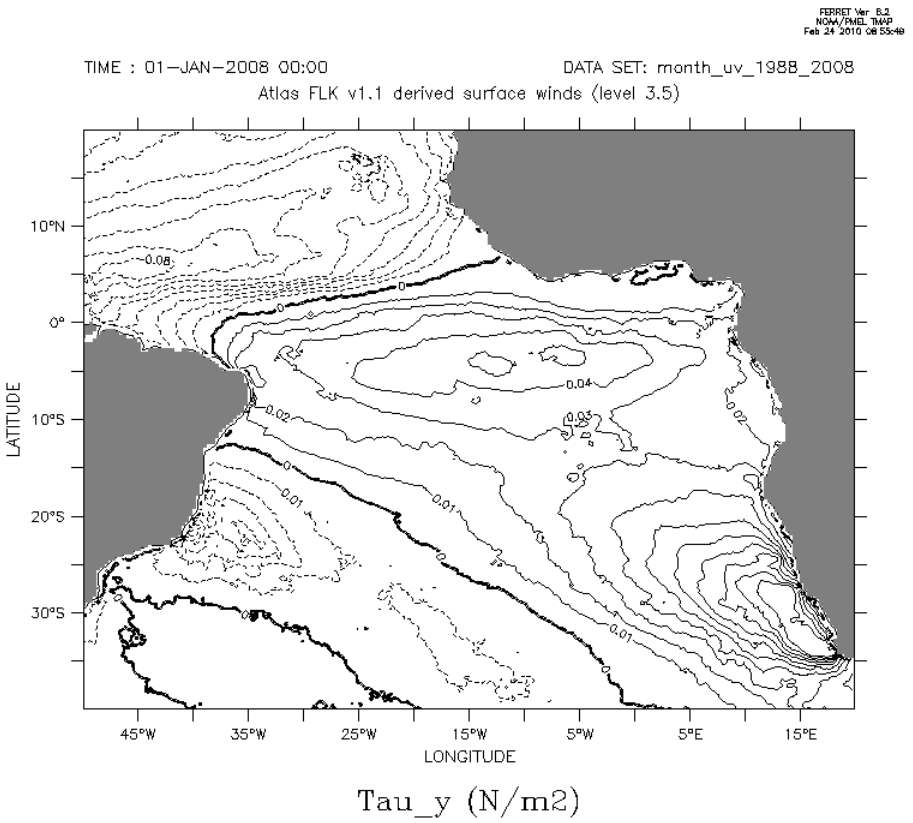




cross-calibrated, multi-platform (CCMP), multi-instrument ocean surface wind velocity data set (http://sivo.gsfc.nasa.gov/oceanwinds)

Wind Data (CCMP)





JAN 2008

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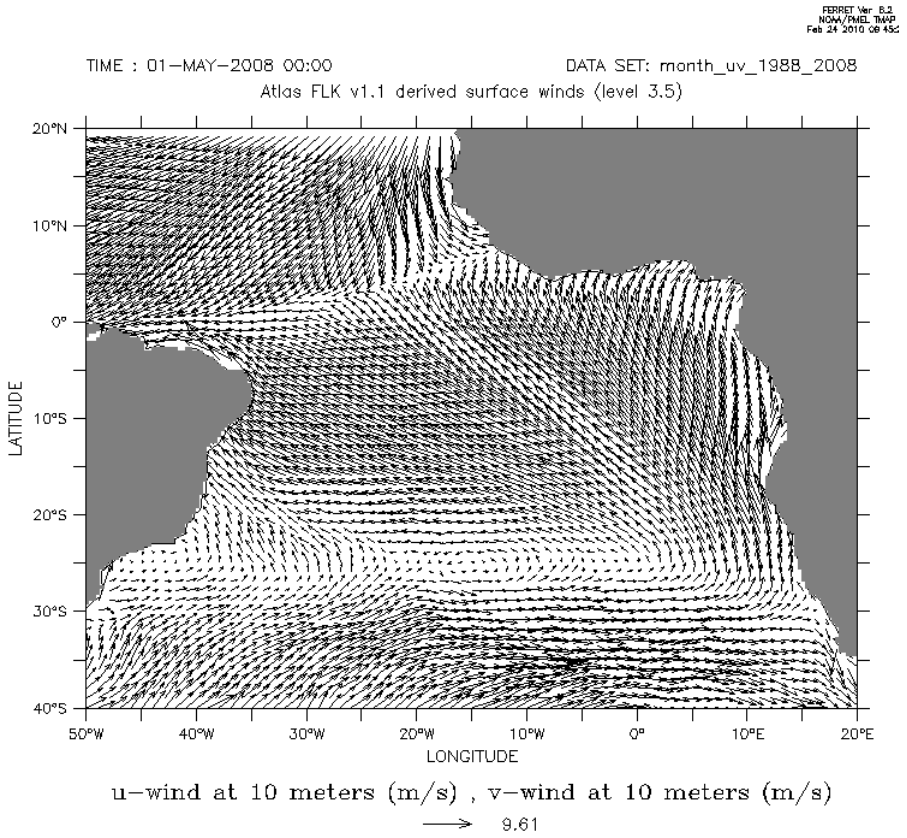

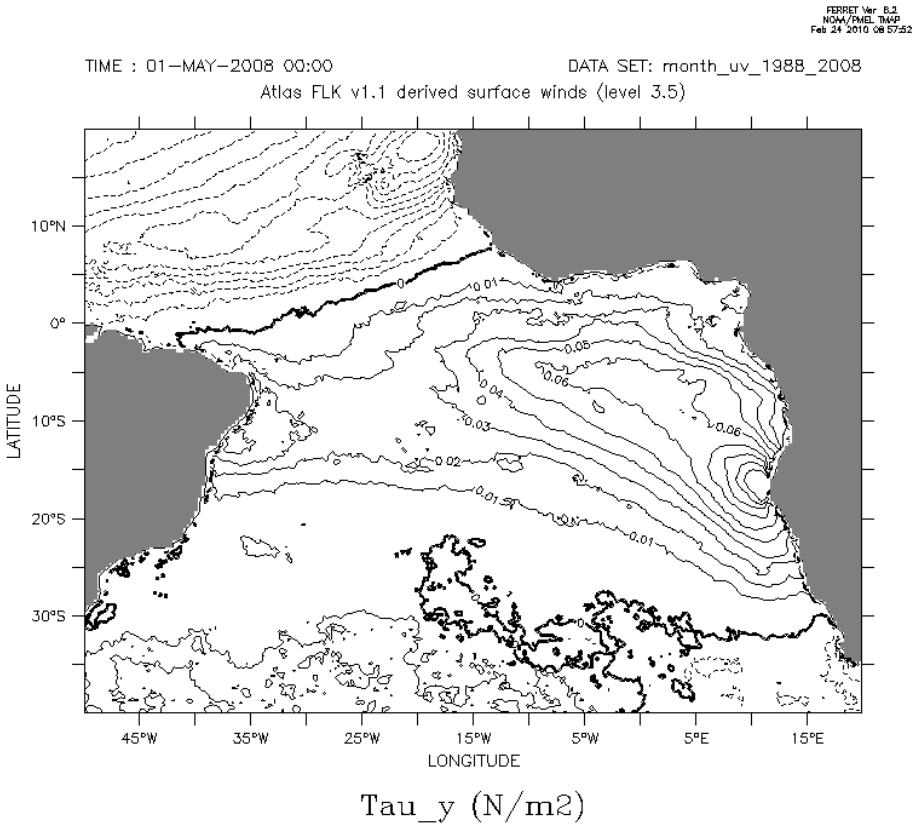

MAY 2008

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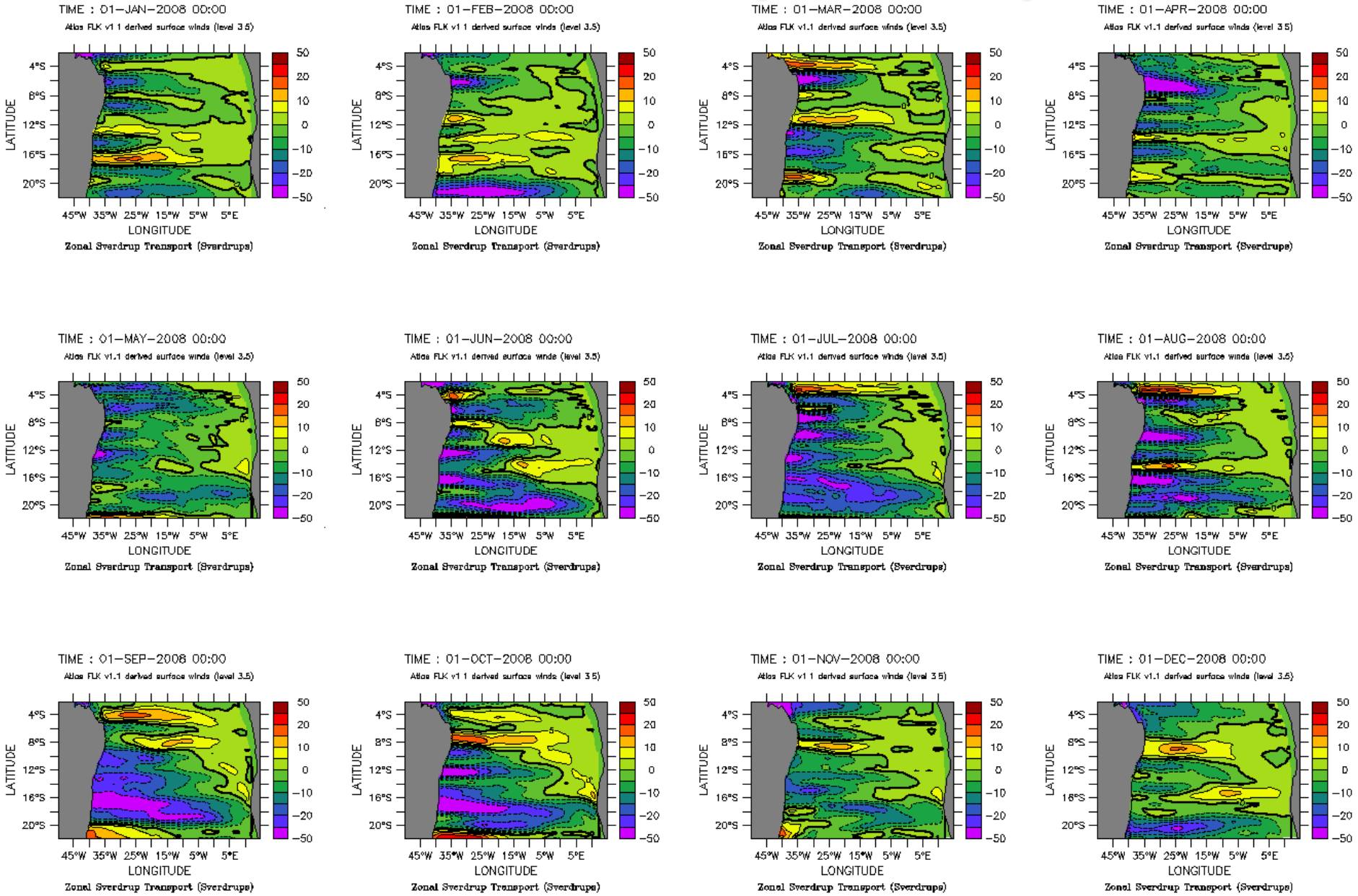

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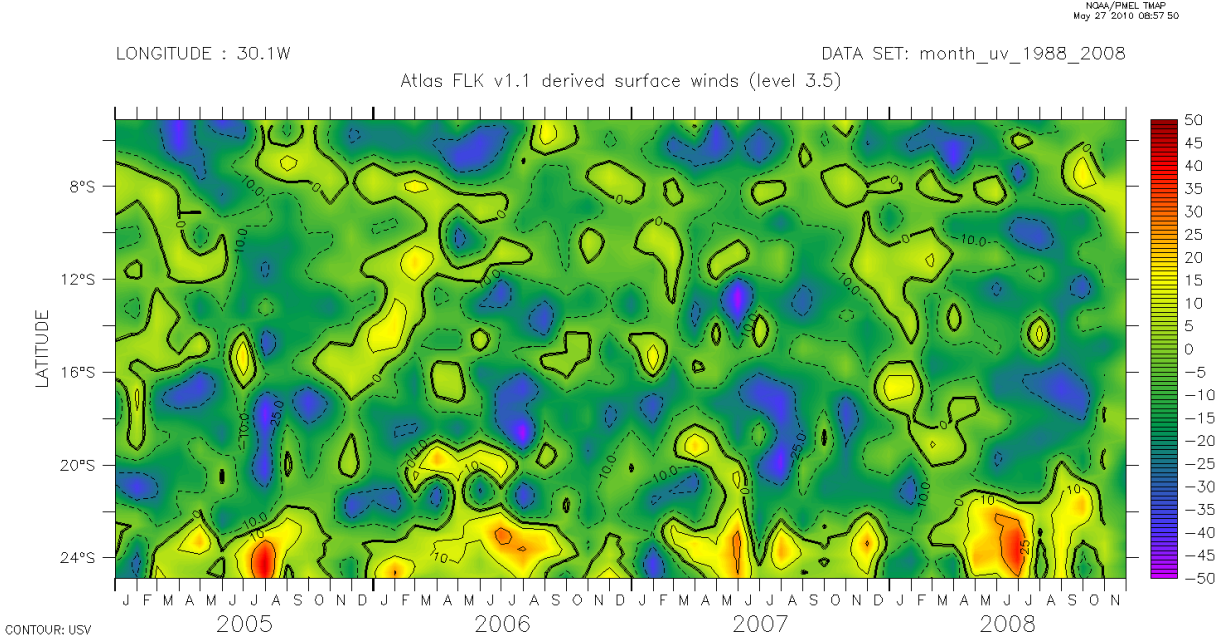
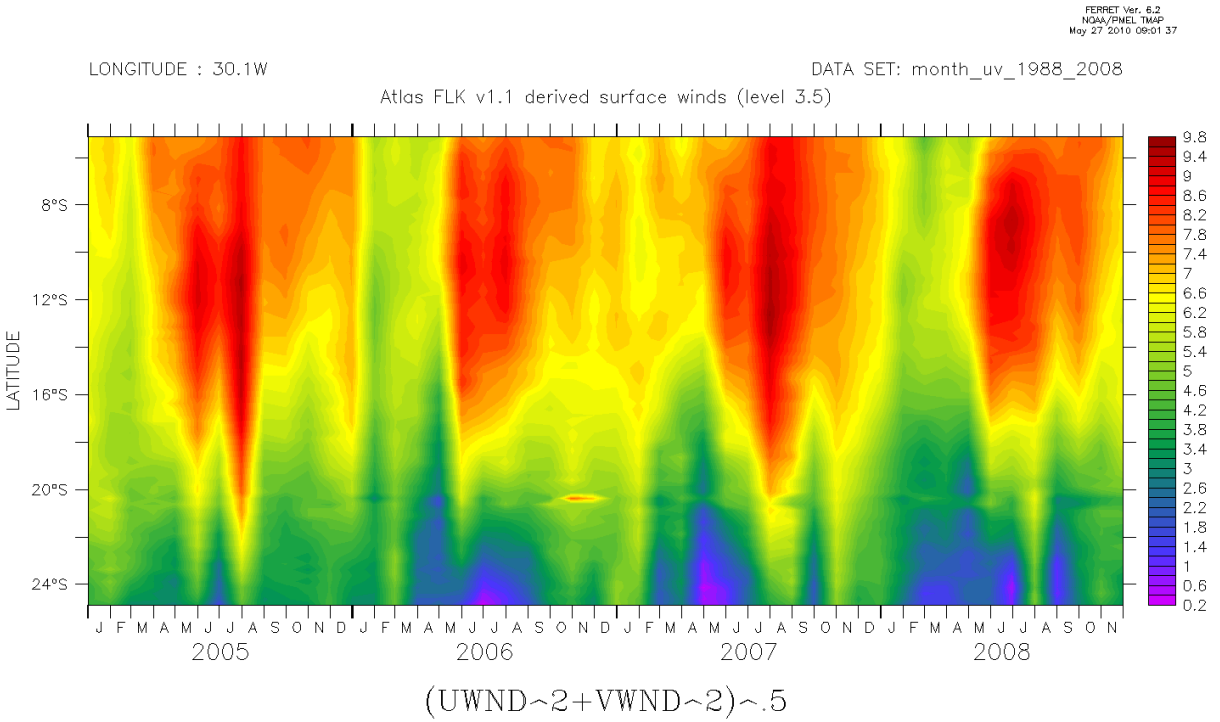


Zonal Sverdrup Transport (Sverdrups)

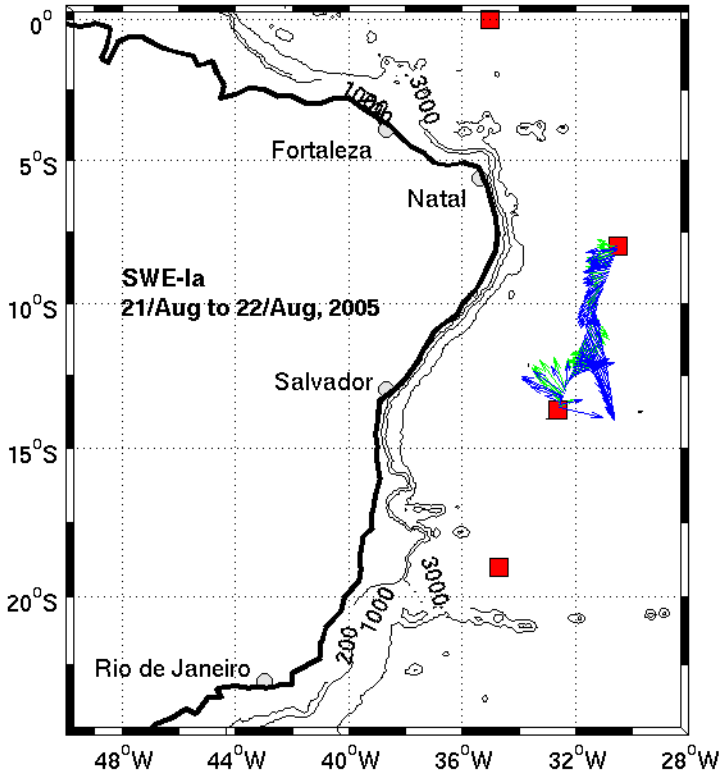


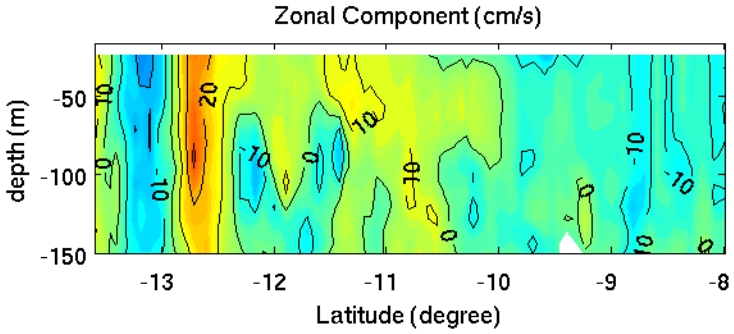
(UWND~2+VWND~2)~.5

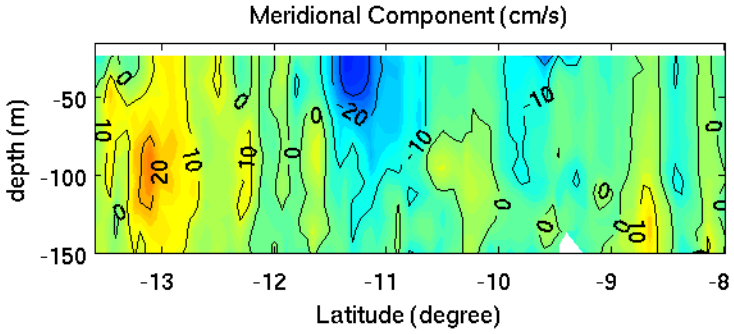
Direct Velocity Data

PIRATA Cruise	Date	Austral Season
SWE-I	Aug 2005	Winter
SWE-II	Nov 2007	Spring
SWE-III	Apr/May 2008	Fall
SWE-IV	Mar 2009	late Summer
SWE-IV	Nov 2009	Spring

Direct Velocity Data





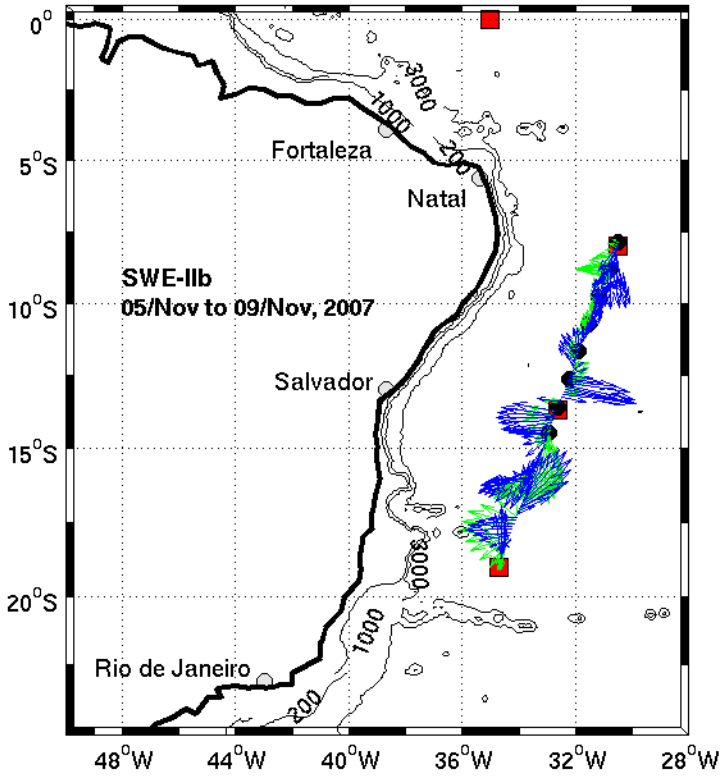


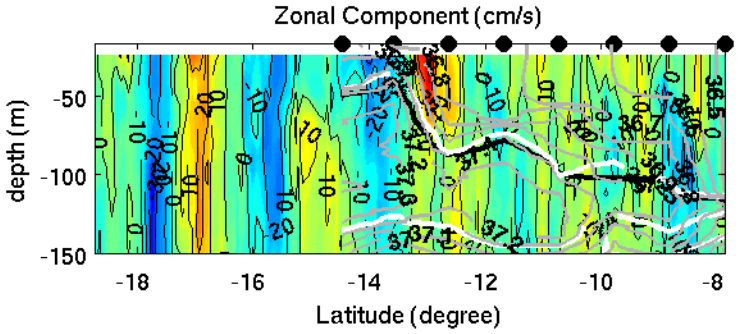
16 - 48 m

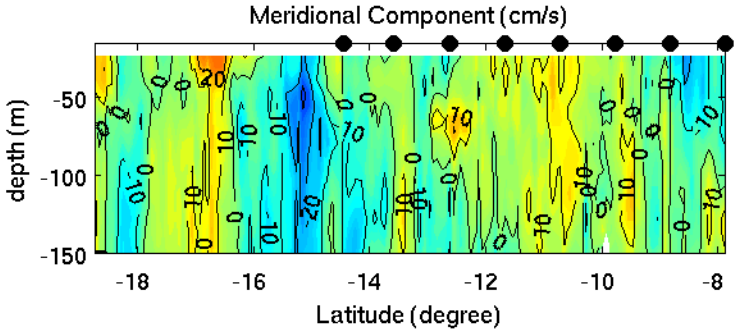
56 -152 m

ATLAS

Direct Velocity Data







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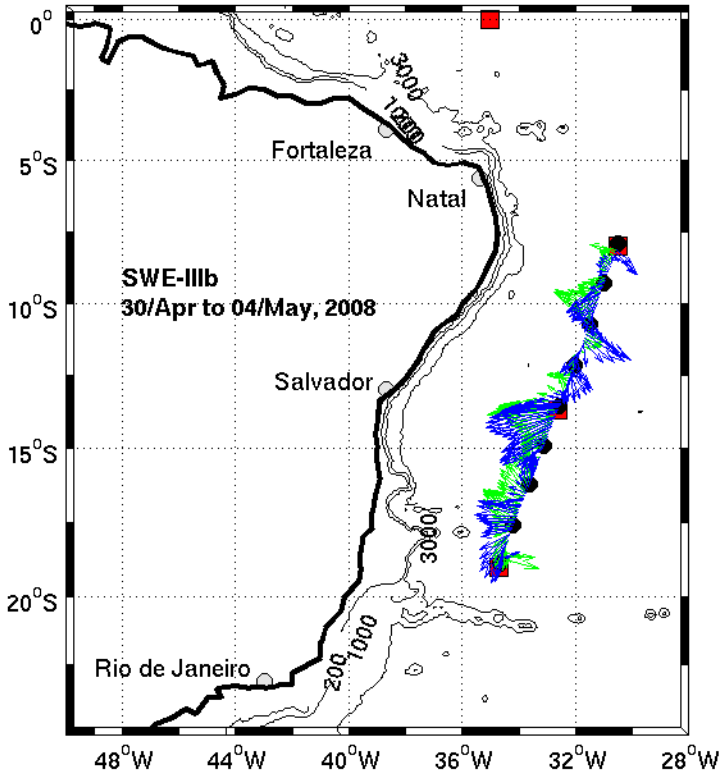
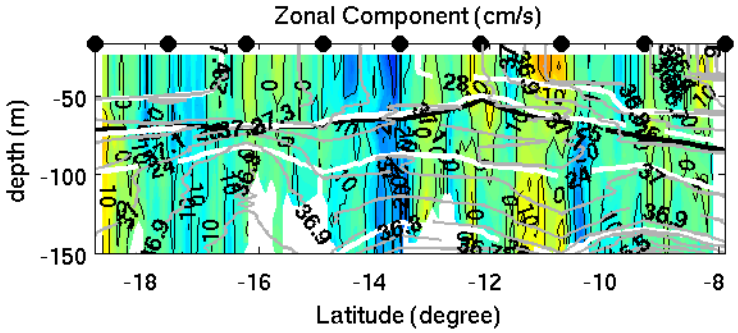
56 -152 m

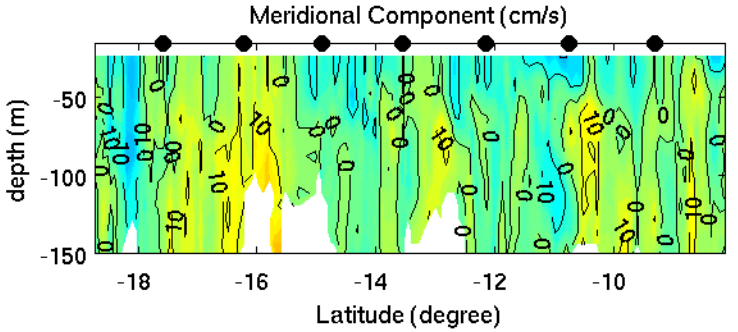
ATLAS

CTD

Direct Velocity Data







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ATLAS

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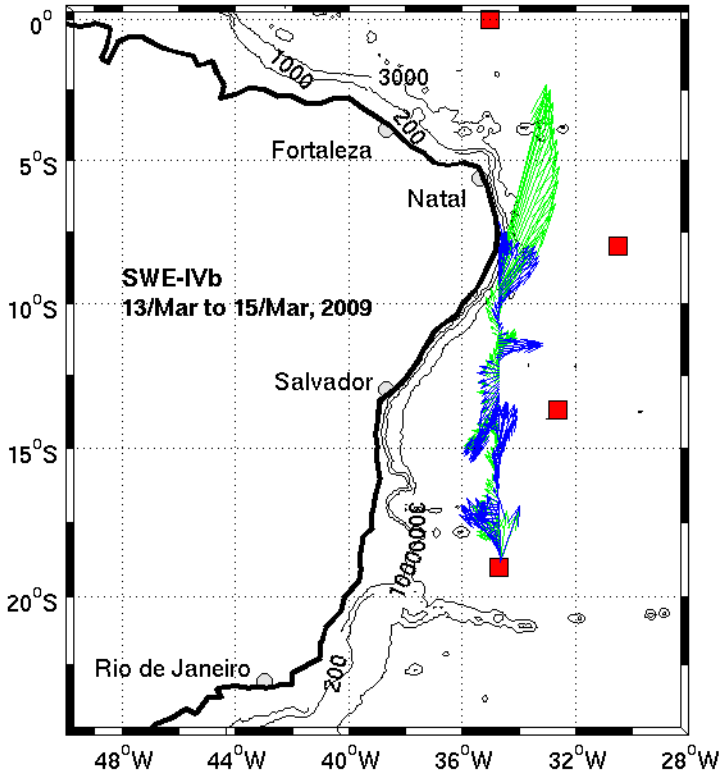

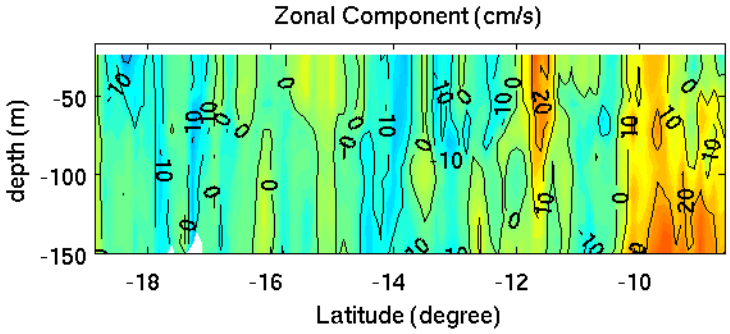

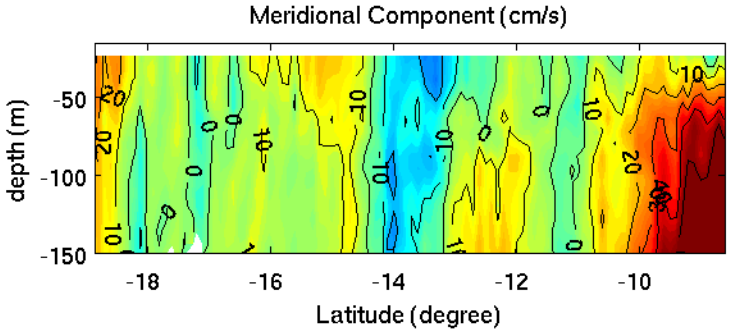

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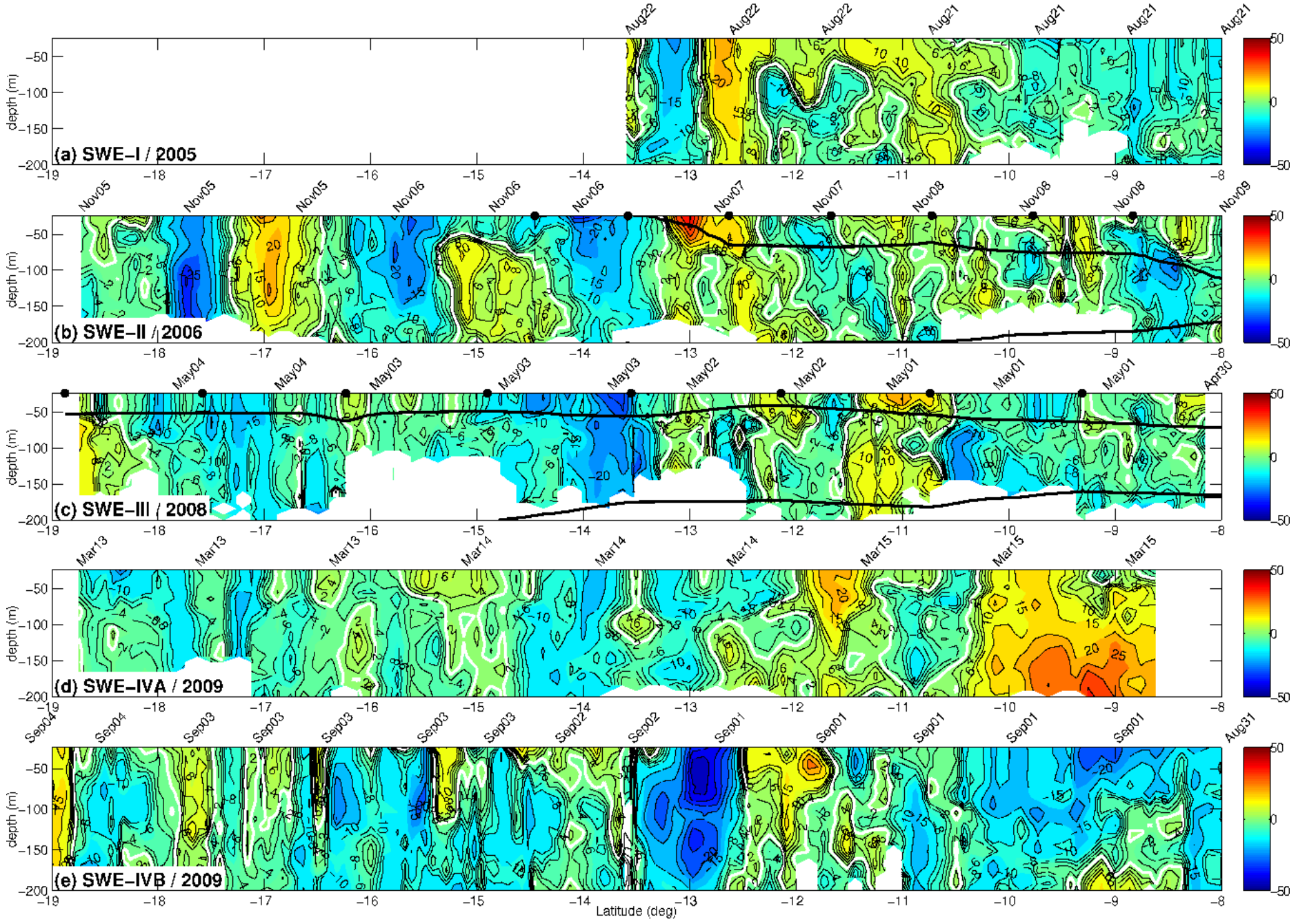
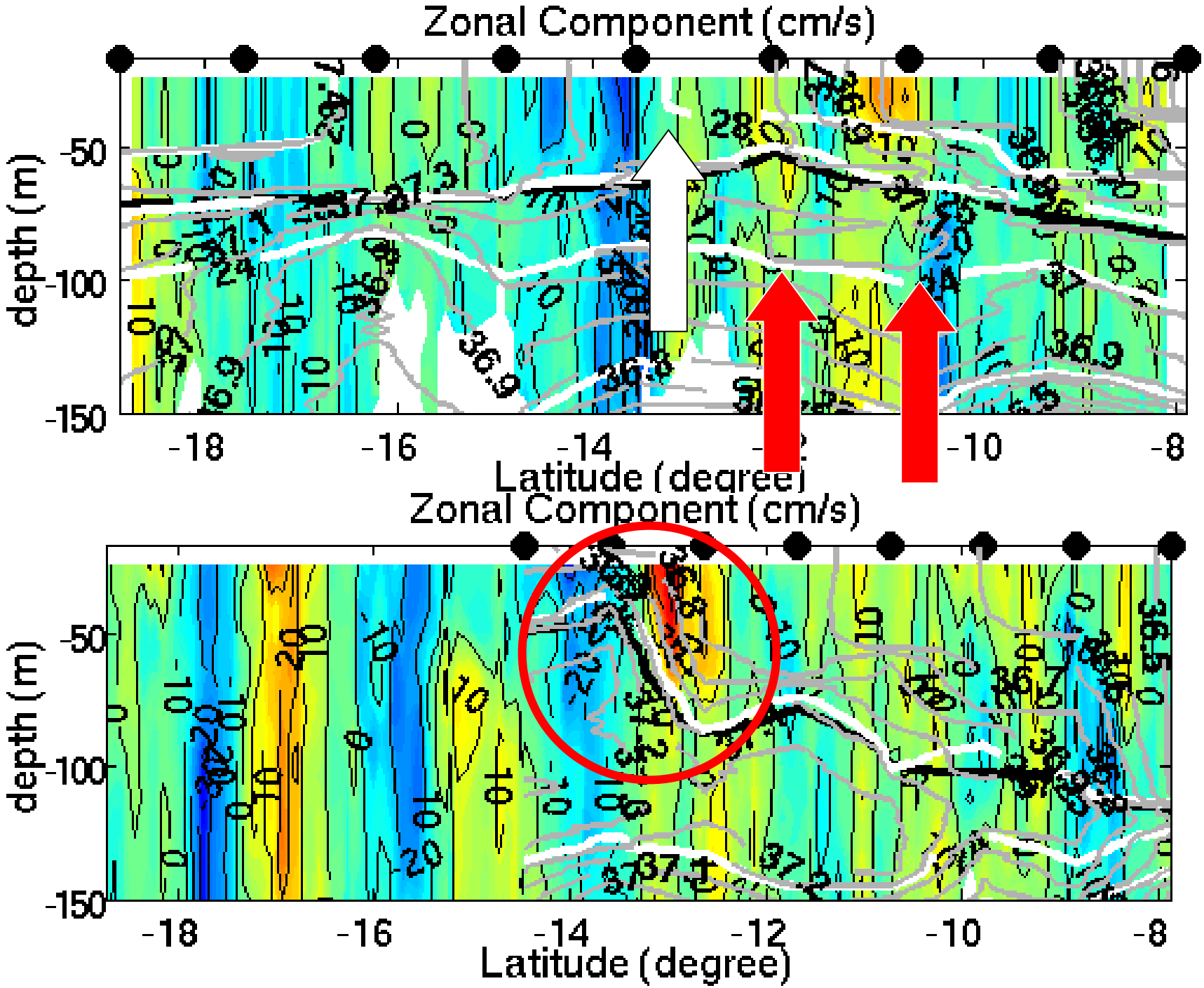
ATLAS

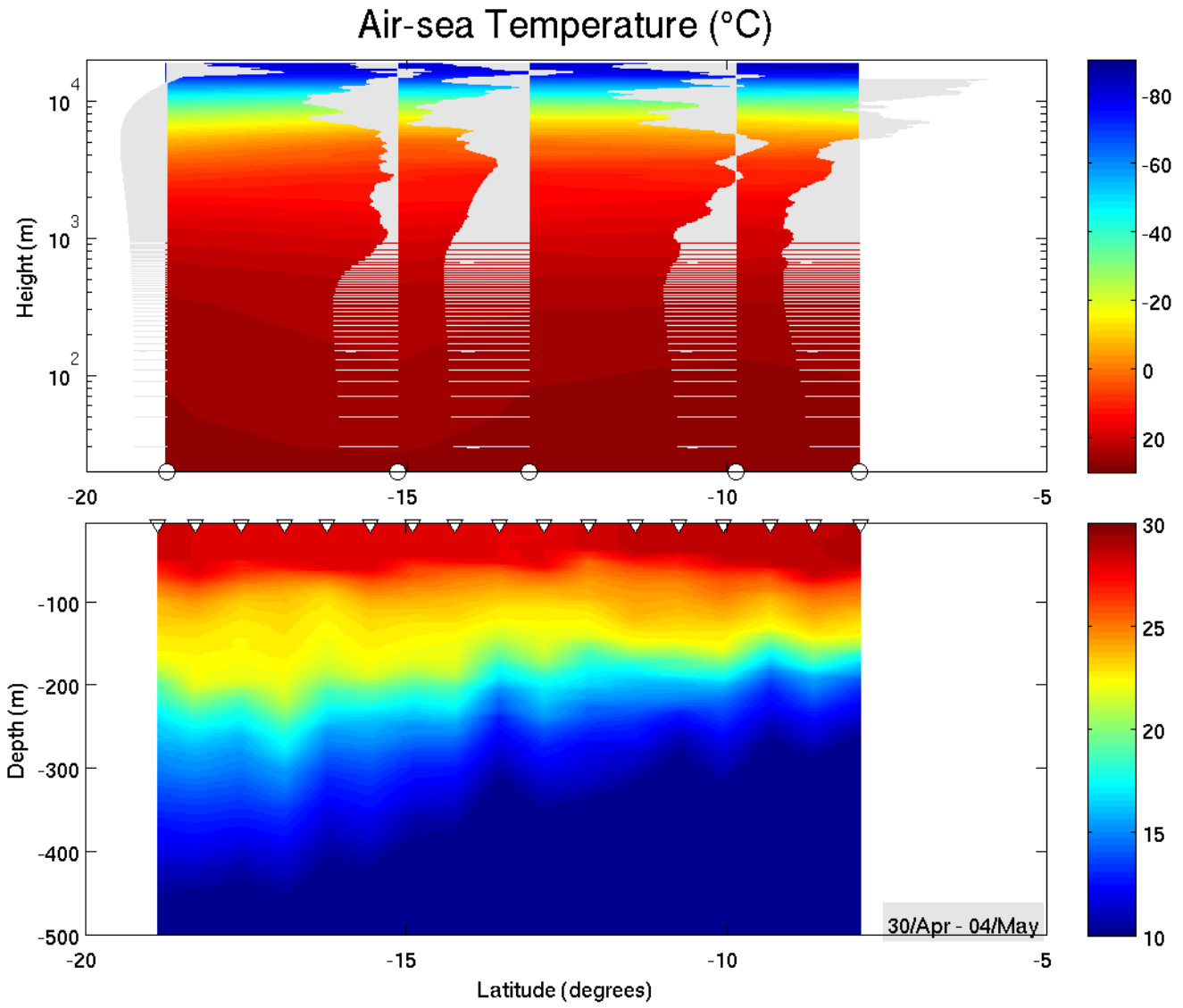

(a) SWE–I / 2005
(b) SWE–II / 2006
(c) SWE–III / 2008
(d) SWE–IVA / 2009
(e) SWE–IVB / 2009
depth (m)
Latitude (deg)

FALL 2008

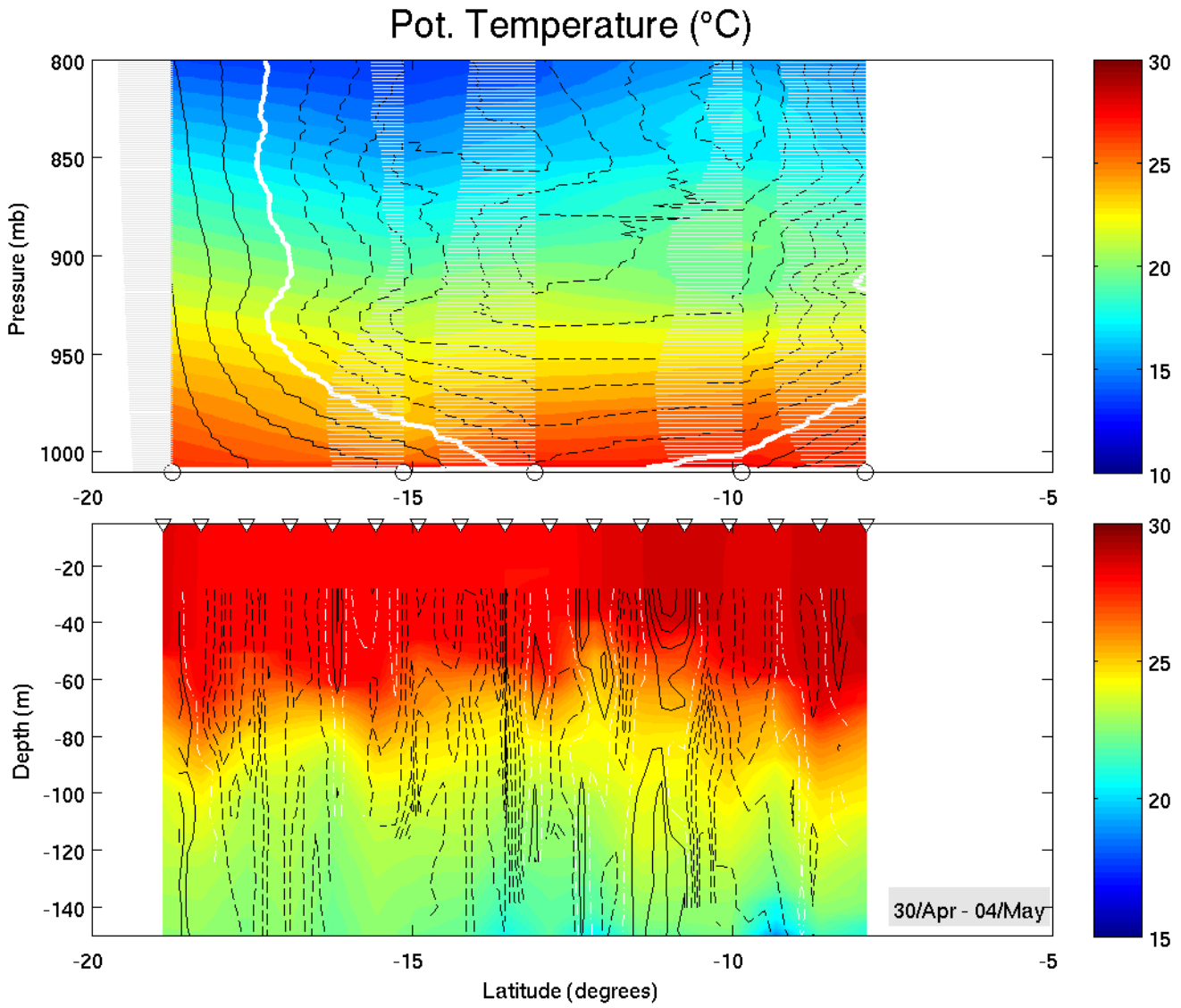
SPRING 2007



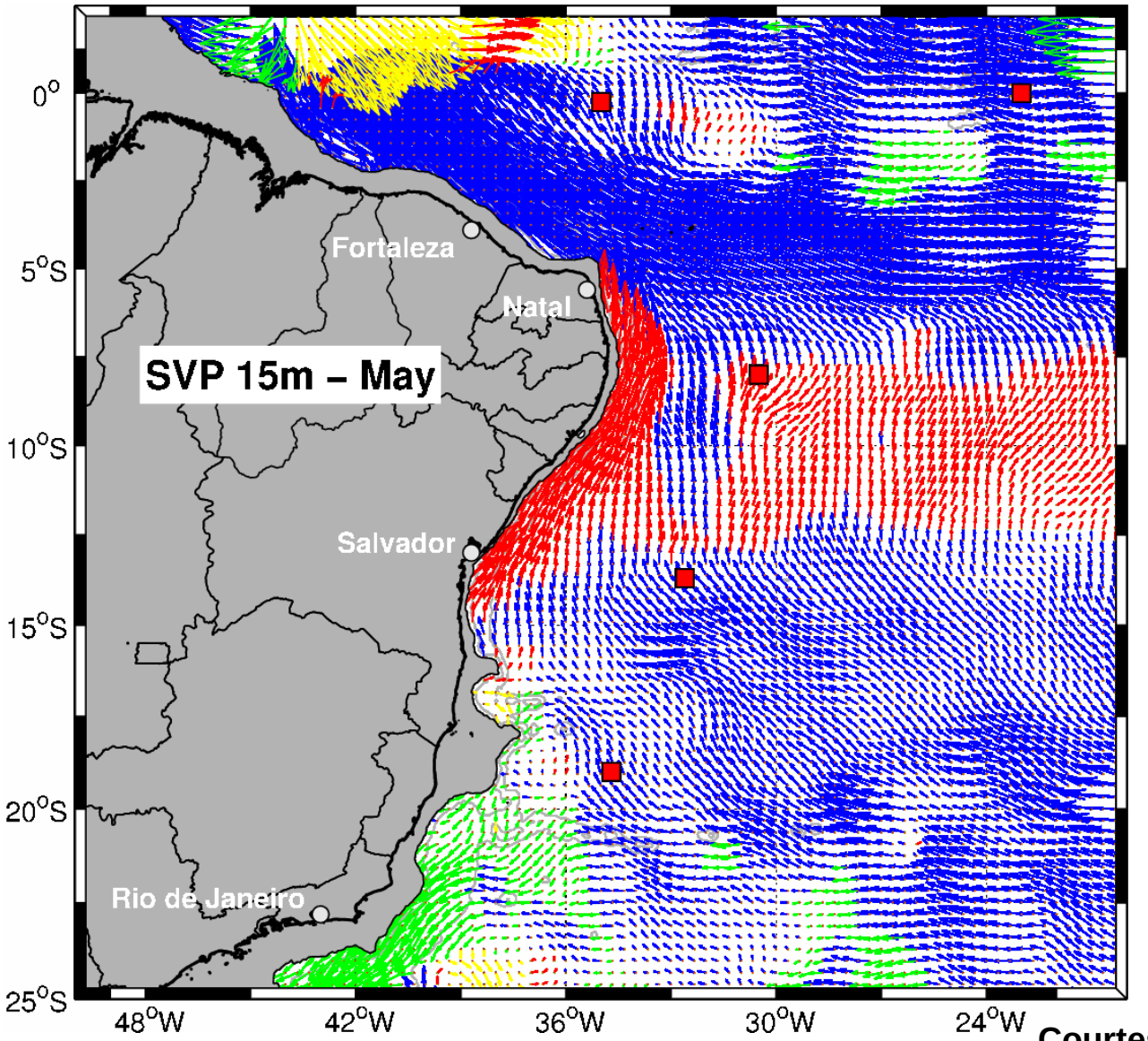
Direct Velocity Data - OA



Direct Velocity Data - OA

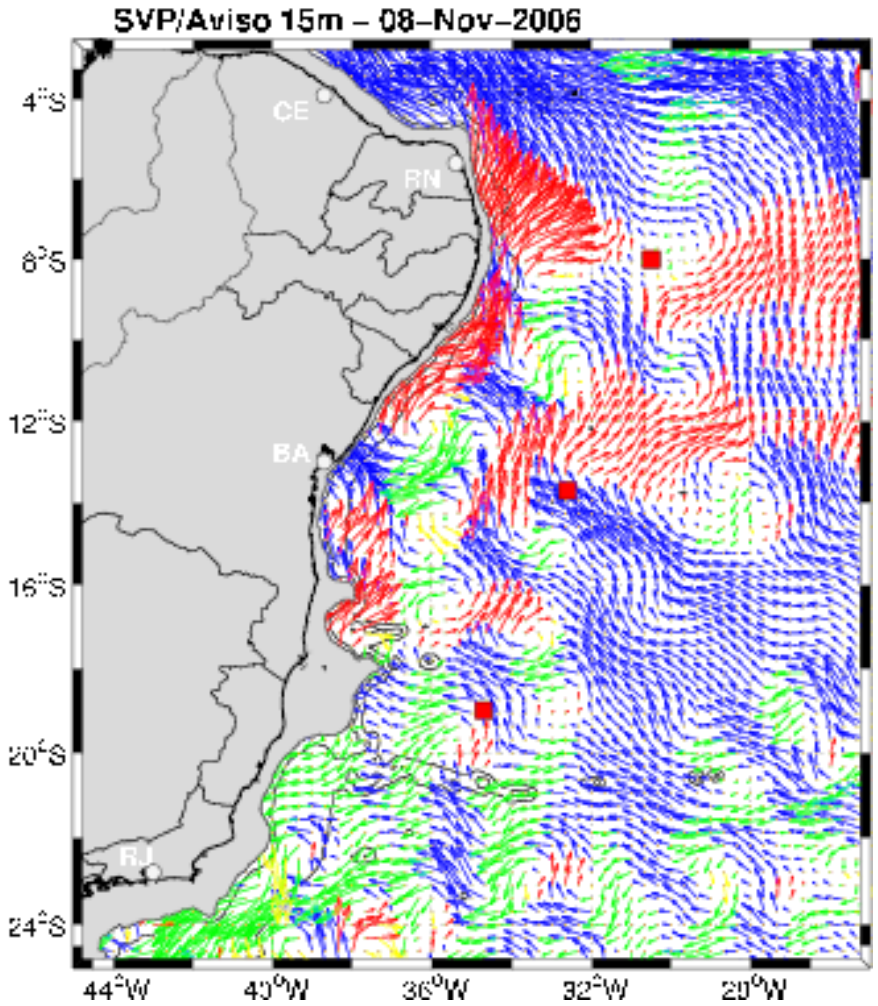


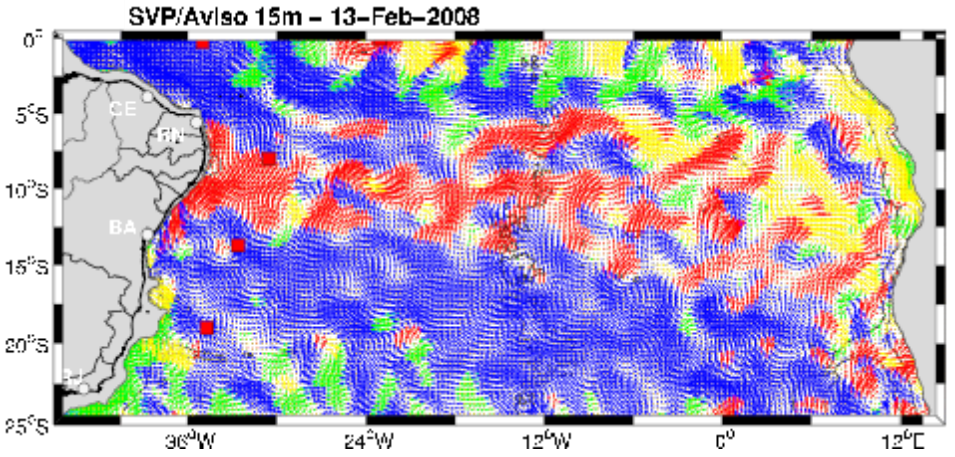
SVP Data

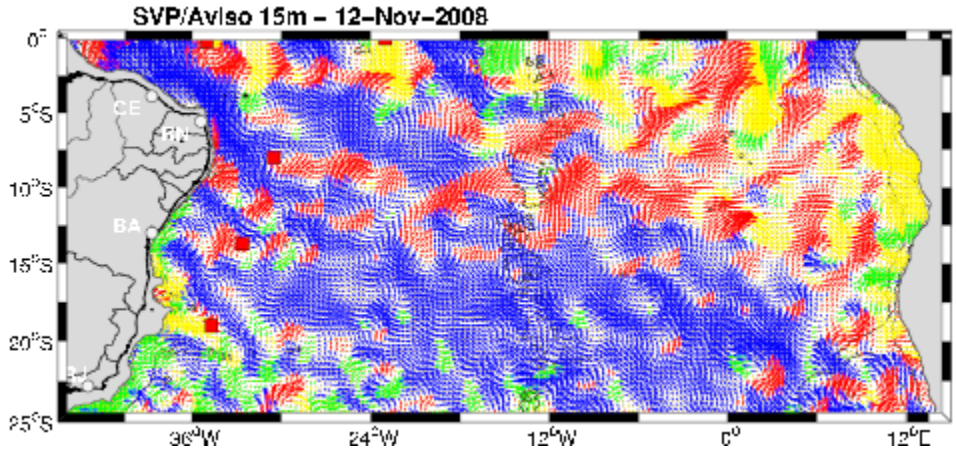


Courtesy of Rick Lumpkin

SVP Data


SVP/Aviso 15m – 08–Nov–2006
CE
RN
BA
RJ
4°S
8°S
12°S
16°S
20°S
24°S
44°W
40°W
36°W
32°W
28°W


SVP/Aviso 15m – 13–Feb–2008
CE
RN
BA
RJ
0°
5°S
10°S
15°S
20°S
25°S
36°W
24°W
12°W
0°
12°E


SVP/Aviso 15m – 12–Nov–2008
CE
RN
BA
RJ
0°
5°S
10°S
15°S
20°S
25°S
36°W
24°W
12°W
0°
12°E

Final remarks

- Direct velocity data from the upper ocean (lower atmosphere), as part of the PIRATA Program, show intense eastward flow.
- Waters from the SA NBC leave the coast to feed the SECC at 10 -14 S. This current presents double core with complex interannual variability and strong meso-scale eddy activity superimposed.
- An subsurface eastward undercurrent apears in the second half of the calendar year south of 14S.
- The seasonal cycle presents a sharp change in May, with no zero line windstress curl from May to August.
- Coupled Ocean-Atmosphere models are needed to:
  - better understand the SECC,
  - its interaction with the SEC
  - feedbacks associated with the SACZ and the climate over South America