

# Is there a continuous Brazil Current north of Vitória-Trindade Ridge?

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# The Western Boundary Currents (WBC)

## Possible ways to think of what is a WBC

- **Large Scale:** Strong and narrow currents that flow at the western boundary of the oceans, as response to a return transport of the Sverdrup steady circulation in the interior of these oceans.
- **Mesoscale:** Strong and narrow currents that flow at the western boundary of the oceans, presenting rich meandering activity caused by several regional or dynamical factors like topography and geophysical instability.



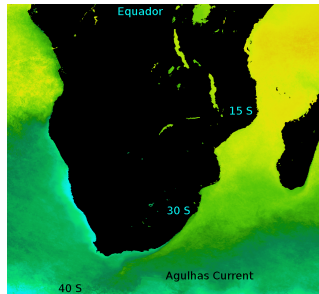
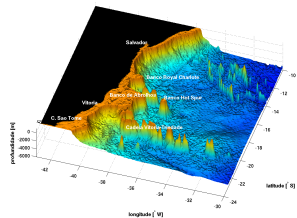
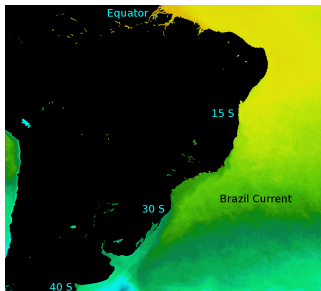
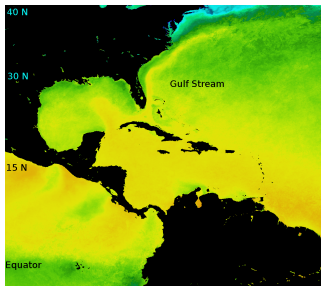
# The Western Boundary Currents (WBC)

## Where do they originate?

- **Large Scale:** According to Sverdrup/Stommel theories, considering oceans bounded by meridionally oriented coastlines both at east and west sides, homogeneous fluid and constant depth, the limits of each oceanic gyre are located at the zero wind stress curl lines.
- **Mesoscale:** Although above statement still applies and controls the location of a WBC origin, several other regional factors are important. These are, for example, topography, coastline orientation and other sources of flow that are independent of Sverdrup/Stommel theory, thermohaline circulation.

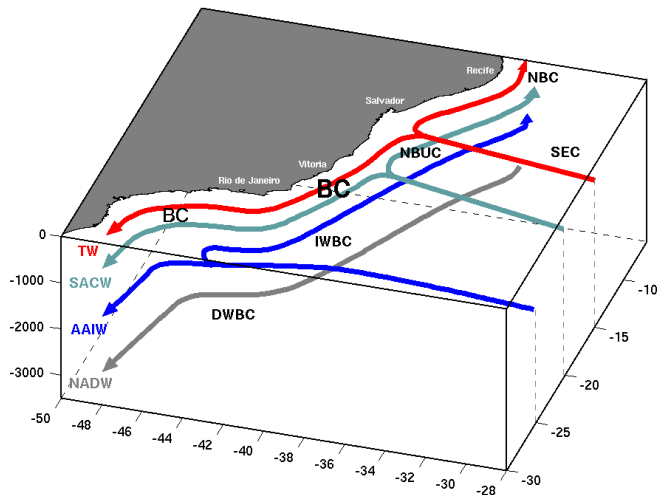


# WBCs - Regional Complications

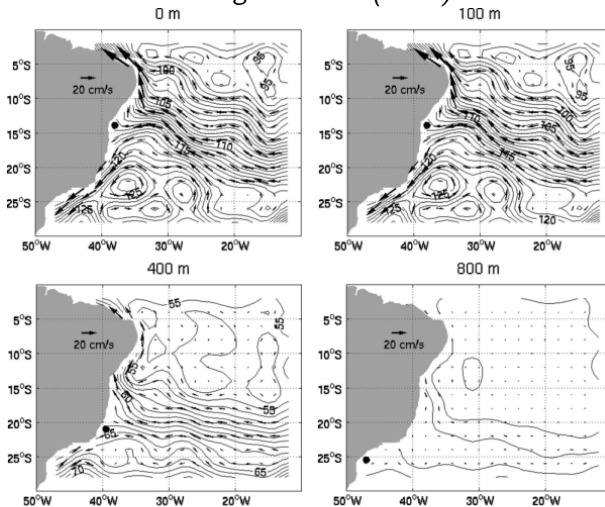


# BC - Regional complications

## Stratification and Termohaline Circulation

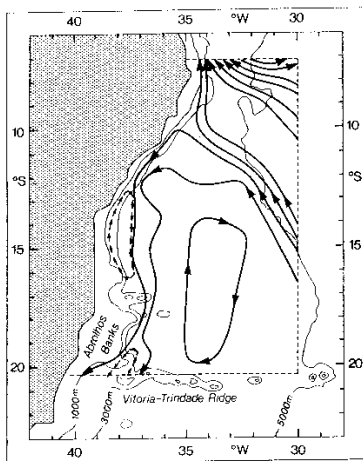


## BC Origin Site - Previous results based on mean patterns

*Rodrigues et al. (2006)*

# BC Origin Site - Previous results based on mean patterns

*Stramma et al. (1990)*

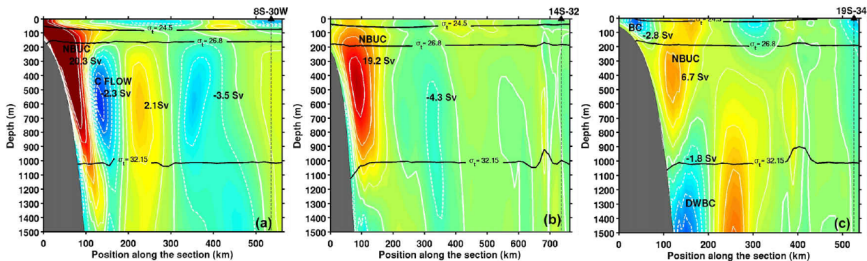


- T,S historical data - annual mean
- Southward and northward flows sharing analyzed sections
- Southward BC flow was first observed at 10°S (Feb and Mar)
- South of 15°S mean transport (0-1000 m) is southward and north of 15°S it is northward

# BC Origin Site - Previous results based on mean patterns

*Silva et al. (2009)*

- ROMS high resolution interannual simulation
- Meridional current and transport averaged from Sep 2005 to Jul 2007





# Regional circulation importance

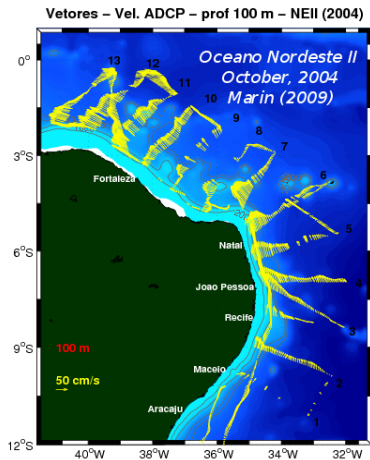
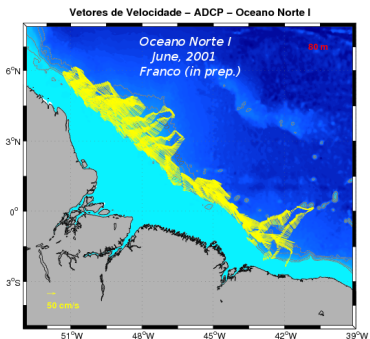
## Why should we worry about regional circulation?

- ✓ To have better scientific knowledge on the features of our western boundary current system;
- ✓ To have better scientific knowledge on the dynamics of our western boundary current system;
- ✓ To better represent regional currents and other features in numerical simulations;
- ✓ To better represent annual and interannual variability that are result of time-averaged regional circulation;
- ✓ To better understand heat poleward transport;



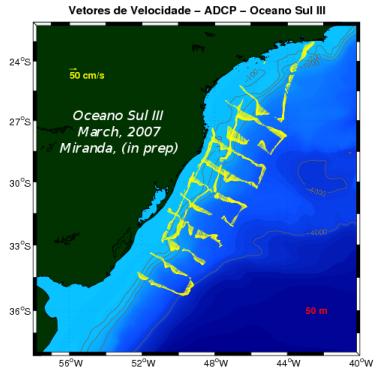
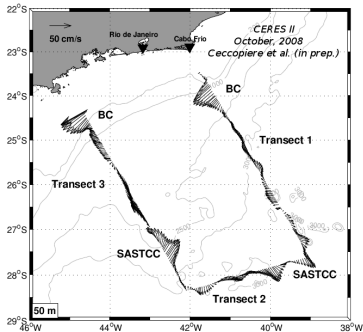
# Recent results regarding regional circulation off Brazil

These are examples of strong WBCs:



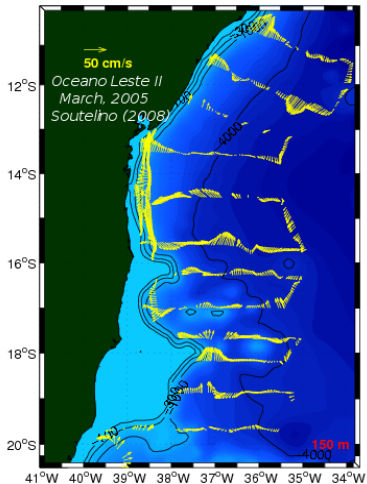
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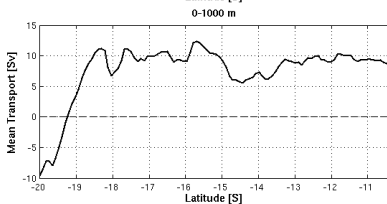
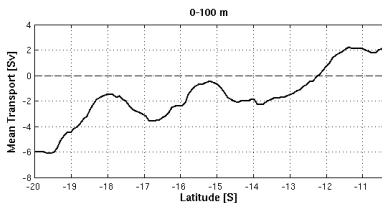
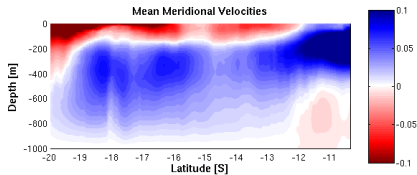
## Regional observations at BC origin site

This is **not** an example of a “classical” WBC:





# Regional observations at BC origin site



# Time Series - AVISO SSH data

**AVISO** → Archiving, Validation and Interpretation of Satellite Oceanographic data

- Multi-satellites
- Surface heights computed with respect to a seven-year mean
- Spatial resolution of  $1/3^\circ \times 1/3^\circ$
- Mean temporal resolution: 10 days.

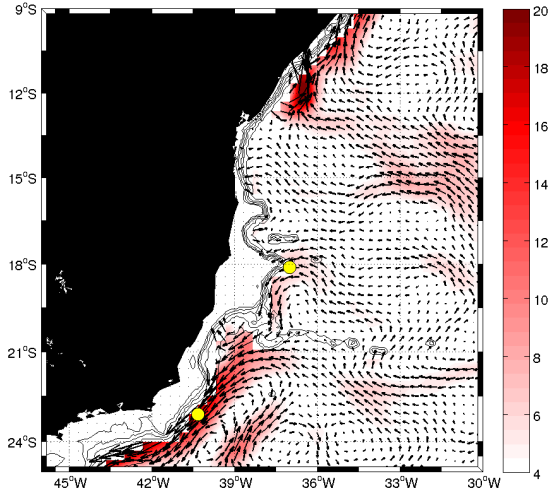
Geostrophic velocities were calculated using geostrophic relations:

$$u = -\frac{g}{f} \frac{\partial \eta}{\partial y} ; \quad v = \frac{g}{f} \frac{\partial \eta}{\partial x}$$



# Time series: AVISO data

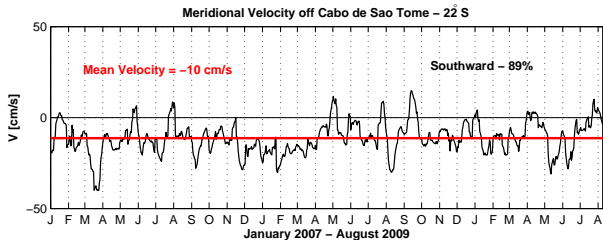
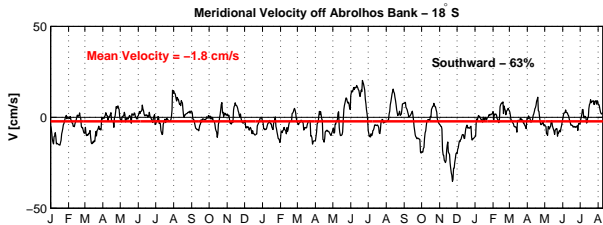
January 2007 - August 2009 → mean geostrophic velocity field





# Time series: AVISO data

January 2007 - August 2009 → time series



# Final Remarks

- It seems doubtful to consider an organized WBC southward **near-surface** flow between Vitoria-Trindade ridge ( $21^{\circ}\text{S}$ ) and NBUC surfacing site ( $12^{\circ}\text{S}$ , according to AVISO's annual mean).
- Should we start looking the current system off Brazilian eastern coast as if there is not a surface continuous WBC? Instead, should we consider that there is a weak and eddy-dominated near-surface southward flow?
- We need more data to better answer this question, such as top-bottom current measurements in a space-time observation strategy.
- Data-oriented regional numerical experiments can also help us to better understand current patterns and features off Brazilian eastern coast.

