Main causes of low-frequency variability of the Brazil Current

Ivenis Pita

GFD I

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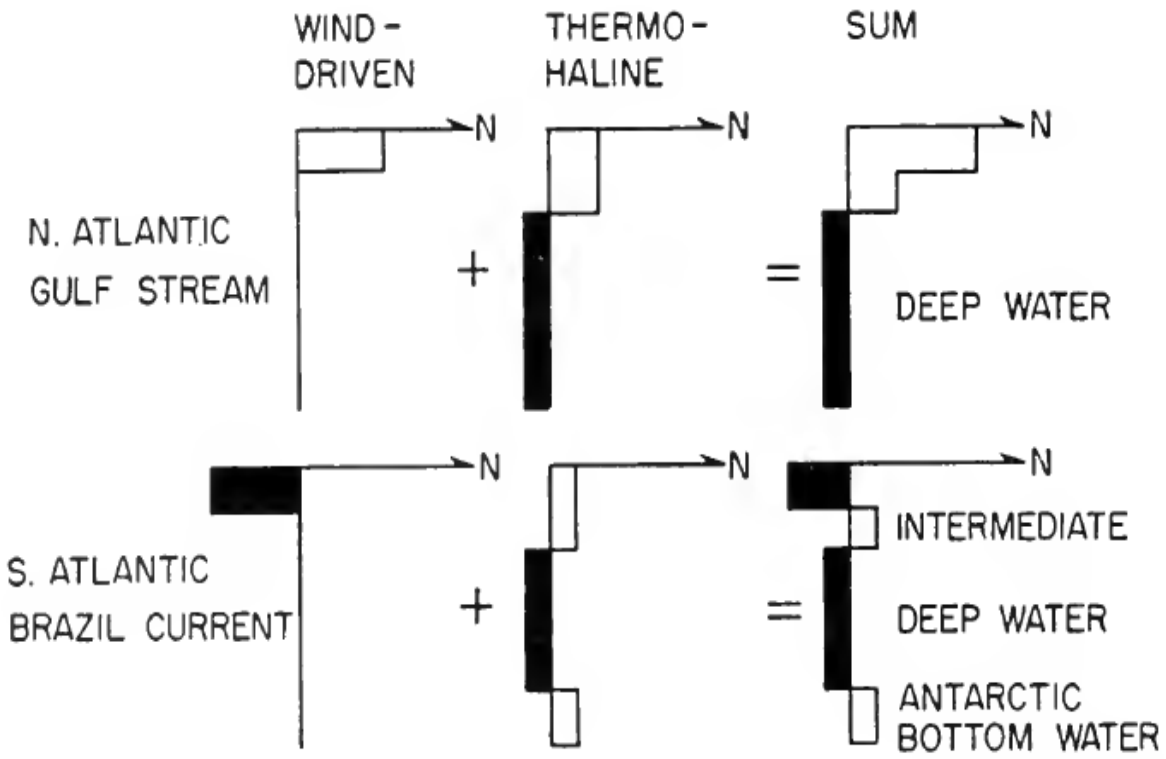
Outline

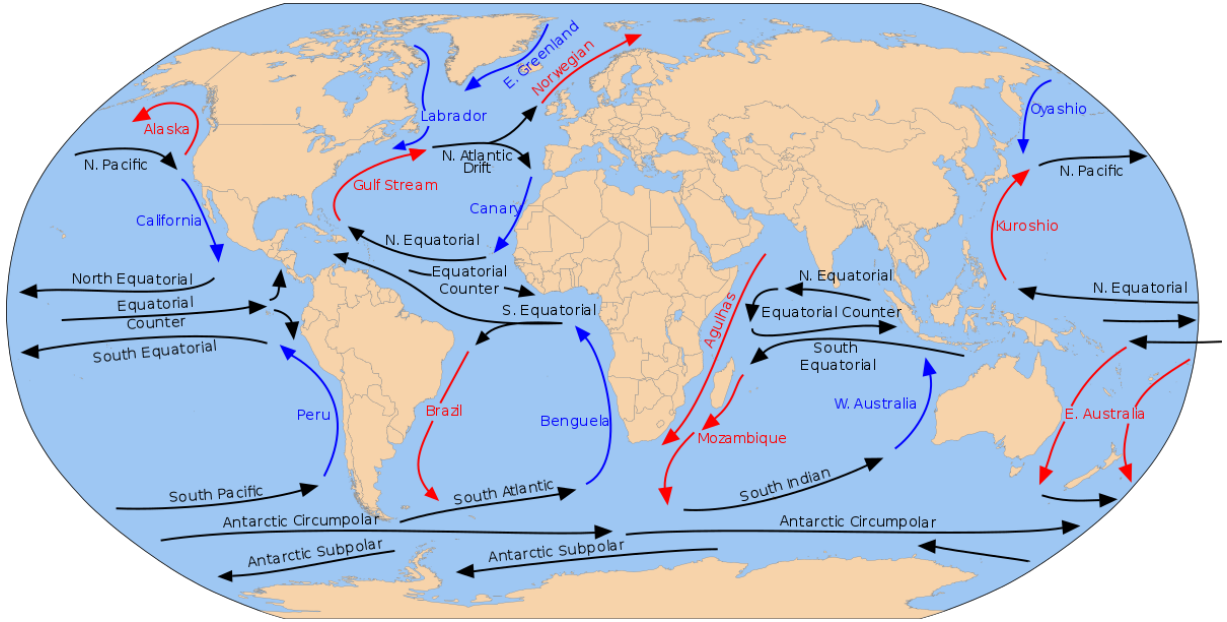
- Why is Brazil Current (BC) weaker than Gulf Stream?
- Description of BC
- Area I
- Area II
- Area III
- Takeaways

Why is BC weaker than Gulf Stream?

- Stommel (1965)



Stramma *et al.* (1990)



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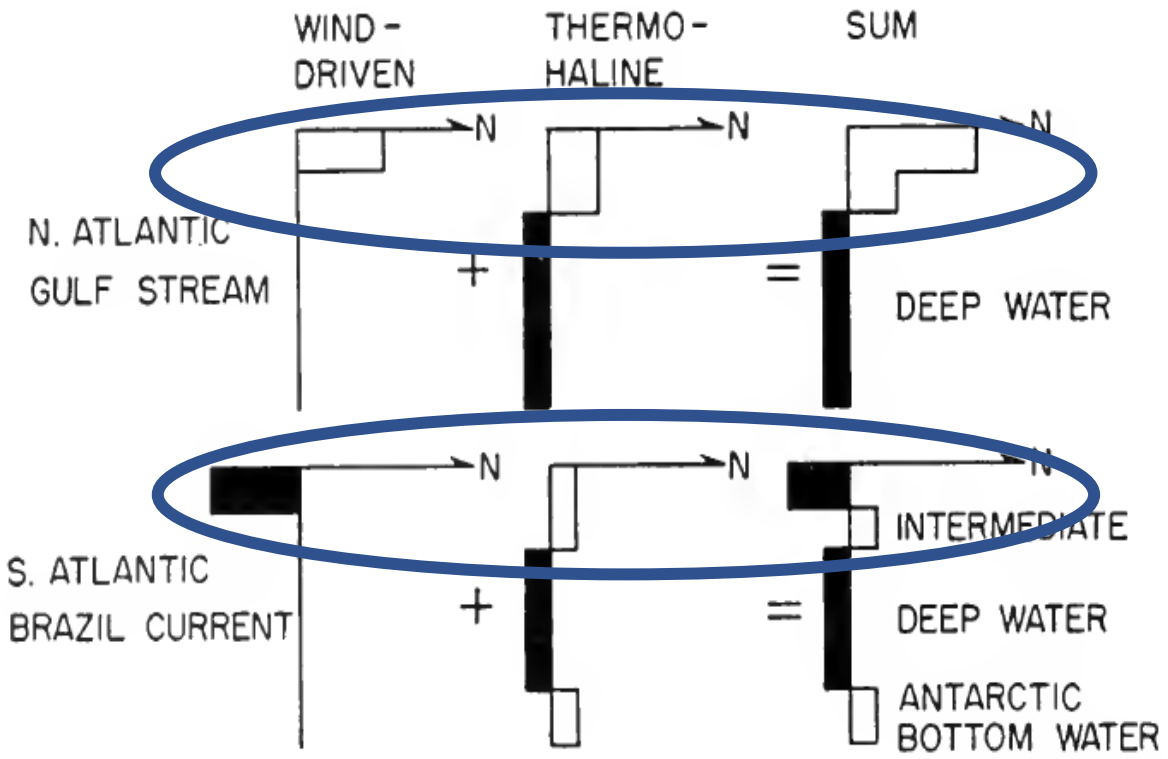

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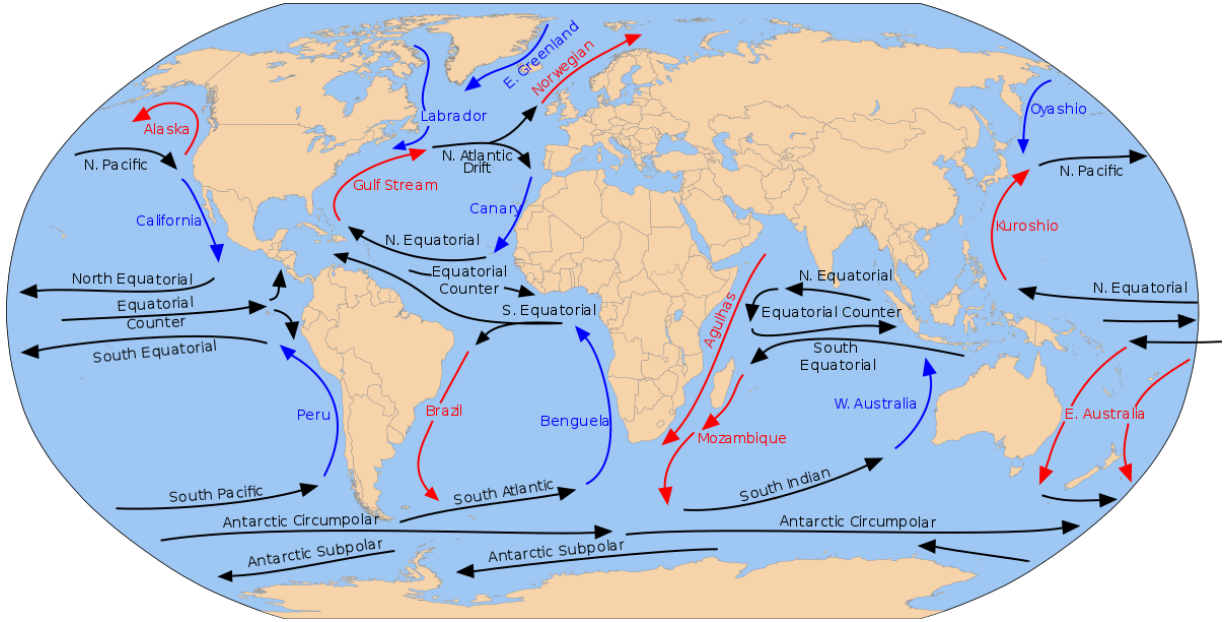

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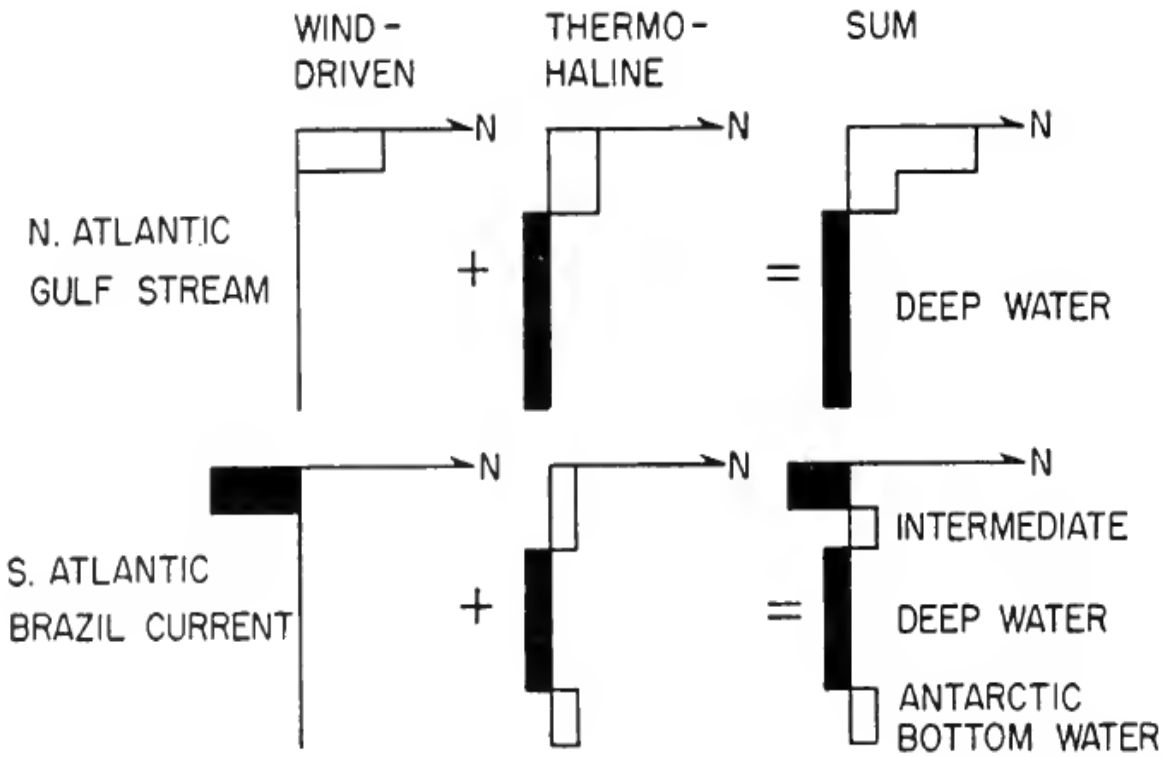

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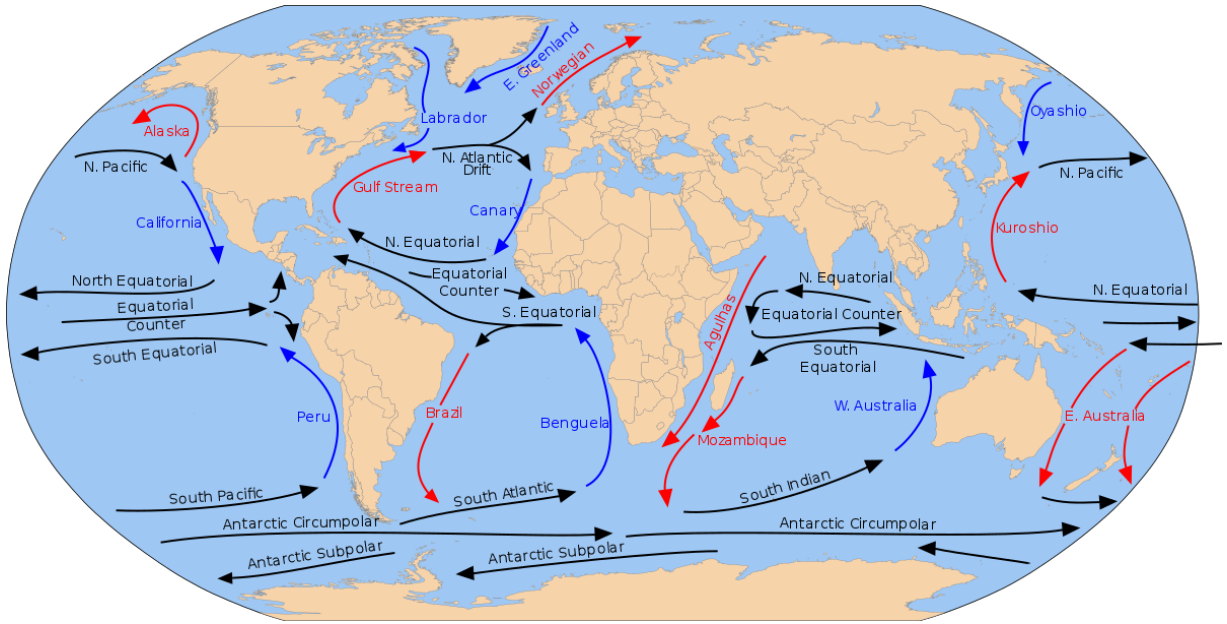
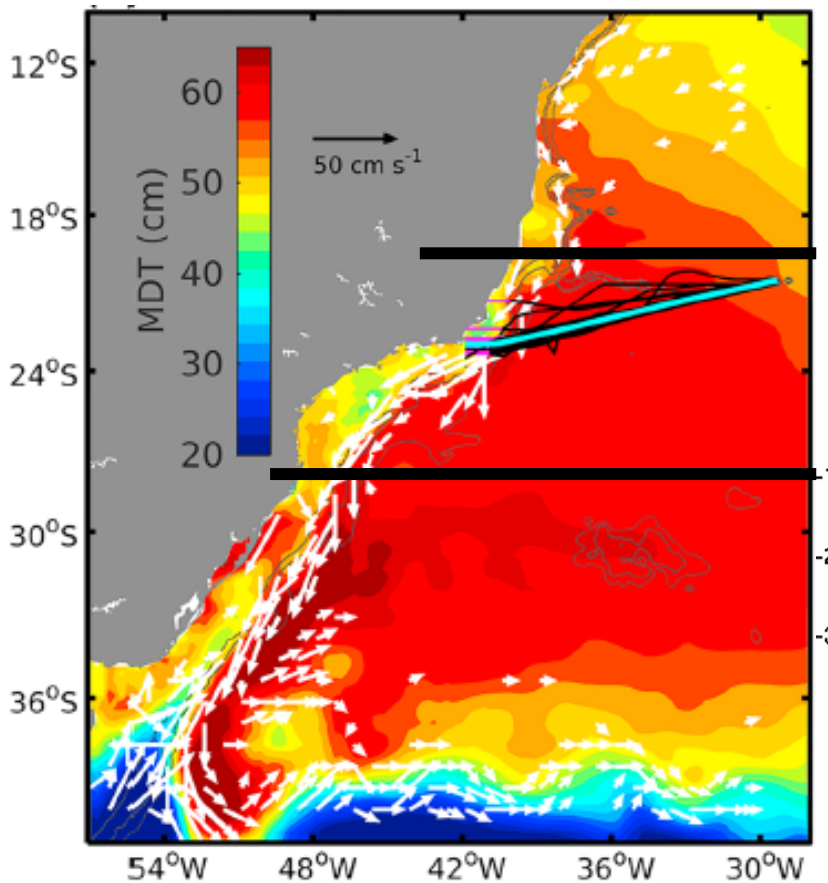
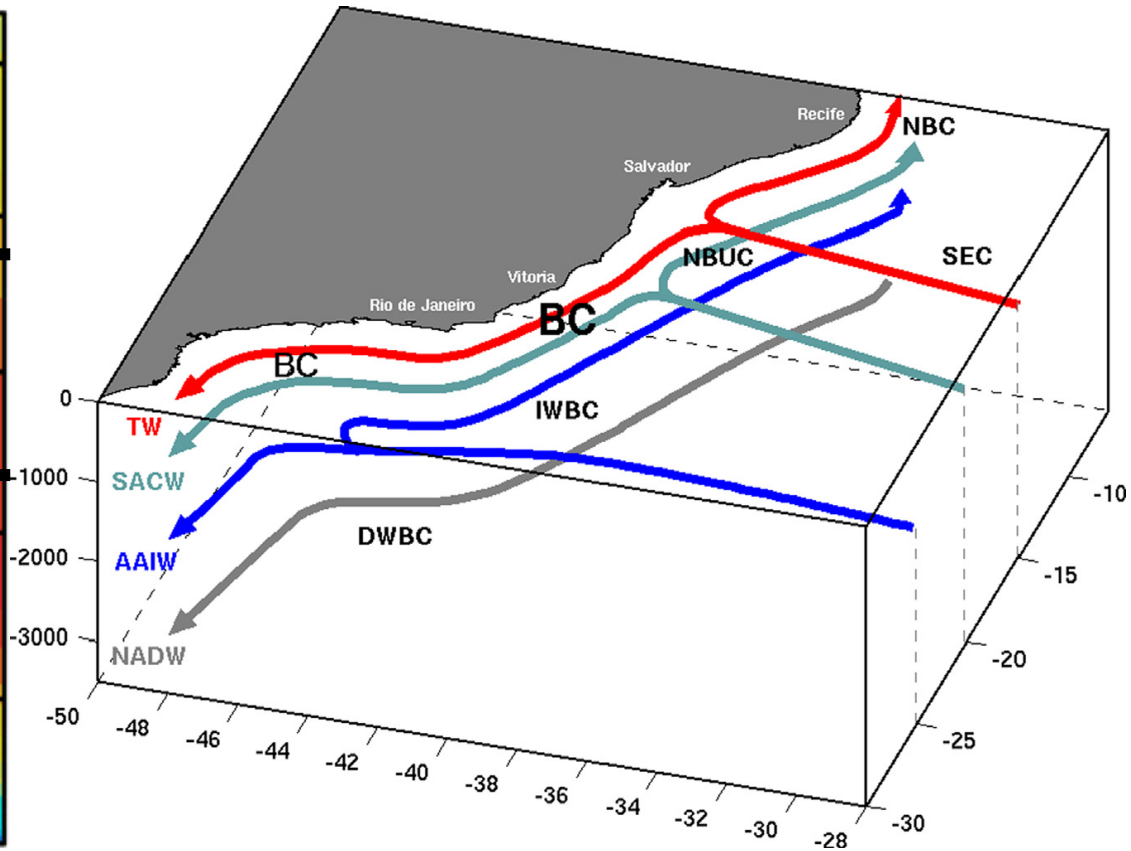
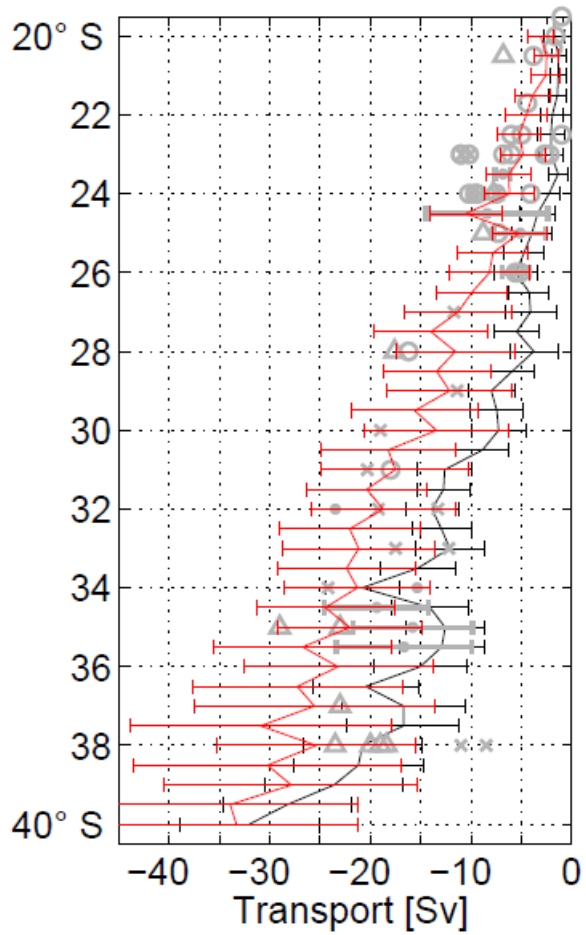


NBC – 12 Sv
BC – 04 Sv

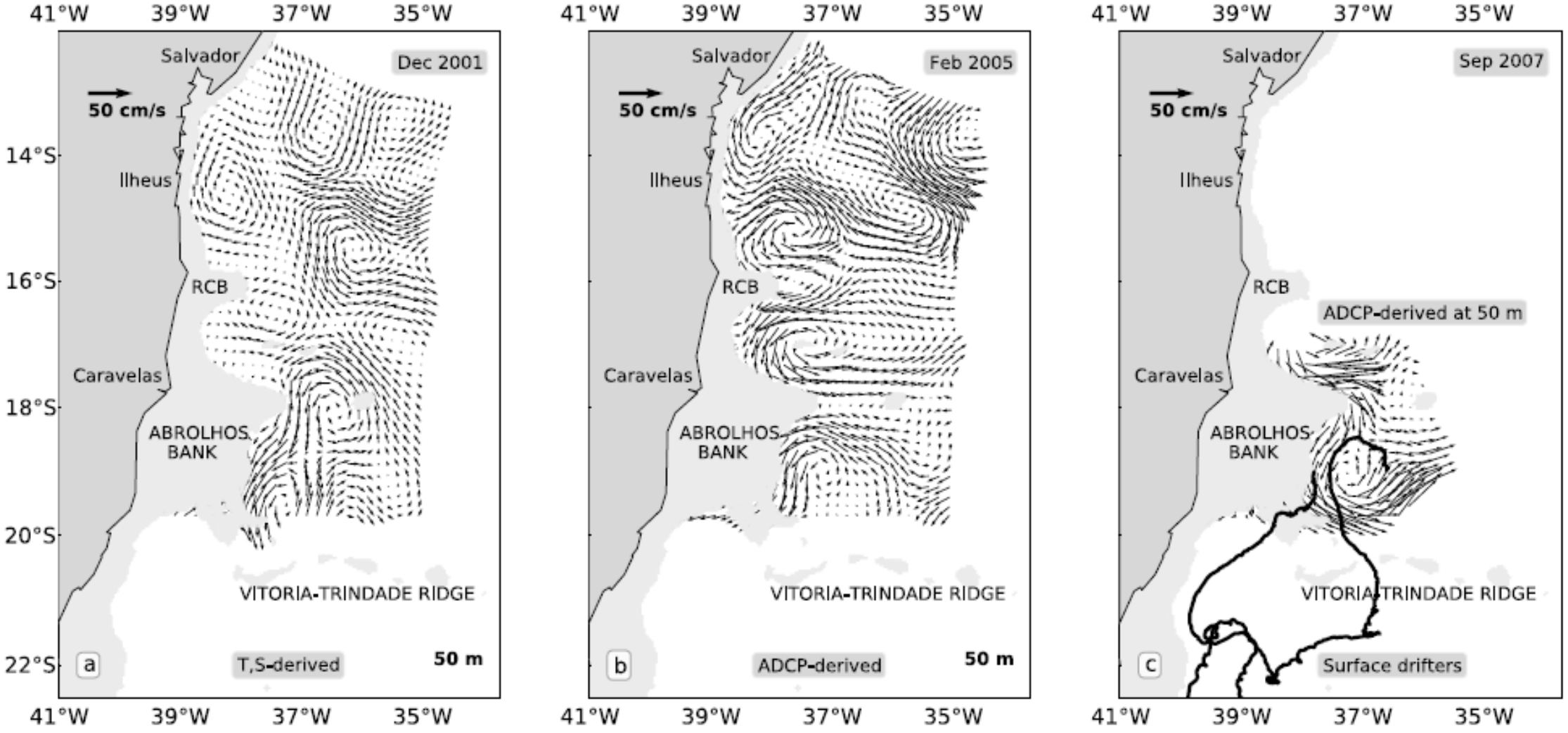
Description of BC







Area I – BC origin



Soutelino et al. (2011)

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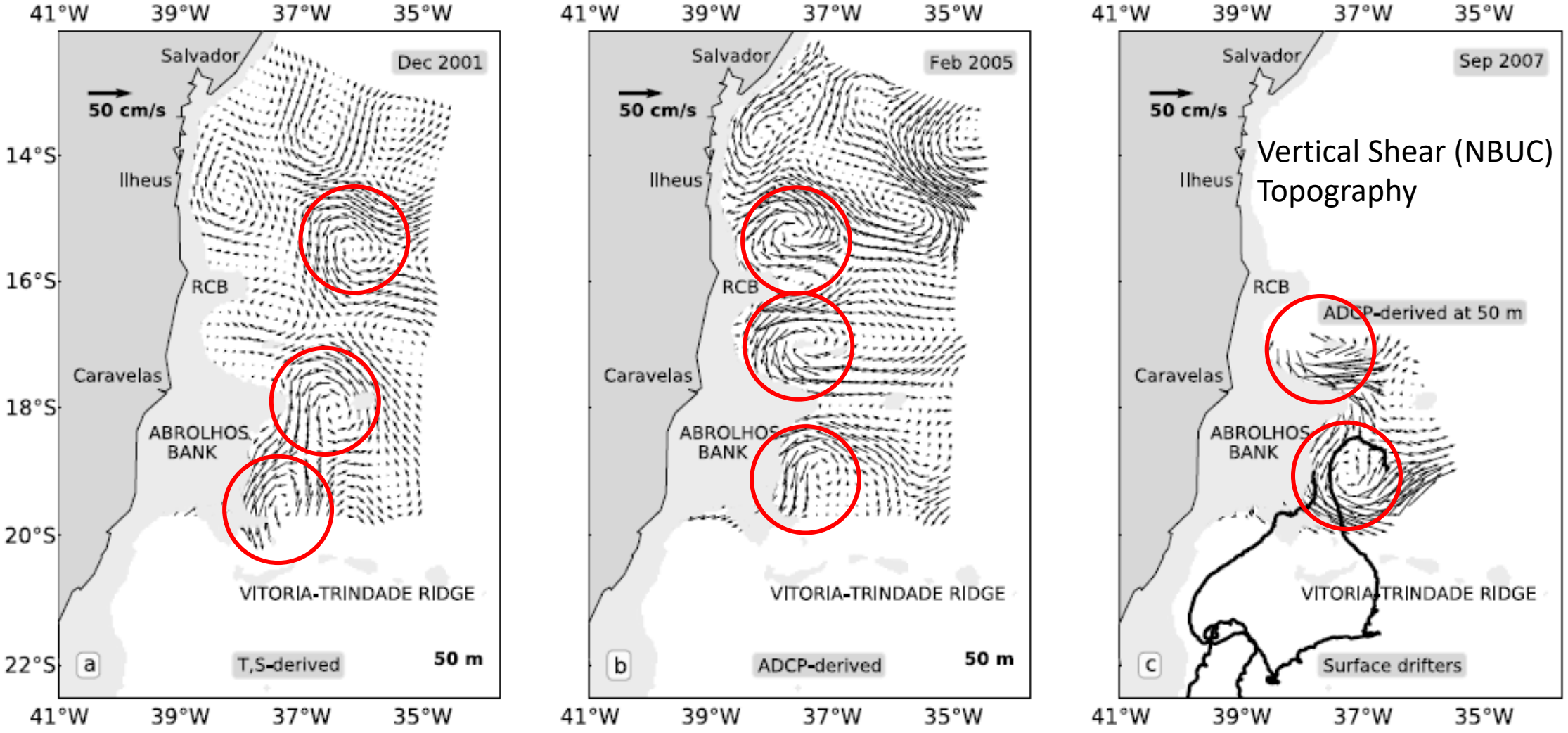
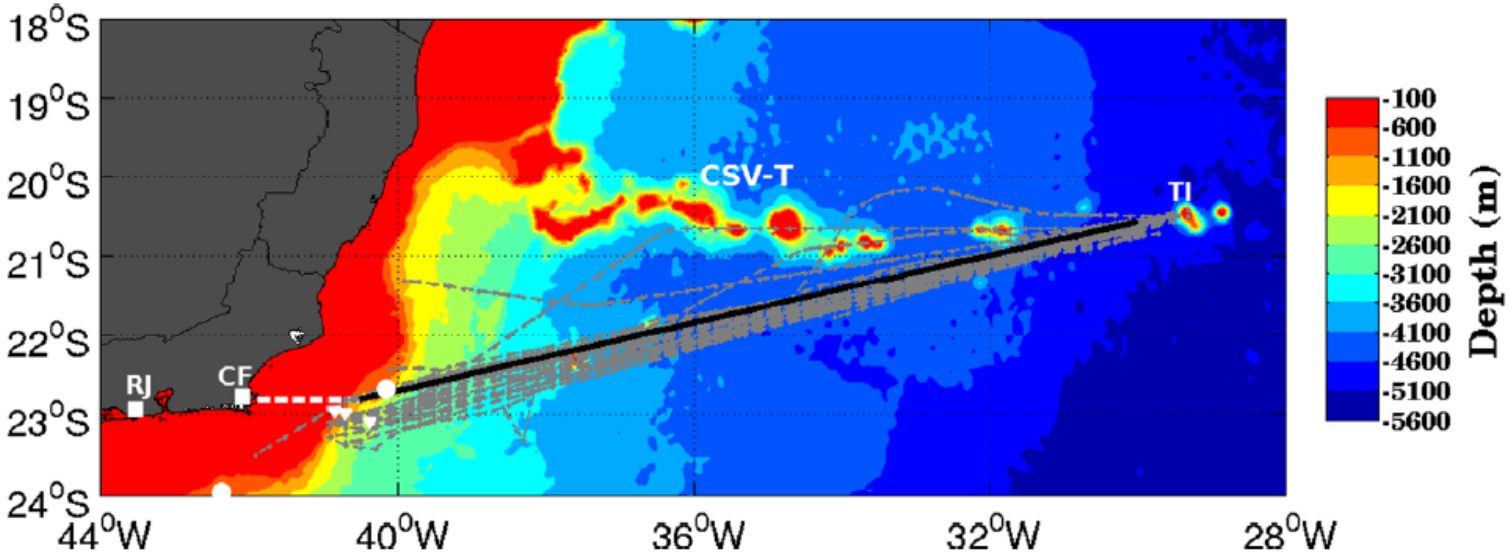
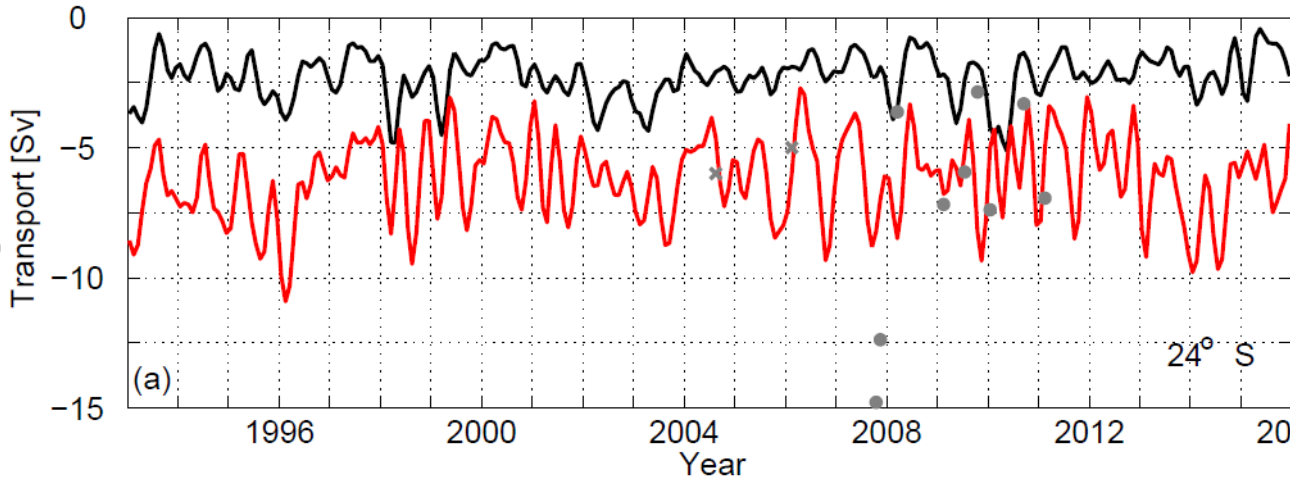


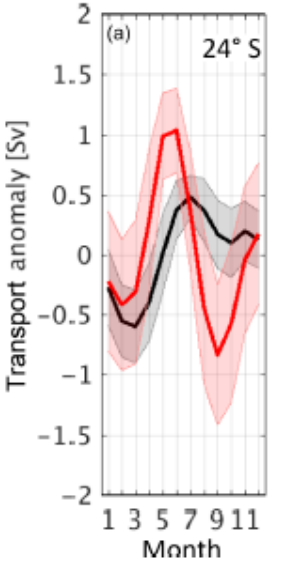
Soutelino et al. (2011)

Area II – Vitoria-Trindade Ridge

- Mata *et al.* (2012)
  - Variability of BC -> South Atlantic Gyre variability.
- Lima *et al.* (2016)
  - Confirmed Mata *et al.* (2012)
  - Continental Shelf - 21% of BC transport
- Schimd & Majumder (2018)
  - ↑ BC Transp (austral summer)
  - ↓BC Transp (austral winter)



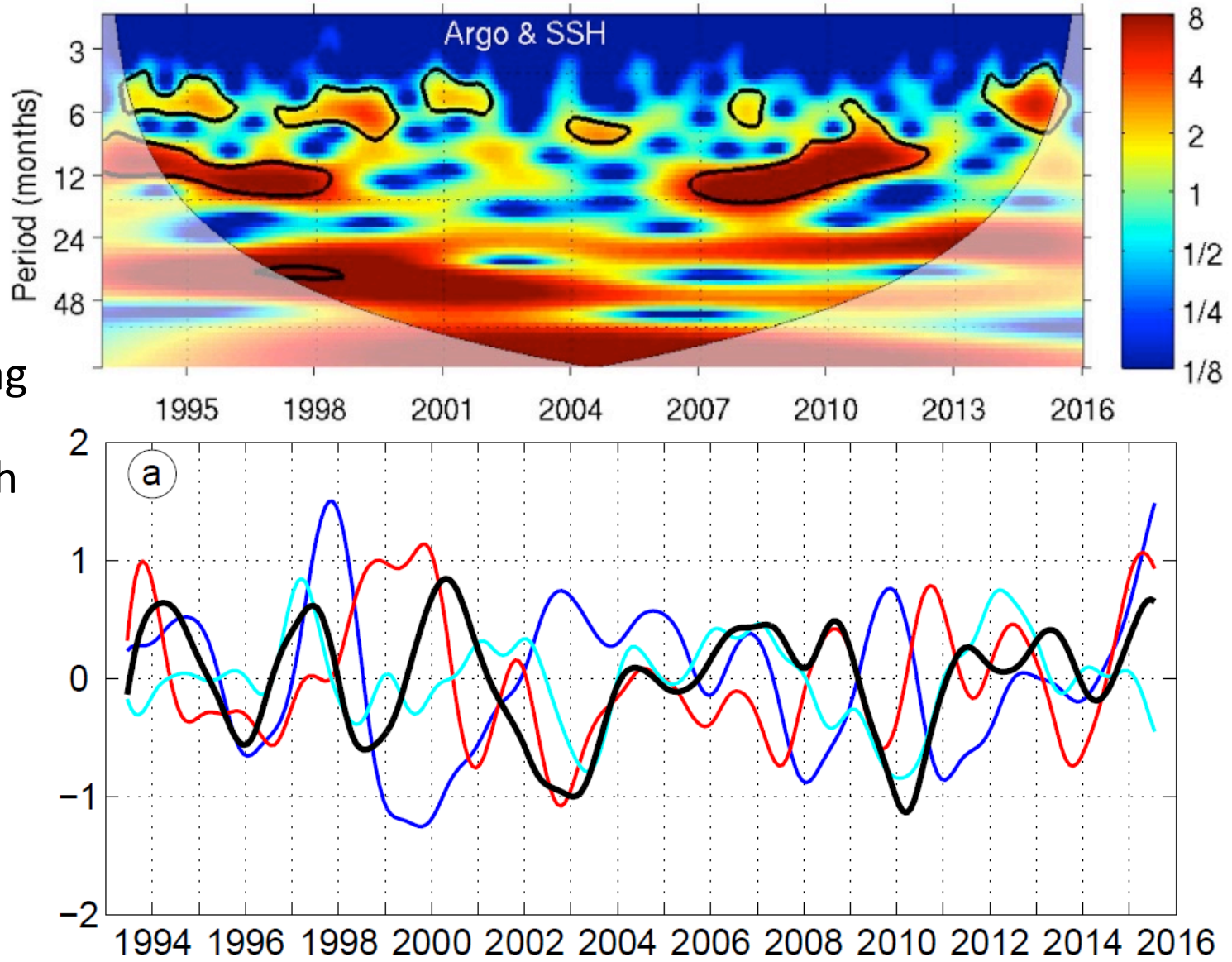




ARGO & SSH **Model**

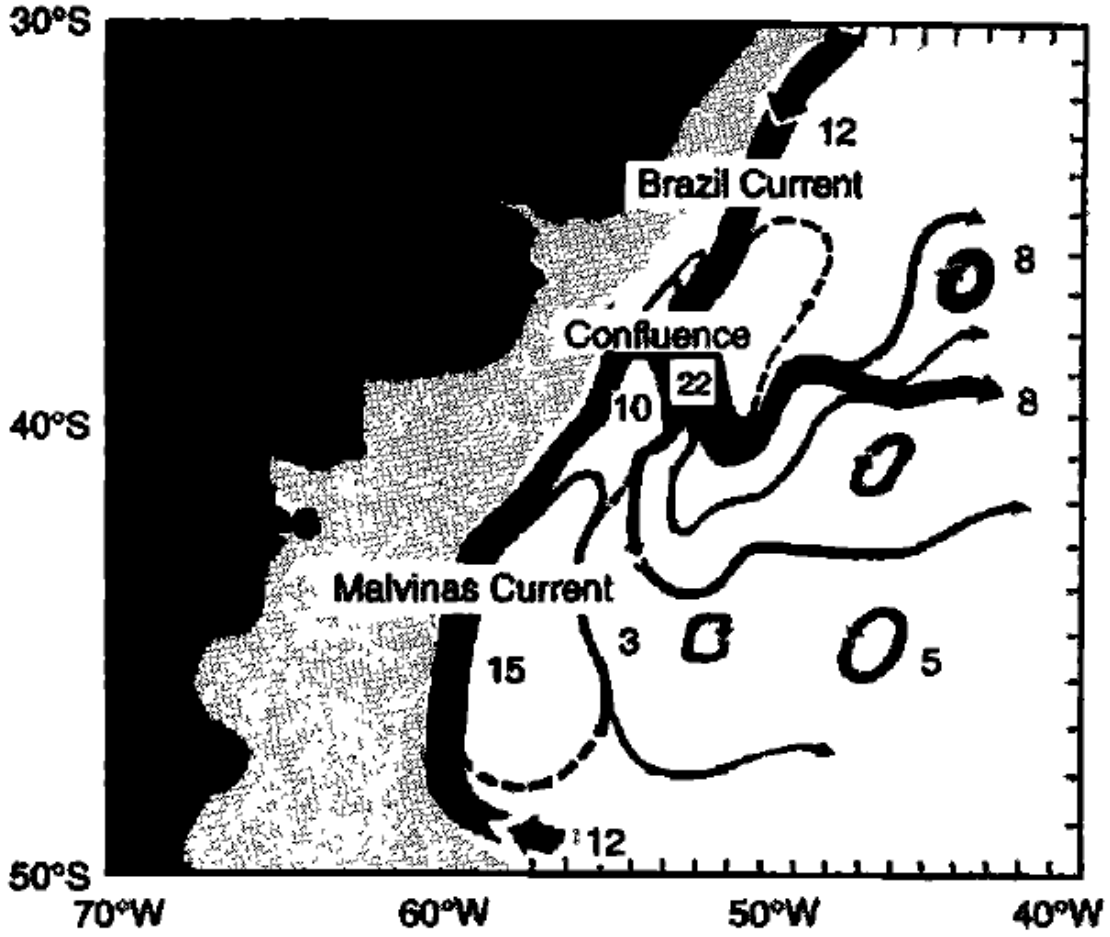
Area II

- Schmid & Majumder (2018)
  - 2 to 4 years cycle
  - SAM – Corr. of 0.4 with lag of 6 months
  - El Niño 3.4 Index – Corr. of 0.4 with lag of 8 months
  - SASD – Corr. of 0.5 with lag of 1month
  - EOF (Pressure and BC transp.)
    - 1st mode (36% of the variance)
      - Effect of Tropical Pacific on SAM
    - 2nd mode (15% of the variance)
      - ENSO impact on the BC transport
- Goes *et al.* (2019)
  - Wind stress Curl – Corr. of 0.43



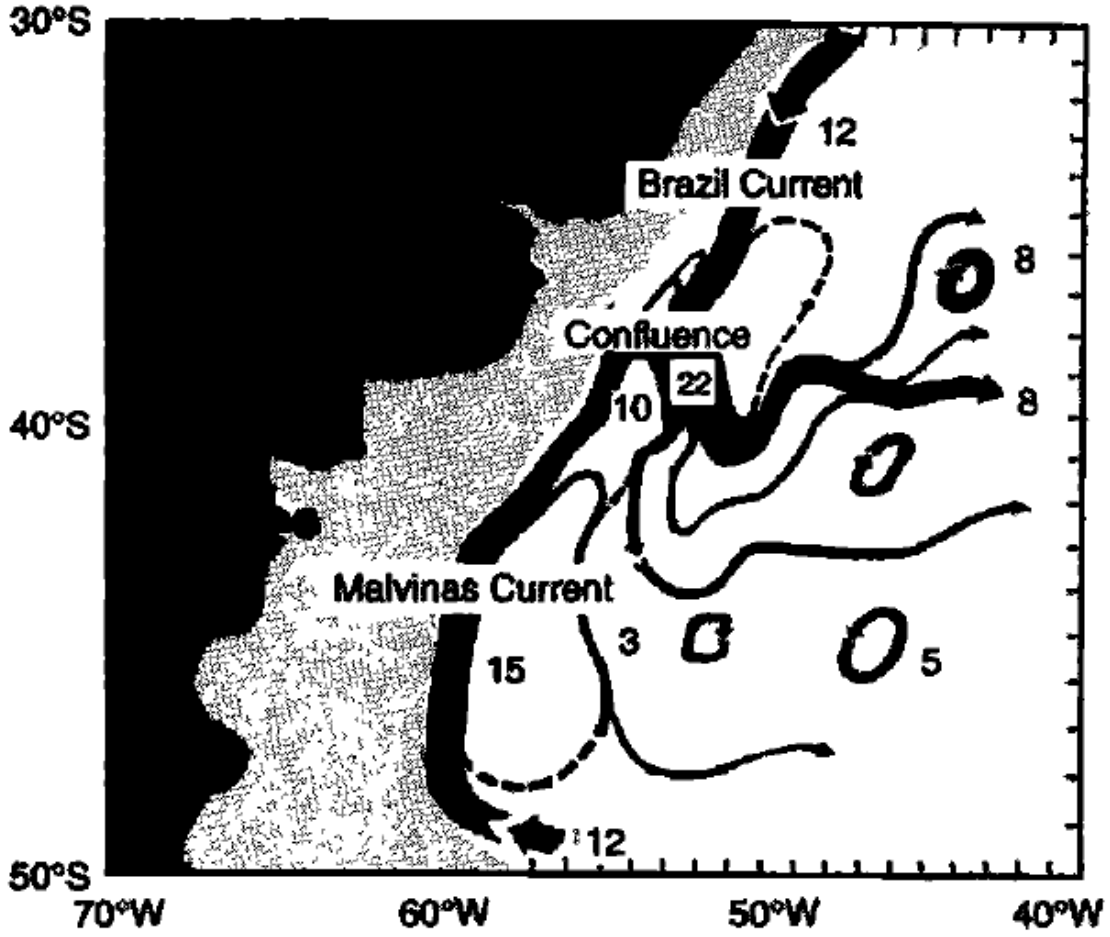
Area III

- Goes et al. (2019)
  - Brazil-Malvinas Confluence zone could move southward - strengthening of the BC and weakening of Malvinas Current.
- Goni & Wainer (2001)
  - BC variability sets the Brazil-Malvinas Confluence location
  - 75% of the frontal oscillations are explained by semi and annual processes.



Area III

- Lumpkin & Garzoli (2011)
  - No correlation with SAM
    - Confirmed by Schmid and Majumder (2018)
  - Agulhas Current eddies could influence the frontal zone position in low-frequency cycles.



Takeaways

- Lack of studies regarding BC variability northern of 20° S
- BC is a complex system.
  - Inumerous mechanisms causes the low frequency variability
  - Semi-annual, annual, 2-4 years
  - SAM explains 36% BC variability at area II
  - ENSO explains 15% BC variability at area II
  - BC variability dictates the Brazil-Malvinas Confluence location