Impacts of REMO Ocean Data Assimilation System (RODAS) on the HYCOM 1/12° Forecast

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Oceanographic Modeling and Observation Network (REMO)

DATA ASSIMILATION SYSTEM

- **RODAS** ⟹ REMO Ocean Data Assimilation System
  - Ensemble Optimal Interpolation (Oke et al., OD 2005; Xie and Zhu, OM 2010; Tanajura et al., AOSL 2014)
  - Results of the first version of the full DA system

- **RODAS** consists of:
  1. 00 UTC ⟹ Assimilation of SST from UK MetOffice **OSTIA**
  2. 03 UTC ⟹ Assimilation of **T/S Argo** data, **MOVAR AX97**
  3. 06 UTC ⟹ Assimilation of **along-track SLA** from **CLS ATOBA – 7km**
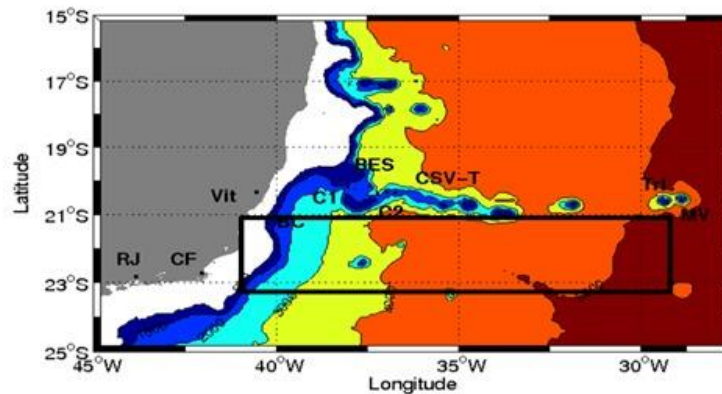
DATA ASSIMILATION SYSTEM

- **Assimilation is realized every 3 days**

	SST	IN_SITU	SLA
Observational window	-	72h	72h
Radius of localization	150 km	150 km	110-200 km*
State vector	ALL	DP, U,V, T,S	ALL

- **126 ensemble members**
    - 6 years to calculate the ensemble spread
    - 21 members per year
    - 60-day window centered in the corresponding assimilation day
- **For more details about RODAS (Tanajura et al., AOSL 2014; Mignac et al., OS 2015)**

    * **Lima & Tanajura, RBGF 2013; Costa & Tanajura, JOO 2015**

HYCOM CONFIGURATION

Numerical domain

Western Tropical and South Atlantic Ocean

Horizontal resolution

1/12°

Vertical resolution
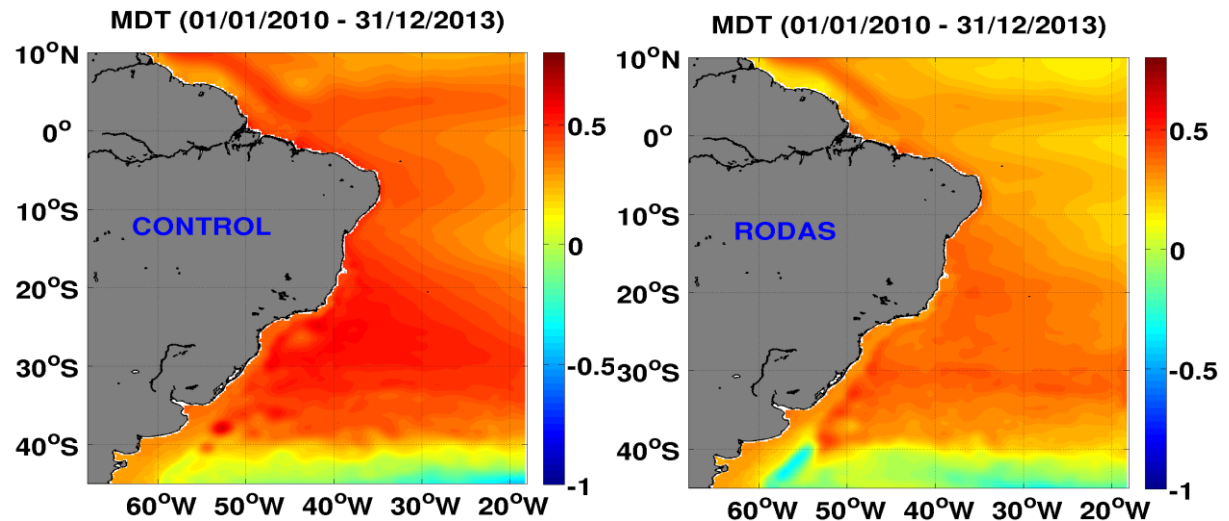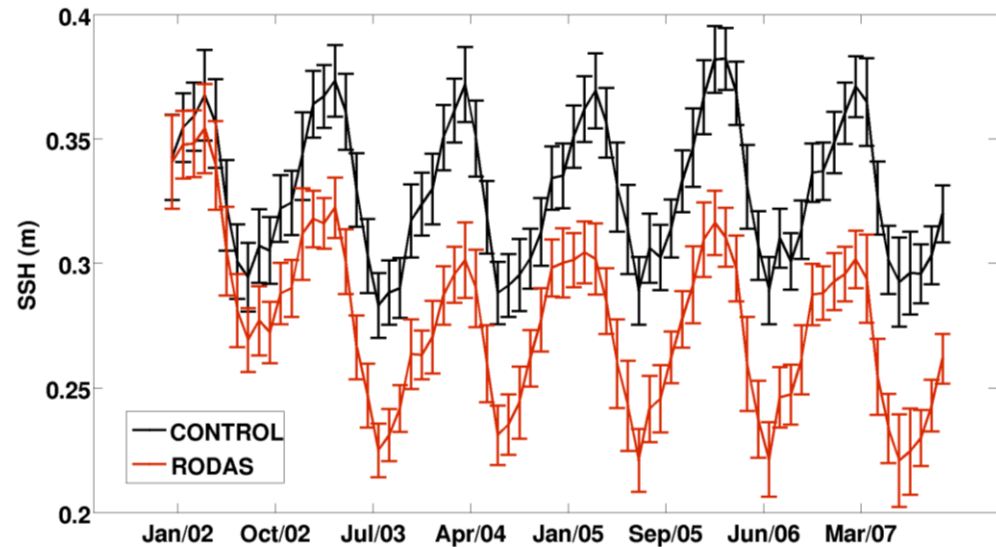
21 layers

Spin-up Free Run

Climatological
Interpolated from 1/4°

1995–2013
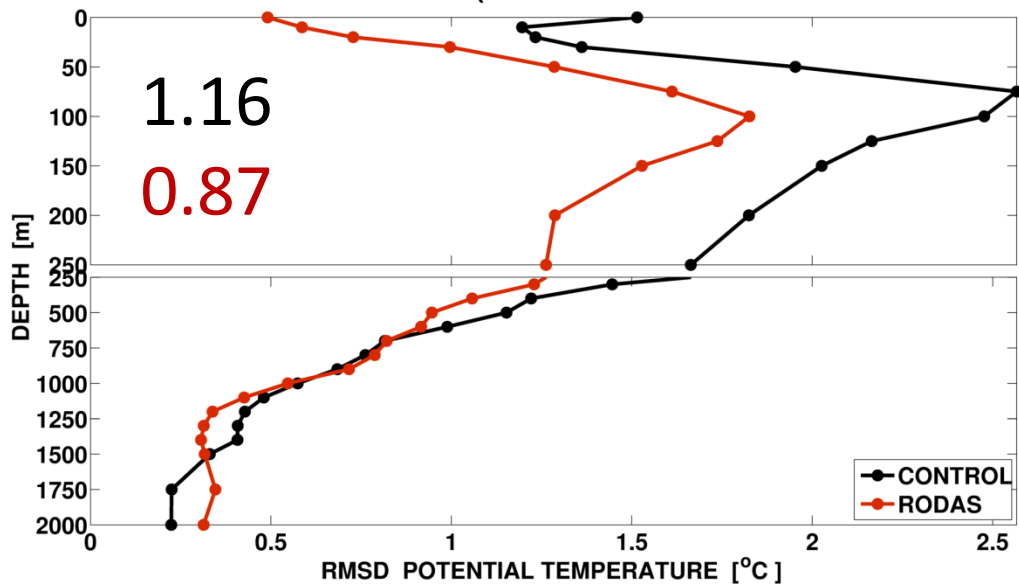(6h NCEP/CFSR Reanalysis forcing)
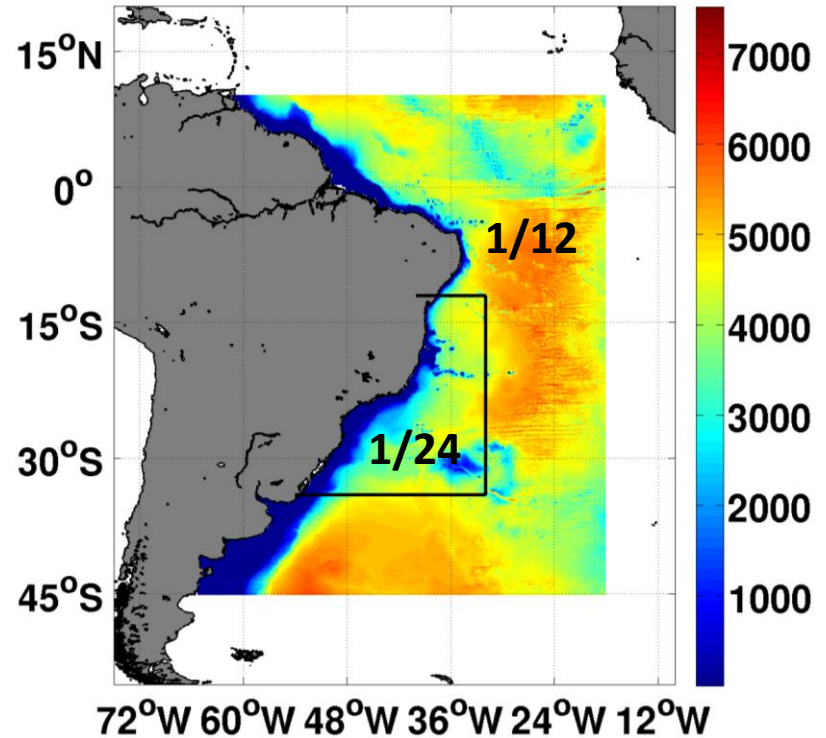
RODAS

- **2002 - 2007 assimilation of SST + Argo ➡ get a stable SSH mean**

- **2004 - 2007 SSH mean**

- **2008 - 2013 assimilation including SLA**

- **2010 - 2013 Evaluation of the 24h, 48h and 72h after assimilation**

RESULTS – T/S

ARGO RMSD 45S–10N 68W–18W (1/1/2010–31/12/2013 – TOTAL BUOYS 10138)

1.16
0.87

<- Temperature

-> 25%

ARGO RMSD 45S–10N 68W–18W (1/1/2010–31/12/2013 – TOTAL BUOYS 10138)
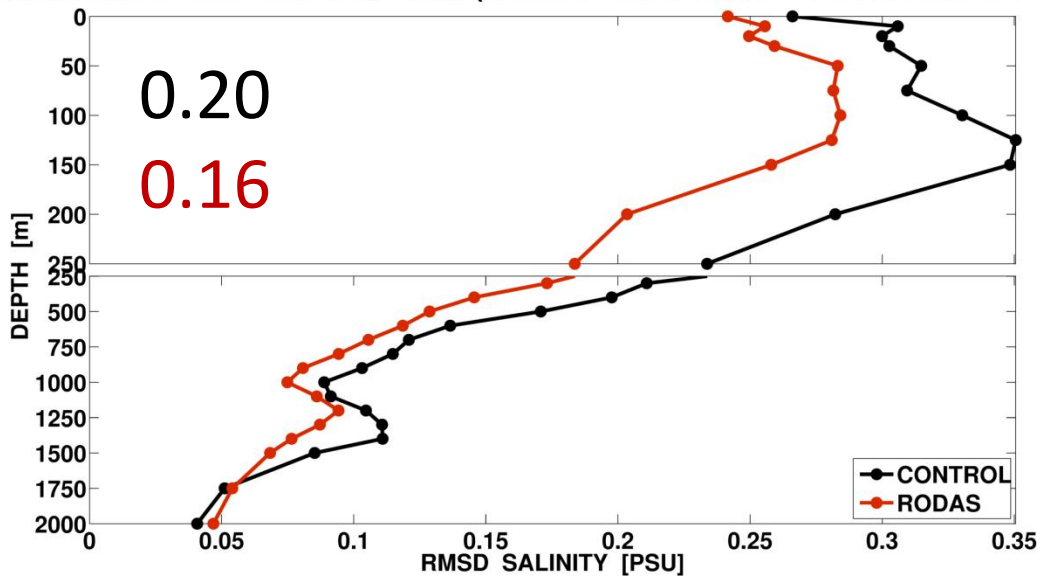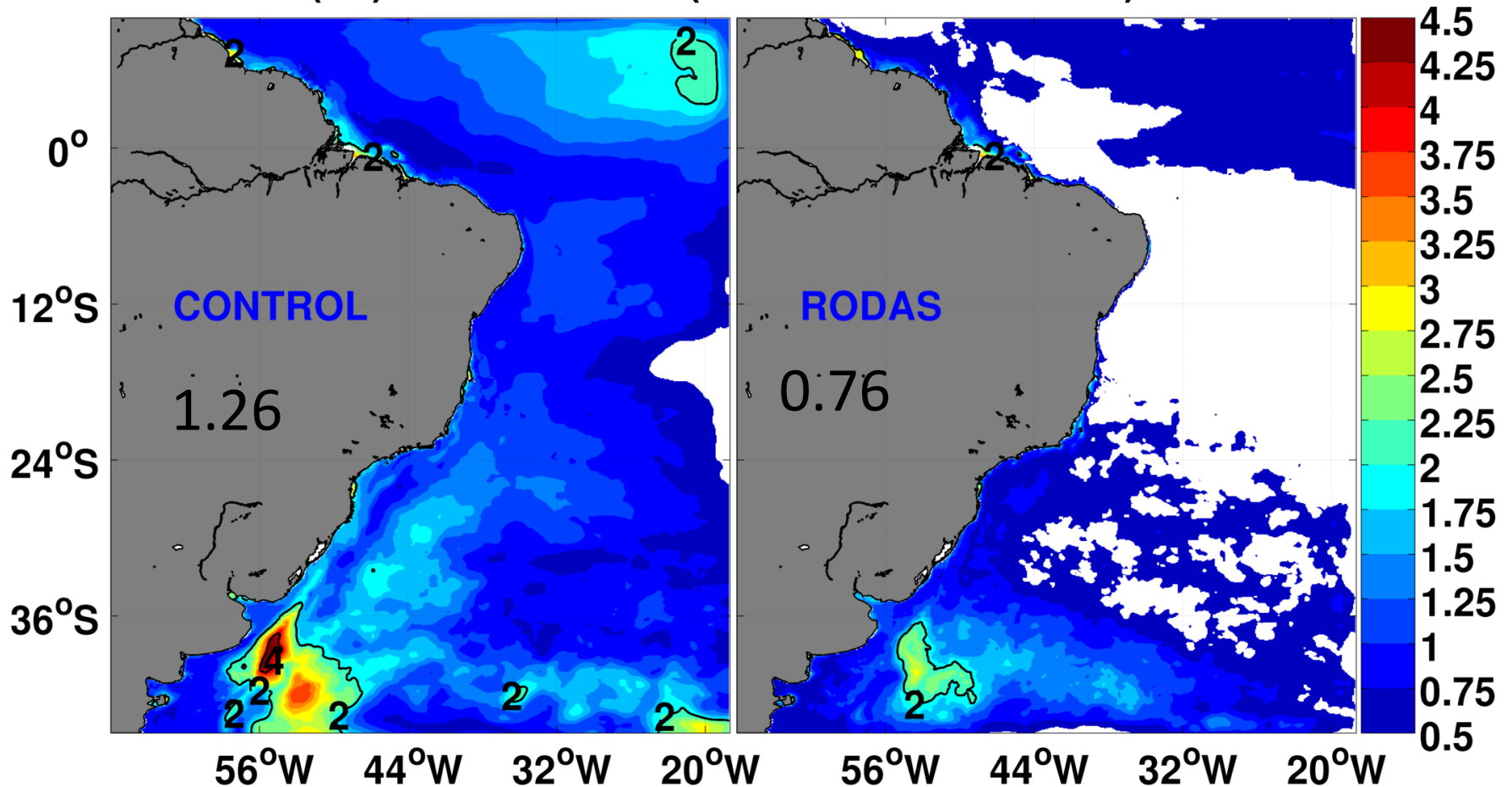
0.20
0.16

<- Salinity

-> 17%

RESULTS - SST

SST RMSD W.R.T. OSTIA (45S-10N 68W-18W)
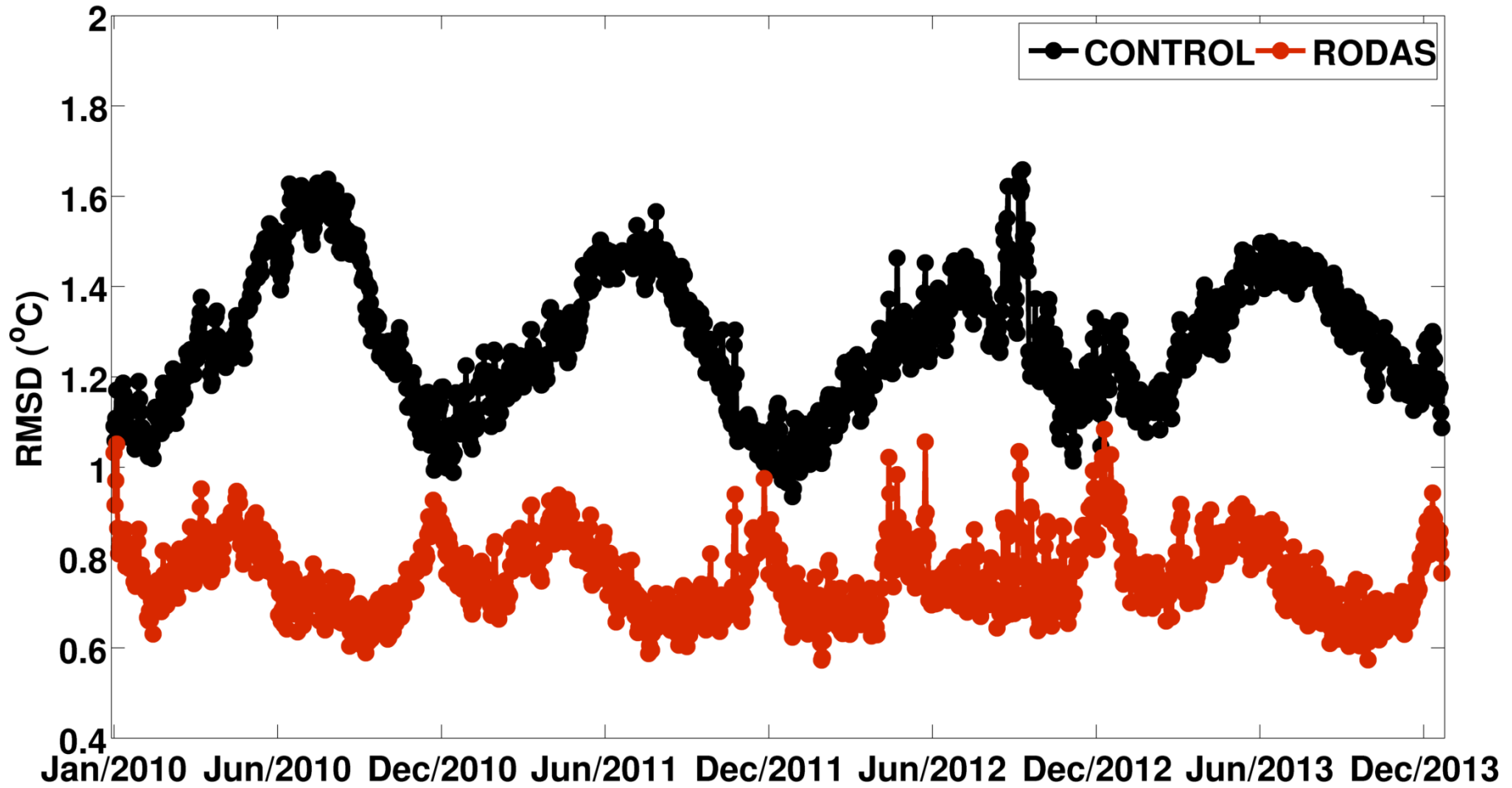
RESULTS - SST

-> 40%

SST RMSD (°C) W.R.T. OSTIA: (01/01/2010-31/12/2013)

CONTROL 1.26

RODAS 0.76

RESULTS - SLA

-> 88%

SLA CORRELATION W.R.T. AVISO (01/01/2010 - 31/12/2013)
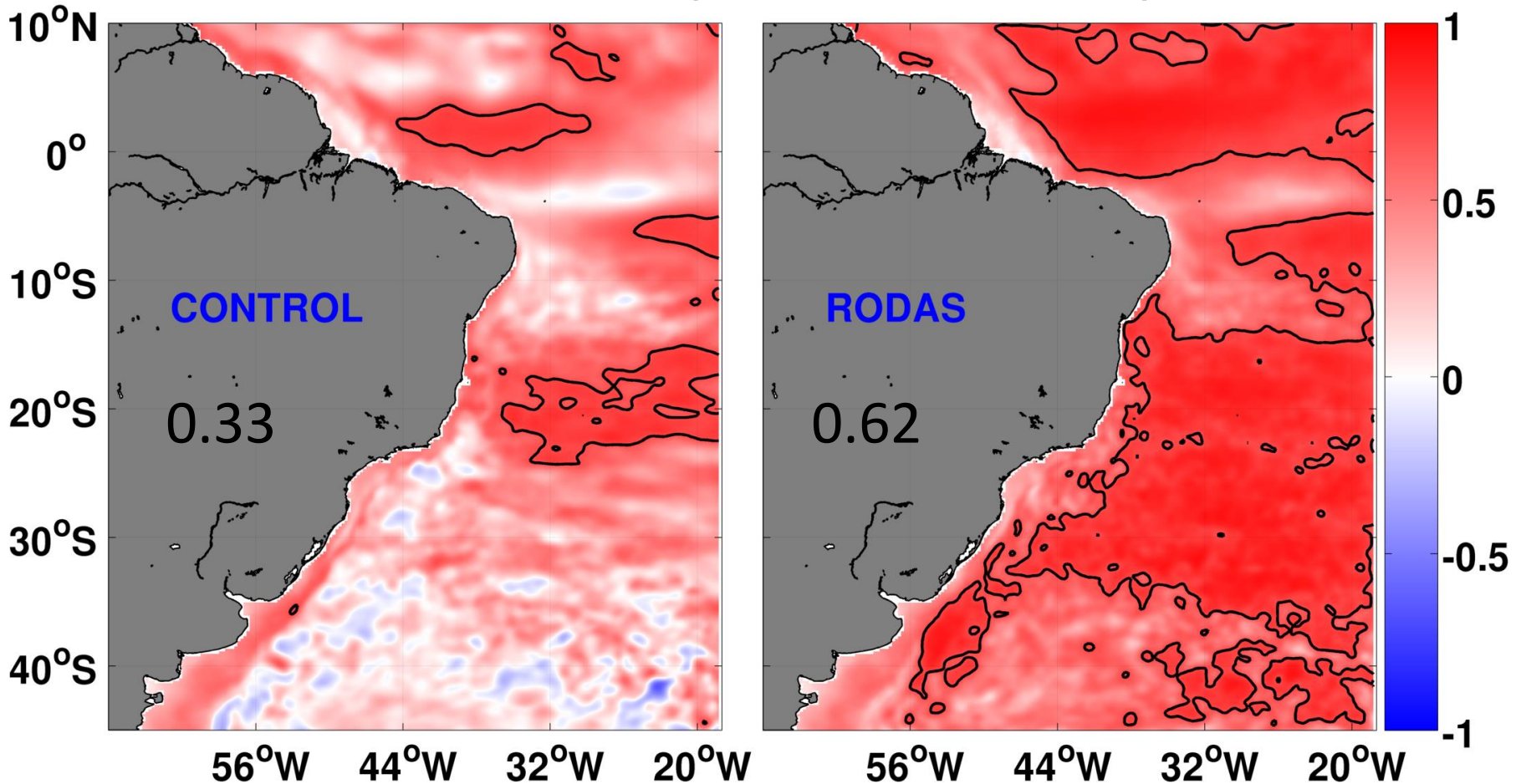
• Black Line -> 0.7 of Correlation

RESULTS – SEC BIFURCATION

-> 15-16°S

-> 12-13°S

Rodrigues et Al., 2007	10-14°S
Silva et al., 2009	8°-13°S

MEAN VELOCITY FOR 0-30 m (01/01/2010 - 31/12/2013)
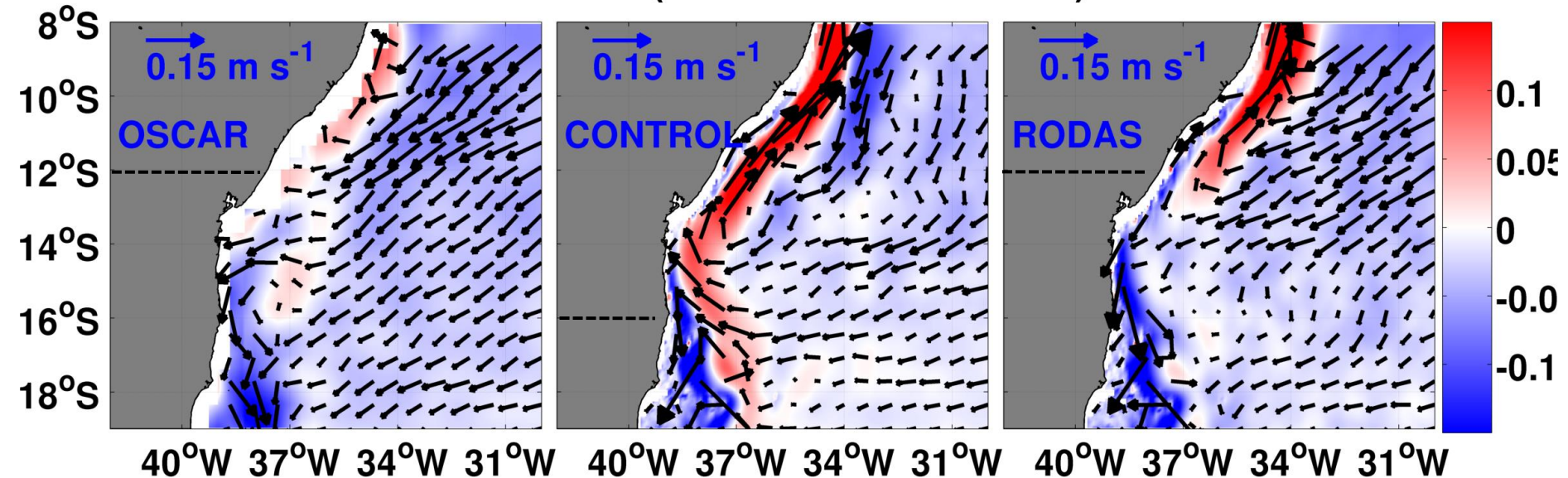
RESULTS – BRAZIL-MALVINAS CONFLUENCE

MEAN VELOCITY FOR 0-30 m (01/01/2010 - 31/12/2013)
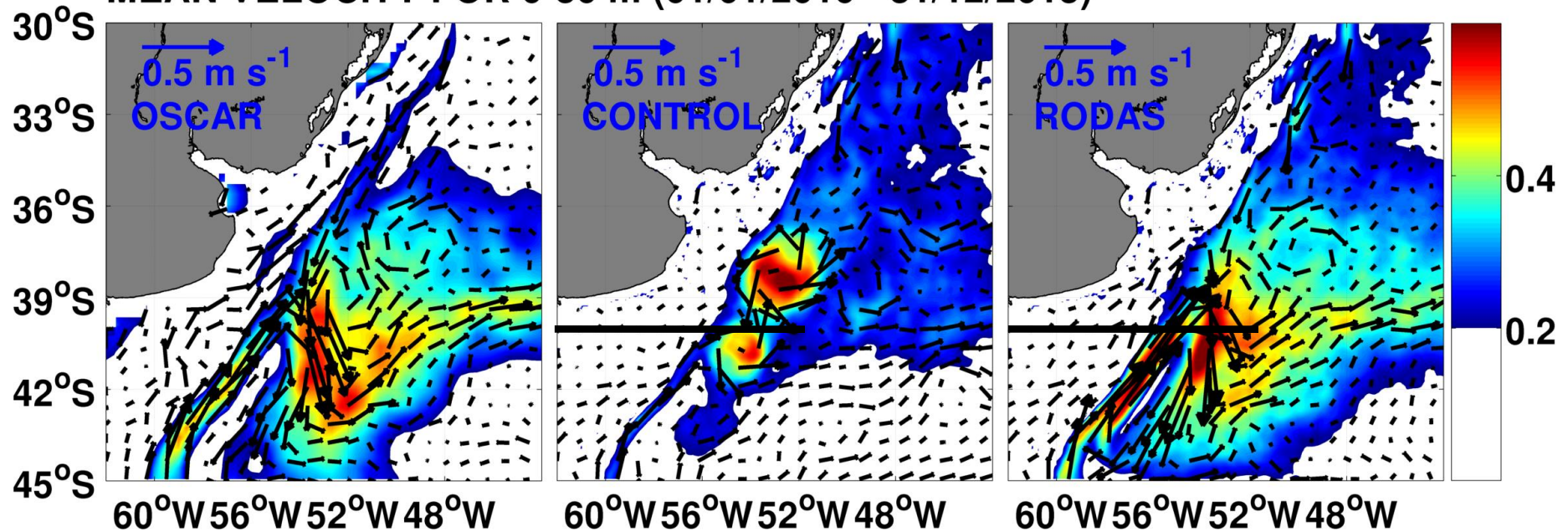
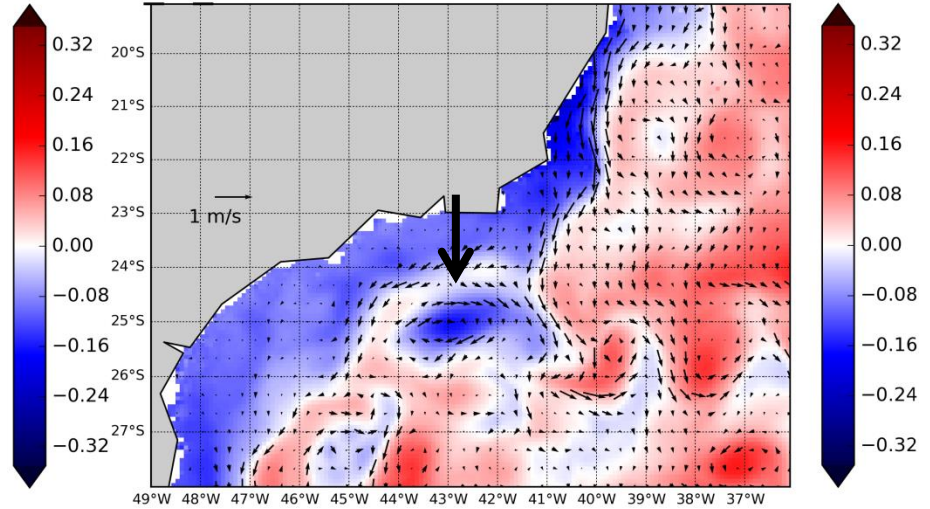# RESULTS – BRAZIL-MALVINAS CONFLUENCE

Zonal Section at 40°S
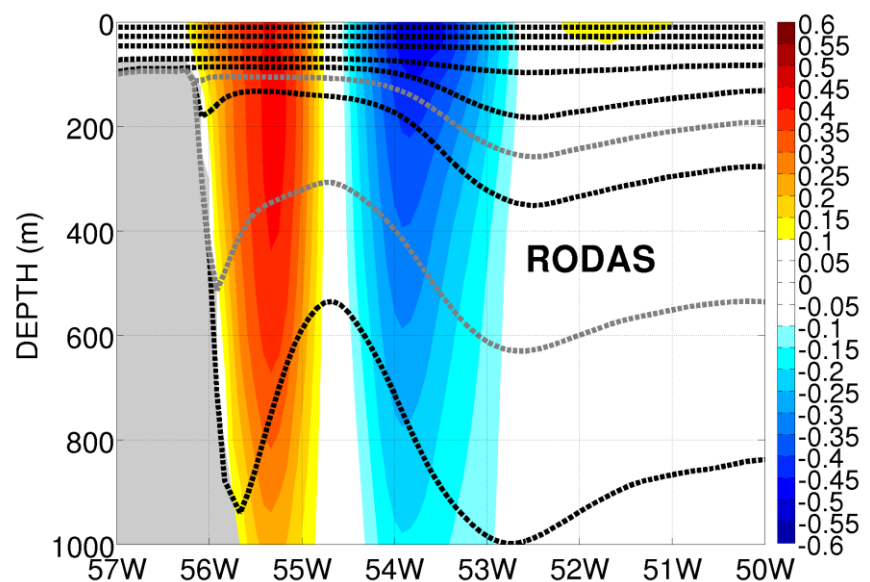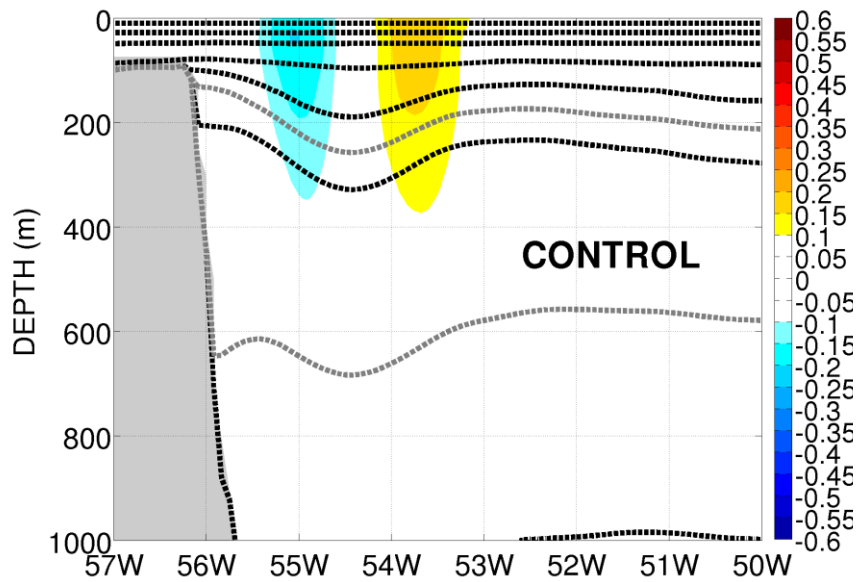
RESULTS – *CABO FRIO* EDDY
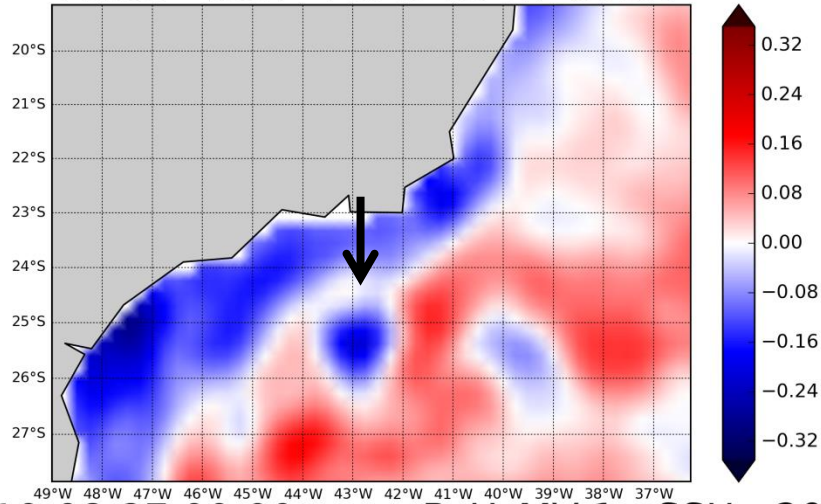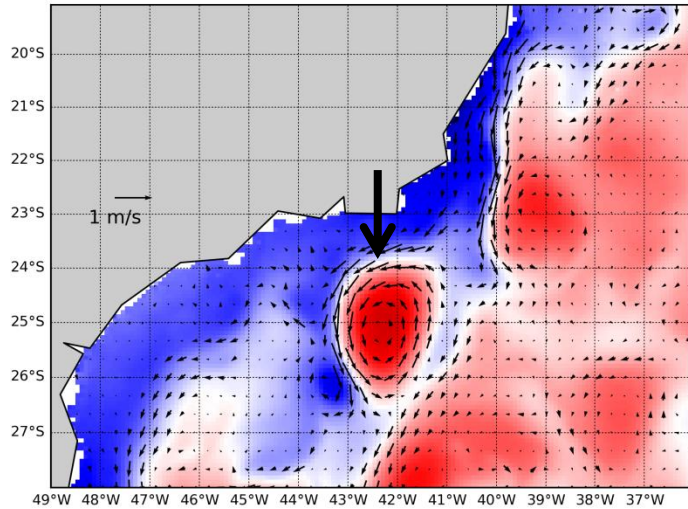
RESULTS – *SÃO TOMÉ* EDDY
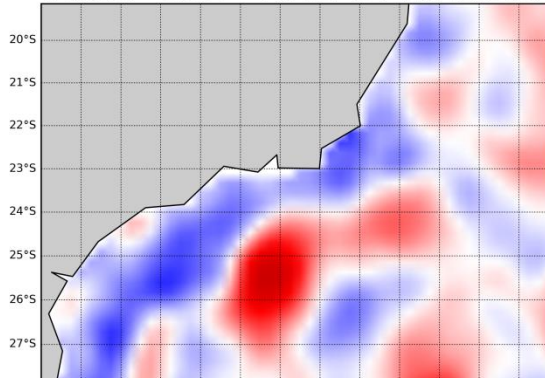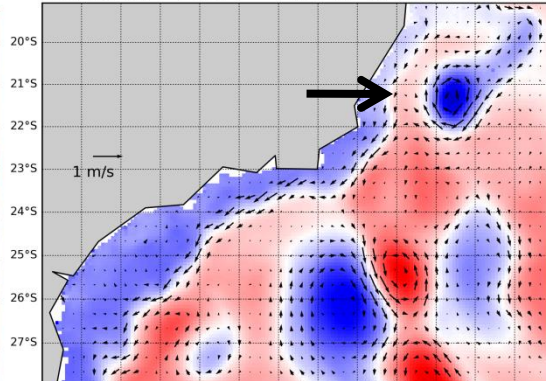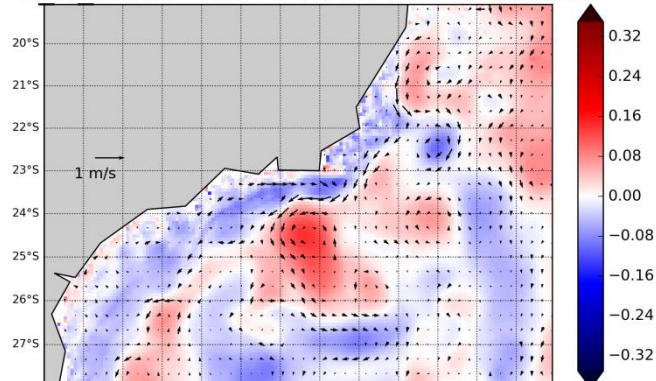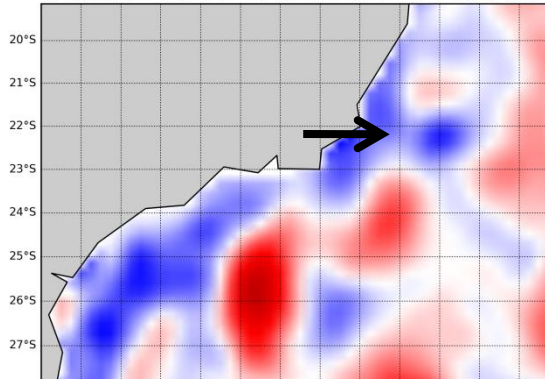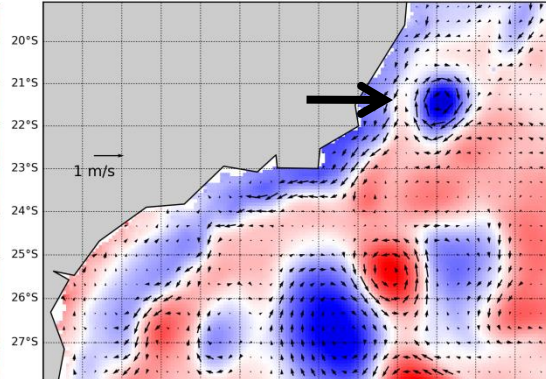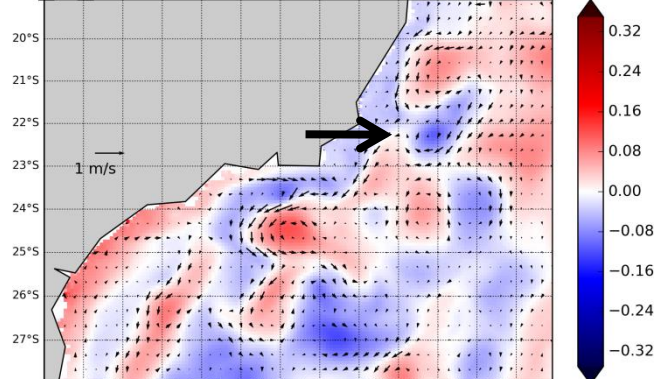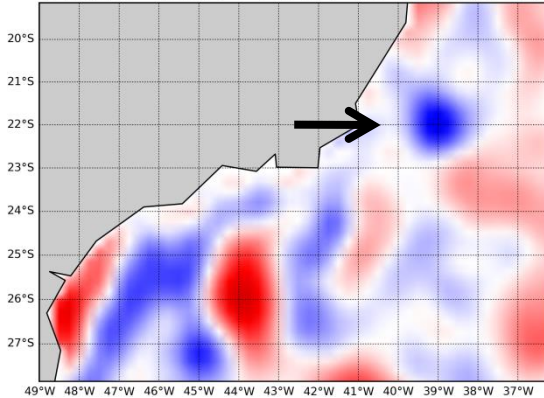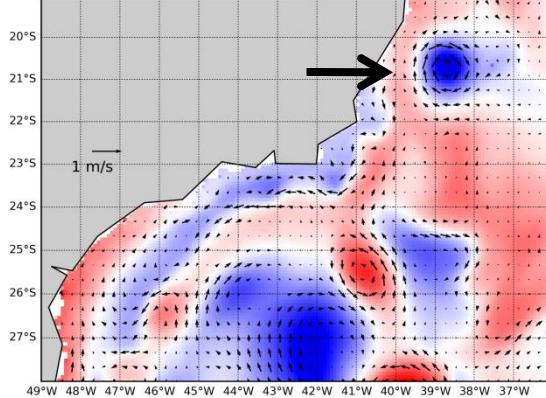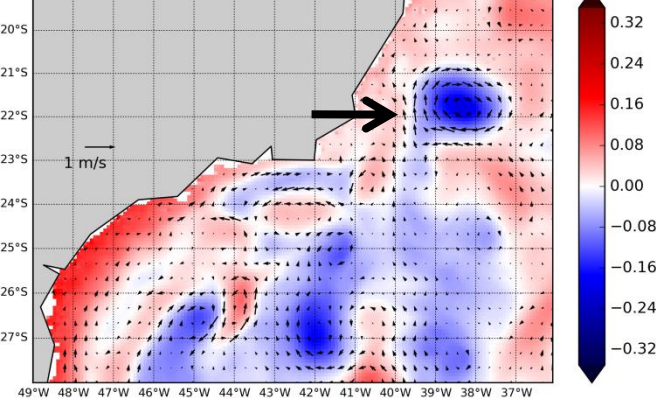
CONCLUSIONS

- RODAS ➡ Greatly improved HYCOM circulation
    - Large-scale -> SEC Bifurcation; Brazil-Malvinas Confluence
    - Meso-scale -> *Cabo Frio* and *São Tomé* eddies

- RODAS ➡ Achieved better SST, SLA and T/S subsurface structure

Variable	Control	RODAS	Reduction/Gain
Subsurface T	1.16°C	0.87°C	25%
Subsurface S	0.20 PSU	0.16 PSU	17%
SST	1.26°C	0.76°C	40%
SLA	0.33	0.62	88%