Fine Scales Structures of the Abrolhos Bank Circulation during the SWOT FSP together with Insitu and Copernicus Data

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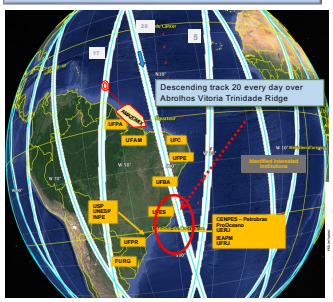
SWOT-Brésil. General circulation, mesoscale and internal tides interactions along the Brazilian coast : insights from model, in situ data, altimetry, SAR and SWOT

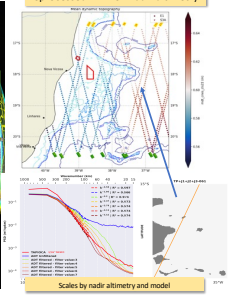
New insight on SSH Scales between 10 and 50 km :

- Partnership with Brazil on satellite altimetry
- Fine scales in a Western Boundary dynamics
- Internal Waves along the Brazilian shelf
- SWOT-ABROLHOS 2023: Cal/Val SWOT

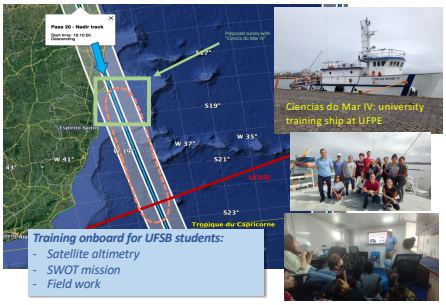
SWOT during Cal/Val: 1 day repeat orbit



Preliminary analysis at LEGOS of reprocessed XTRACK nadir altimetry



SWOT-Abrolhos (May & September 2023)



Training onboard for UFSB students:

- Satellite altimetry
- SWOT mission
- Field work

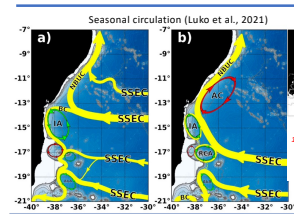
Objectives of SWOT-Abrolhos:

- Brazil Current dynamics and mesoscale over the shelf, on the Banks:
- Banks of Abrolhos: rich ecosystem and MPA
- SSH on coastal areas
- Wave, tidal influence over the Banks
- Biogeochemistry (for Ocean Colour)

SWOT-Abrolhos Field Campaign:

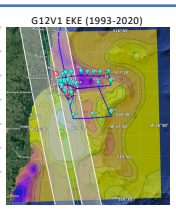
- 2 Legs : VM-ADCP, TSG
- CTD casts
- Biology, biogeochemistry, water sample
- 2 shallow water moorings (ADCP, SSH, wave)

Seasonal circulation (Luko et al., 2021)

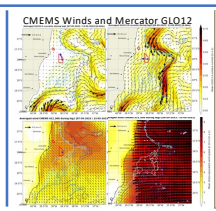


Lopes and Castro (2013)

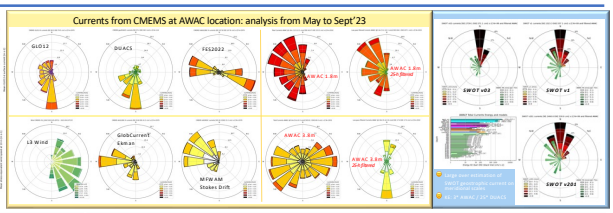
G12V1 EKE (1993-2020)



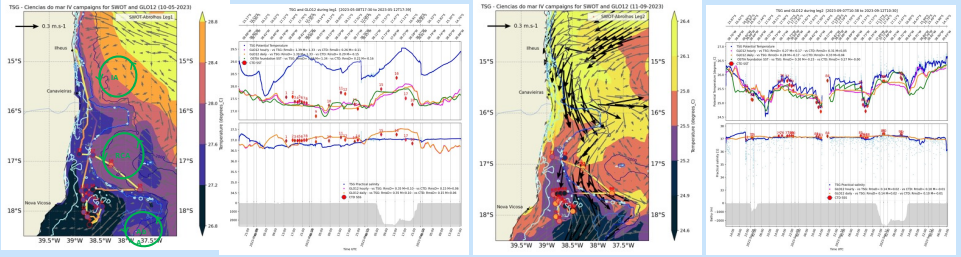
CMEMS Winds and Mercator GLO12



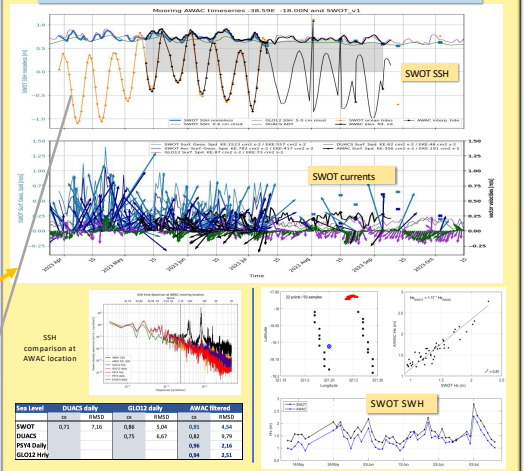
Currents from CMEMS at AWAC location: analysis from May to Sept'23



Preliminary description of the water masses and circulation dynamics from Ciencias do Mar IV TSG and CTD casts, together with CMEMS operational forecasts: May (leg1) and September (leg2) 2023



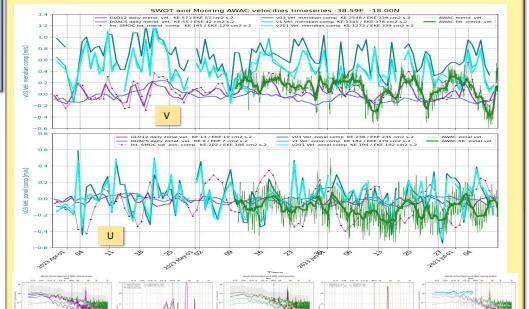
Comparison of SWOT L3 (v0.3) against GLO12, DUACS and Moored ADCP (20 m-depth)



SSH comparison at AWAC location

Sea Level	DUACS daily		GLO12 daily		AWAC filtered	
	CR	RMSD	CR	RMSD	CR	RMSD
SWOT	0,71	7,16	0,86	5,04	0,91	4,54
DUACS			0,75	6,67	0,82	6,79
PSY4 Daily					0,96	2,16
GLO12 Hrly					0,94	2,51

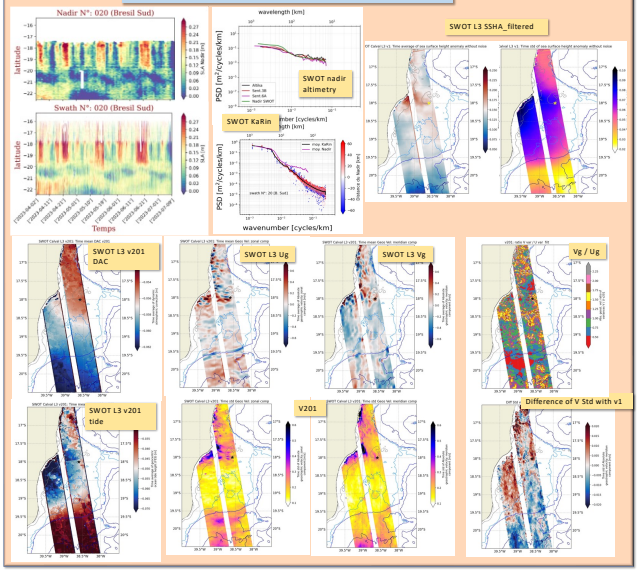
SWOT and Mooring AWAC velocities timeseries : 38.59E - 18.00N



Velocity comparison at AWAC location

	AWAC @ 1.75 m		AWAC @ 3.75 m		AWAC @ 1.75 m		AWAC @ 3.75 m		GLO12-h		geoDUACS		totGLOBC-h		
	CR	RMSD (cm/s)	CR	RMSD (cm/s)	CR	RMSD (cm/s)	CR	RMSD (cm/s)	CR	RMSD (cm/s)	CR	RMSD (cm/s)	CR	RMSD (cm/s)	n
Zonal component															
GLO12 hrly	0,25	16,2	0,11	11,9	0,54	12,0	0,56	5,7							2932
geoDUACS daily	0,14	18,4	-0,02	11,4	-0,23	14,6	0,14	5,5							2932
GLOBC hrly	0,41	16,6	0,76	13,6	-0,01	18,2	0,09	17,9							2932
SMOC hrly	0,59	15,6	0,91	12,9	0,17	19,2	0,29	19,6							2932
SWOT v03	0,06	29,1	-0,01	23,2	0,13	26,2	-0,03	21,0	-0,18	22,6	-0,06	21,9	-0,14	30,8	55
SWOT v1	0,06	26,7	0,08	19,6	0,02	24,4	-0,09	18,0	-0,15	19,5	-0,05	18,8	-0,05	27,4	55
SWOT v201	0,07	27,1	0,09	20,3	0,06	24,8	-0,06	18,3	-0,17	20,4	-0,04	19,7	-0,05	28,0	55
Merid. component															
GLO12 hrly	0,70	16,8	0,73	8,2	0,75	13,5	0,91	7,2							2932
geoDUACS daily	0,13	23,4	0,10	11,3	0,15	20,5	0,14	10,0							2932
GLOBC hrly	0,49	20,9	0,44	12,5	0,56	17,9	0,57	11,5							2932
SMOC hrly	0,71	15,8	0,80	11,8	0,73	13,5	0,84	12,7							2932
SWOT v03	0,15	56,6	0,28	62,1	0,08	19,2	0,09	64,4	0,10	64,4	0,02	73,8	0,09	71,3	55
SWOT v1	0,16	40,6	0,24	43,4	0,08	41,8	0,18	45,4	0,21	45,2	-0,08	54,6	0,01	53,0	55
SWOT v201	0,15	40,3	0,21	43,1	0,09	41,2	0,17	45,0	0,20	44,9	-0,06	54,3	-0,02	52,8	55

First analysis at LEGOS of SWOT CalVal Pass 20 (L3 v0.3, v1, v201)



The SWOT Abrolhos Campaign

- First cal/val campaign of the Ciencias do Mar IV: difficulties at the first leg with TSG temperature measurements, ship-mounted ADCP data not yet processed
- Contribution to the SWOT ST AdAC projects (thank for their help during the cruises)
- Good agreement between CTD casts and CMEMS GLO12 and OSTIA products
- Sampling of the expected mesoscale features along the Brazil Current shelf and over the Banks

1-day repeat analyses

- SWOT L3 SSH and SSH filtered very similar in the area
- Larger SSH variability closer to the coast need further analysis
- Mean SWOT SSH, sigma0_std , velocities reveal possible contamination by bathymetry (MSS corrections)
- The L3 v201 products still with artefacts for dac and tide corrections
- Progresses from SWOT L3 v03 to v201 less noisy in particular on velocity std
- Variability of zonal/meridional currents need further analysis, although very high. Current pattern due to « real » dynamics on this shallow area need to be infered against other sources (satellite SST, color, ocean models)

Analysis at mooring location of SWOT (v03, v1, v201), CMEMS products, against moored ADCP data (May to Sept' 2023)

- Only one shallow water mooring correctly operating, equiped with AWAC ADCP (Pressure → Sea level / Currents at the surface)
- Evaluation of SWH, SSH, currents from the AWAC, and compared against SWOT L3, CMEMS GLO12 and DUACS data over the period on coastal dynamics (opportunity to **validate CMEMS products in this shallow area**)
- **Good agreement between AWAC SLP and SWOT L3 SSH** and GLO12 SSH. However, DUACS too low frequencies
- Good agreement between AWAC and SWOT SWH (wave spectrum under evaluation)
- Local dynamics: weaker and non consistent currents of CMEMS GLO12 and DUACS compared to AWAC
- **SWOT currents too large and noisy** in particular V (impact of tidal, MDT and MSSH errors under investigations)
- Detailed analysis of current at AWAC location show the large influence of Ekman, Stokes Drift and other inertial / subinertial regimes, with also a strong influence of tides: **SWOT not able to capture this dynamics**
- AWAC currents below 3-m depth, below influence of surface are not better matching SWOT geostrophic currents (although better comparison with GLO12)
- Comparison of sea level (from AWAC pressure) to **FES2022 : very good agreement of major tidal constituent** (S2 might be polluted by atmospheric tides)