



❖ SST ESTIMATION IN UPWELLING AREA: ISSUES AND STRATEGIES

❖ SST UPDATES AT REMO

Rosa Cristhyna Paes, Rodrigo Sousa, Gutemberg França
Federal University of Rio de Janeiro - Brazil



Outline

- I. SST time series and its updates;
- II. Extended area and with possible GHRSSST's support;
- III. Special requirements from REMO;
- IV. To retrieve SST during upwelling events.



Outline

- I. SST time series and its updates;**
- II. Extended area and with possible GHRSSST's support;
- III. Special requirements from REMO;
- IV. To retrieve SST during upwelling events.



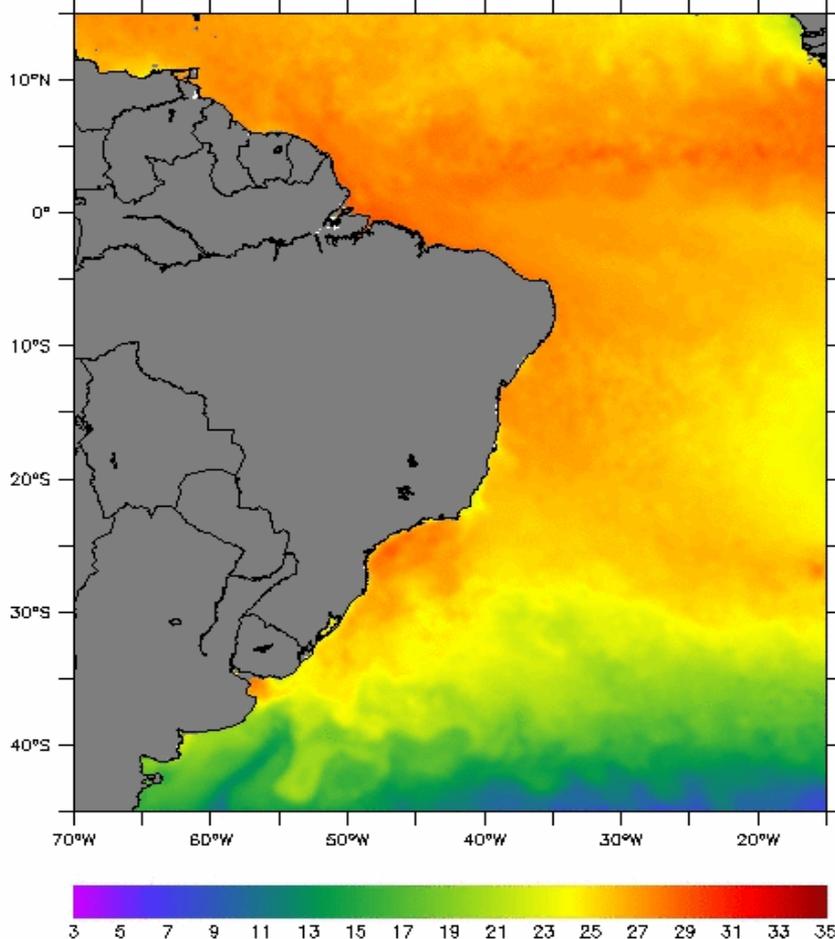
Rede de Modelagem e Observação Oceanográfica
Temperatura da Superfície do Mar (Celsius)
Valido para 01-JAN-2014



- Daily SST analysis (NOAA18-19 & TRMM)
- Resolution: 0.05°
- Time series: 1st August 2002 – 28th February 2015

Previous series in netCDF GDS v2 format

ftp://podaac.jpl.nasa.gov/OceanTemperature/ghrsst/data/GDS2/L4/SAMERICA/UFRJ/REMO_OI_SST_5km/v1/



NOAA-18 + NOAA-19 + TRMM

↓
Mar 2015 ↓

↓
Nov 2014 ↓

NAVO discontinued MCSST
processing of data

Data quality became
questionable

Replacing NOAA-18 & TRMM

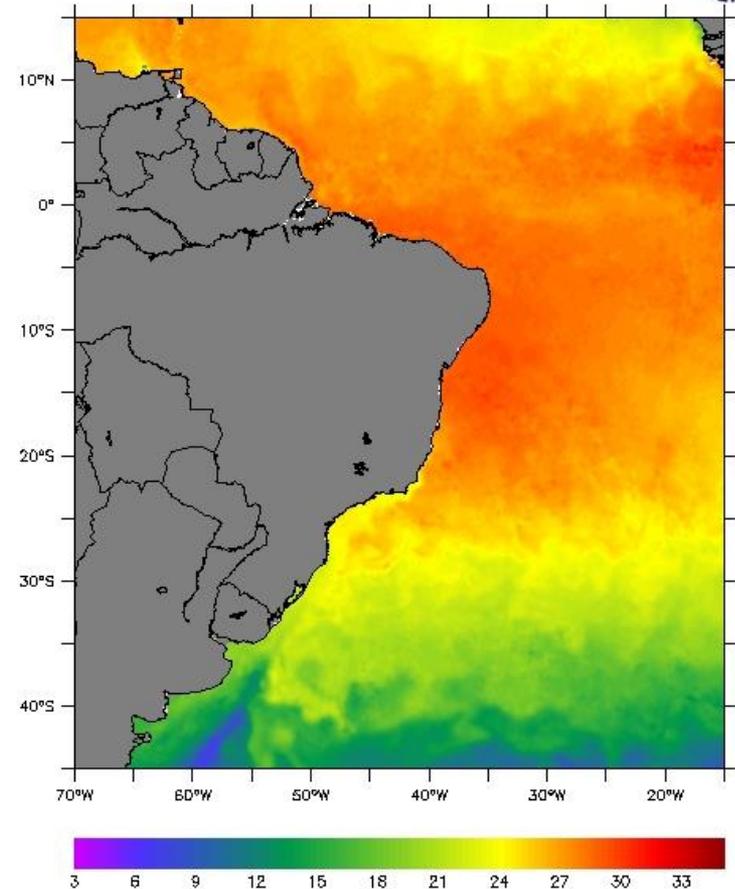


New version of SST

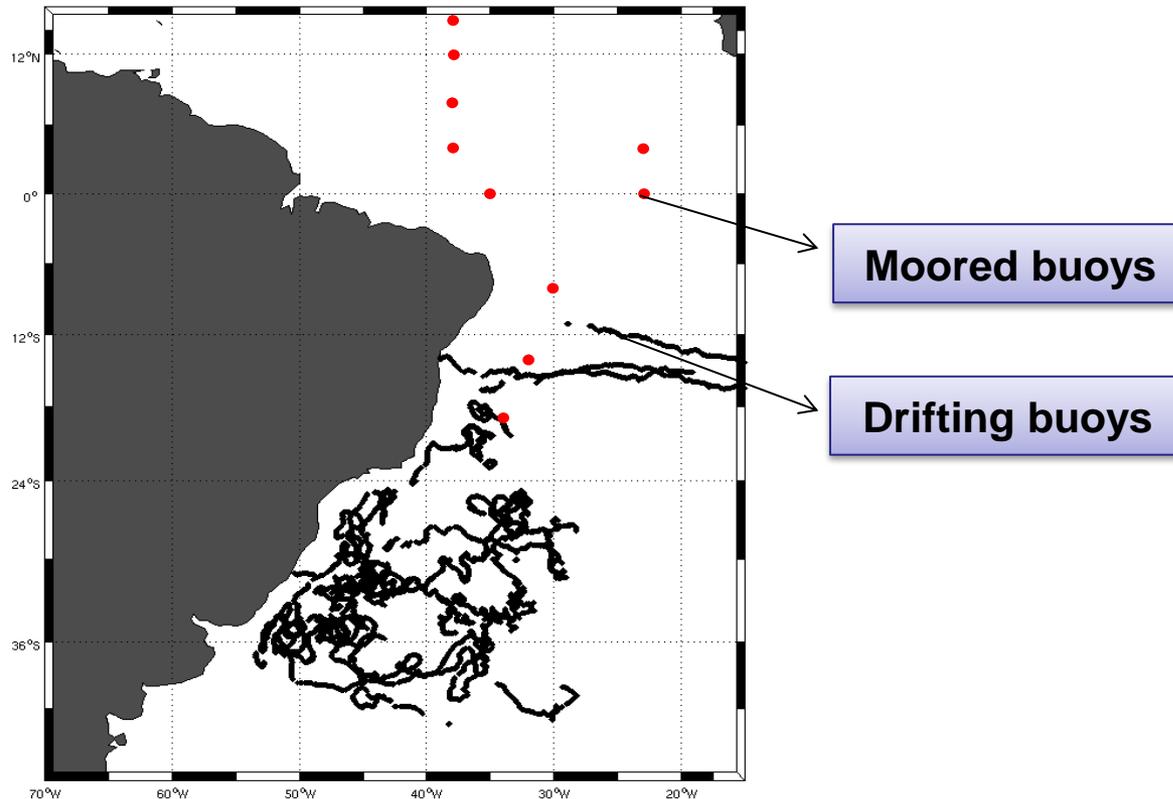
- Daily SST analysis (NOAA19, METOP-A, AMSR-2 & Windsat)
- Resolution: 0.05°
- Time series: 1st December 2014 up to now

✓ Current series in netCDF GDS v2 format

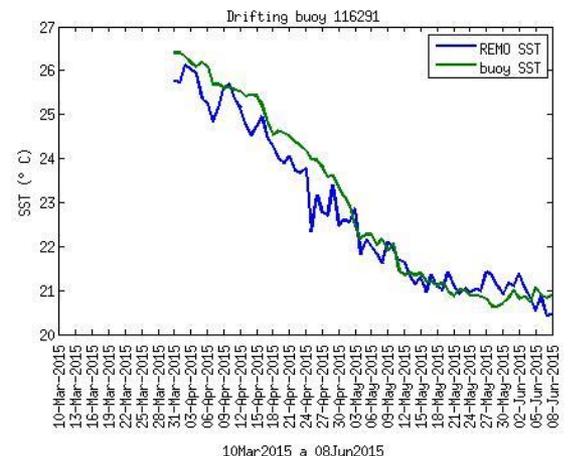
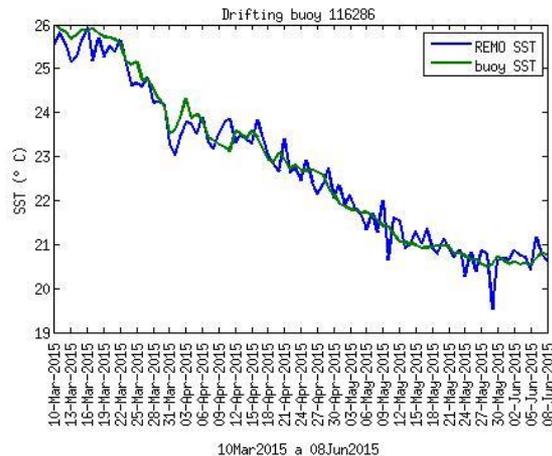
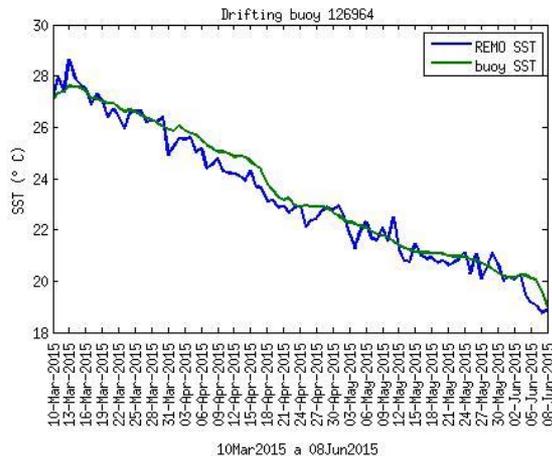
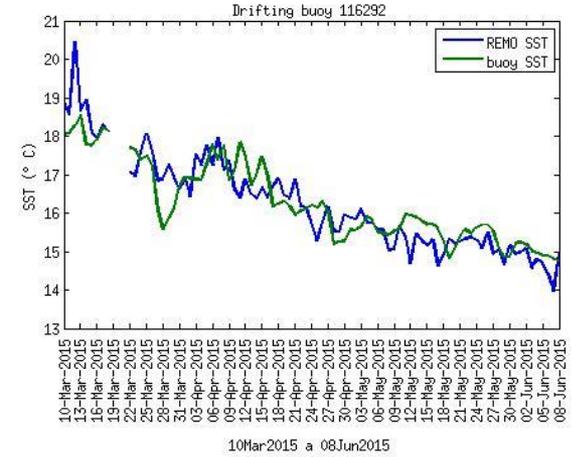
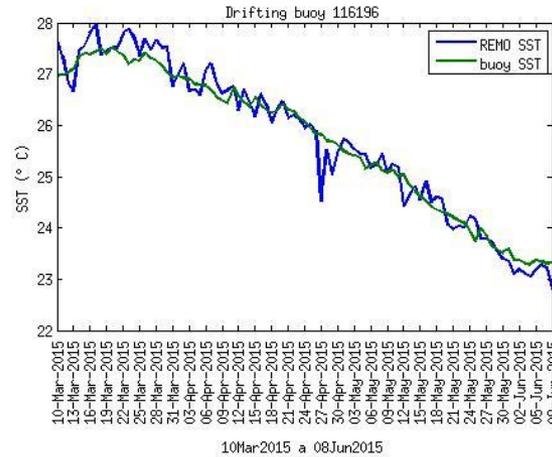
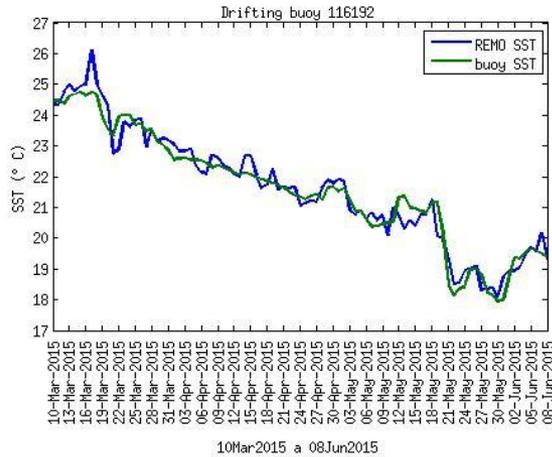
Rede de Modelagem e Observação Oceanográfica
Temperatura da Superfície do Mar (Celsius)
Valido para 30-APR-2015



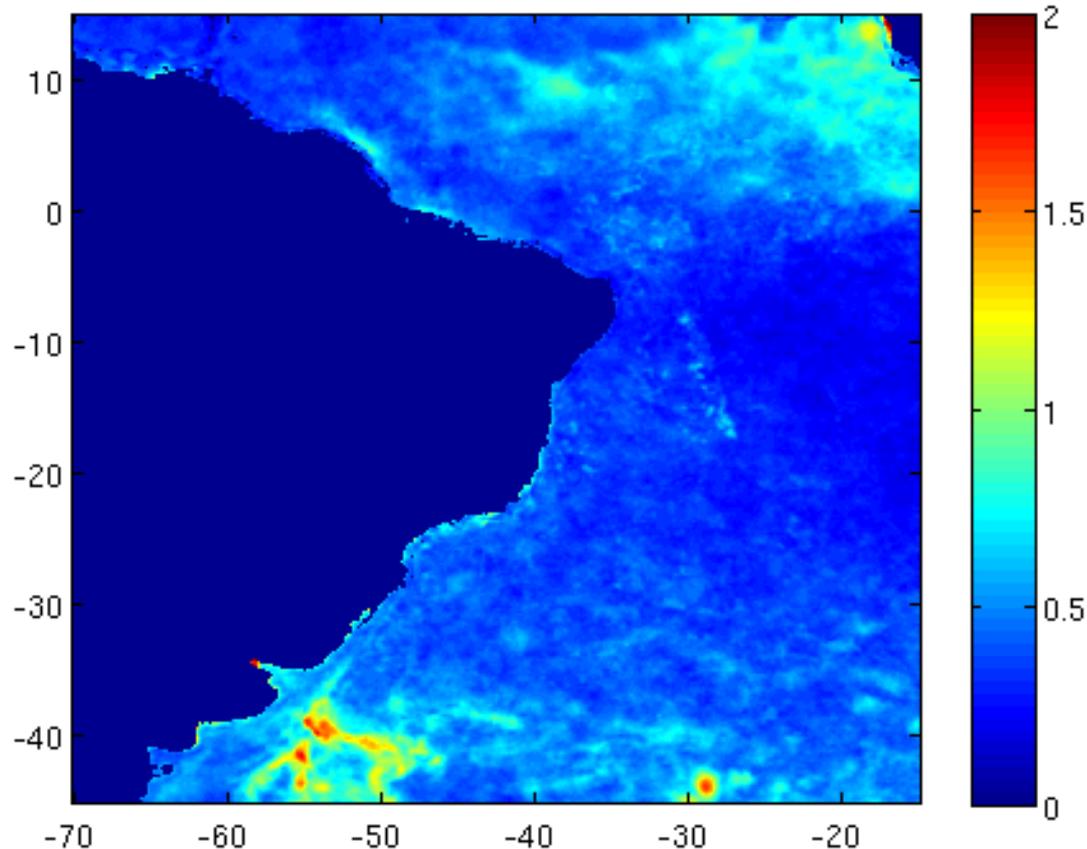
Validation has been continuously carried out with moored and drifting buoys and also against GHR SST products.



Validation with some drifting buoys (March-June 2015)



RMSE field generated from REMO SST and OSTIA SST during the period from March 2015 to June 2015.



✓ **March to June 2015 in validation process**



Extended area to be assimilated in...



**REMO Ocean Data Assimilation System (RODAS)
using HYCOM-1/4**



Rede de Modelagem e Observação Oceanográfica
Temperatura da Superfície do Mar (Celsius)
Valido para 31-MAR-2015

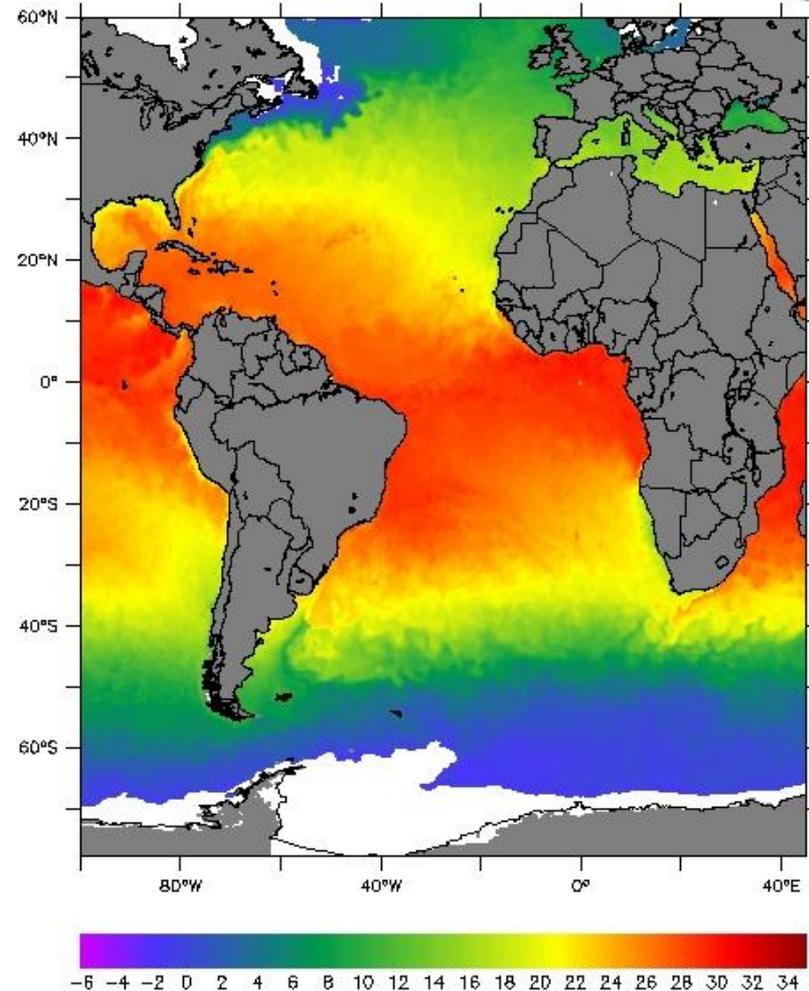


Extended area

Resolution: 0.05°

Data: NOAA-19, Metop-A, AMSR-2
and Windsat

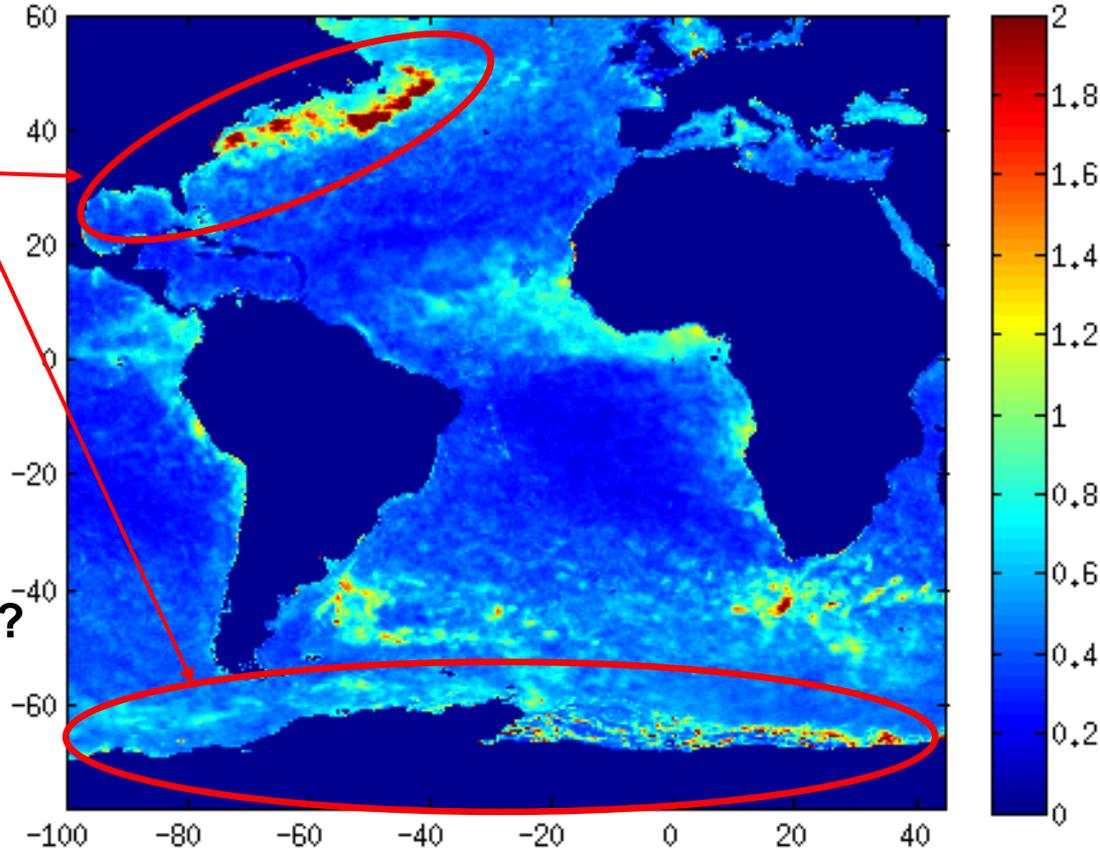
Area: 60°N → 78°S / 100°W → 45°E



Extended area

RMSE field generated from REMO SST and OSTIA SST during the period from March 2015 to June 2015.

High error



Strategies:

- ✓ Ice model (south/north of the grid)?
- ✓ To ingest *in situ* data operacionally (north of the grid)?

How to do it?

In development: to improve the analysis and to perform **the inter-comparison** with GHRSSST products in order to make available our SST time series.



Outline

- I. SST time series and its updates;
- II. Extended area and with possible GHRSSST's support;
- III. Special requirements from REMO;**
- IV. To retrieve SST during upwelling events.

High SST product to Campus and Santos basin

NOAA19 (1.1km) + METOP A (1.1km) + VIIRS (1.1km)

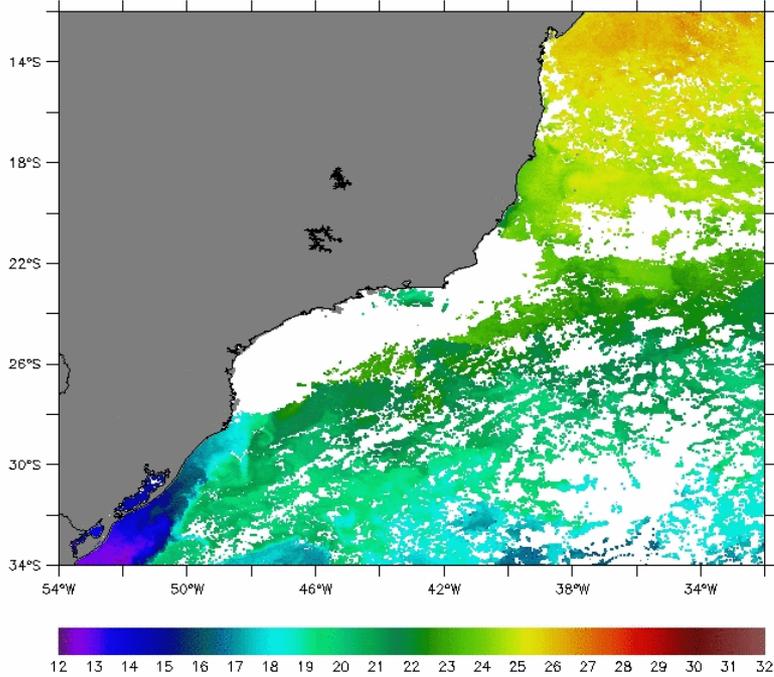
Domain:

12°S a 34°S e 54°W a 30°W

Resolution: 0.01°

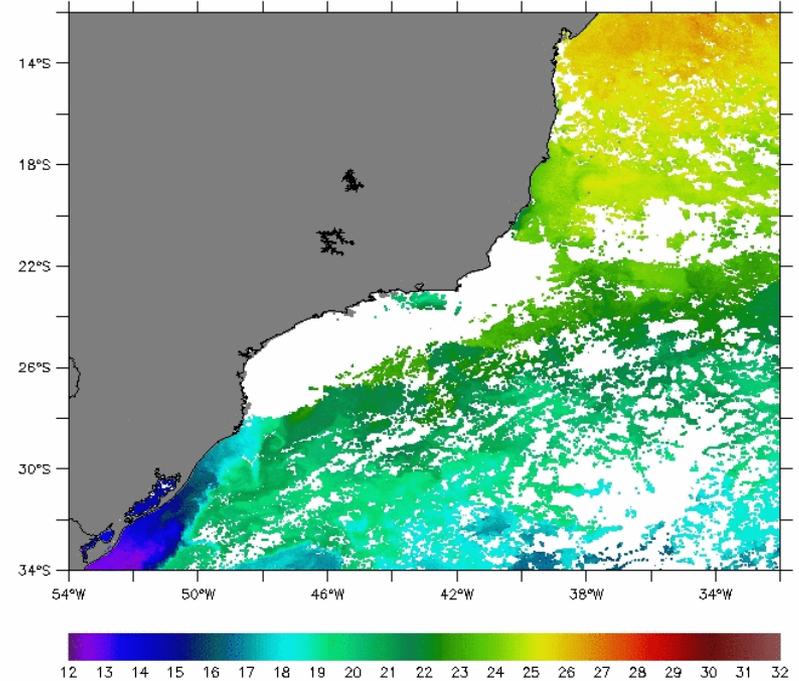
**2 products: only observations (cloudy)
and analysis (no cloud)**

Temperatura da Superfície do Mar (Celsius)
Alta Resolução (METOP + NOAA19 + VIIRS)
Valido para 10-AUG-2014



**Observations
(METOP-A + NOAA-19 + VIIRS)**

Temperatura da Superfície do Mar (Celsius)
Alta Resolução (METOP + NOAA19 + VIIRS)
Valido para 10-AUG-2014



Analysis (no cloud)

Next steps:

- To ingest MSG/GOES13;
- To ingest microwave data.

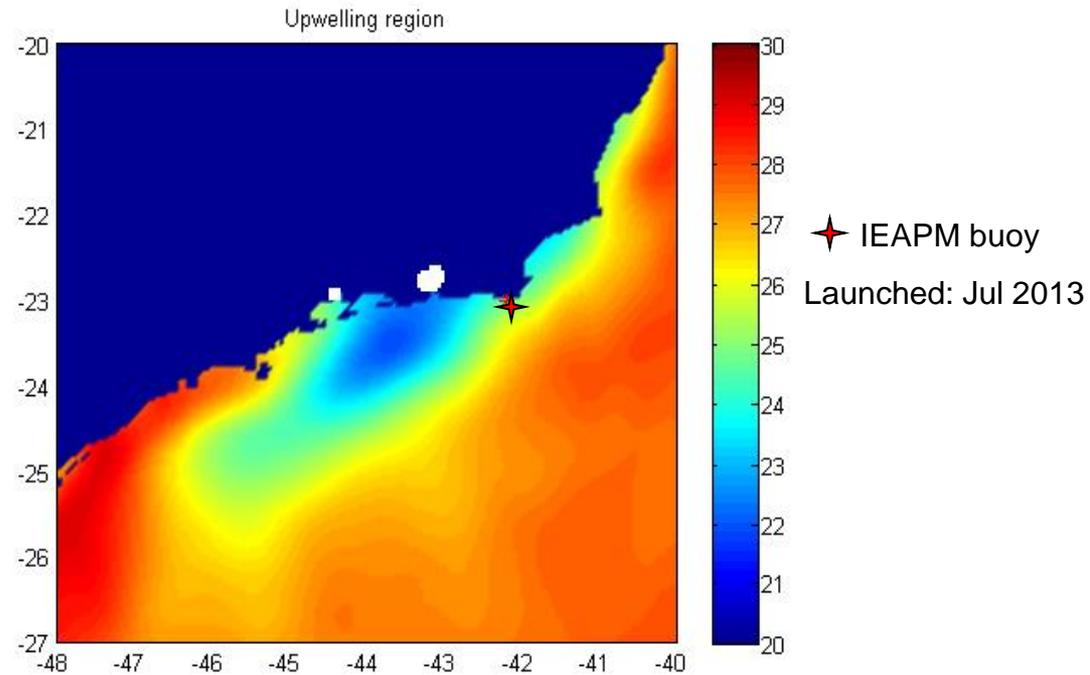
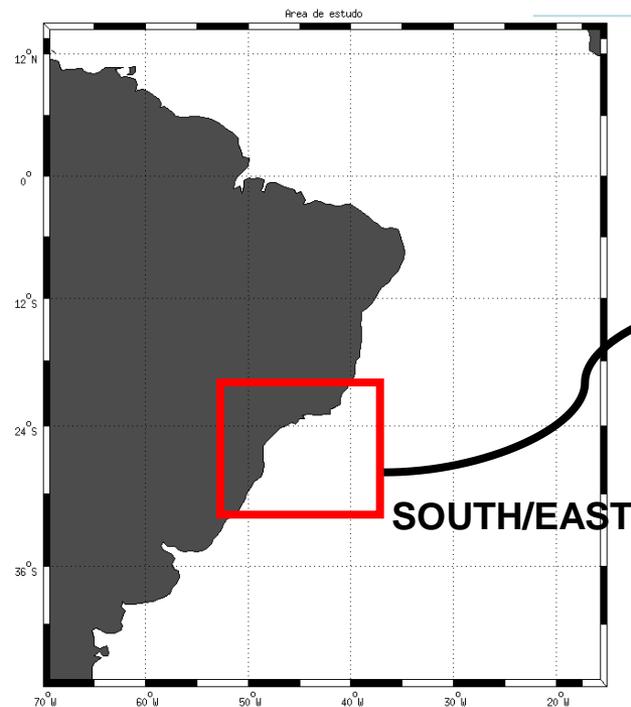


Outline

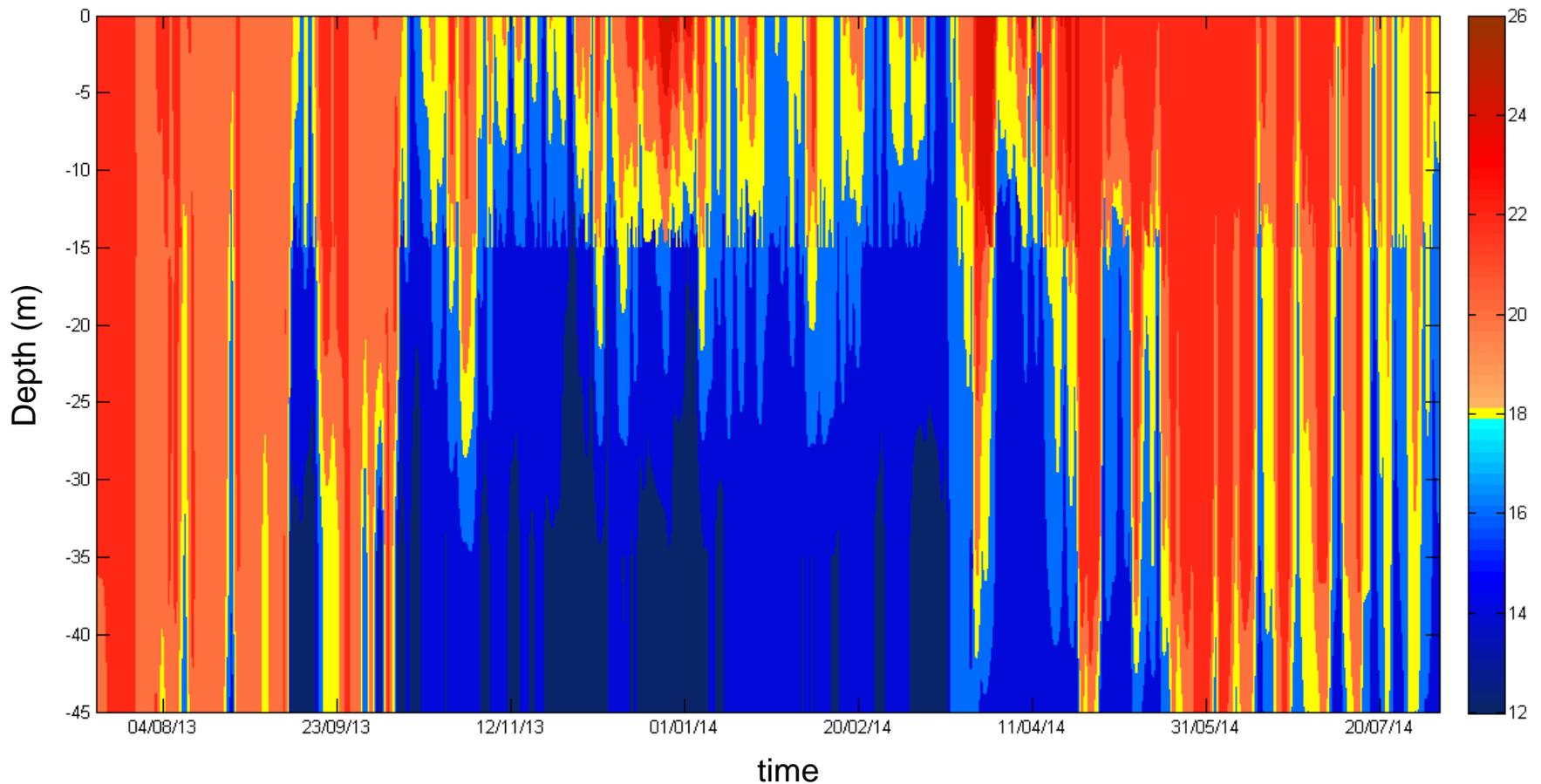
- I. SST time series and its updates;
- II. Extended area and with possible GHRSSST's support;
- III. Special requirements from REMO;
- IV. To retrieve SST during upwelling events.**

Present Challenge:

To develop a better SST analysis during upwelling event in Campus and Santos basins



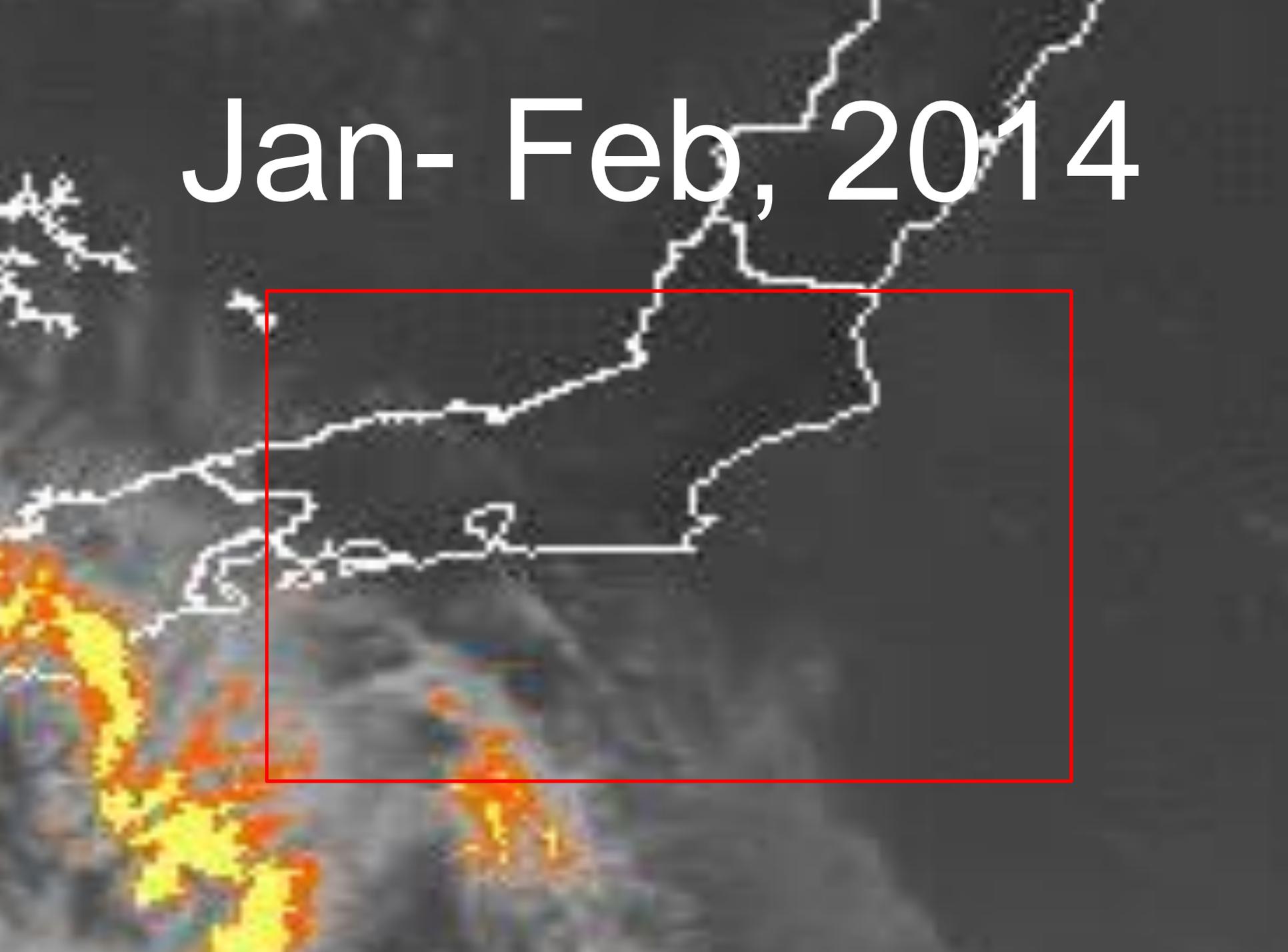
Temperature profile of IEAPM buoy (Arraial do Cabo, RJ, Brasil)



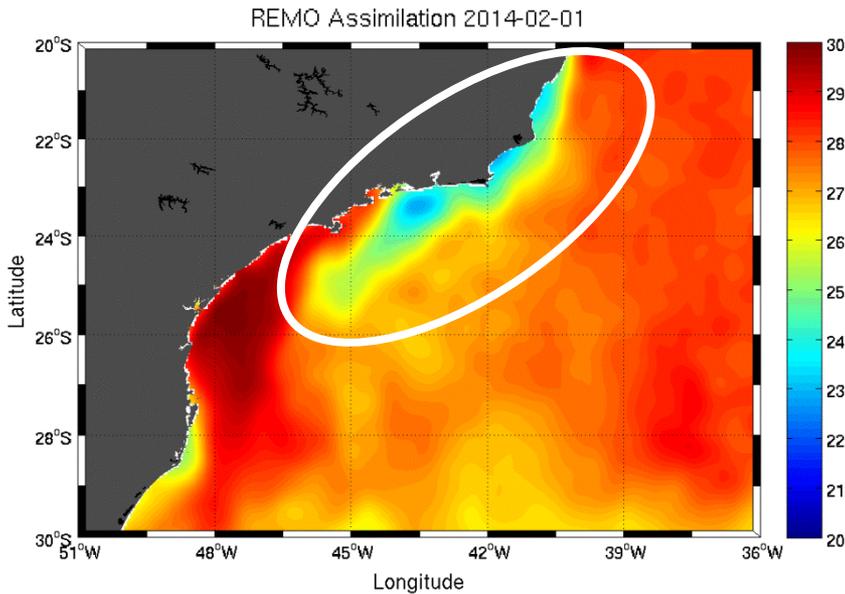


LMA – Applied Meteorology Laboratory

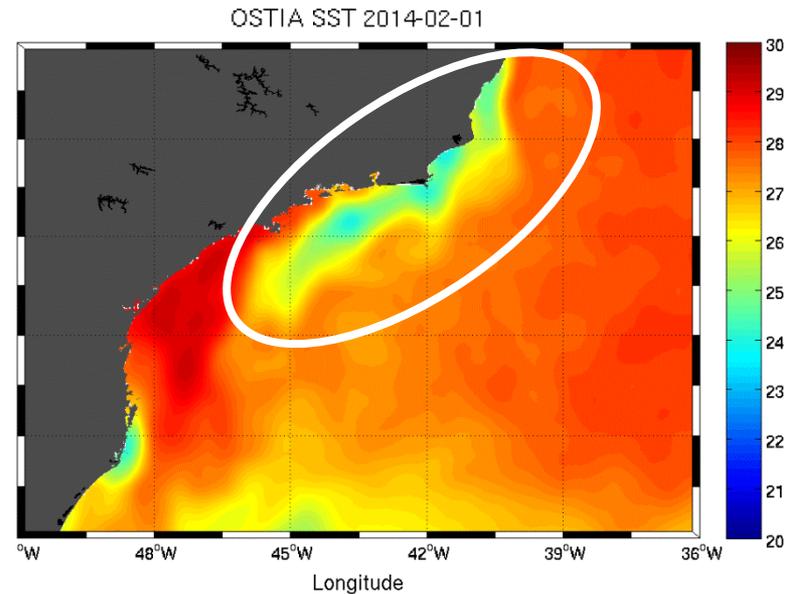
Jan- Feb, 2014



Temporal comparison between REMO and OSTIA during upwelling event



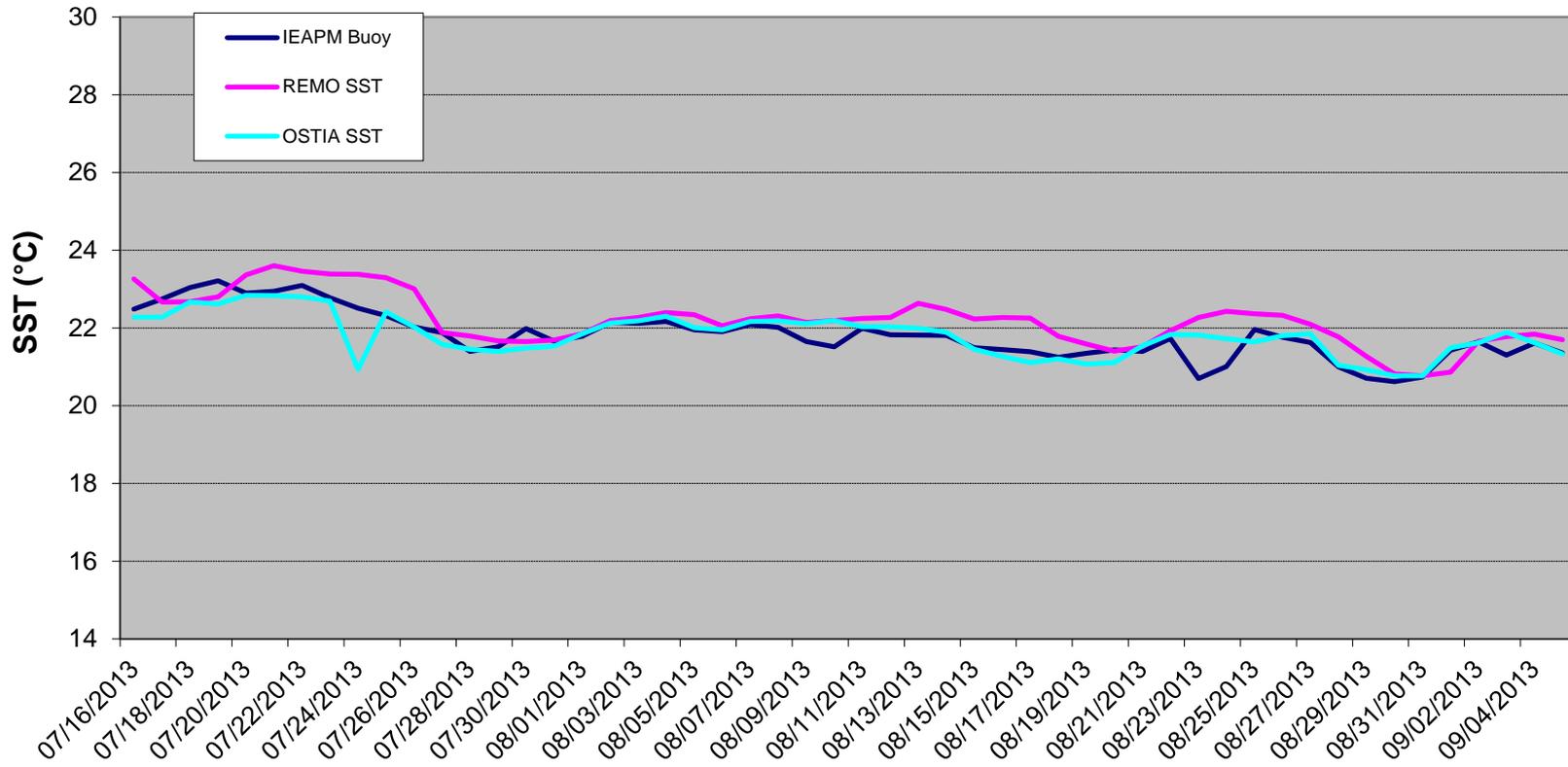
IEAPM buoy assimilated in REMO SST



OSTIA SST

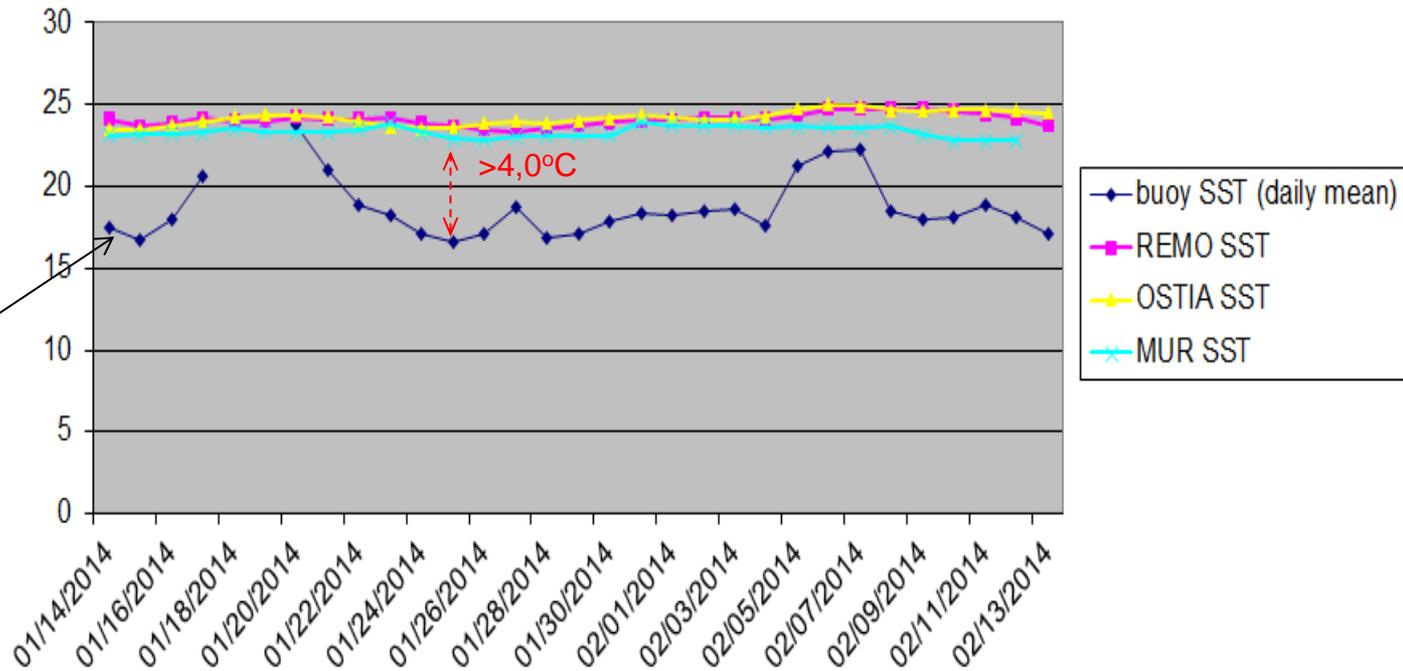
- ❖ REMO SST values are nearest IEAPM buoy values during upwelling event

Comparison between buoy and SST products for no upwelling period

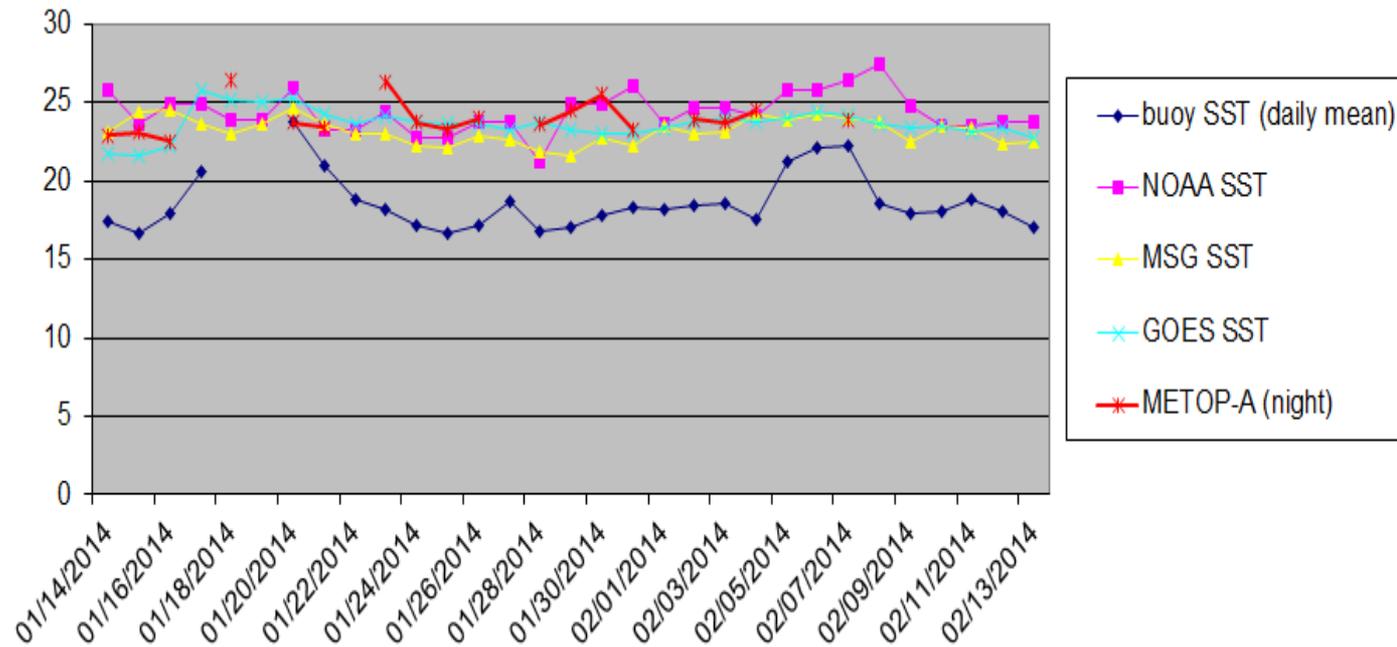




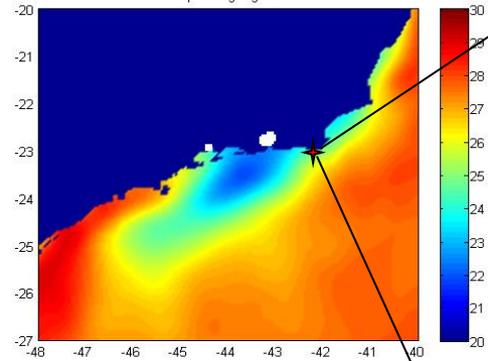
Comparison between SST analyses and *in situ* SST (buoy)



Comparison between SST estimation and *in situ* SST (buoy)



Upwelling region



MSG: <ftp://eftp.ifremer.fr/cersat-rt/project/osi-saf/data/sst/l3c/seviri>

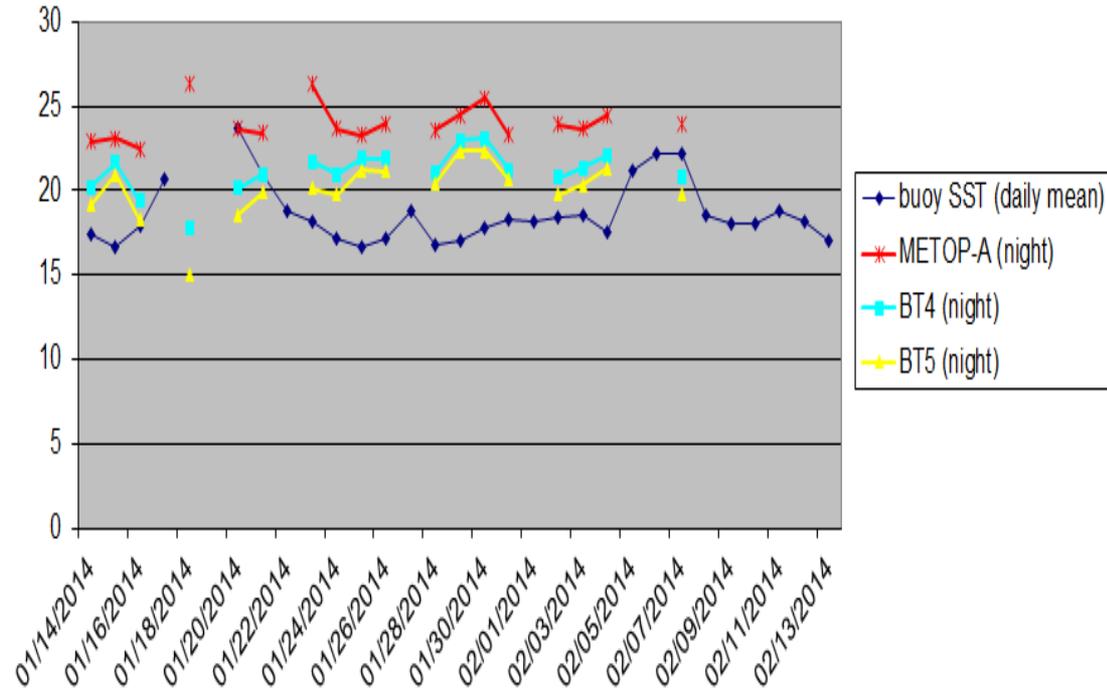
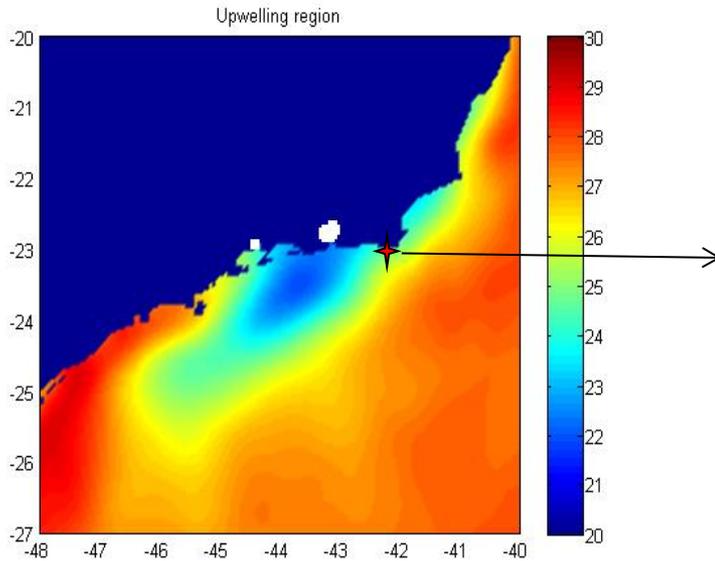
GOES: <ftp://eftp.ifremer.fr/cersat-rt/project/osi-saf/data/sst/l3c/goes13>

NOAA-18: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_9km_gac/noaa18/

NOAA-19: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_9km_gac/noaa19/

METOP-A: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_2km_frac/metopA/

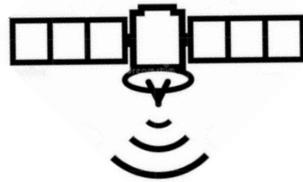
Comparison between *in situ* SST (buoy), METOP-A SST and METOP-A BT3 and BT4



Buoy SST < BT !!!

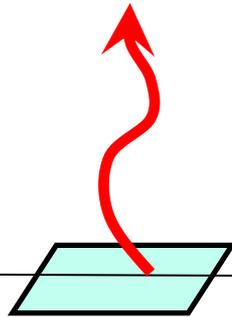
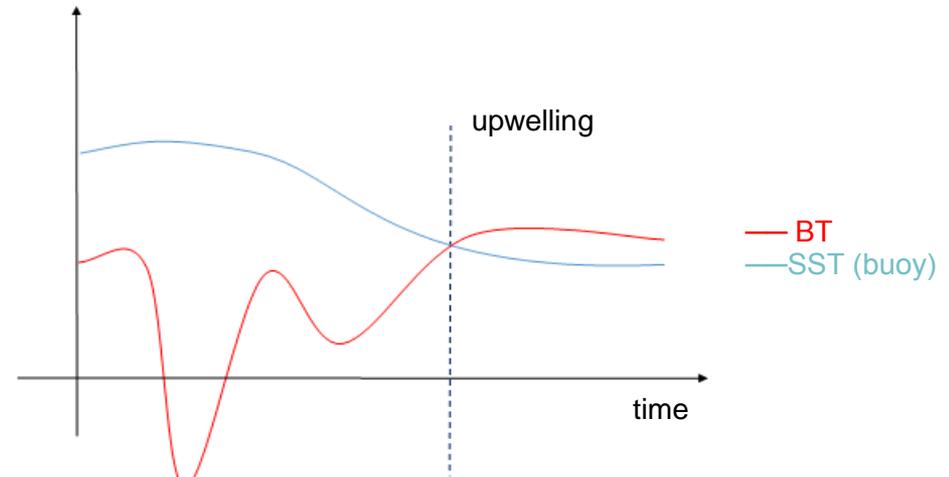
METOP-A: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_2km_frac/metopA/

No upwelling period:



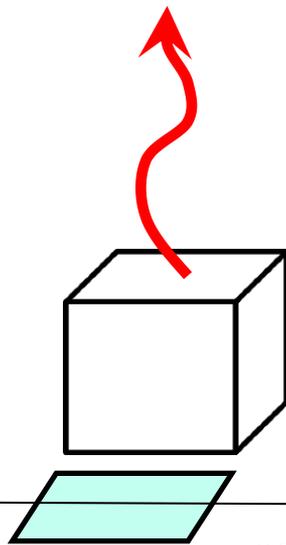
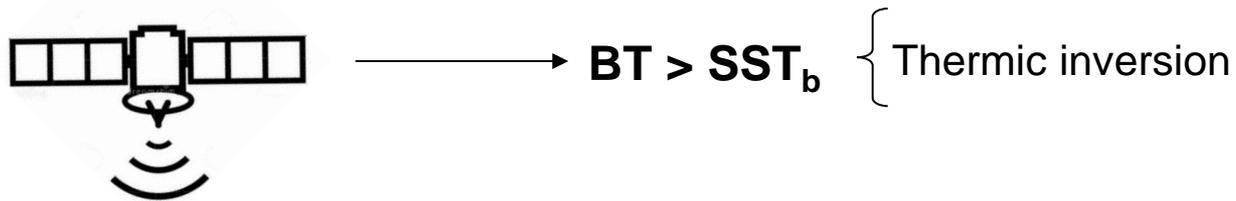
$$BT < SST_b$$

BT and SST(buoy)

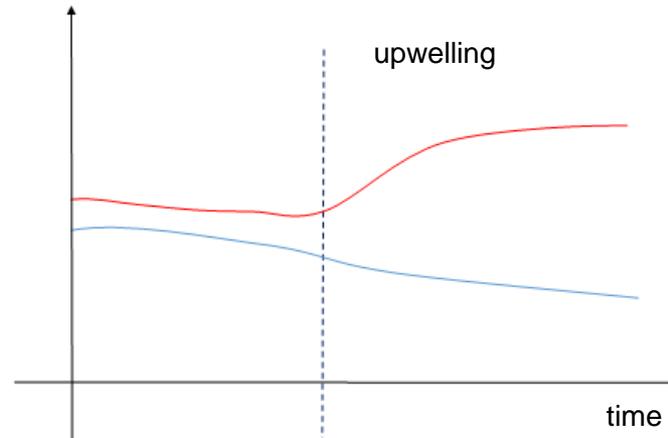


SST_b (buoy)

Upwelling period:

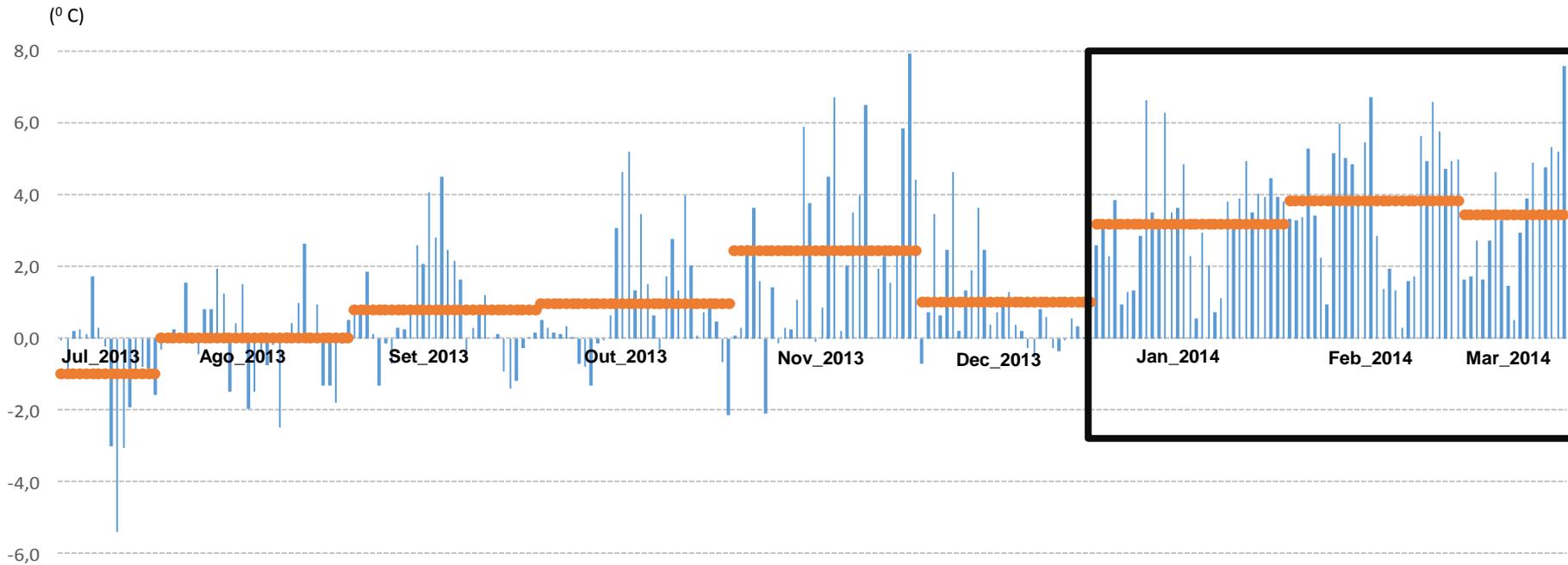


T_{air} and SST(buoy)



— T_{air}
— SST (buoy)

Upwelling ($T_{air} - SST_b$)



Blue: $T_{ar} - SST_b$ (daily difference)

Orange: $T_{ar} - SST_b$ (monthly mean difference)

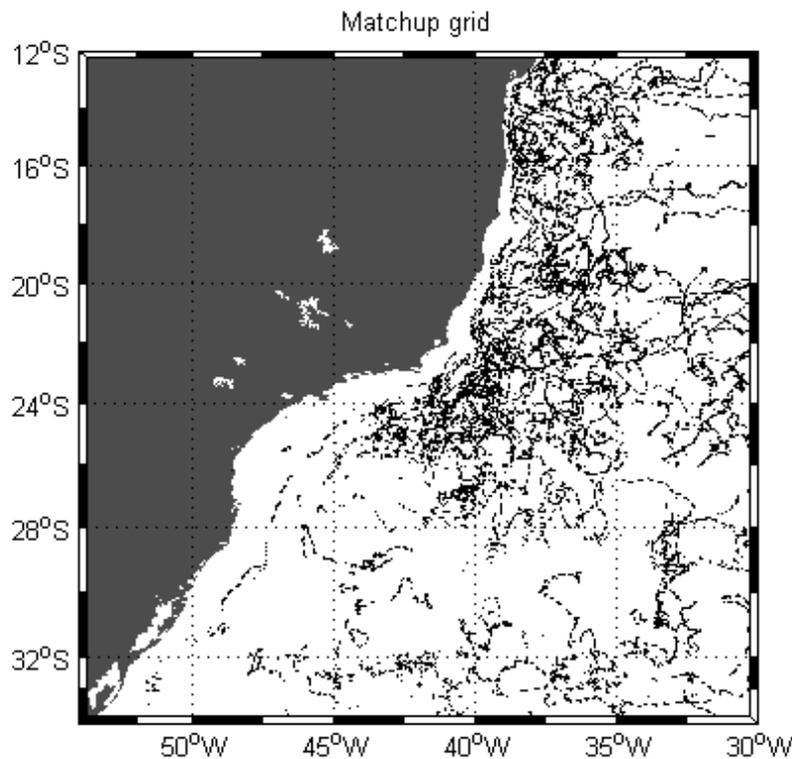


Strategies to estimate SST during upwelling event:

1. To estimate local coefficients (*in situ* vs BT's);
2. To develop **local atmosphere correction** algorithm.

Estimating local coefficients:

Building up a locally match-up database: 2011, 2012 (processed), 2013, 2014, 2015.



Match up Metop, buoys		
	2011	2012
jan	1.726	3.038
feb	1.767	39
mar	1.254	3.829
apr	1.125	3.674
may	2.705	3.311
jun	2.628	4.945
jul	2.407	6.147
ago	1.824	5.343
sep	1.886	3.862
oct	1.644	2.217
nov	265	1.697
dec	928	1.328
	20.159	39.430
	Total:	59.589



Thank you!