ERRORS ANALYSIS OF SST ESTIMATION IN UPWELLING AND ATMOSPHERIC SUBSIDENCE CONDITION

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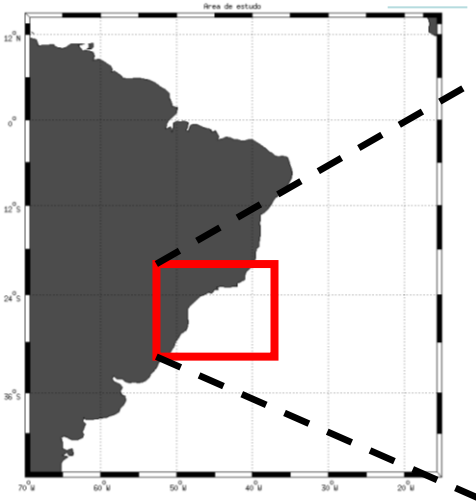
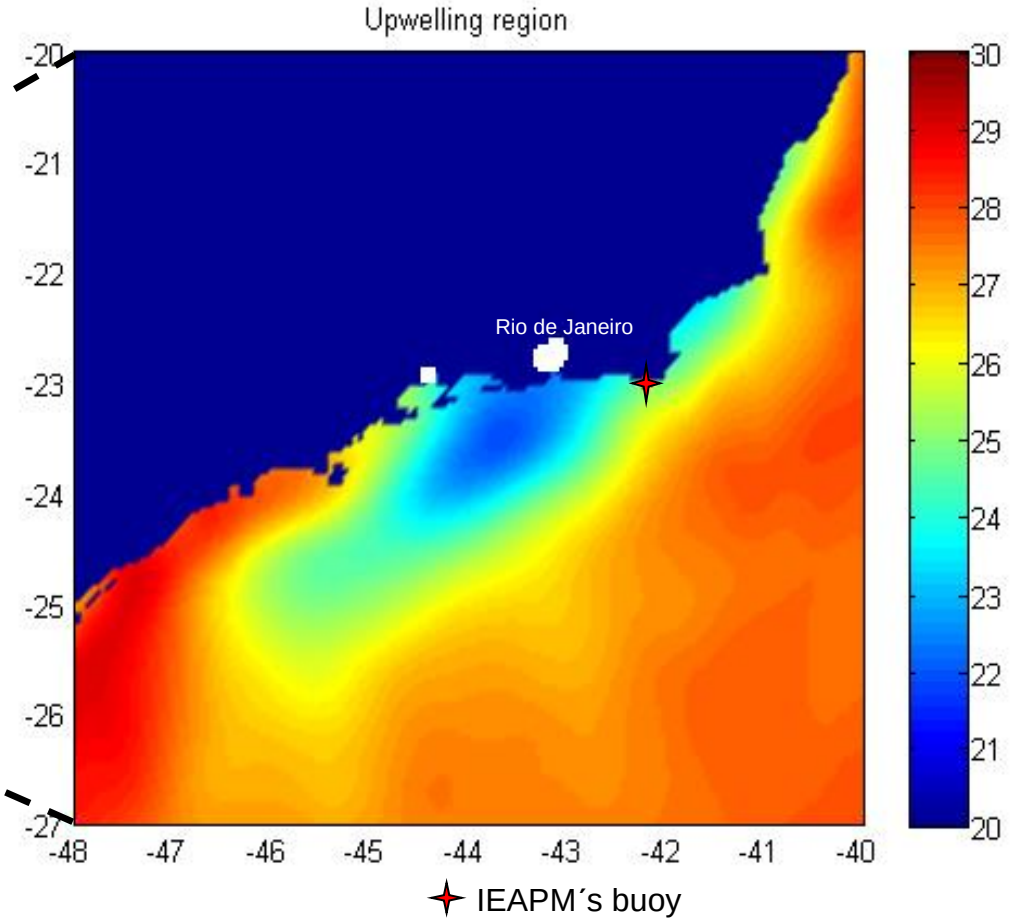
OUTLINE:

1. Brief review of the presentation of the last GHRSST
2. The problem: a curious positive bias values were observed on SST retrieval of until 4 K.
3. Analysis of turbulent fluxes
4. An attempt to solve an unexpected positive SST bias by using optimal estimator (OE)
5. Conclusions

Brief review of the presentation of the last GHRSST

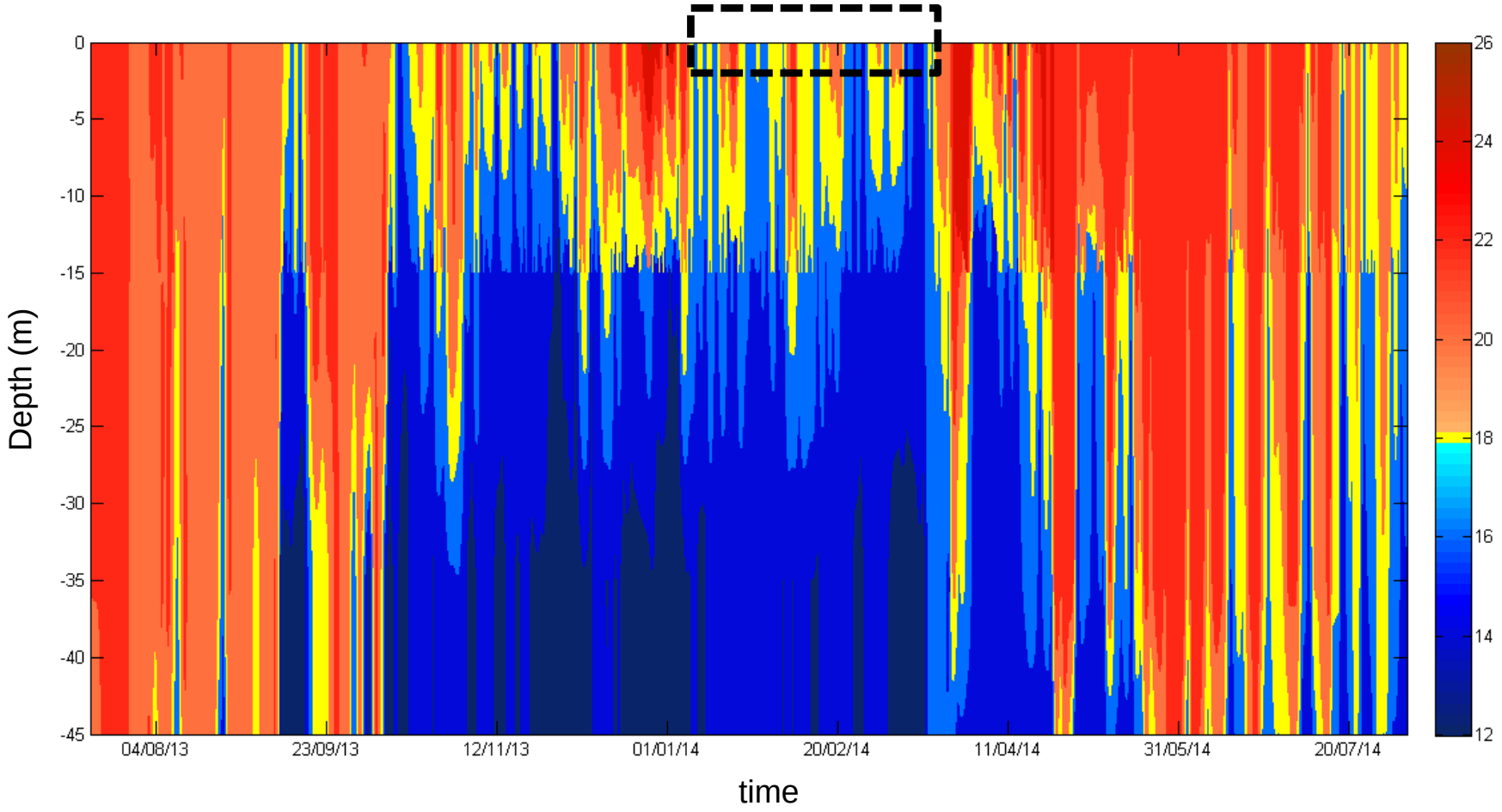
The Ocean area influenced by upwelling events in Campus and Santos basins





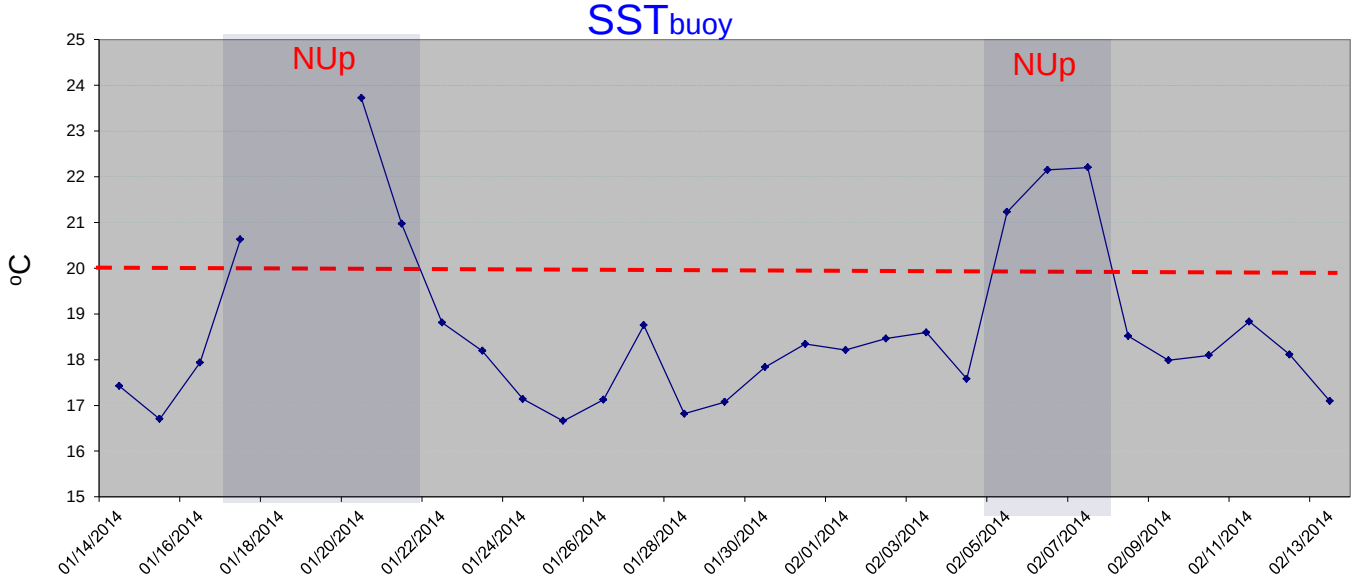
Brief review of the presentation of the last GHRSST

Temperature profile registered by the buoy

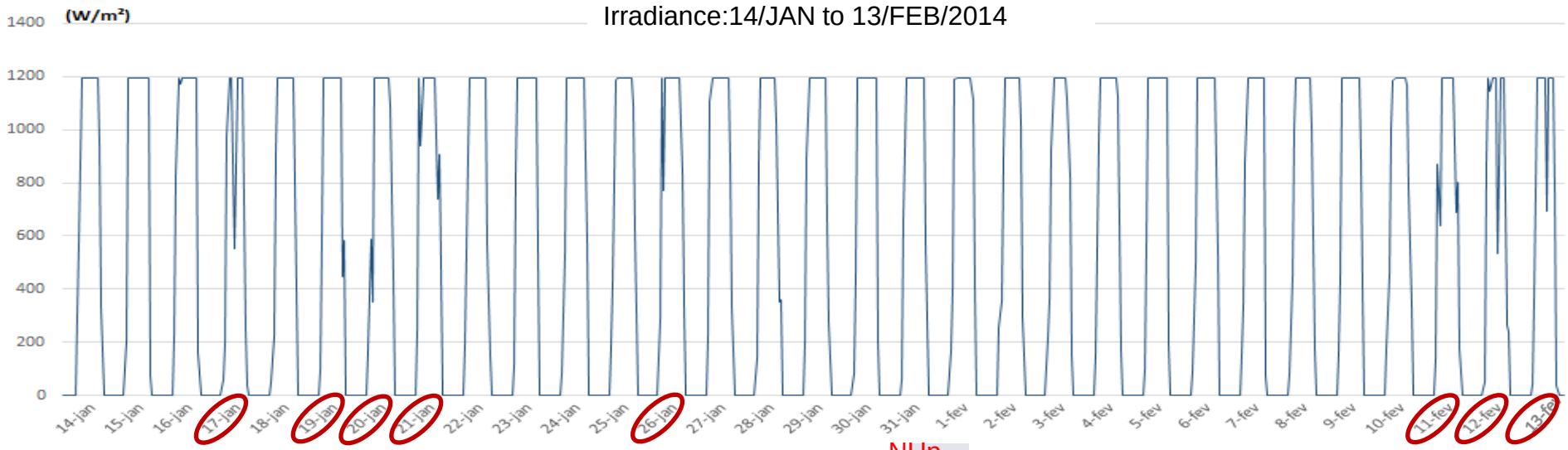


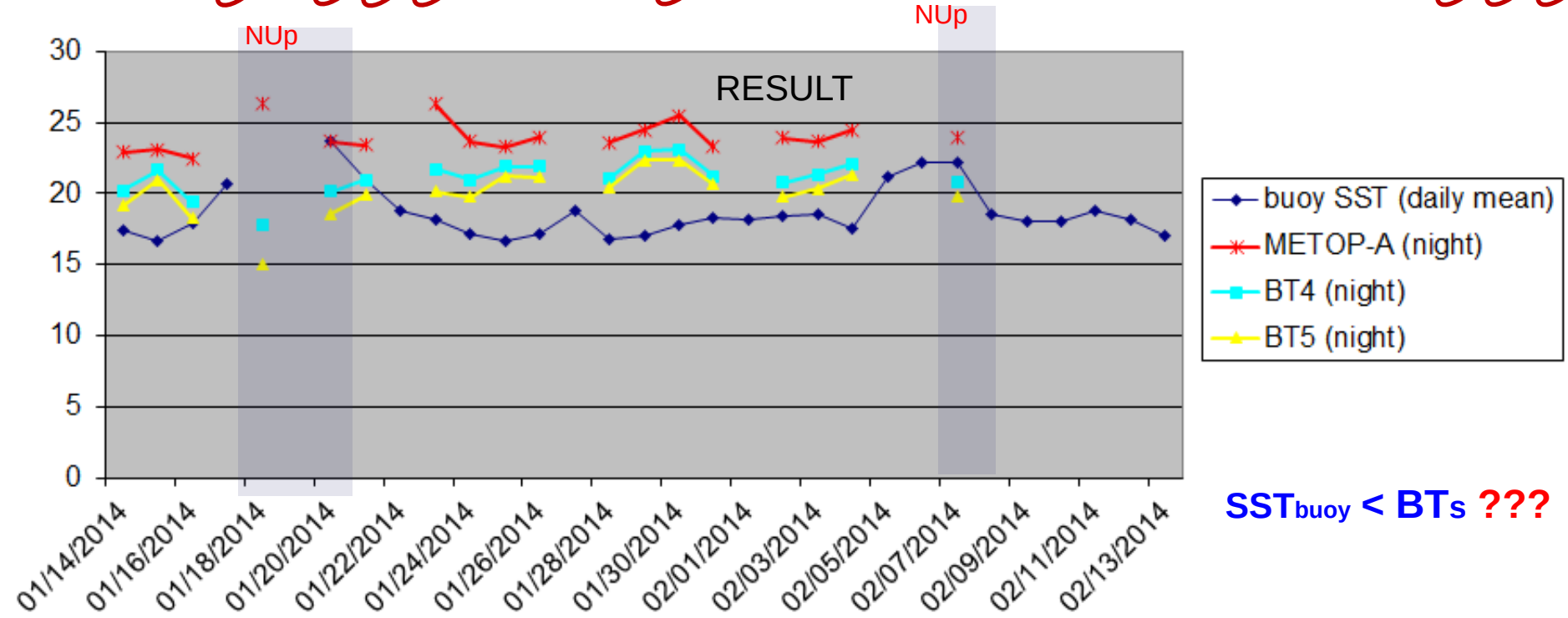
Brief review of the presentation of the last GHRSST

STUDY CASE: 14 Jan to 14 Feb 2014



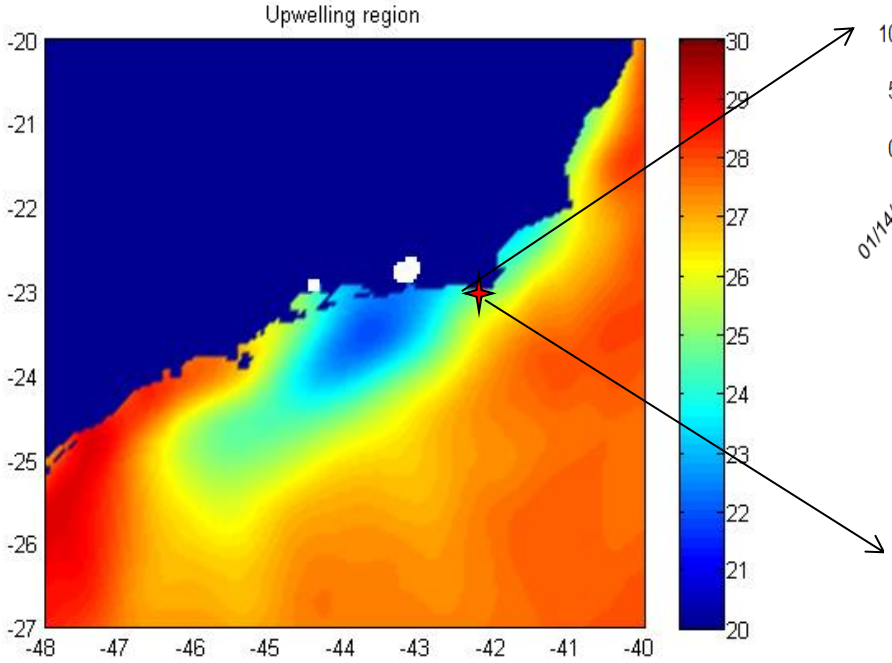
Data Classification: Cloudy days



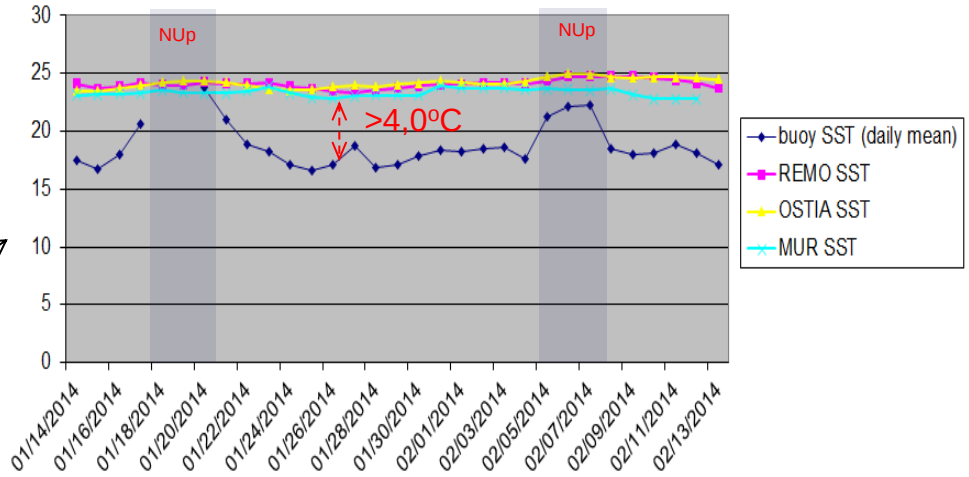


SST_{buoy} < BTs ???

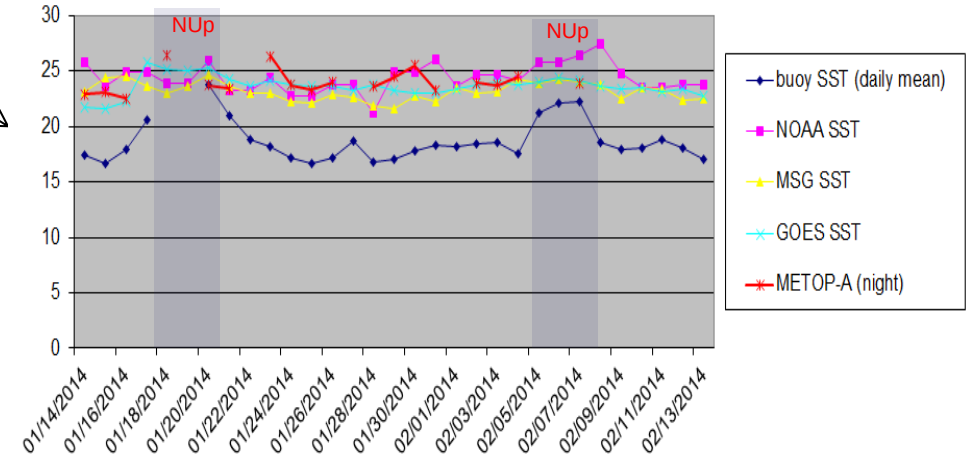
As result, unexpected positive bias values were observed on SST retrieval.



SST$_{analyses}$ and SST$_{buoy}$

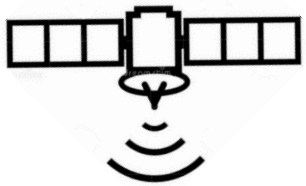


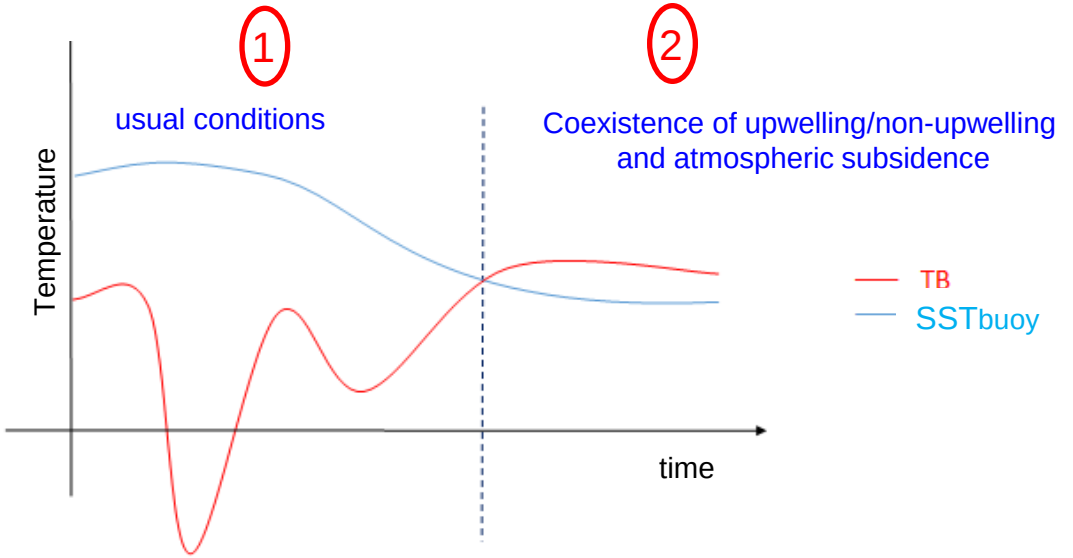
SST$_{algorithms}$ and SST$_{buoy}$

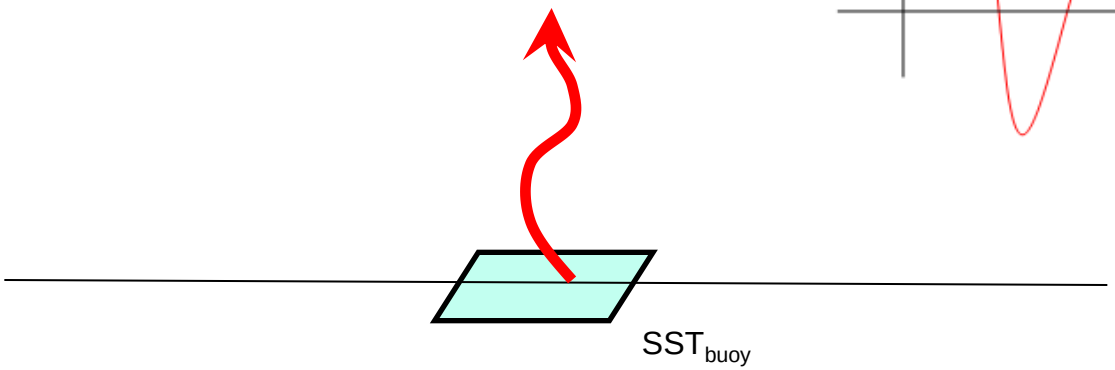


MSG: ftp://eftp.ifremer.fr/cersat-rt/project/osi-saf/data/sst/l3c/seviri
GOES: ftp://eftp.ifremer.fr/cersat-rt/project/osi-saf/data/sst/l3c/goes13
NOAA-18: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_9km_gac/noaa18/
NOAA-19: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_9km_gac/noaa19/
METOP-A: ftp://podaac-ftp.jpl.nasa.gov/allData/avhrr/L2/navo_mcsst_2km_frac/metopA/

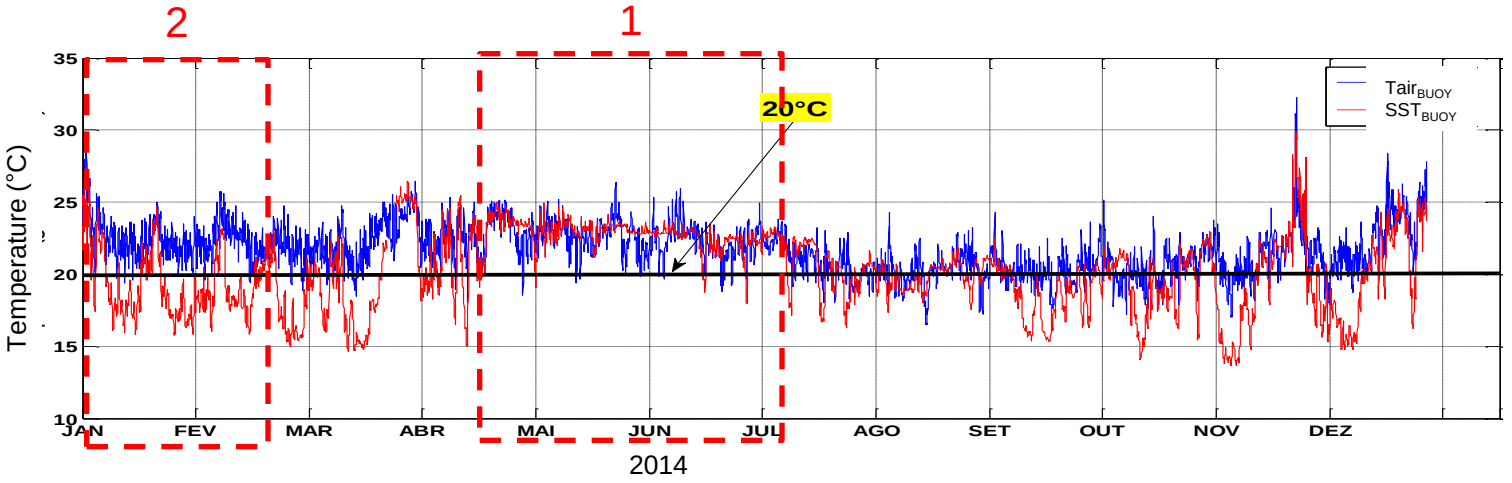
Upwelling/Non-upwelling and Atmospheric Condition







Analysis of Turbulent Fluxes for conditions 1 and 2



Case 1: Non-Upwelling (NUp)

$H_{L\,(NUp)} \lesssim |15|\ W/m^2$
$H_{s\,(NUp)} \lesssim |40|\ W/m^2$

Case 2: Upwelling (Up) with atmospheric subsidence (Case Study)

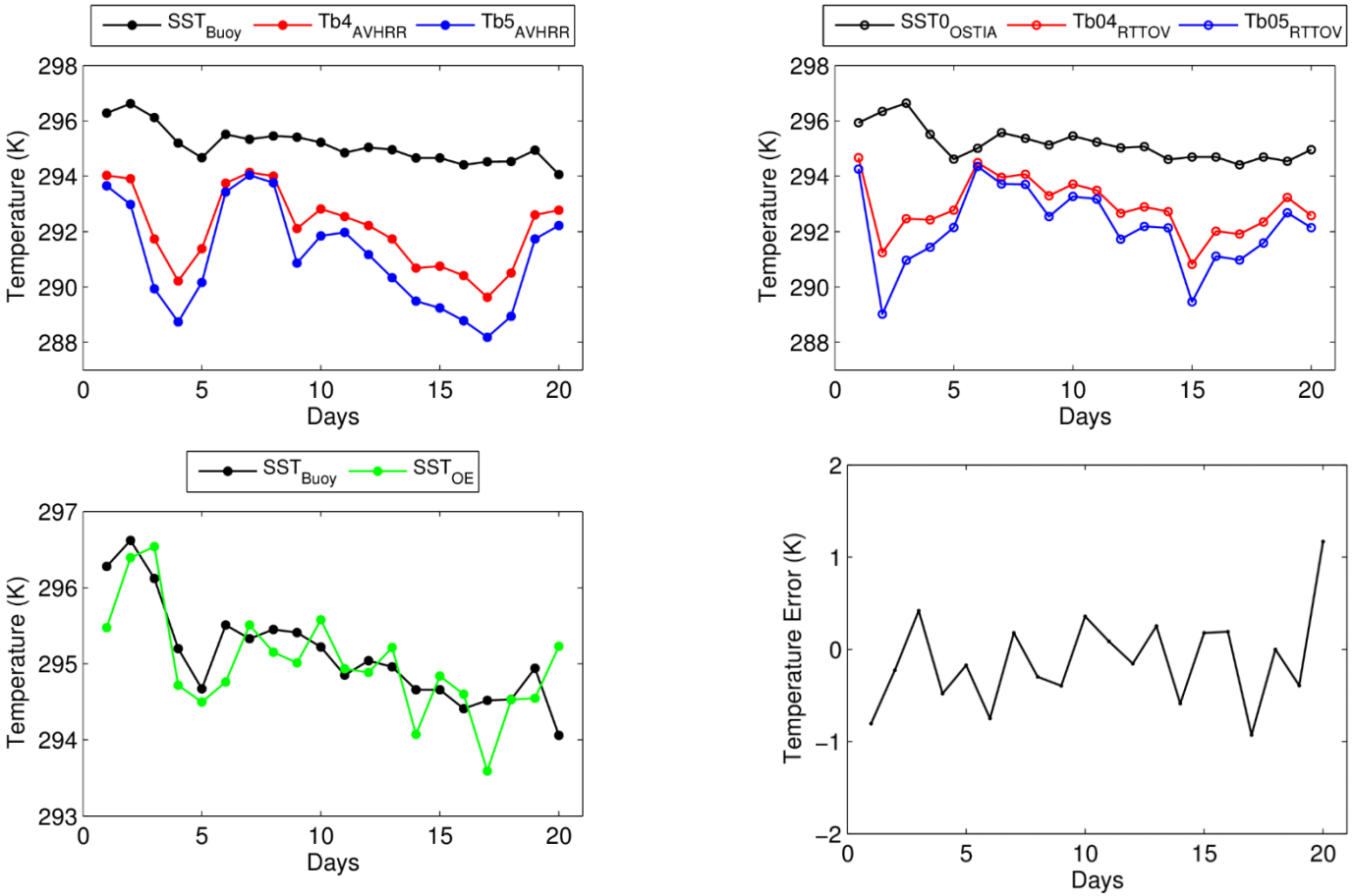
$H_{L\,(Up)} \gtrsim |40|\ W/m^2$
$H_{s\,(Up)} \gtrsim |60|\ W/m^2$

An attempt to solve an unexpected positive SST bias by using optimal estimator (OE)

Experiments:

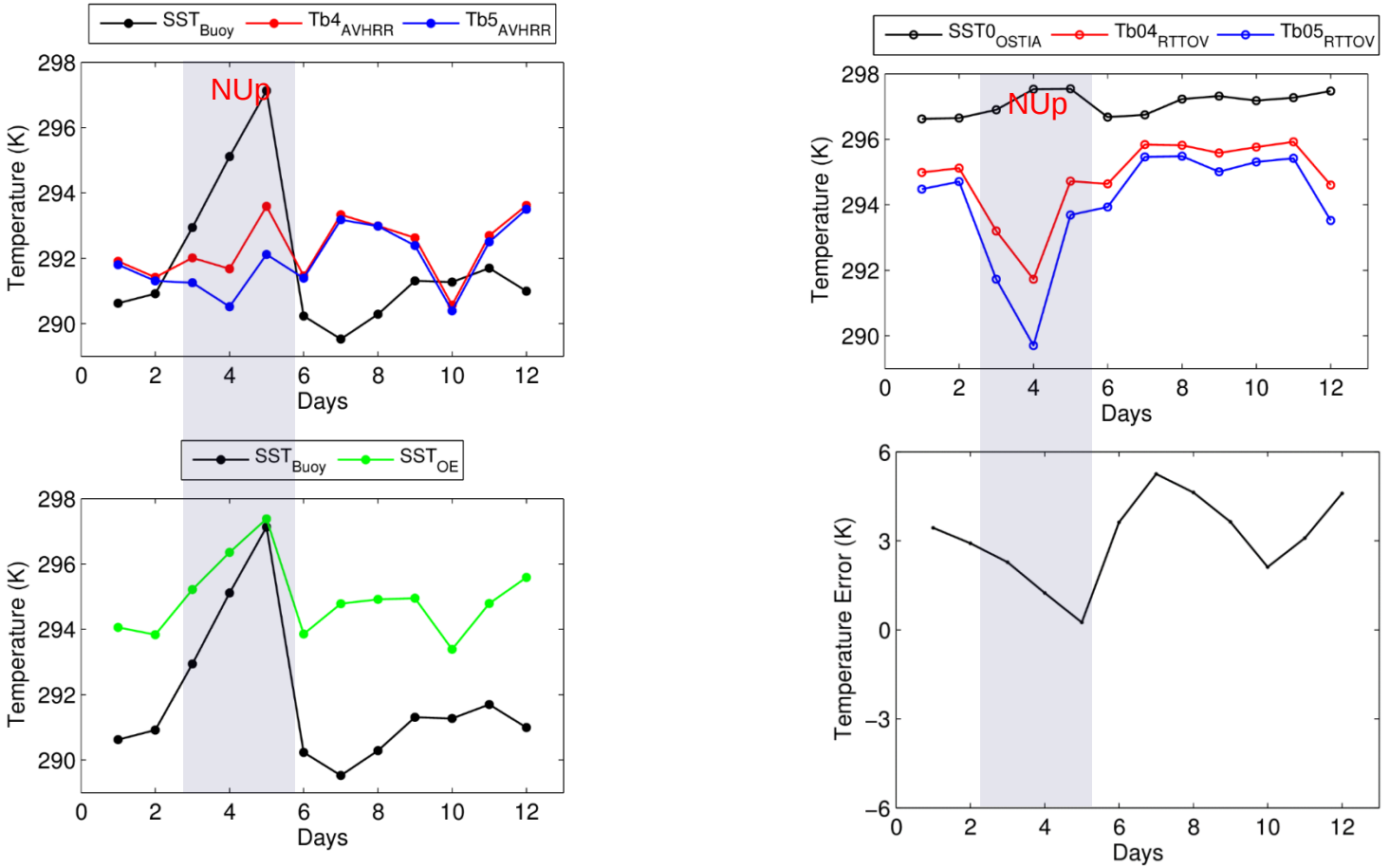
1. OE with SST_{OSTIA} as first guess during non-upwelling
2. OE with SST_{OSTIA} as first guess during coexistence of non-upwelling/upwelling and atmospheric subsidence
3. OE with SST_{buoy} as first guess during coexistence of non-upwelling/upwelling and atmospheric subsidence

Results 1: SST_{OE} during non-upwelling events (First guess: SST_{OSTIA})



The upper left panel exhibits BT measurements in AVHRR-3 channels 4 and 5, and SST *in situ* measurements from buoy whereas the upper right panel exhibits simulated BTs in AVHRR-3 channels 4 and 5, and the prior knowledge of SST_{OSTIA}. The lower and right left panels show SST_{OE} retrievals together with SST_{buoy} and SST_{error}, respectively.

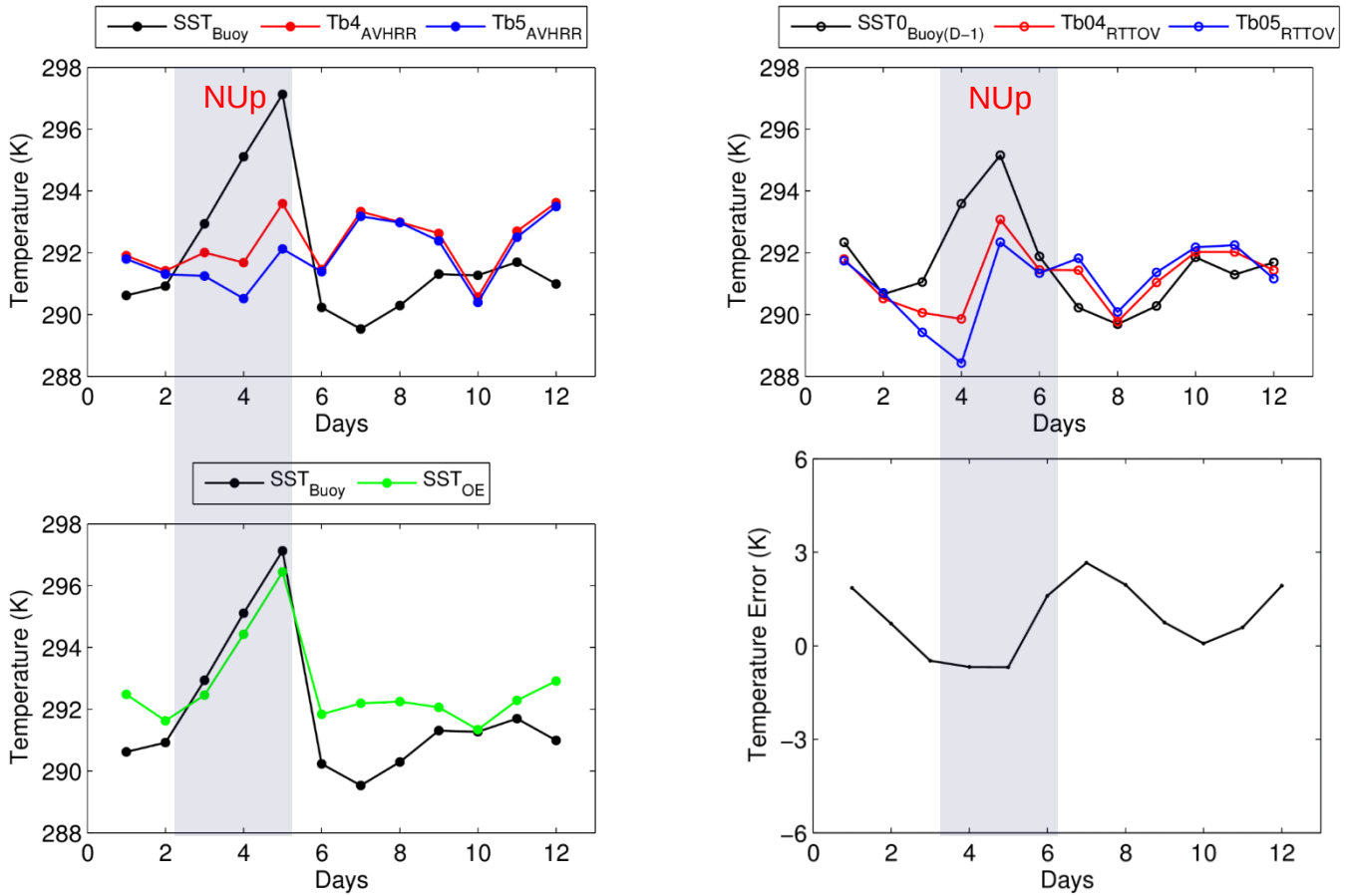
Results 2: SST_{OE} during coexistence of non-upwelling/upwelling and atmospheric subsidence (first guess: SST_{OSTIA})



The upper left panel exhibits BT measurements in AVHRR-3 channels 4 and 5, and SST *in situ* measurements from buoy whereas the upper right panel exhibits simulated BTs in AVHRR-3 channels 4 and 5, and the prior knowledge of SST_{OSTIA}. The lower and right left panels show SST_{OE} retrievals together with SST_{buoy} and SST_{error}, respectively.

Results 3: SST_{OE} during coexistence of non-upwelling/upwelling and atmospheric subsidence

First guess: SST_{buoy}



The upper left panel exhibits BT measurements in AVHRR-3 channels 4 and 5, and SST *in situ* measurements from buoy whereas the upper right panel exhibits simulated BTs in AVHRR-3 channels 4 and 5, and the prior knowledge of SST_{buoy} from previous day. The lower and right left panels show SST_{OE} retrievals together with SST_{buoy} and SST_{error}, respectively.

RESULTS

Performance of different algorithms for upwelling conditions with atmospheric subsidence.

Algorithm	RMSE (K)	Bias (K)	STD (K)
OE (ostia as first guess)	3.30	3.00	1.38
(SST_{buoy} as first guess)	(1.39)	(0.80)	(1.12)
NOAA	6.02	5.72	1.89
MSG	4.91	4.61	1.69
GOES	5.06	4.76	1.73

Conclusions:

- ✓ Unexpected errors are due mainly to the water vapour compression in the lower layer of the atmosphere related to a temperature inversion;
- ✓ The use of SST_{buoy} as first guess in OE could be a solution;
- ✓ to develop a strategy to correct remotely-sensed SST field by using data collected by two others moored buoys just deployed in the upwelling area .

Thank you!