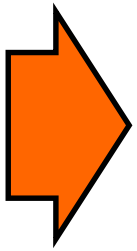
MyOcean-2 RDAC

Progress Report

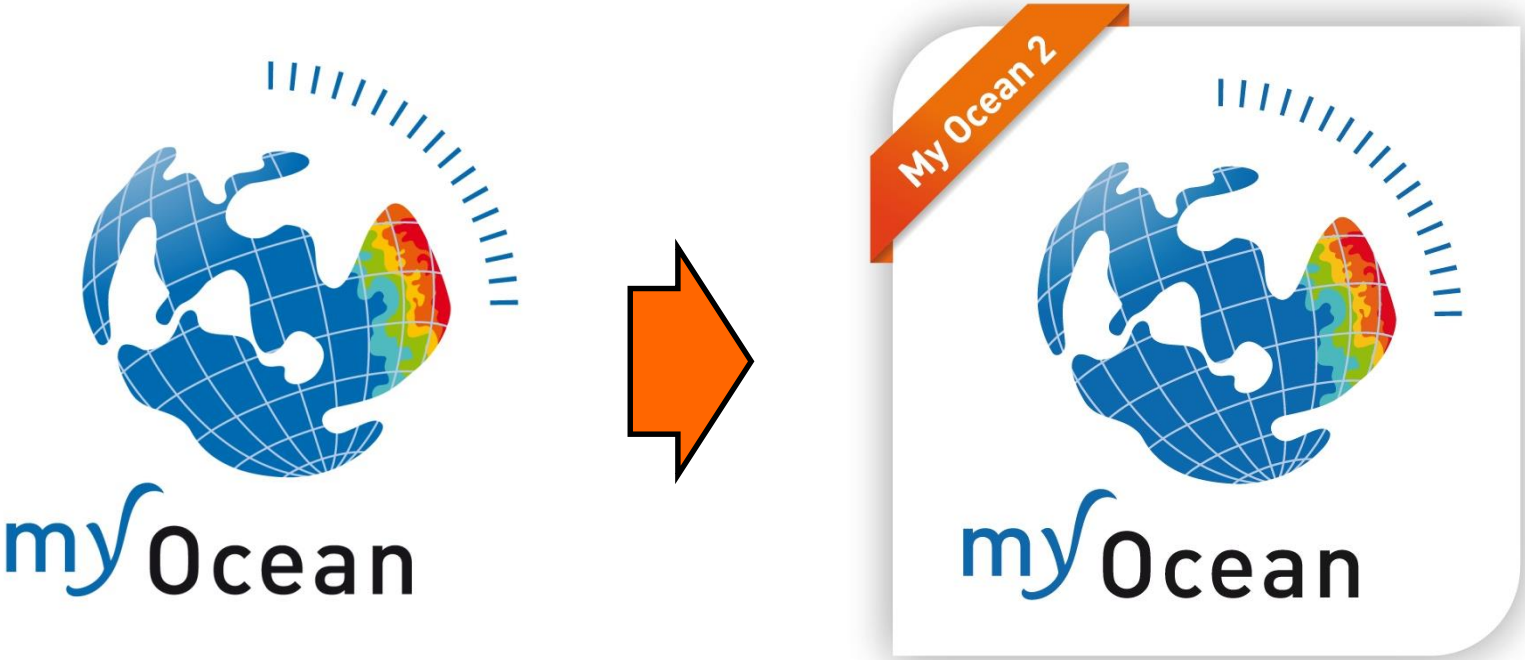
Introduction (1)



January 2009 – March 2012

April 2012 – September 2014

Introduction (2)



SST TAC (M-F) : SST
SIW TAC (met.no) : Sea Ice & Wind

OSI TAC (met.no) : SST, Sea Ice & Wind

Introduction (3)

Name	PU	DU
SST-METOFFICE-EXETER-UK	X	X
SST-IFREMER-BREST-FR	X	X
SST-CNR-ROMA-IT	X	X
SST-DMI-COPENHAGEN-DK	X	
SST-METNO-OSLO-NO	X	
SST-METFR-LANNION-FR	X	

Current and future NRT SST products

- UKMO :
  - Global foundation L4 (OSTIA) + sensor biases
  - GMPE
  - **2014** : global diurnal L4
- IFREMER :
  - Global L3S (ODYSSEA)
  - Regional foundation L4 (IBI + NWS)
- DMI :
  - Regional foundation L4 (Baltic Sea)
  - **2014** : regional Ice Surface Temperature L4 (Arctic)
- MET.NO :
  - Regional foundation L4 (Arctic)
- CNR :
  - Regional L3S + foundation L4 (Med Sea + Black Sea)
  - Both HR (0.0625°) and UHR (0.01°) resolution
- M-F/CMS :
  - Regional L3C + L3S (European Seas)
  - **2014** : regional diurnal L3S + L4 (European Seas)

On-going SST re-processing activities

- DMI :
  - Regional foundation L4 (Arctic) : 1985 – 2011

- IFREMER :
  - Global L3S (ODYSSEA) + regional foundation L4 (IBI + NWS)
  - 3 re-processing steps : 2006-2010 (NRT data, completed), 2001-2006 (OSI-SAF + AATSR NRT data + PATHFINDER), 1991-2001 (ARC + PATHFINDER)

Main products upgrades since GHRSST-XIII

- **OSTIA (UKMO) :**
  - 17 January 2013 : update of background variance estimates, use of METOP-A/AVHRR in satellite bias correction, increased number of geostationary input data, minimum SST set as –2° C
  - 29 April 2013 : lake ice added to OSTIA ice field
  - use of a new SST climatology
  - available in GDSV2 format

GDS2.0 Implementation

- **(M-F/CMS)**
  - **Regional L3C and L3S over European Seas** January – April 2013 : transition from GDS1.7 to GDS2.0 (GDS1.7 stopped on 30 April 2013)

Issues

- **FOCUS ON TWO R&D ACTIVITIES**

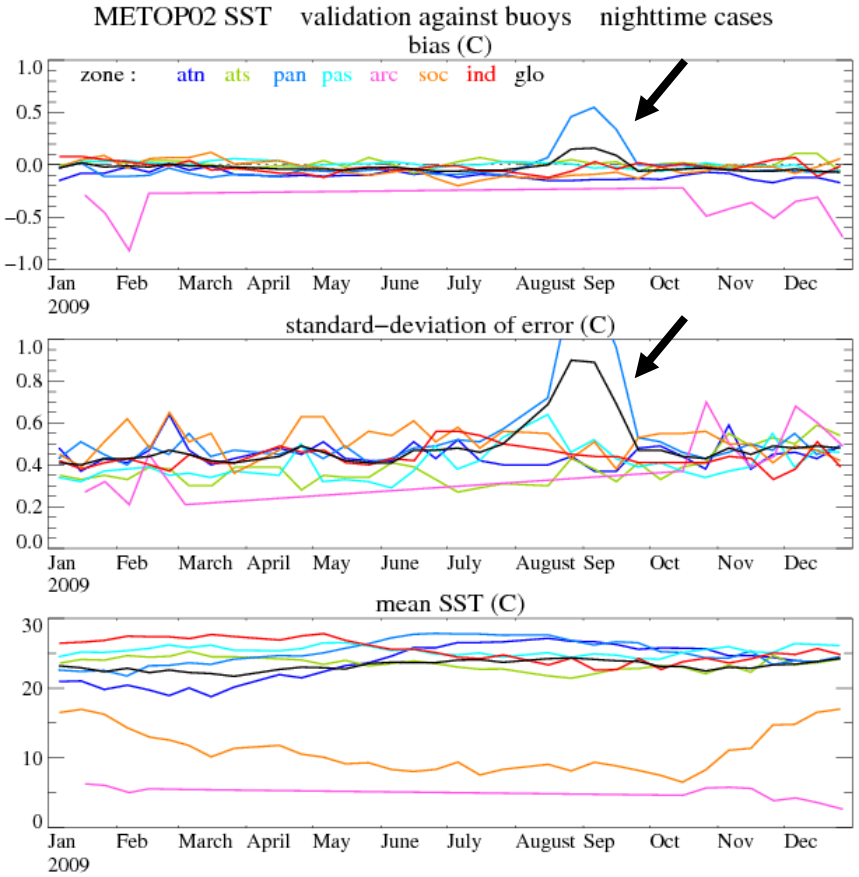
  - **CMS Buoys Blacklist**
  - **BESST : Inter-sensor Bias Estimation in Sea Surface Temperature**

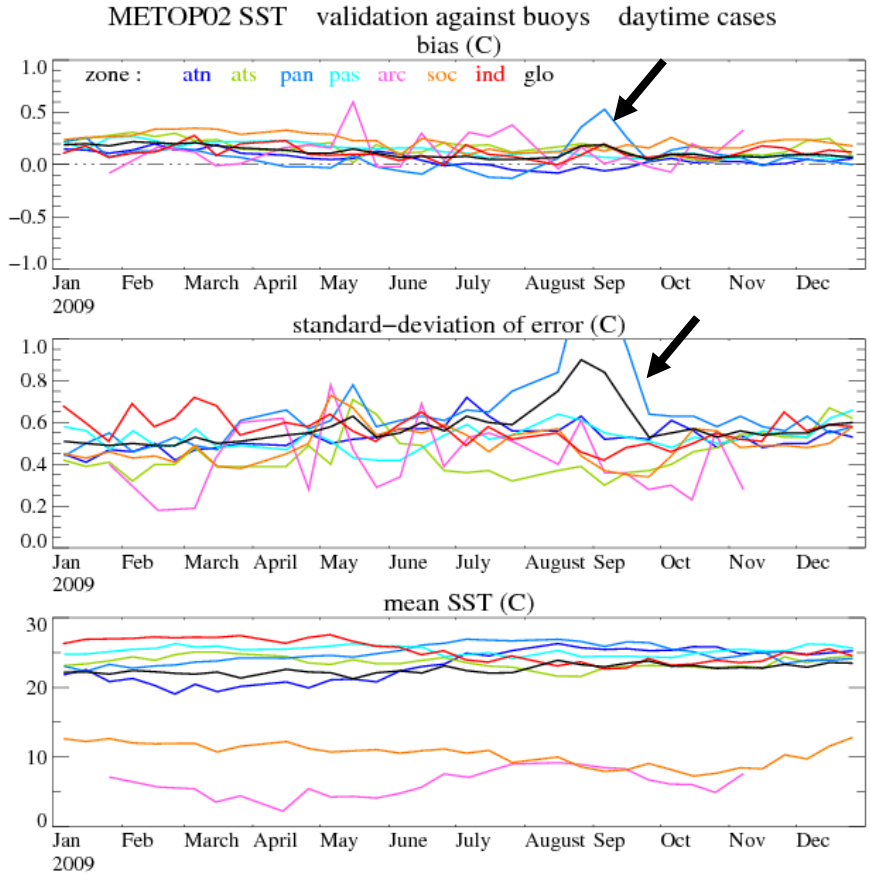
CMS Buoys Blacklist

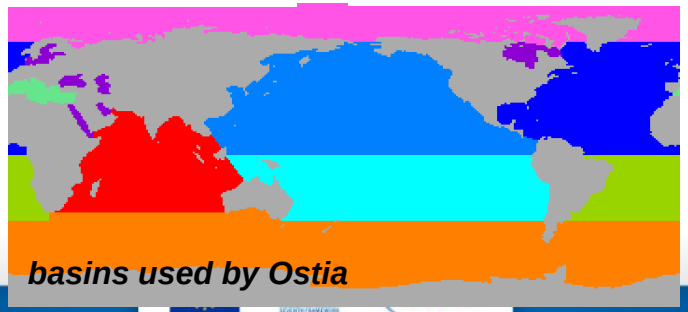
Sonia Péré, Anne Marsouin

Meteo-France

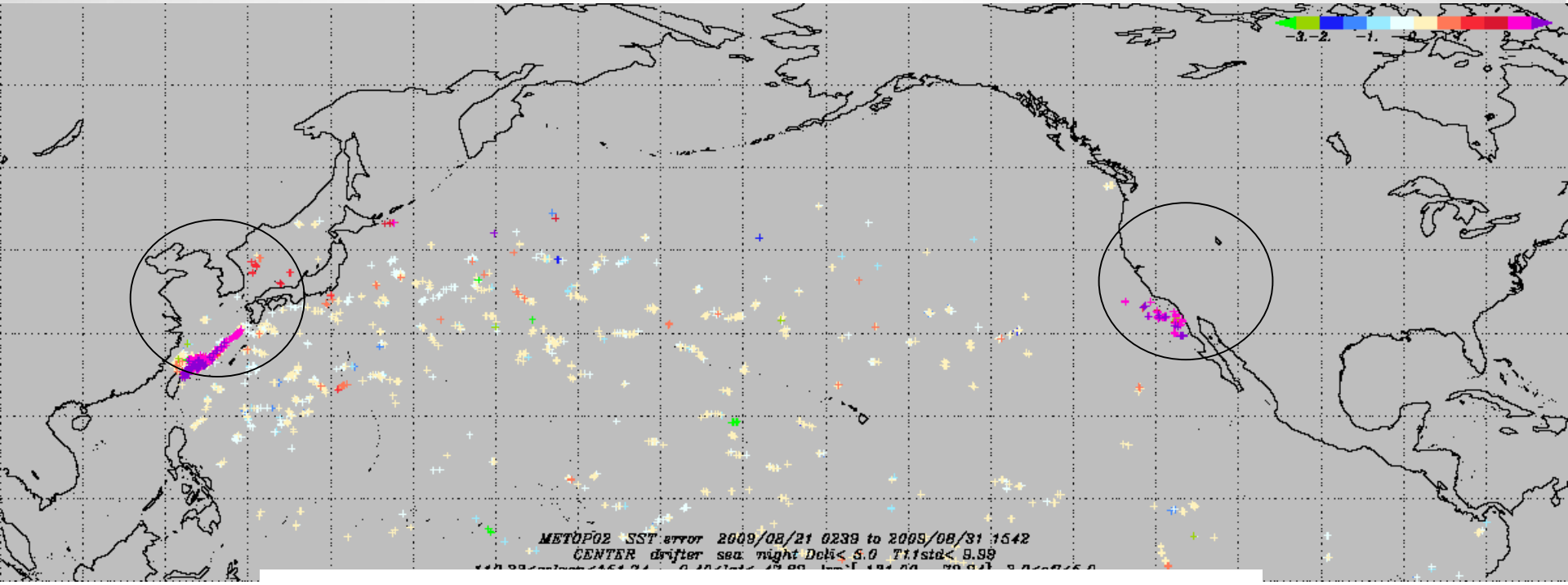
METOP SST validation results showed an anomaly in summer 2009: observed on the global and North Pacific results







SST anomaly was due to erroneous buoys



Two sets of Technocean buoys were launched
at the end of July 2009, showing a 2 to 3K negative bias

=> How to eliminate such buoys? …building a buoy blacklist

Method: automatic scheme

- Night time data

- Satellites: METOP-2, NOAA-18, NOAA-19

  METEOSAT, GOES-13 since 1st June 2011

- Automatic update on 5, 15, 25 of the month: process two successive 10-day periods

  buoy blacklisted if |bias| > 1.5C

  for 2 satellites on 1 period or 1 satellite on both period

- Distributed every 10 days:
  - mailing list (initially MyOcean SST TAC members)
  - **ftp://ftp.ifremer.fr/ifremer/cersat/projects/myocean/sst-tac/insitu/blacklist/**

Method: interactive control

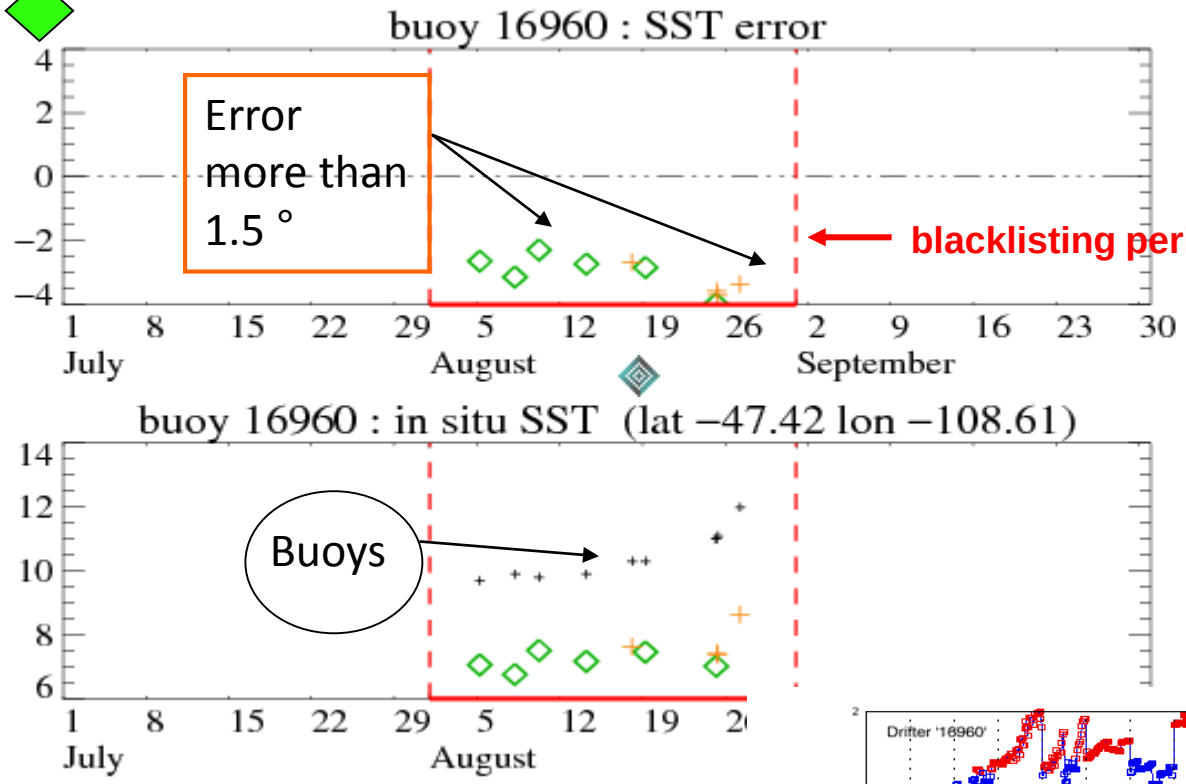
- Every 3 months; at the begining of month N, months N-4, N-3, N-2 are checked
- Information used:
  - SST plots derived from the CMS MDB
  - UKMO blacklist *(and MF ARPEGE blacklist)*
- The blacklisted buoy period may be enlarged using:

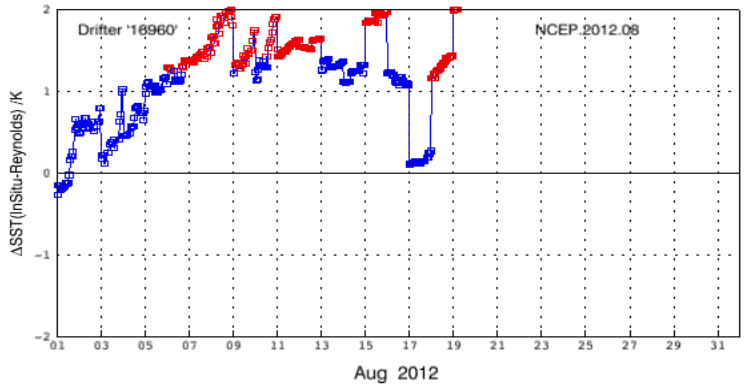
  (SST plot only) or (SST plot and UKMO blacklist)
- A buoy may be added to the blacklist if:

  blacklisted by UKMO and errors on SST plot, especially by day

Example 1: an easy case for the automatic scheme

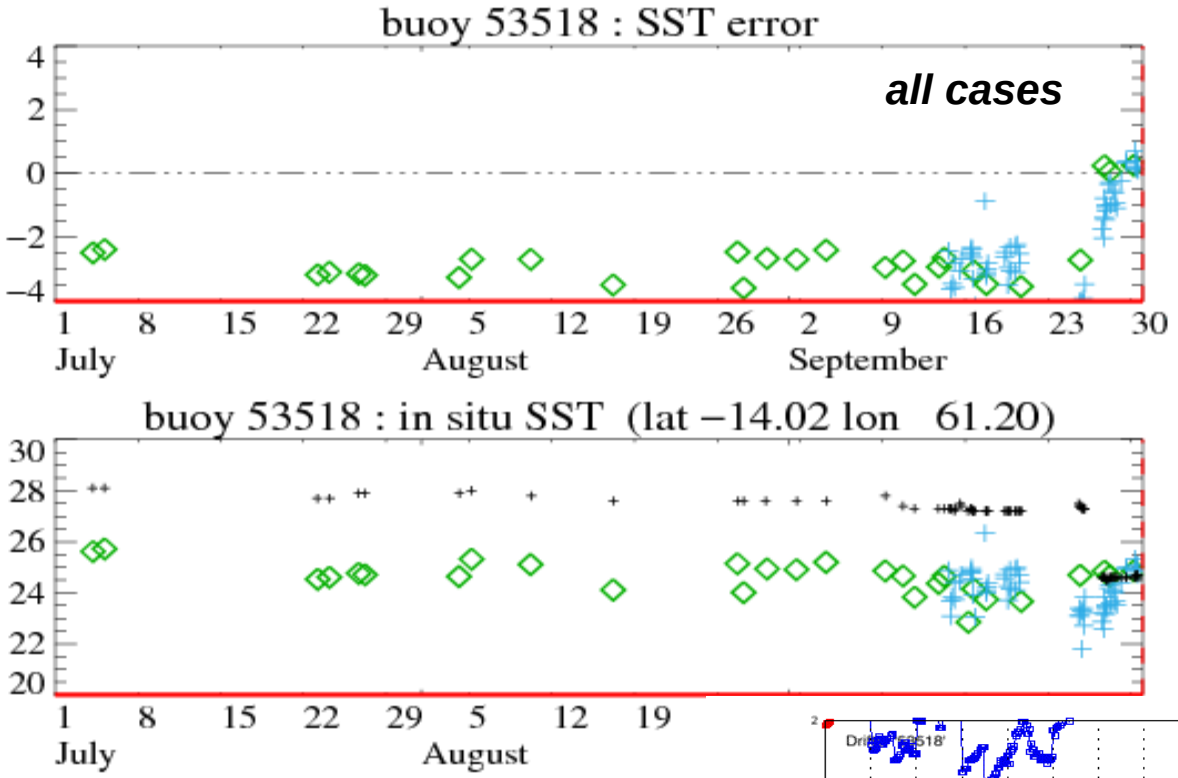
in situ **METOP-2** **METEOSAT-9** **GOES-13** +



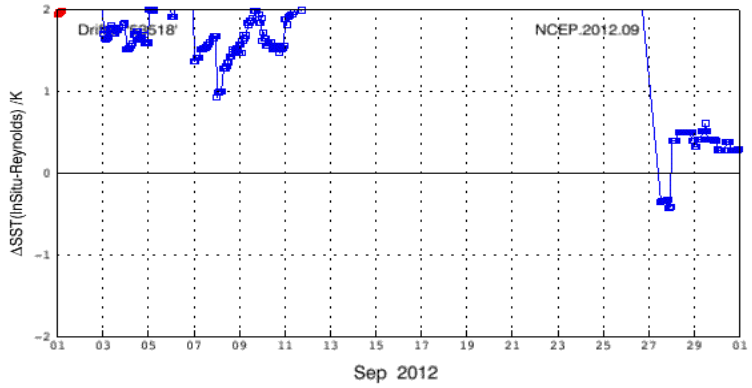


Example 2: a case modified by the interactive control

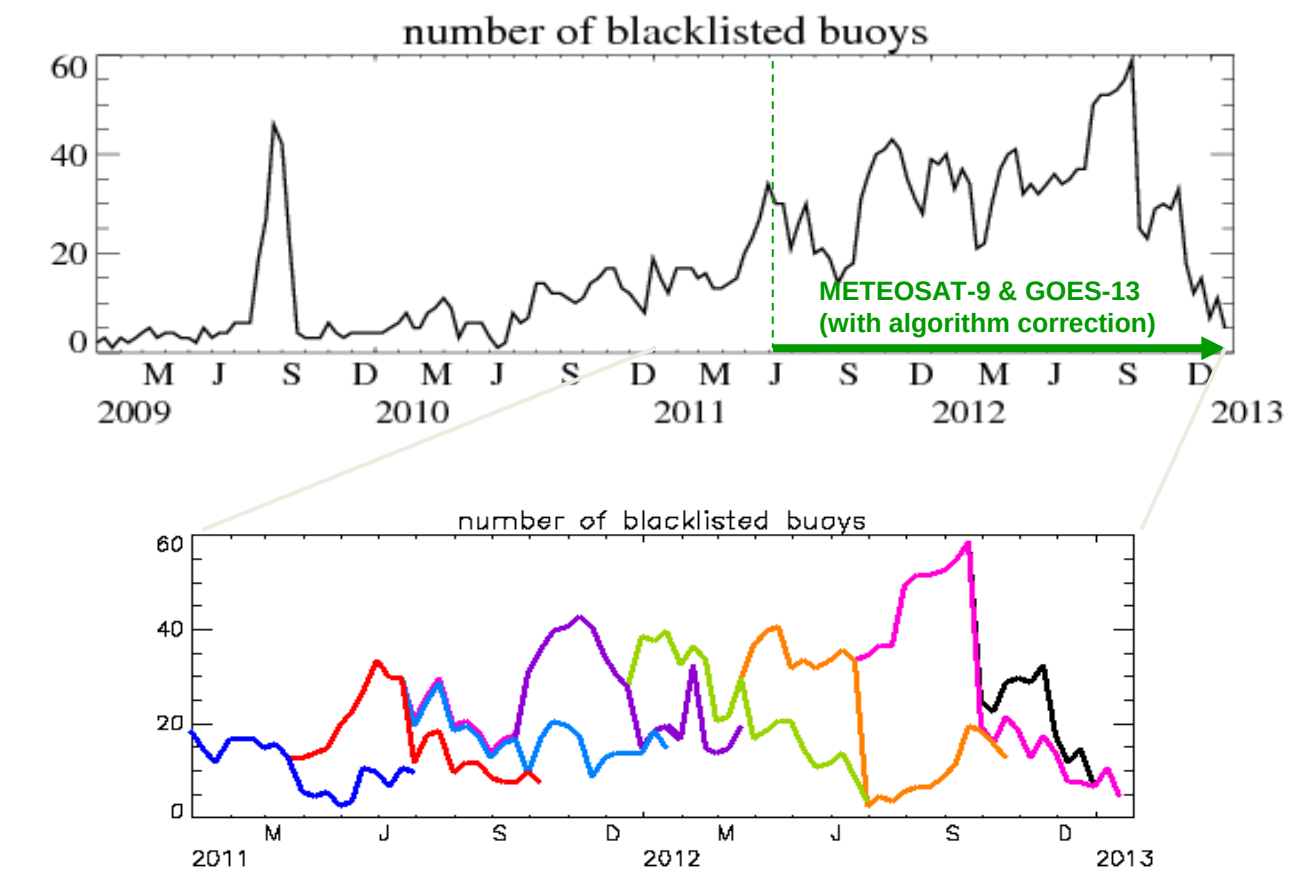
Results after the interactive control:



in situ METOP-2 METEOSAT-9



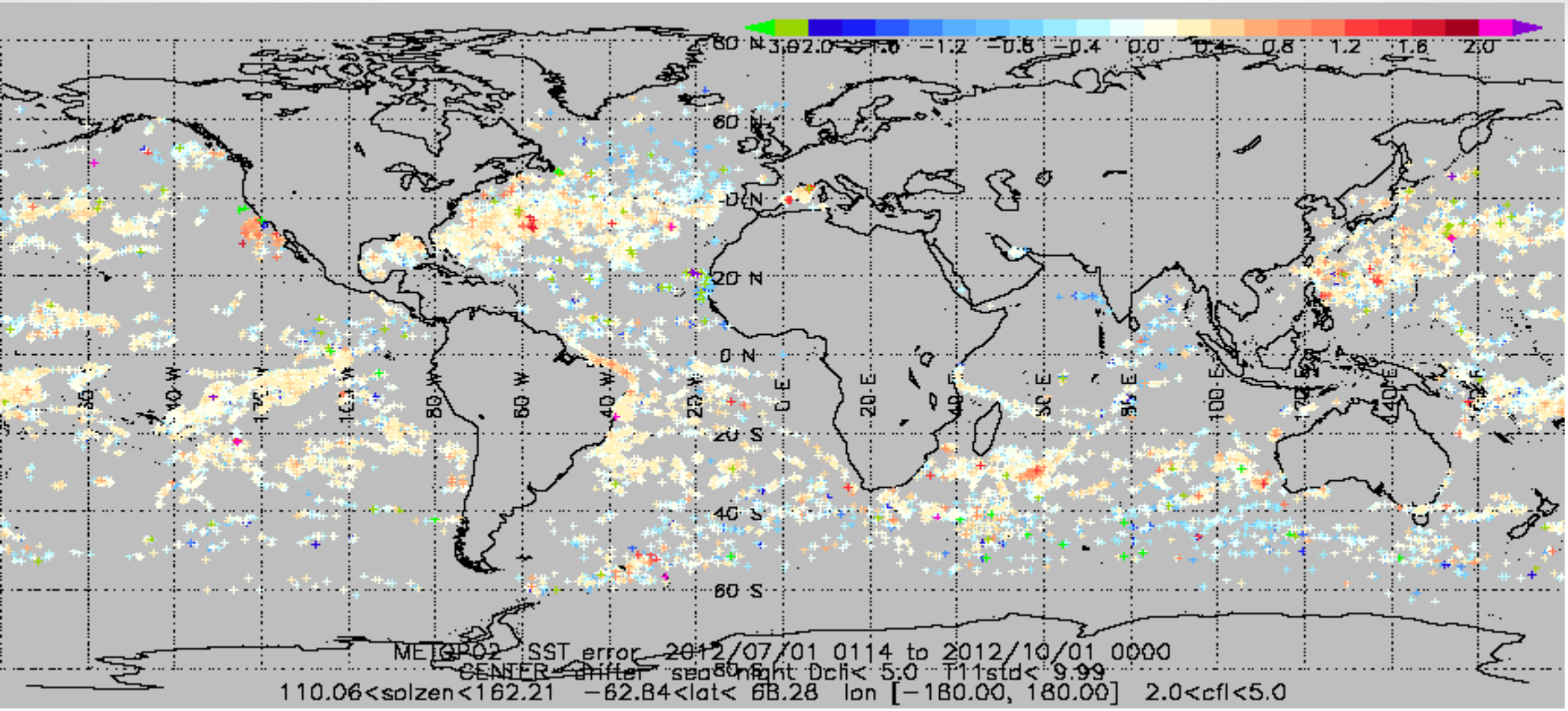
How many buoys in the blacklist?



Variations associated with the interactive control

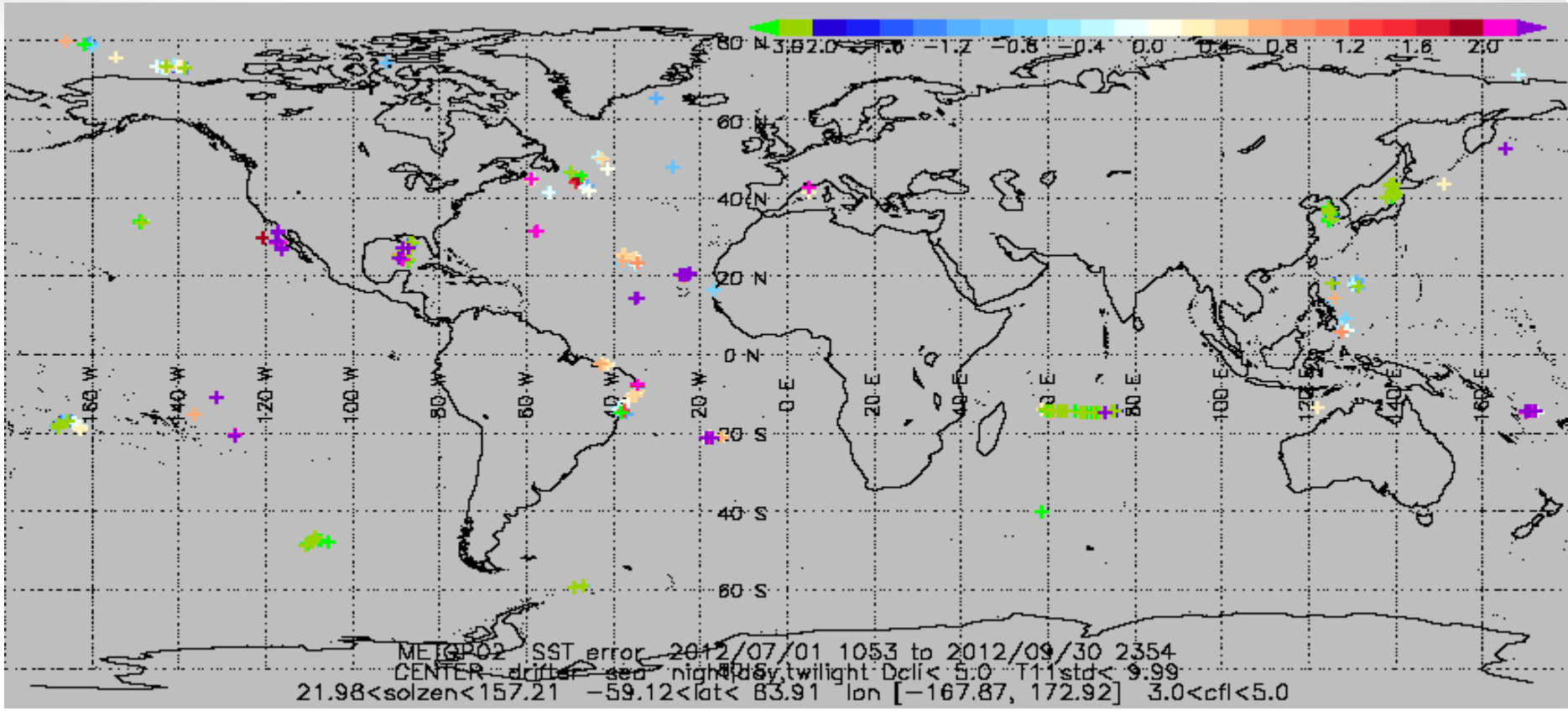
Buoys in METOP MDB over 3 months

July-September 2012 (night)



Blacklisted buoys over 3 months

July-September 2012



Conclusion 1

- A buoy blacklist is routinely maintained at CMS
  - updated every 10 days
  - interactive control every 3 months, using UKMO blacklist
  - distributed to users
- Blacklist characteristics
  - global, starting on 1 January 2009
  - drifting buoys only
  - based on nighttime satellite data
  - main contributors: METOP, METEOSAT and GOES-E

Conclusion 2

- Scheme could be improved, … if somebody available
  - Change the automatic scheme using a sliding window, others methods than threshold
  - A few buoys are detected only by the interactive control (3 months delay!!!)
  - The interactive control is very laborious : handling of the data, many plots, etc
  - Not yet used in Myocean products validation (on going)

Inter-sensor Bias Estimation in Sea Surface Temperature

I. Tomažić1, A. Alvera-Azcárate1,
A. Barth1, J.M. Beckers1 and F. Orain2

1University of Liège, Liège (Belgium)
2Meteo-France/CMS, Lannion (France)

Overview - partners

University of Liège AGO department GeoHydrodynamics and Environment Research (1) Liège, Belgium	Aida Alvera-Azcárate Igor Tomažić Alexander Barth Jean-Marie Beckers
Météo-France Centre de Météorologie Spatiale (2) Lannion, France	Françoise Orain

Overview - description

- **Analyse inter-sensor SST biases**
- **Use referent SST sensor (AATSR, Metop-A, …) to improve SST derived from other sensors (AVHRR/SEVIRI, …)**
- **Develop a methodology to derive more accurate SST bias fields based on DINEOF method**
- **Operational context (Meteo-France)**
- **Physical interpretation and application**

Agenda

- **Project overview**
- **Method**
- **Data + intercomparison**
- **Bias correction using referent sensor**
- **- reconstruction of differences RECDIF**
- **- differences of reconstruction DIFREC**

PROJECT BESST overview

Overview – WPs

WP1: Calculation of inter-sensor difference fields
1.1.: Application of two approaches based on reconstruction of difference fields and based on differences of reconstructed fields

1.2: Calculation of spatial maps of the error variance of the inter-sensor difference fields to determine the confidence of the results

1.3: Determination of which of the approaches from WP1.1 leads to best results when comparing to in situ data

Overview - WPs

WP2: SST Applications

2.1. Use of inter-sensor difference SST fields in the bias analysis and correction of CMS – comparison with technique currently used at CMS.

2.2. Assimilation of bias-corrected SST time series in an Antarctic model (PredAntar project)

WP3: SST Spatio-temporal analyses

3.1. Spatio-temporal analysis of the difference fields

3.2. Clouds statistics

3.3. Influence of physical processes

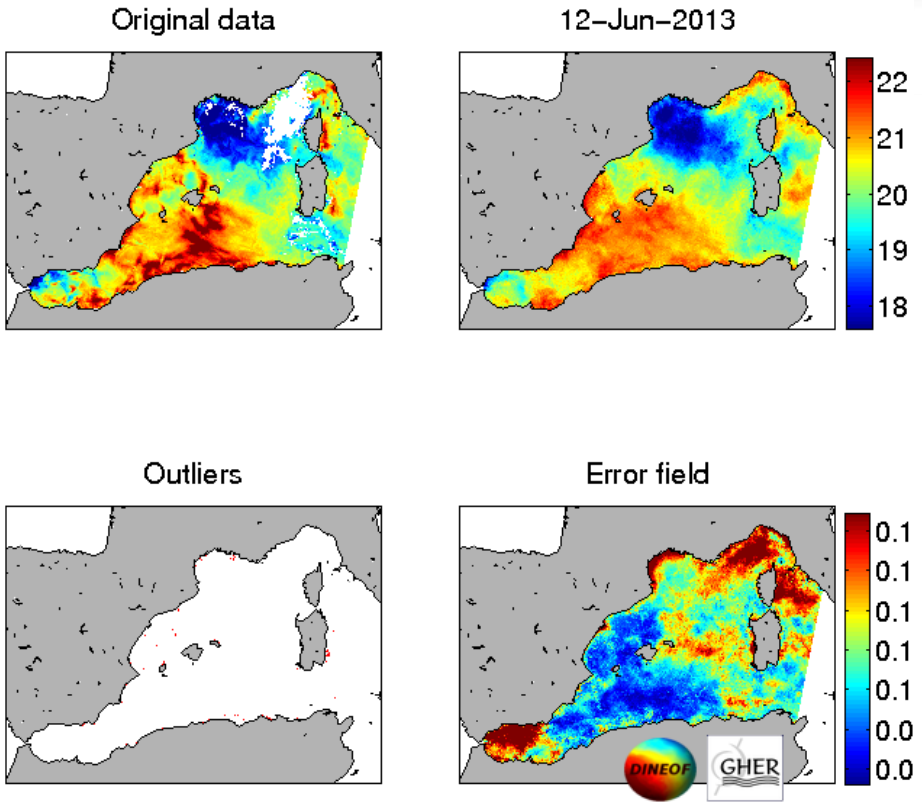
Overview – working packages

WP0: Management, Coordination, Collaboration, Dissemination

- **Internal meeting**
- **Blog (http://besstproject.blogspot.com) for fast and easy correspondence and presentation of intermediate results**
- **Website (http://www.gher.ulg.ac.be/BESST) - links to the preliminary results, publications, etc.**

Method (DINEOF+bias correction)

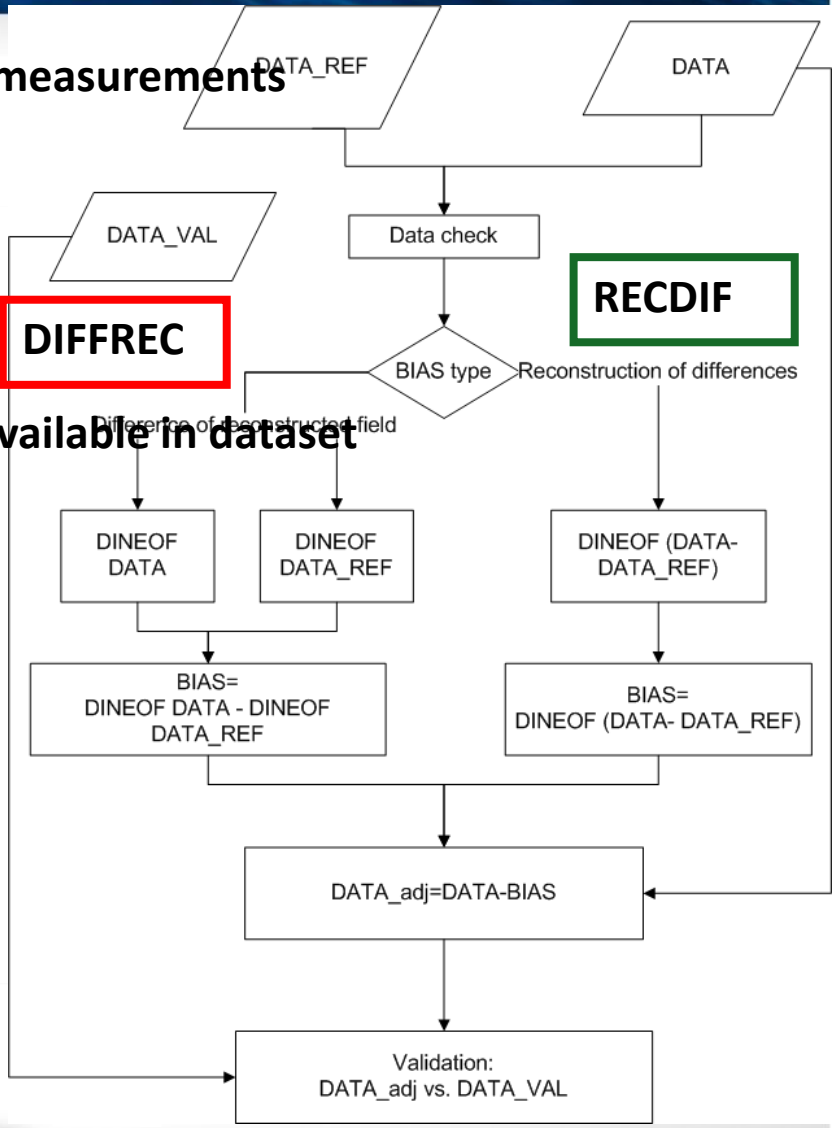
- **DINEOF method**
  - **Technique to fill in n exploiting spatio-ter assumption)**
  - **Truncated EOF basis**
  - **Use of cross-validati determine optimal r**
- **Use DINEOF to derive S**
  - **DINEOF reconstructi**
  - **Difference of DINEO**



Method

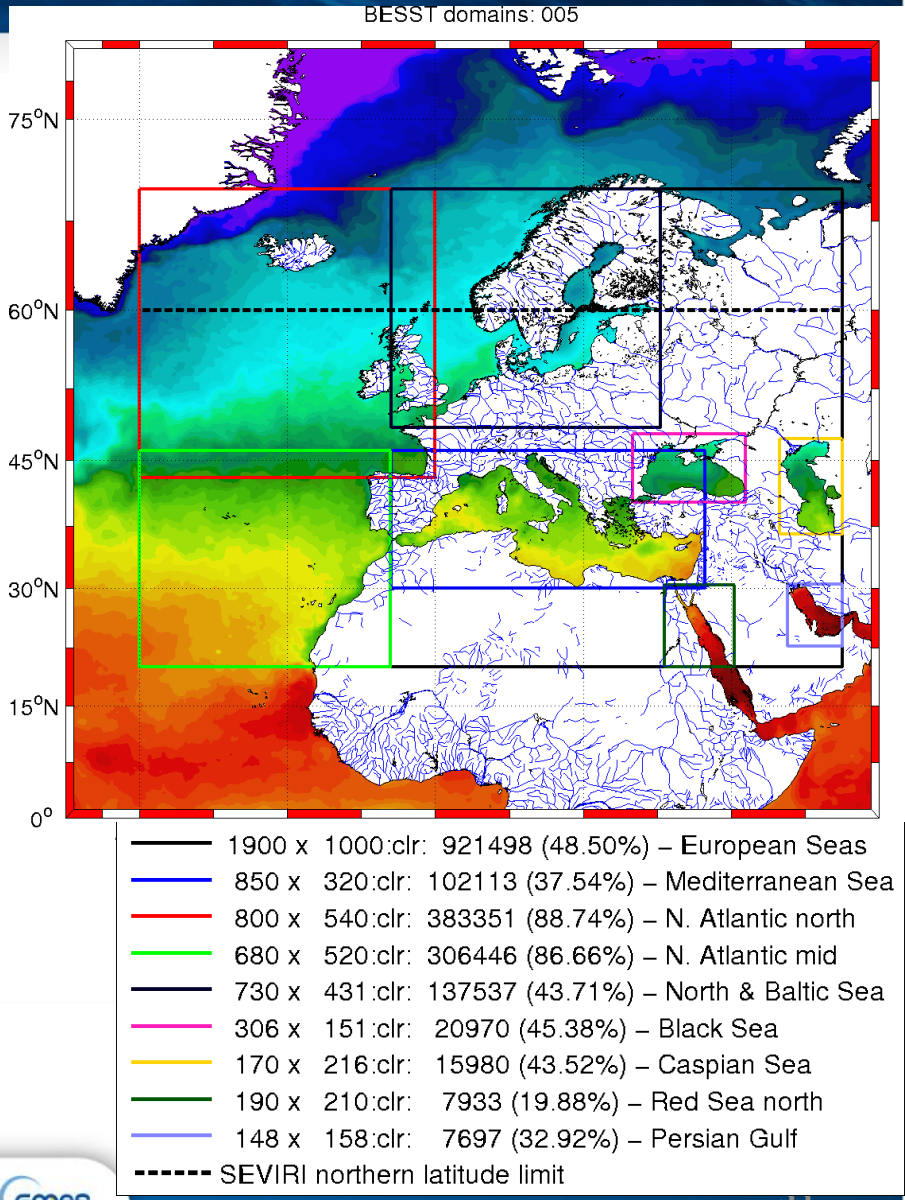
Method – bias corr. using ref. data

- **Adjusting data based on DINEOF method and ref. measurements**
- **Features:**
  - **Inputs: Data; Data_ref; Data_val**
  - **Date range: start + end date**
  - **Area, Grid size, DINEOF params**
  - **Filtering – based on any parameter/variable available in dataset**
  - **Correction to input data (custom function)**
  - **Output: web + netcdf (opendap)**



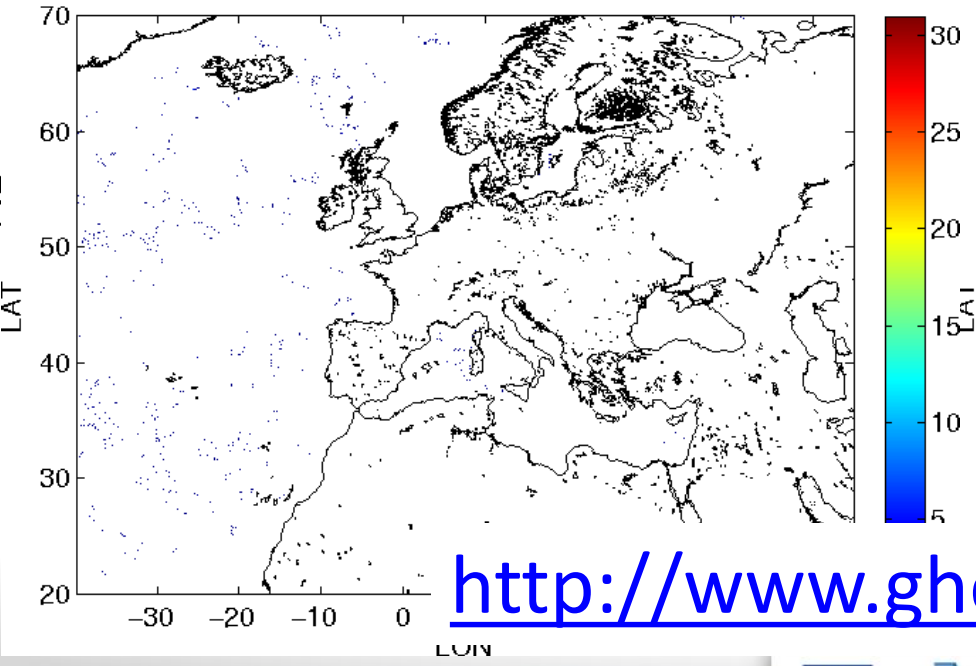
Data + analysis

- SST: SEVIRI, Metop-A
- Ref: AATSR, Metop-A
- Validation: buoy, AATSR
- 10/2010 – 03/2012
  - focus on 2011
- Nighttime
- L3C format (L2→L3C)
- Domain + subdomains

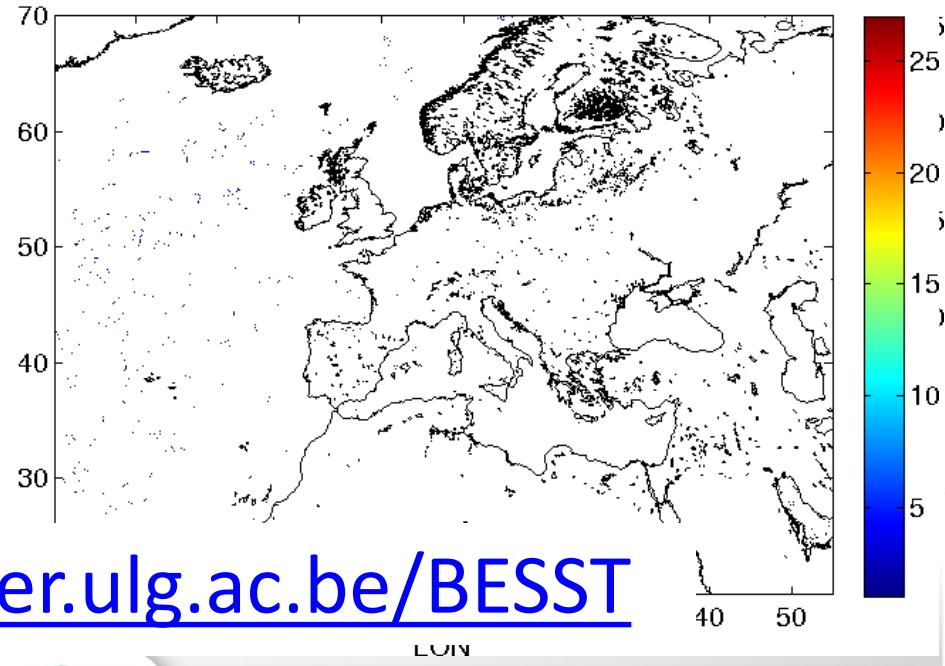


Data - quality check

Number of observations (Nobs): #days: 30.0 #files: 31
AATSR_MYOCEAN_L3C_EUR
01–Dec–2010 – 31–Dec–2010:
Number of observations (Nobs): #days: 30.0 #files: 31
SVRI_MYOCEAN_L3C_EUR
01–Dec–2010 – 31–Dec–2010:
Number of observations (Nobs): #days: 30.0 #files: 31
METOPA_MYOCEAN_L3C_EUR
01–Dec–2010 – 31–Dec–2010:
Number of observations (Nobs): #days: 30.0 #files: 31
BUOY_MYOCEAN_L3C_EUR
01–Dec–2010 – 31–Dec–2010:



Number of observations (Nobs): #days: 30.0 #files: 31
AATSR_MYOCEAN_L3C_EUR
01–Aug–2011 – 31–Aug–2011:
Number of observations (Nobs): #days: 30.0 #files: 31
SVRI_MYOCEAN_L3C_EUR
01–Aug–2011 – 31–Aug–2011:
Number of observations (Nobs): #days: 30.0 #files: 31
METOPA_MYOCEAN_L3C_EUR
01–Aug–2011 – 31–Aug–2011:
Number of observations (Nobs): #days: 30.0 #files: 27
BUOY_MYOCEAN_L3C_EUR
01–Aug–2011 – 31–Aug–2011:



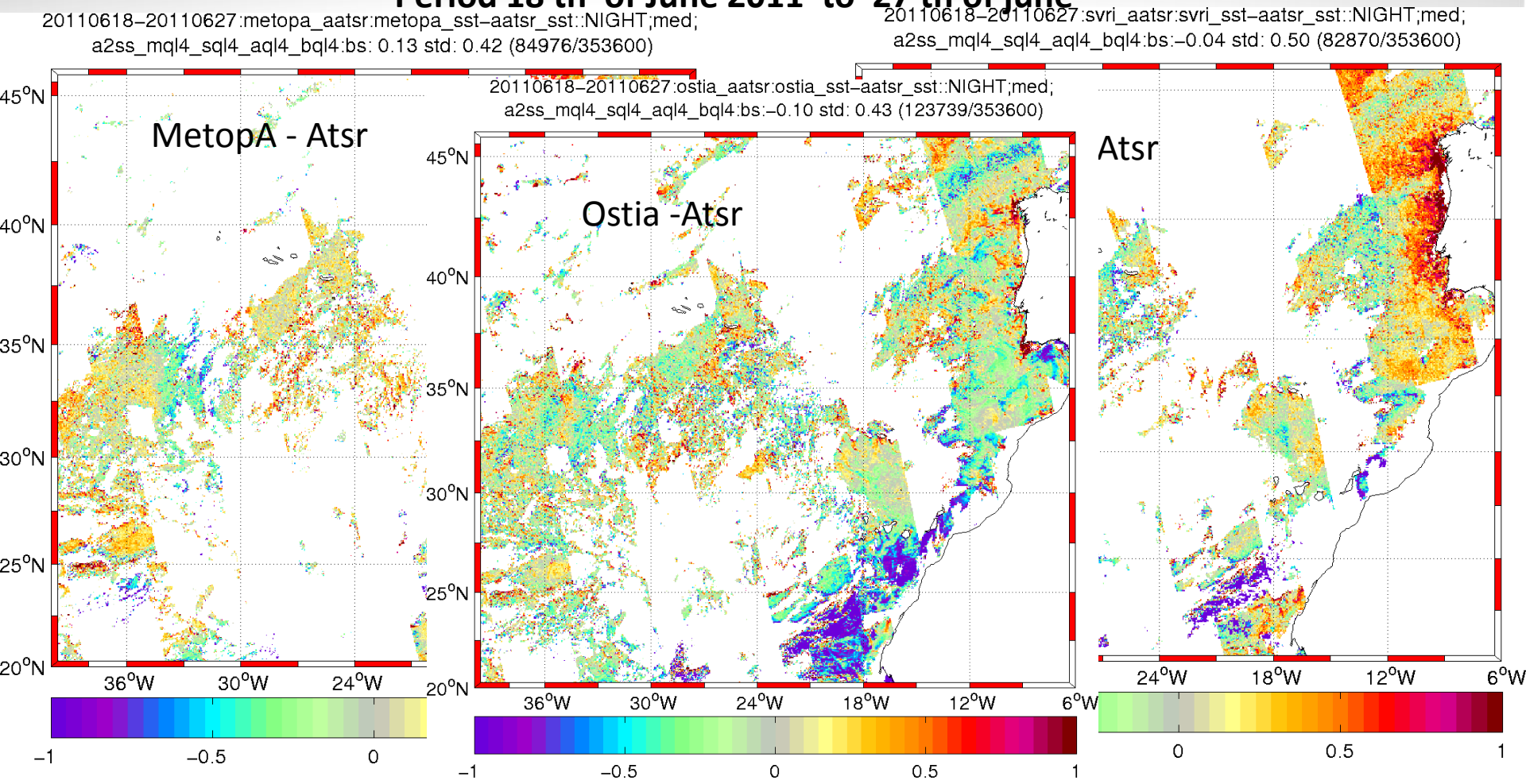
http://www.gher.ulg.ac.be/BESST

Data - intercomparison

- A lot of work done on data intercomparisons (see web site)
  - Merge different datasets http://www.gher.ulg.ac.be/BESST
  - Metop-A/AVHRR, SEVIRI, ENVISAT/AATSR, OSTIA, Buoy, …
  - Different spatial resolutions
  - Zoom on sub-domains
  - Nightime
    - accurate 3.7 µm channel for Metop-A/AVHRR
  - SEVIRI BT adjustment: from 08/2011
  - Statistics + time series + spatial plots

Data – intercomparison – spatial

Period 18 th of June 2011 to 27 th of june



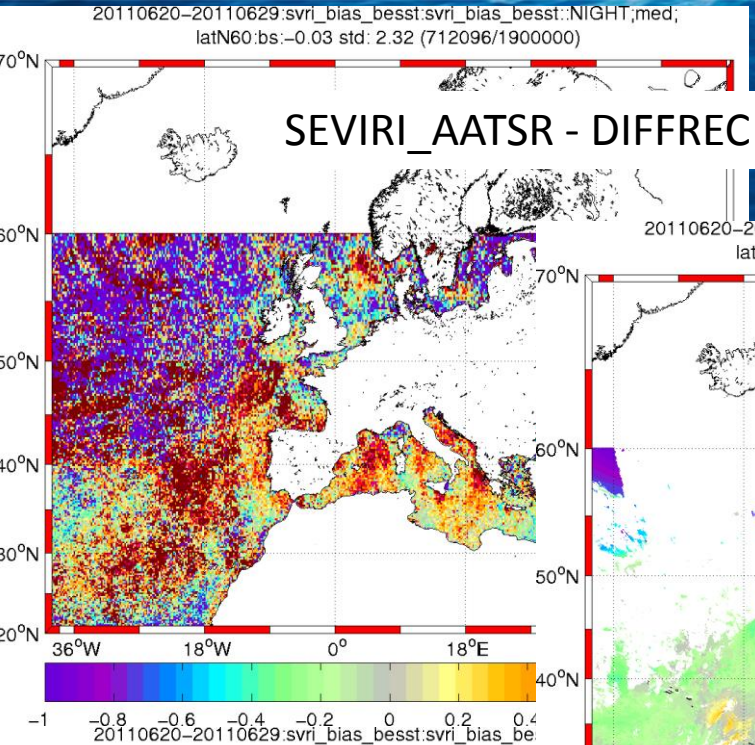
RESULTS

Results

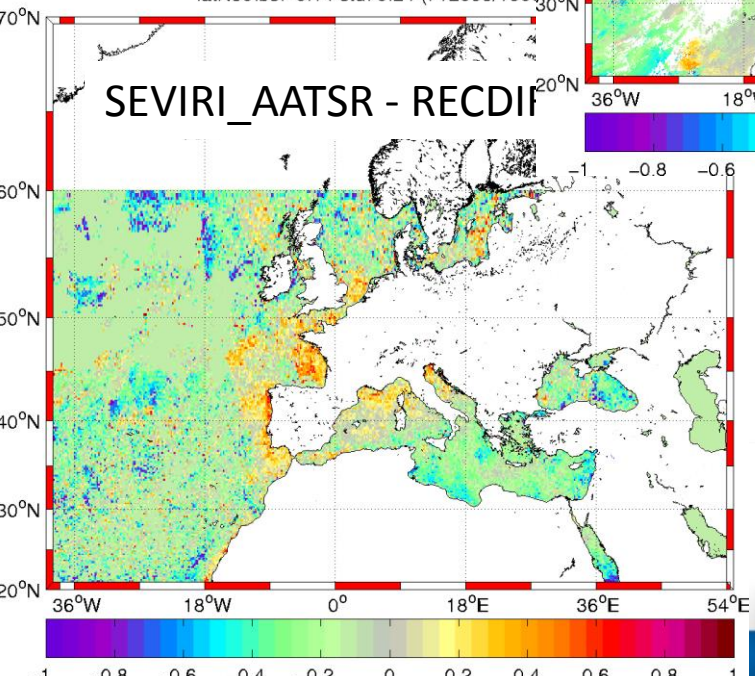
- Bias grid: 0.2 deg
- Period: 01/2011 – 01/2012
- Analysis: starting every 3 months for 120 days
- Bias fields: derived over EUR domain and remapped to original resolution (0.05/0.02 deg)
- SEVIRI vs. AATSR/METOPA – http://www.gher.ulg.ac.be/BESST)
- Statistics – total + 10 days averages
- Time series of 10 days averages

The two methods tested : DIFFREC and RECDIF

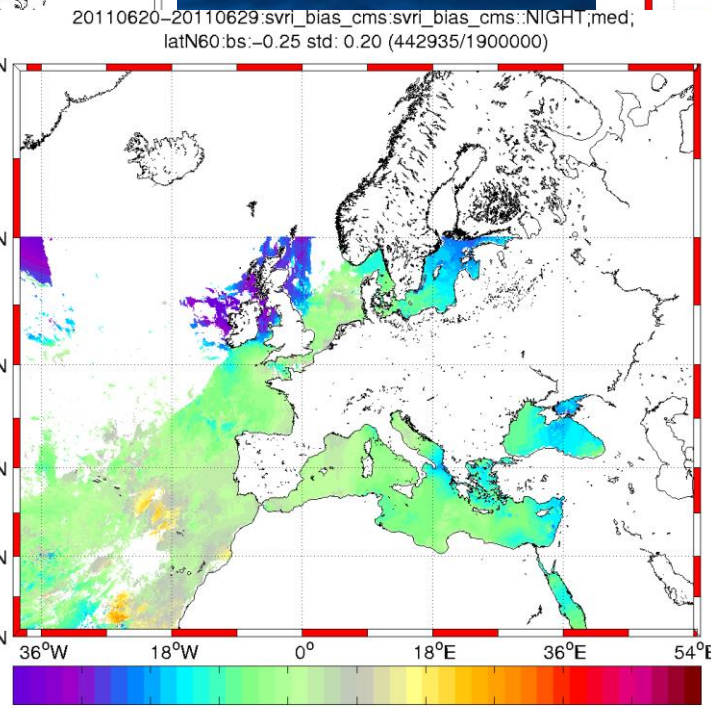
(Poster)



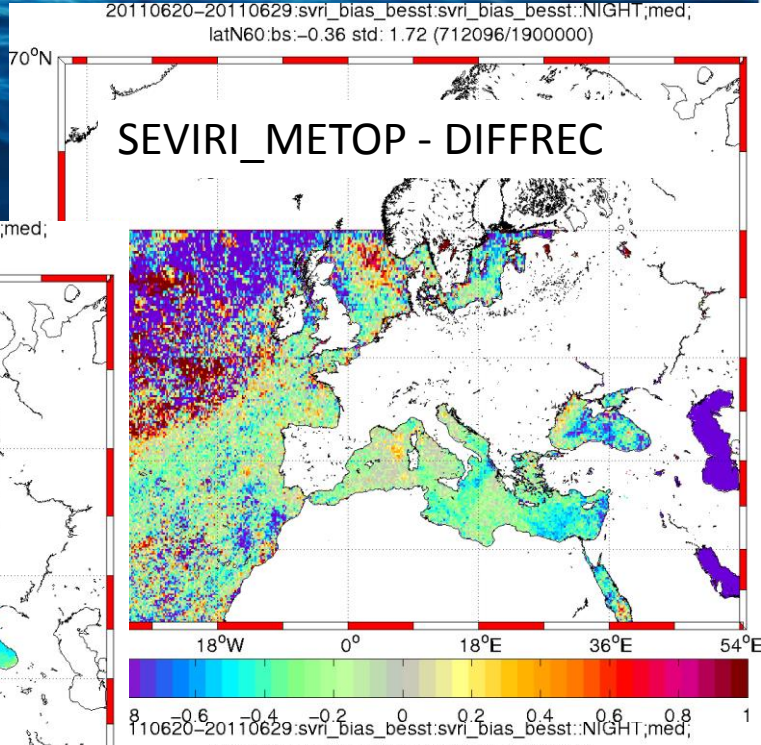
SEVIRI_AATSR - DIFFREC



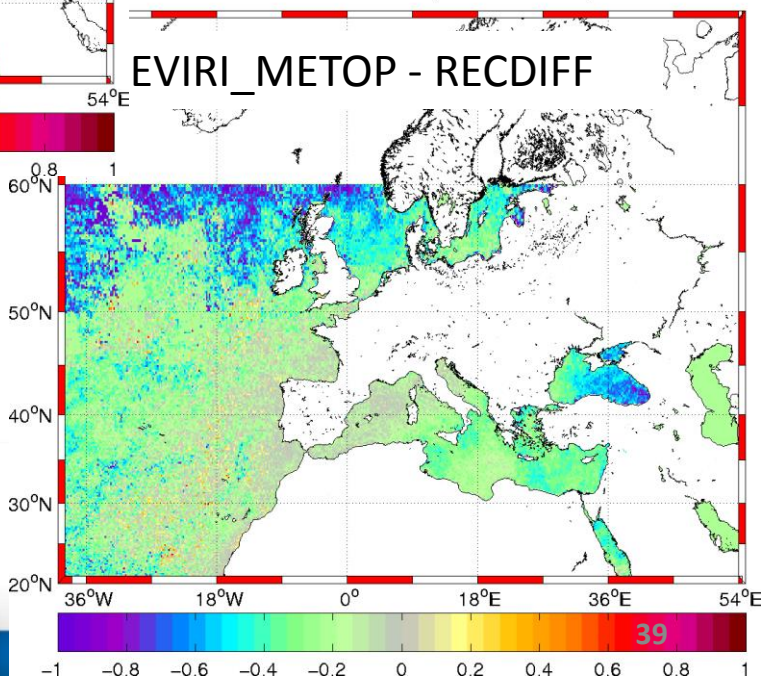
SEVIRI_AATSR - RECDIF



20/06/2011-
29/06/2011

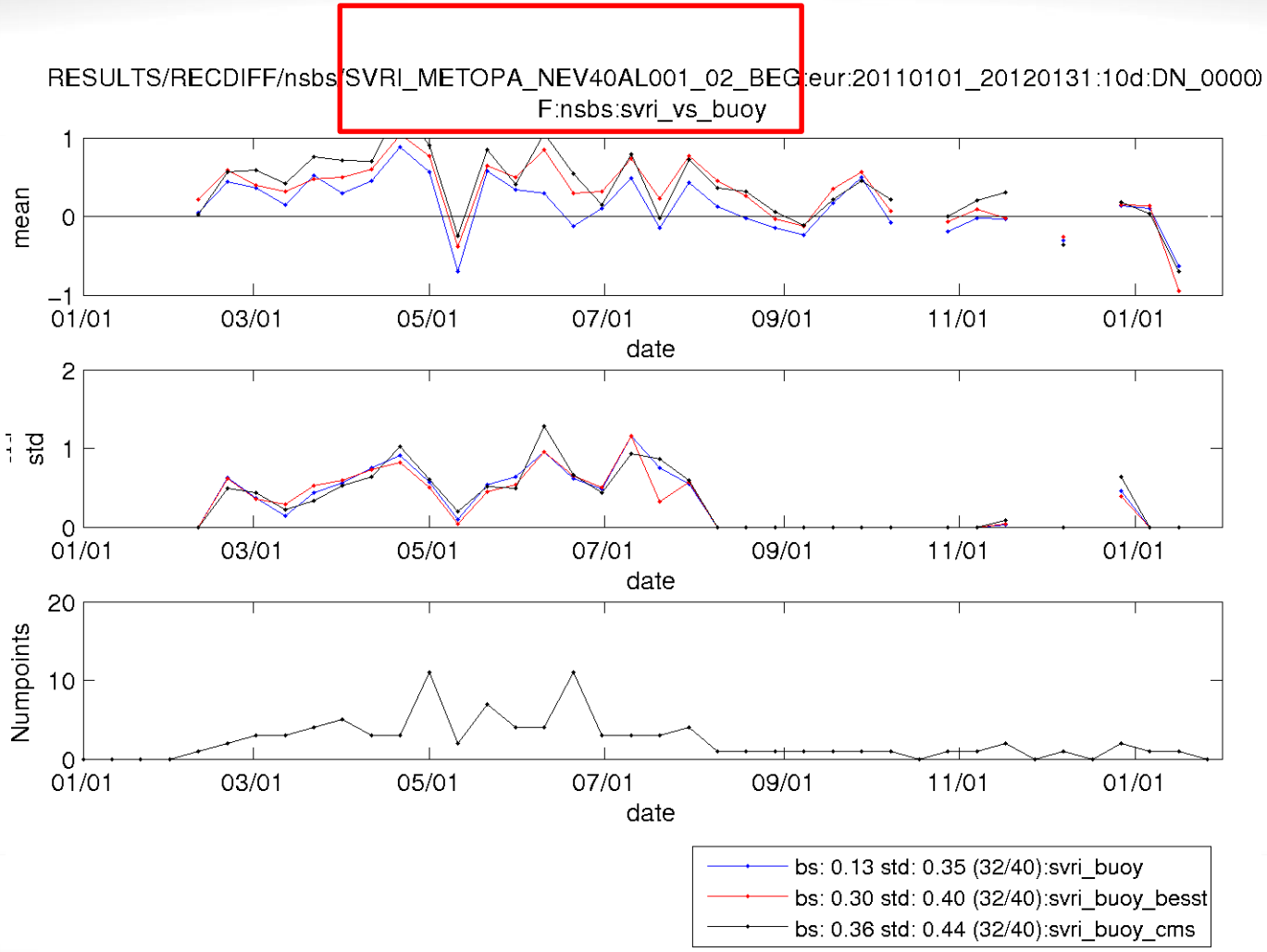


SEVIRI_METOP - DIFFREC



EVIRI_METOP - RECDIFF

Results – RECDIFF:SEVIRI-METOPA vs. BUOY



Conclusions

- **DIFFREC** : difference between reconstruction of each data sensor
  - Biases: close to zero
  - Standard deviations: higher compared to operational
  - Slightly better results when Metop-A used as a ref. sensor
  - AATSR based → too many missing data in reconstruction (>96%) → higher reconstruction errors → higher final std.
  - Metop-A/SEVIRI based → (>80%) → more accurate reconstructions → smaller errors
  - Not a good way

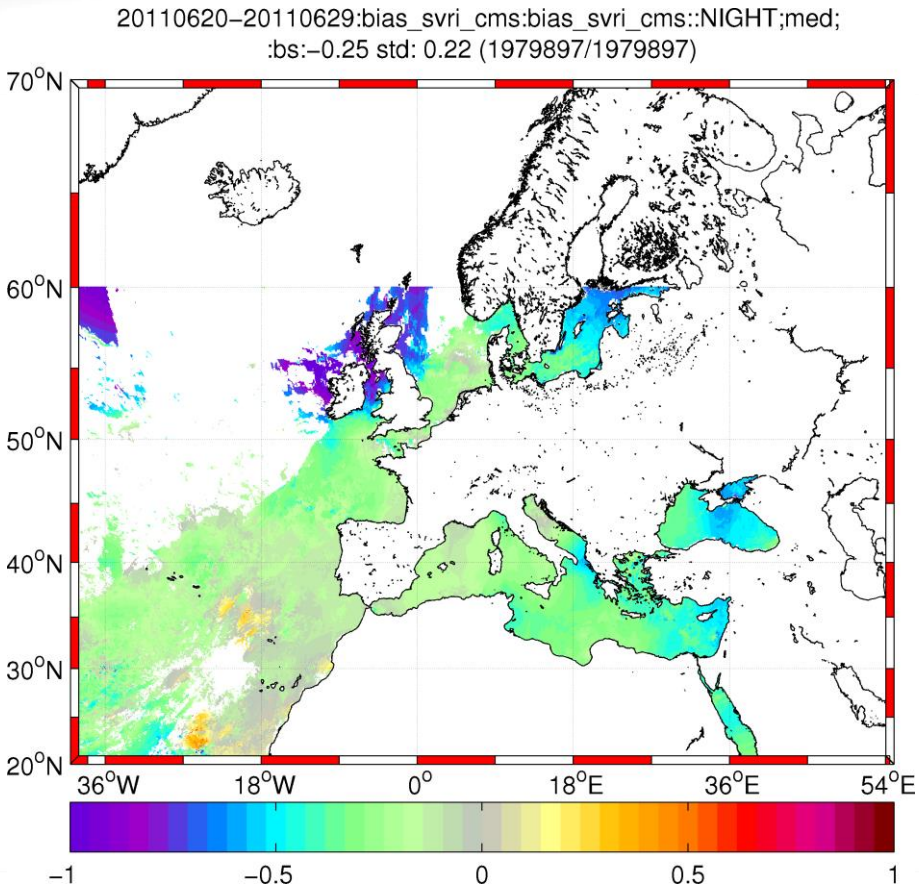
Conclusions

- **RECDIFF (ie reconstructed differences**)
  - Biases: close to zero
  - Standard deviations:
    - AATSR: lower than operational (regardless of ref. Sensor)
    - Buoy: similar or little higher → bias fields are still patchy → impacts sporadic in situ measurements → requires additional spatial smoothing
  - AATSR: only 1 EOF mod
  - Metop-A: 2-3 EOF mods

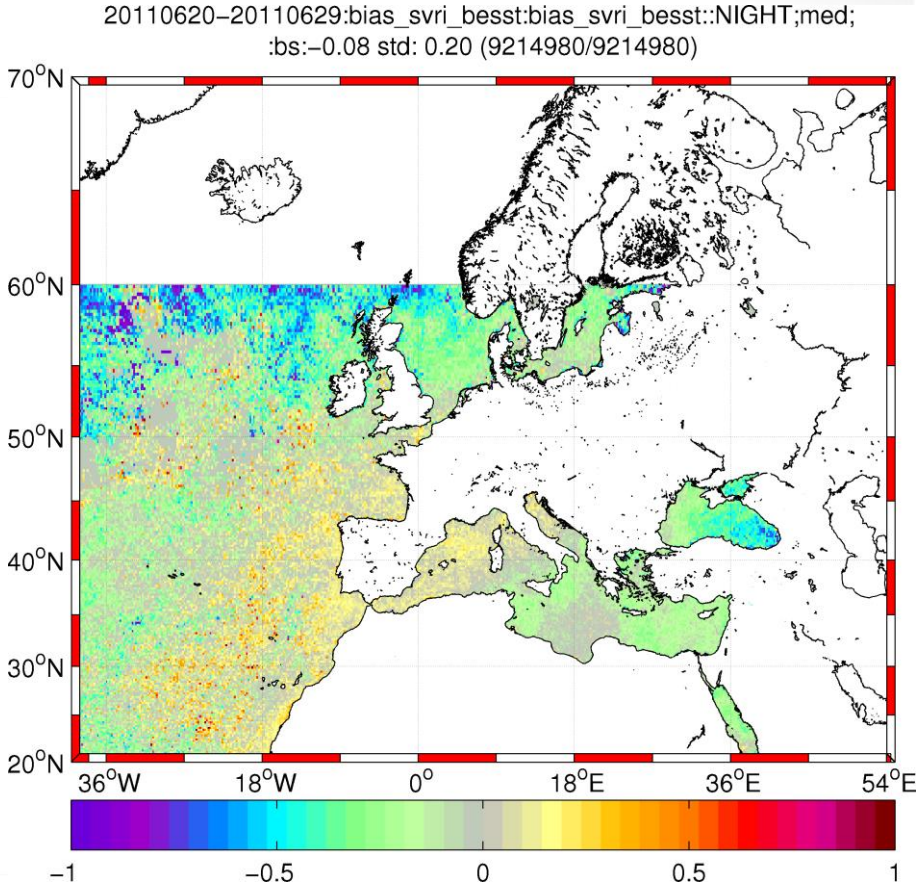
→Favorable approach

SEVIRI (Metop-A) – BIAS field

OI (CMS)



DINEOF



- Implementation of this method in CMS/MYOCEAN test chains this summer

MERCI DE VOTRE ATTENTION

Thanks for attention