



# TOPEX/Poseidon MGRD Quality Assessment Report

**Cycle 430**

**16-05-2004 26-05-2004**

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**SALP-RP-P2-EX-21120-CLS430**

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# 1 Introduction. Document overview

The purpose of this document is to report the major features of the data quality from the Topex/Poseidon mission. The document is associated with data dissemination on a cycle by cycle basis.

The objectives of this document are :

- To provide a data quality assessment
- To provide users with necessary information for data processing
- To report any change likely to impact data quality at any level, from instrument status to software configuration
- To present the major useful results for the current cycle

It is divided into the following topics:

[Cycle overview](#)

[CALVAL main results](#)

## 2 Cycle overview

### 2.1 Cycle quality and performances

Data quality for this cycle appears to be nominal. For this cycle, the crossover standard deviation is 6.66 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 0.00 cm.

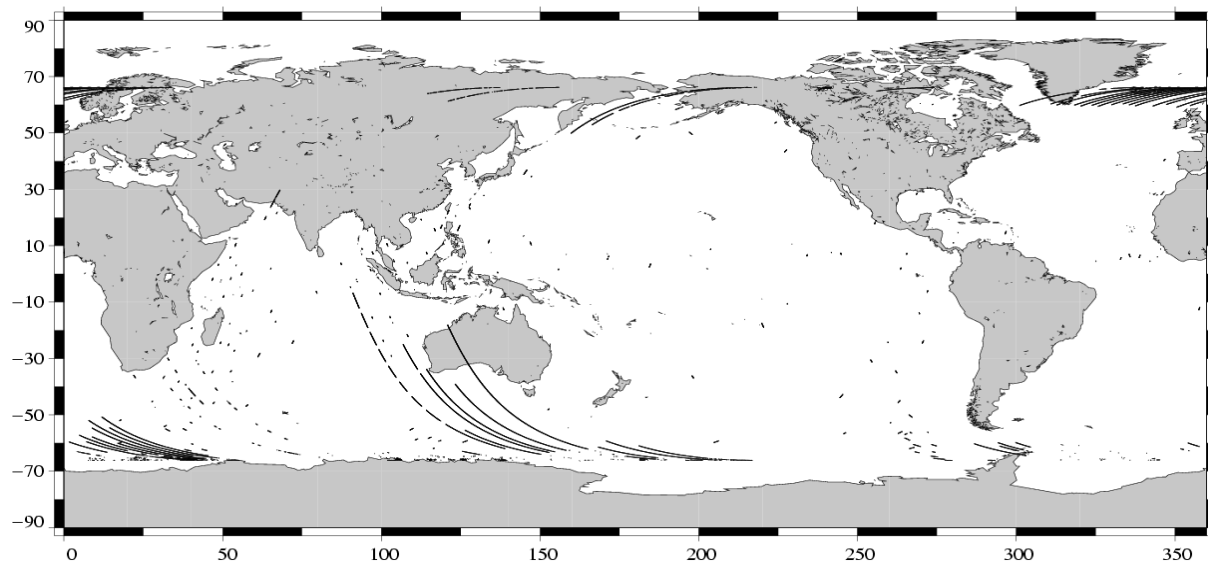
### 2.2 Warnings and recommendations

- TOPEX/Poseidon spacecraft incident :
  - The TOPEX/Poseidon spacecraft has been in a safehold mode from May 26 to June 17 due to a roll reaction wheel failure. Tape recorder and science data recovery operations have been suspended during this period as a result of safe mode operations, that is from pass 253 cycle 430 to the end of cycle 432.
- Missing measurements :
  - There is a lot of data gaps due to tape recorder anomalies, especially in the Indian Ocean, in the South Pacific Ocean close to the South and Central America coasts and below the Groenland coasts. Passes 253 and 254 are missing due to Topex safehold mode.
- Doris ionospheric correction :
  - Due to safehold Topex mode there is no DORIS data available from May 26 (pass 233) to the end of the cycle. Only bent ionospheric correction is available during this period.
- Measurements edited by the TMR parameters :

The following anomalies are explained by the problems in the interpolation of the TMR parameters due to tape recorder failures :

  - 3.37% of the measurements are removed by the TMR correction criterion (see the following figure).
  - Some measurements have radiometer earth flag set to valid over earth. A new criterion has been added to the editing procedure to remove all these measurements (see [Editing](#)) .

Edited parameter : Radiometer wet tropospheric correction  
T/P Cycle 430 (16/05/2004 / 26/05/2004)



### 3 CALVAL main results

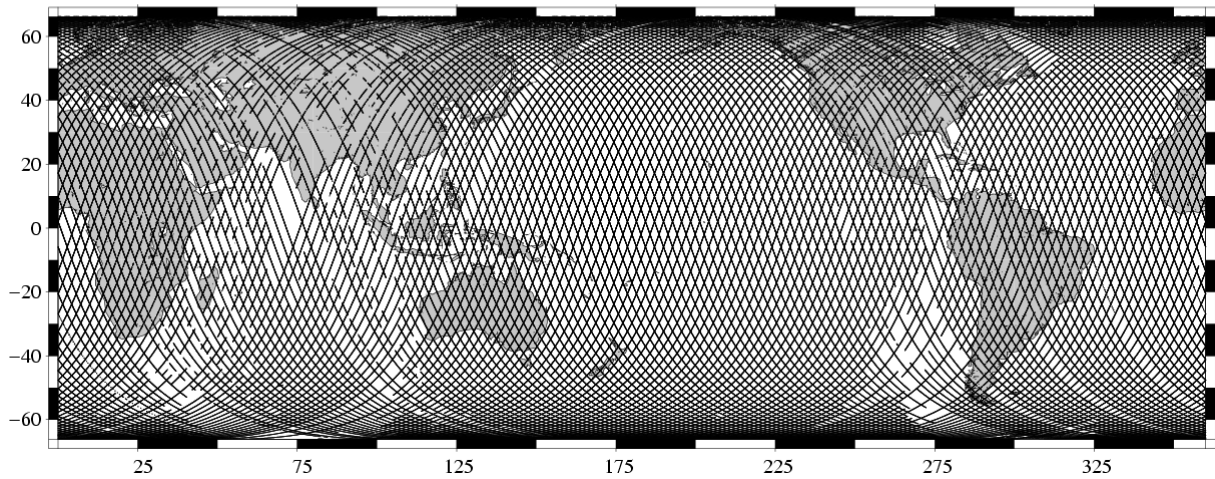
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

#### 3.1 Missing measurements

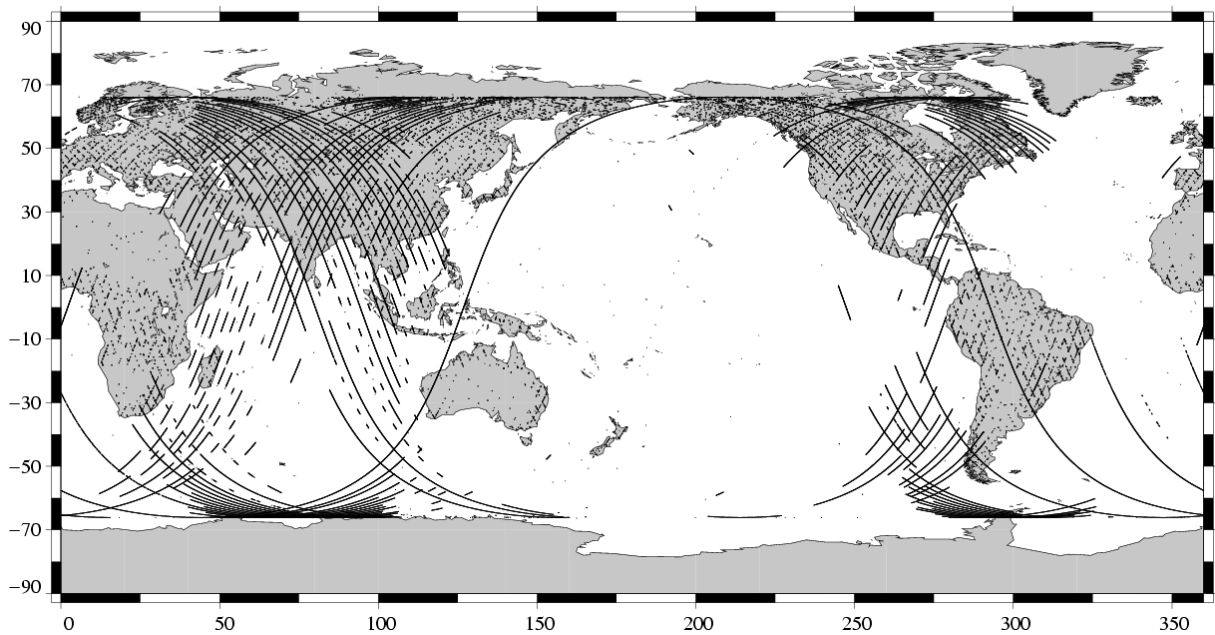
680652 altimeter measurements are present, and 113907 are missing.

The map below shows all the available measurements for this cycle and illustrates the tape recorder problems. The latter figure shows missing 1Hz measurements in the GDRs, with respect to a 1 Hz sampling of a nominal repeat track.

Available measurements  
TOPEX Cycle 430 (16/05/2004 / 26/05/2004)



Missing measurements  
TOPEX/Poseidon Cycle 430 (16/05/2004 / 26/05/2004)



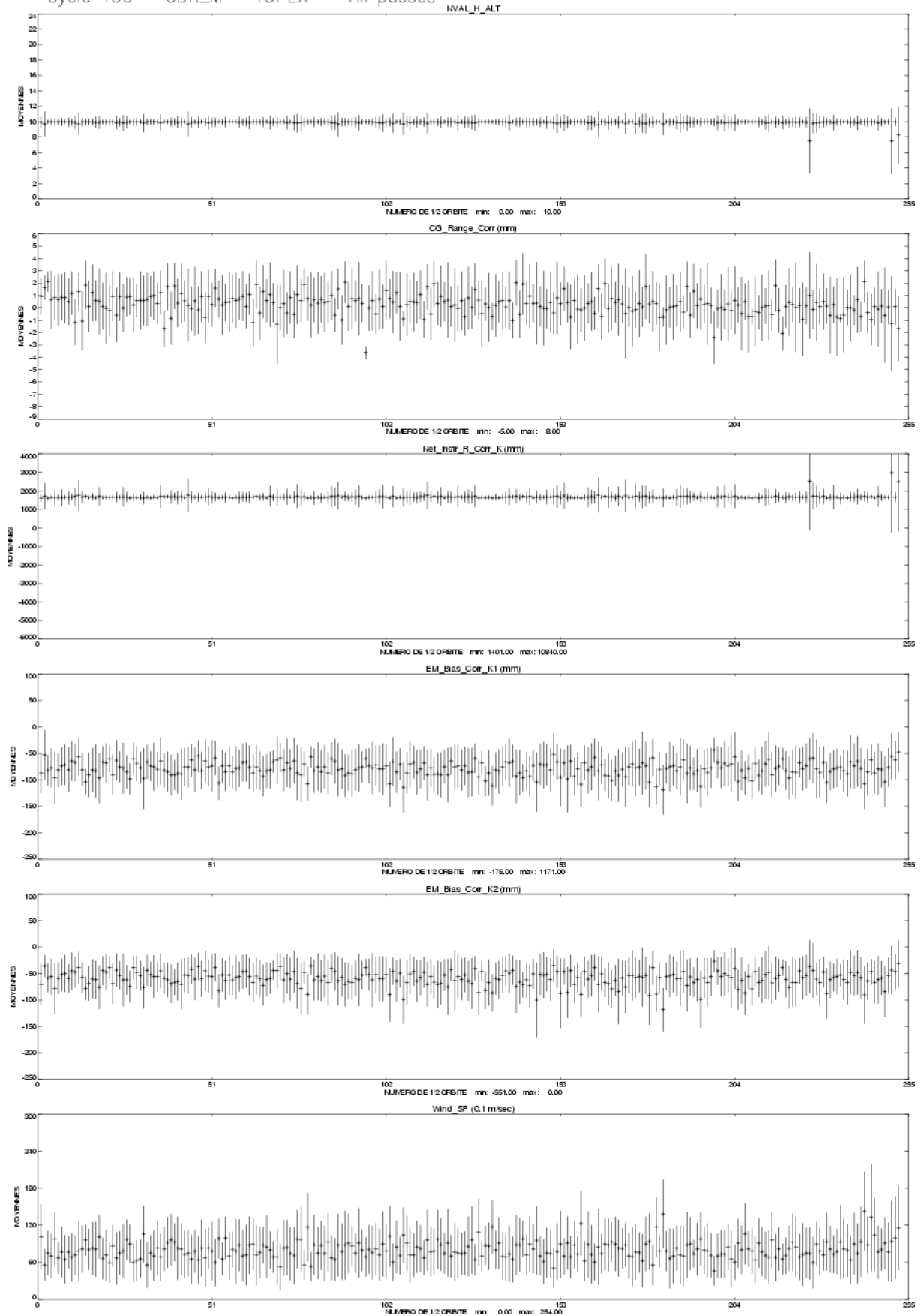
### 3.2 M-GDR quality flags

The following table indicates the percentage of measurements for which those flags are set.

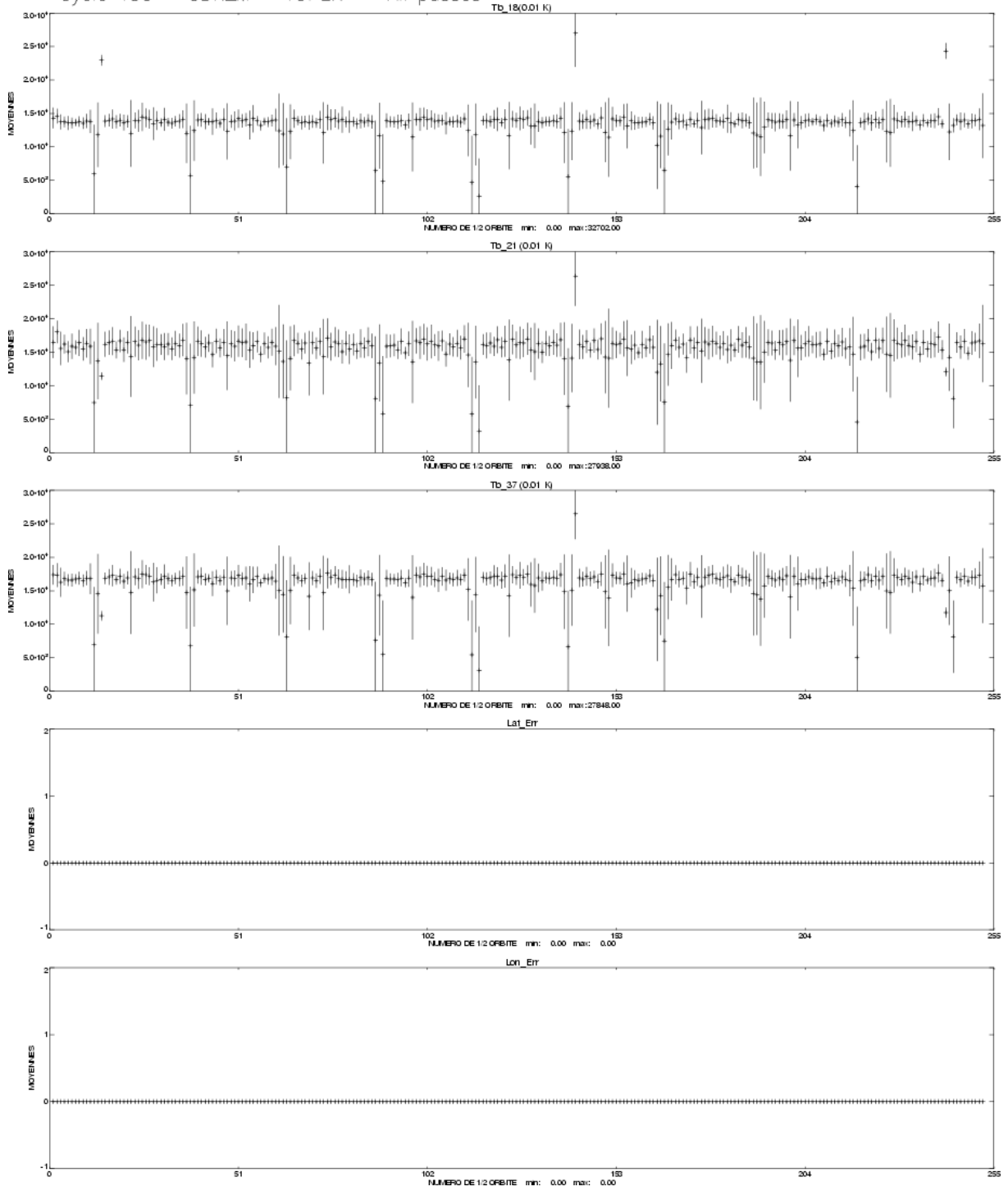
Name	Description	% bad
Geo_Bad_1	altimeter land flag	25.39
Geo_Bad_1	ice flag	5.04
Geo_Bad_1	radiometer land flag	27.95
Alt_Bad_1	conditions 1 altimeter	5.37
Alt_Bad_2	conditions 2 altimeter	5.24
Geo_Bad_2	rain (liquid water in excess)	7.06
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.37
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.60
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	5.67
DORIS	DORIS not valid	0.00

### 3.3 M-GDR parameter plots

Cycle 430 – GDR\_M – TOPEX – All passes –

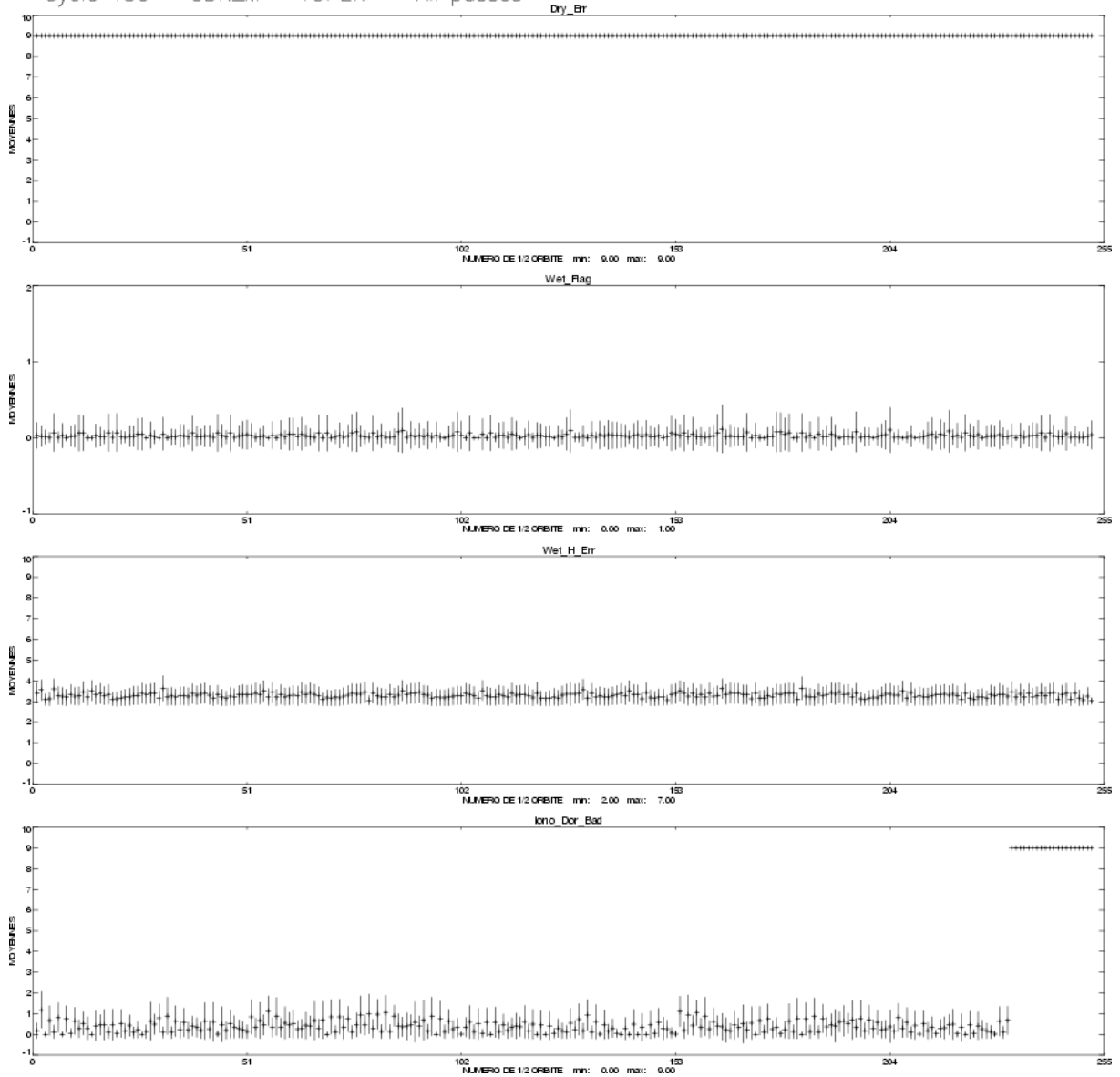


Cycle 430 – GDR\_M – TOPEX – All passes –

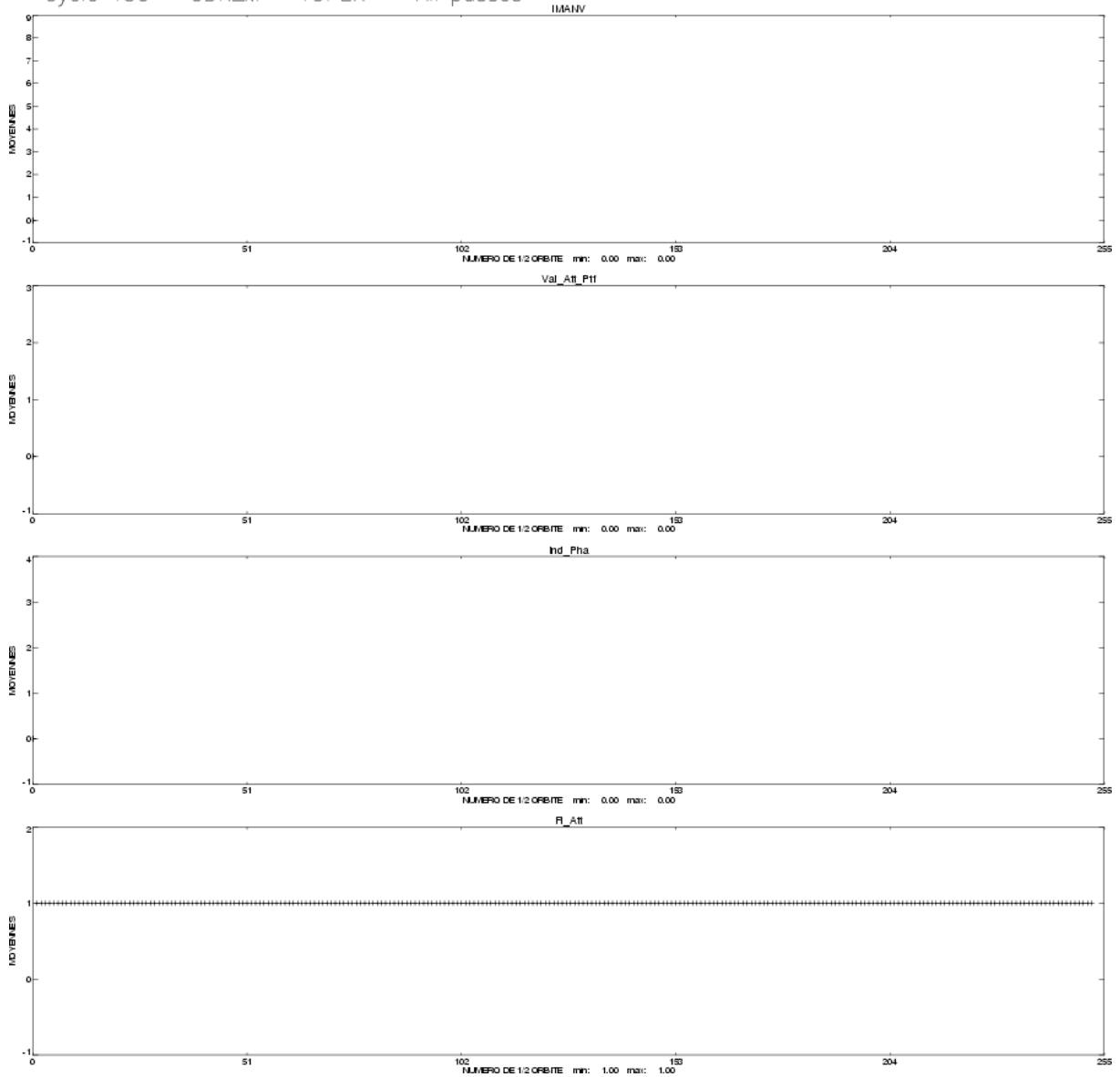


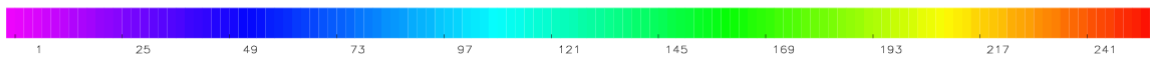
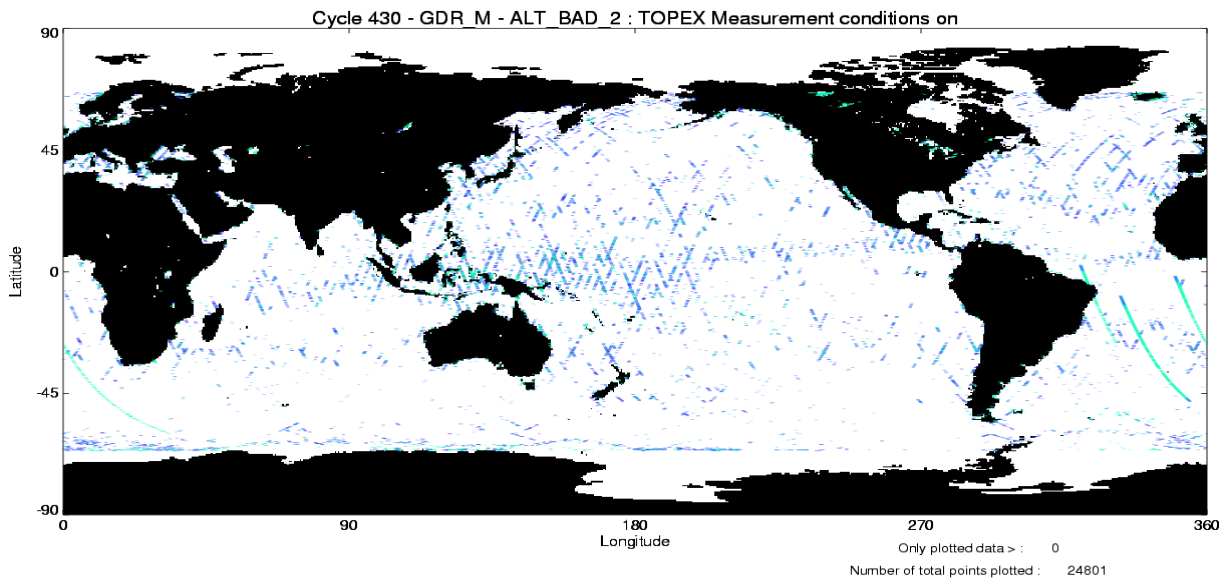
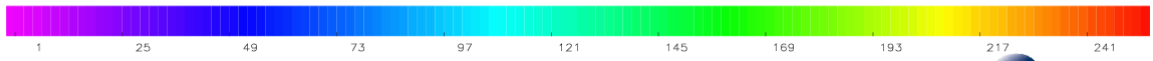
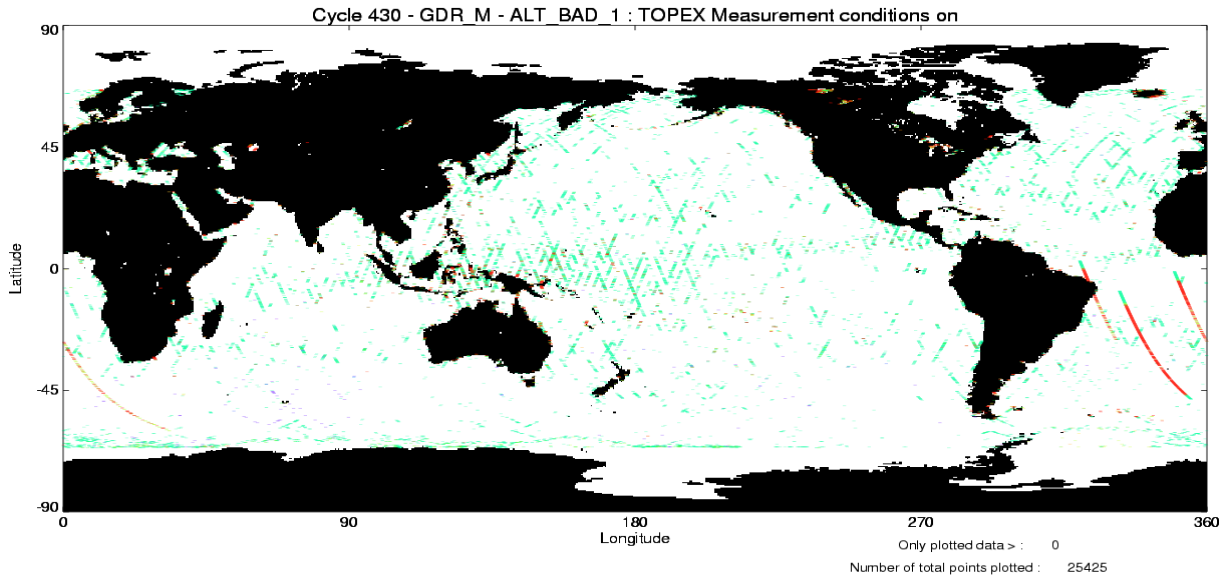


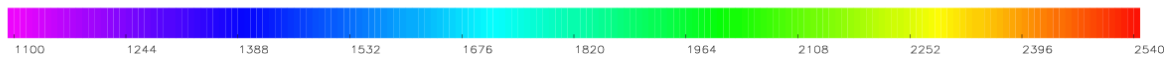
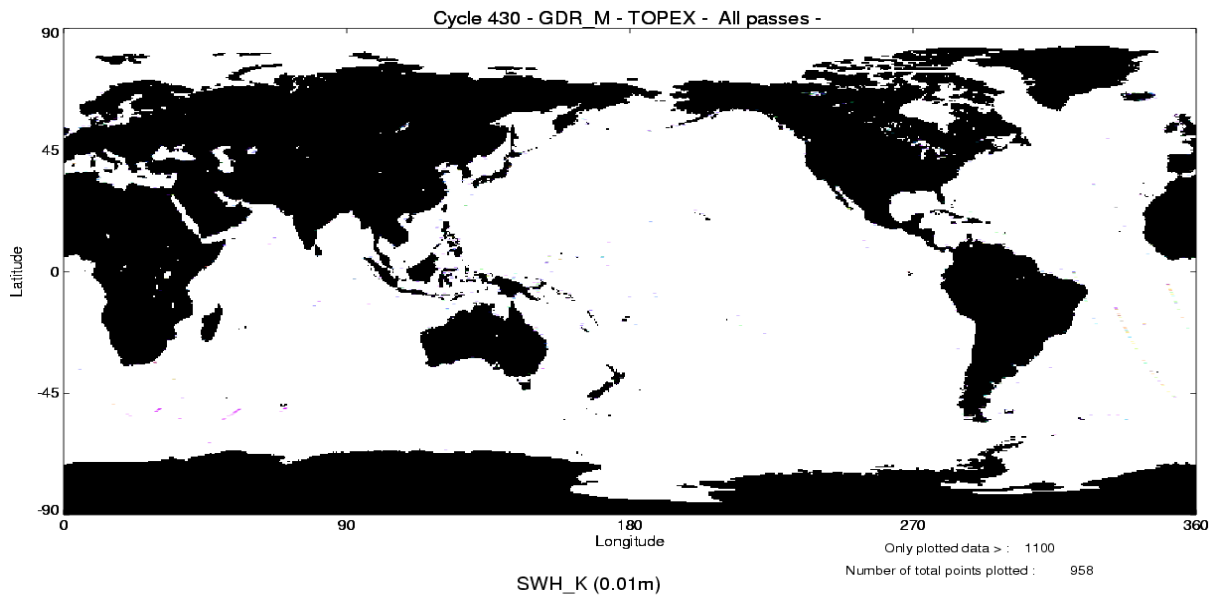
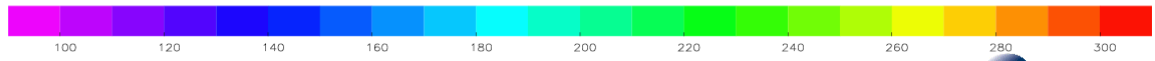
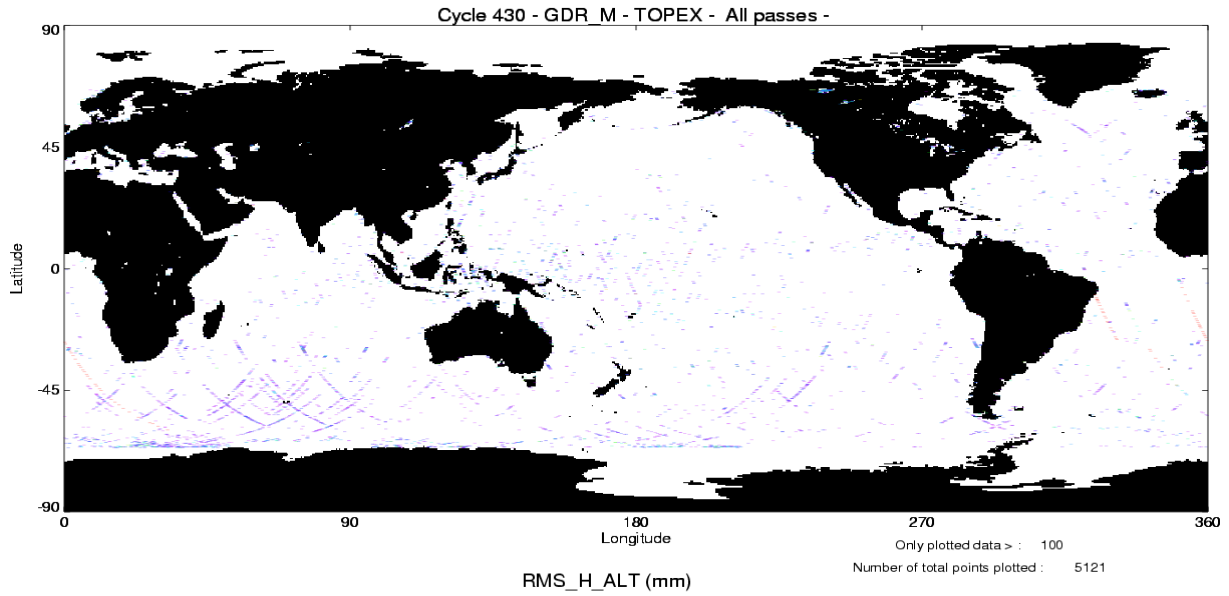
Cycle 430 – GDR\_M – TOPEX – All passes –

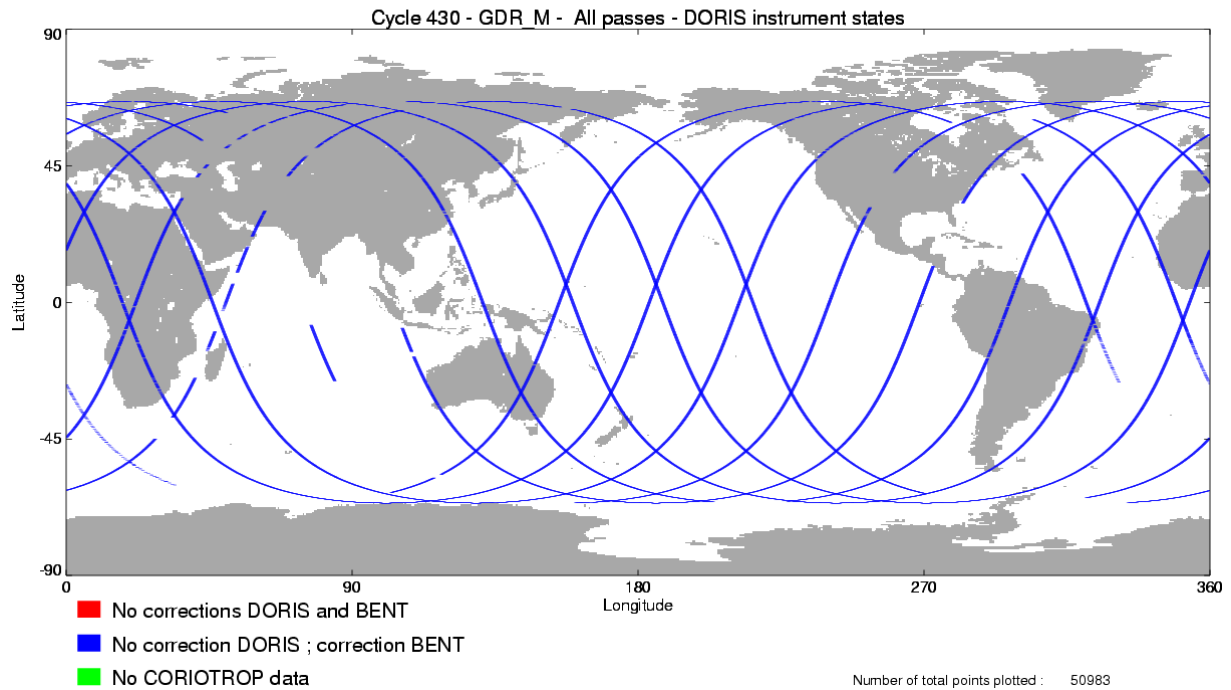


Cycle 430 – GDR\_M – TOPEX – All passes –









### 3.4 Editing

The following table gives for each tested parameter, minimum and maximum thresholds, the number and the percentage of points removed. As a comparison, the mean percentage over one year (1997) is also given.

There are problems in the interpolation of the TMR parameters since cycle 371 when there are missing measurements (tape recorder failures). These bad measurements are removed by the TMR correction criterion but some of them have been kept. Thus a new criterion has been added to the editing procedure since the cycle 376 to remove all the measurements where the absolute value of the difference between the TMR correction and the ECMWF model wet tropospheric correction is greater than 20 cm.

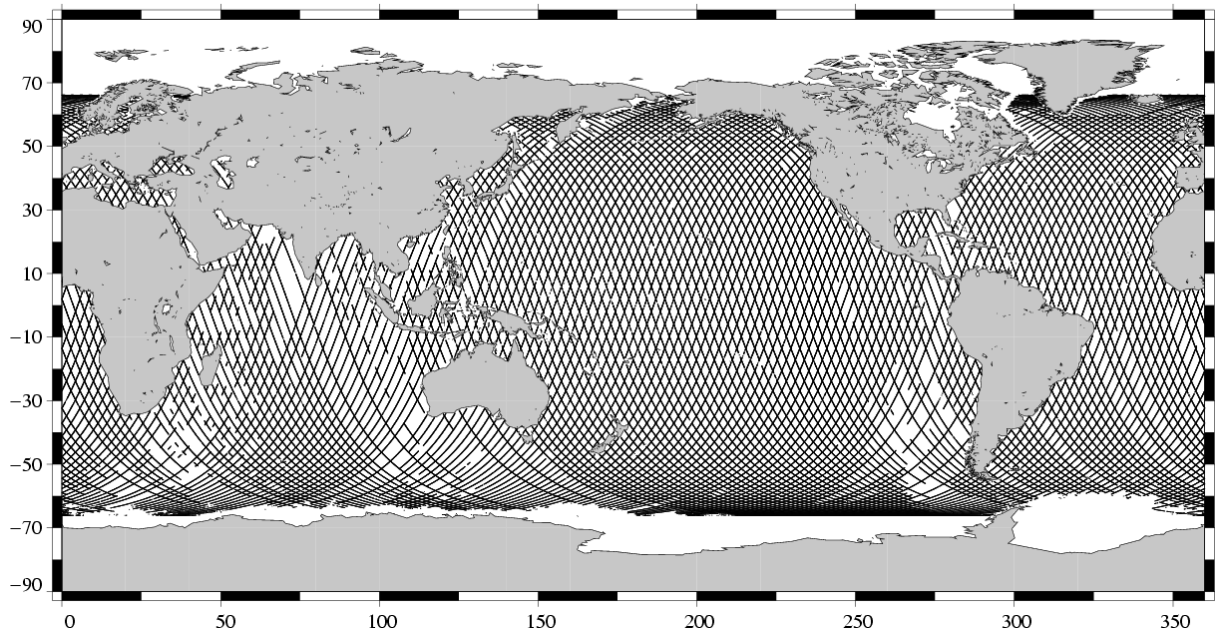
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited measurements. Therefore a new criterion has been added in the editing procedure to remove all the measurements for which the radiometer land flag is set to ocean and the altimeter land flag is set to land.

The number and percentage of points removed by each criterion is given on the following table. Note that these statistics are obtained with measurements already edited for radiometer land flag (27.95 % of points removed) and ice flag ( 5.03 % of points removed).

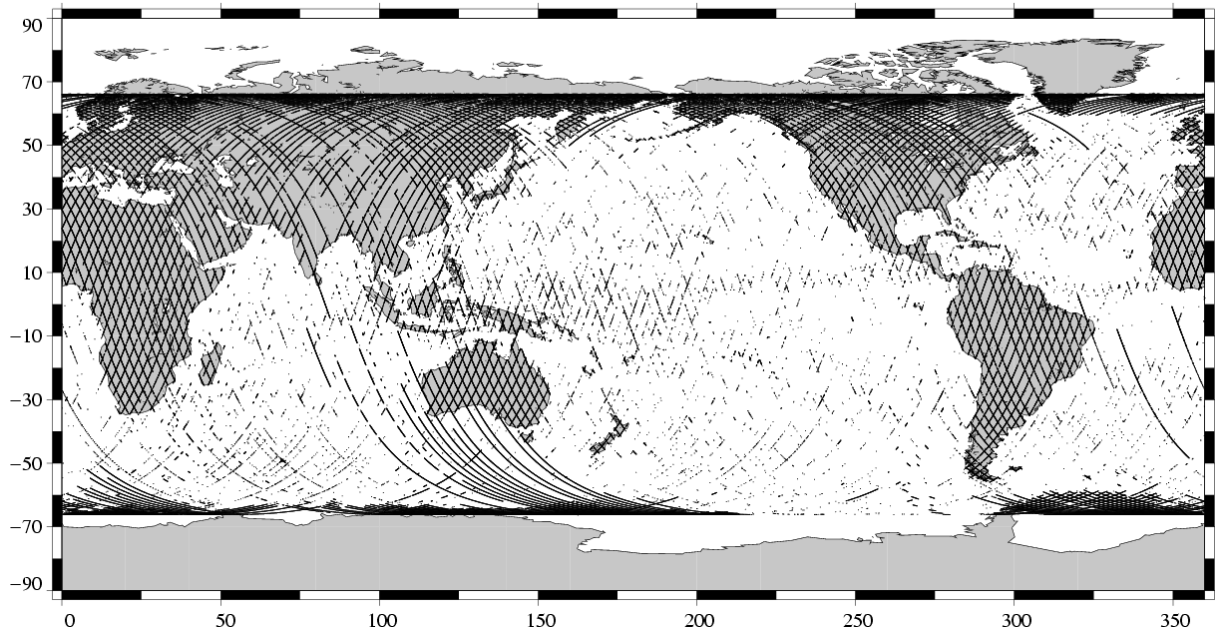
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	0.34
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	0.46
Std. deviation of range	0.000	0.100	m	1.85	1.33
Off nadir angle from waveform	0.000	0.400	deg	1.36	3.73
Dry tropospheric correction	-2.500	-1.900	m	0.00	0.00
Invert barometer correction	-2.000	2.000	m	0.00	0.00
TMR wet tropospheric correction	-0.500	-0.001	m	0.34	3.37
Ionospheric correction (Poseidon:Doris, TOPEX:Dual)	-0.400	0.040	m	0.00	0.46
Significant wave height	0.000	11.000	m	1.46	0.12
Sea state Bias	-0.500	0.000	m	1.39	0.48
Backscatter coefficient	7.000	30.000	dB	1.44	0.65
Ocean tide height	-5.000	5.000	m	0.01	0.15
Earth tide	-1.000	1.000	m	0.00	0.00
Pole tide	-15.000	15.000	m	0.00	0.00
TMR and ECMWF tropospheric differences	-0.200	0.200	m	NaN	0.20
Spline fitting					0.01

The following three maps are complementary: they show respectively the removed, the selected measurements and the percentage of selected measurements in the editing procedure.

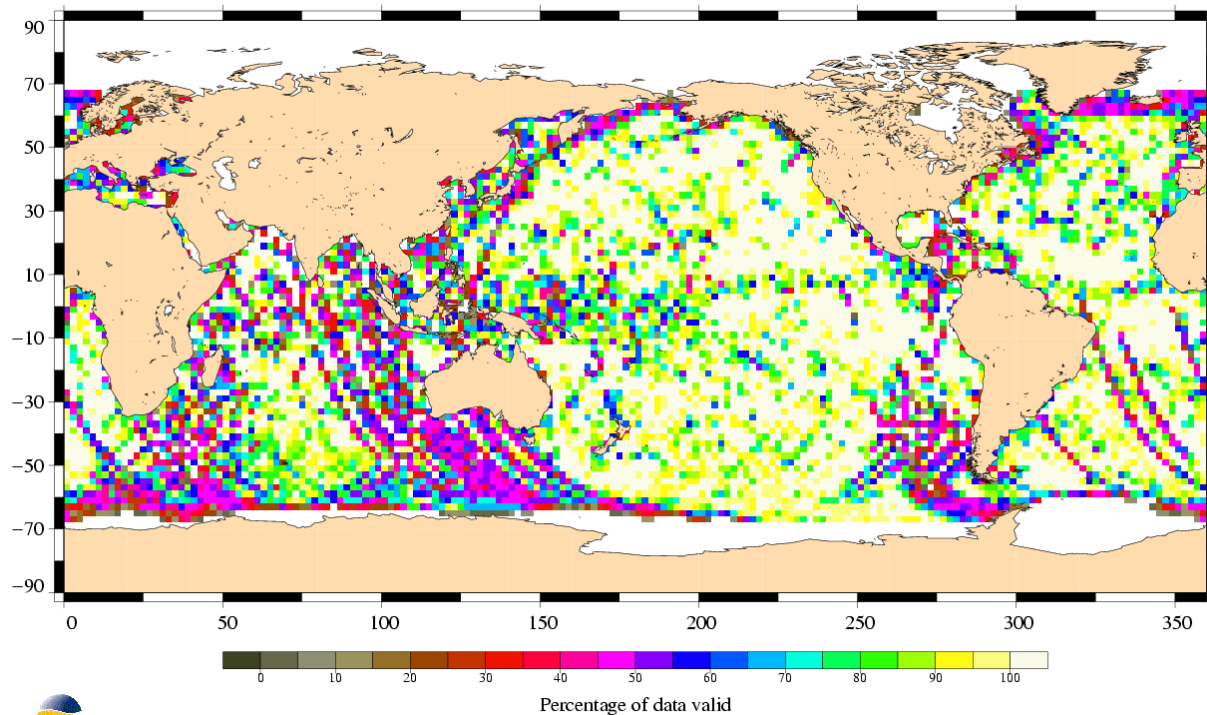
Valid data  
TOPEX/Poseidon Cycle 430 (16/05/2004 / 26/05/2004)



Edited measurements  
TOPEX Cycle 430 (16/05/2004 / 26/05/2004)



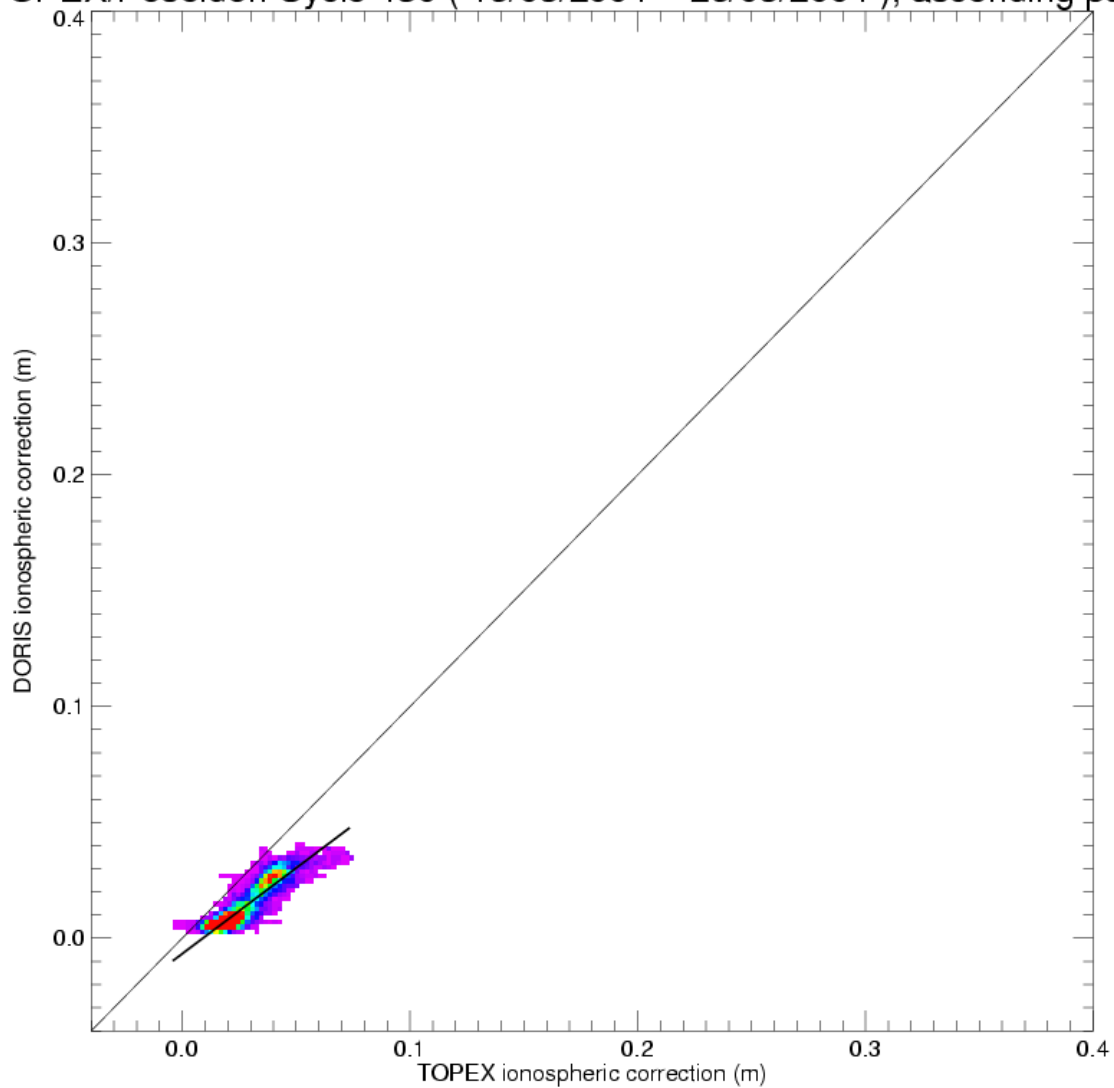
Percentage of valid data relative to the nominal pass  
TOPEX/Poseidon Cycle 430 (16/05/2004 / 26/05/2004)



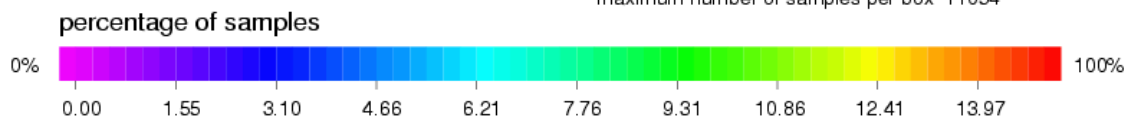


### 3.5 Ionospheric correction

TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), ascending passes



minimum number of samples per box 1  
maximum number of samples per box 11054



#### Statistics Y-X

mean = -0.01311  
rms = 0.01391  
std = 0.00466

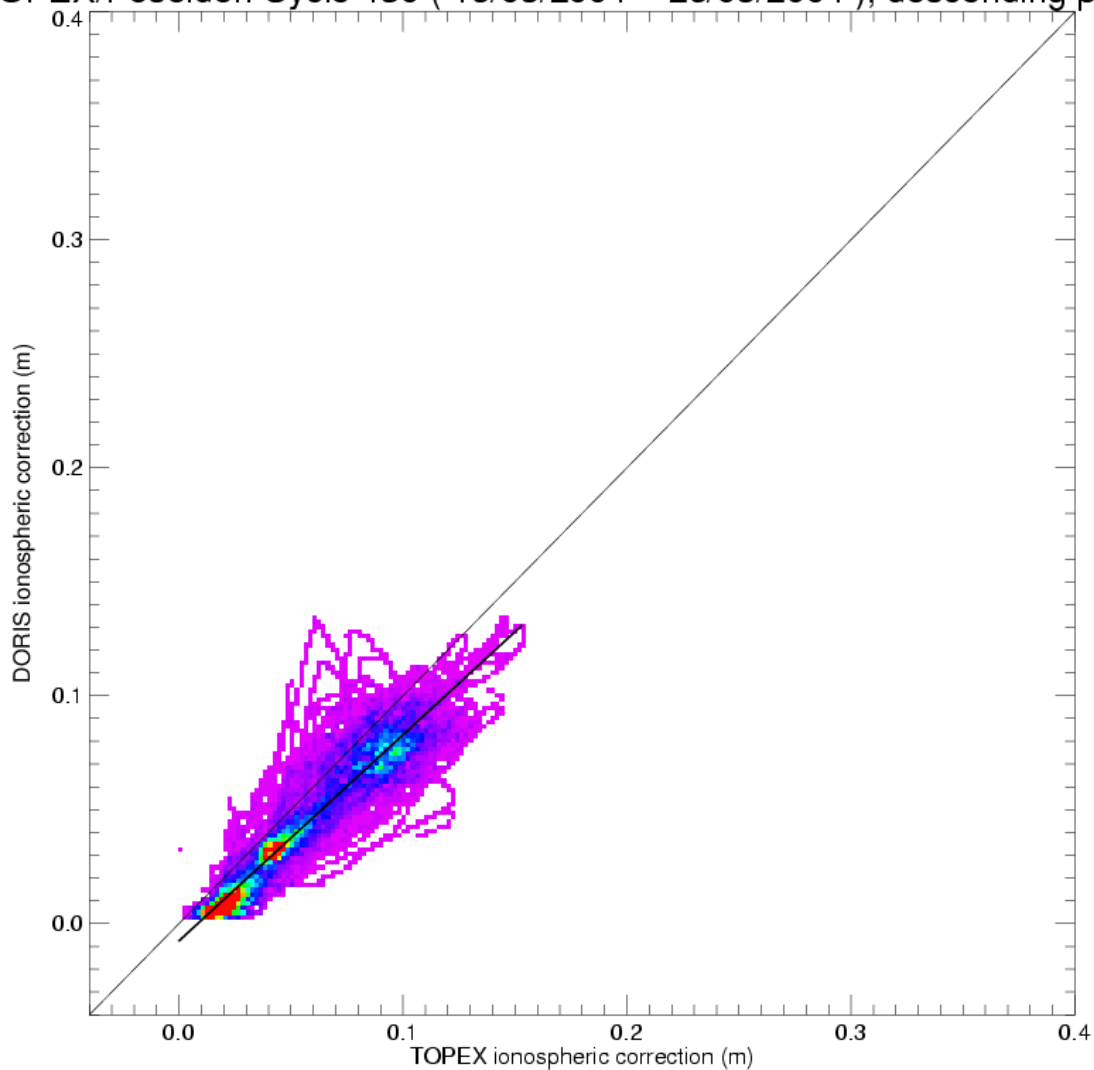
#### Order 1 fit polynomial

$y = a x + b$   
a = 0.73926610  
b = -0.00667859

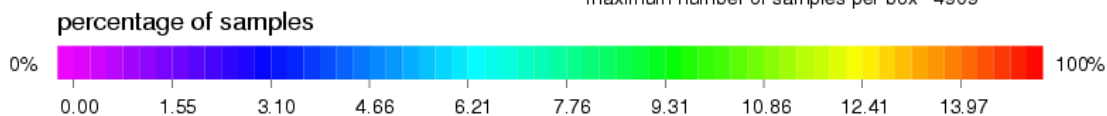
#### Legend

— Order 1 fit polynomial  
— Bisectrix

TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 4909



**Statistics Y-X**

mean = -0.01228  
 rms = 0.01623  
 std = 0.01060

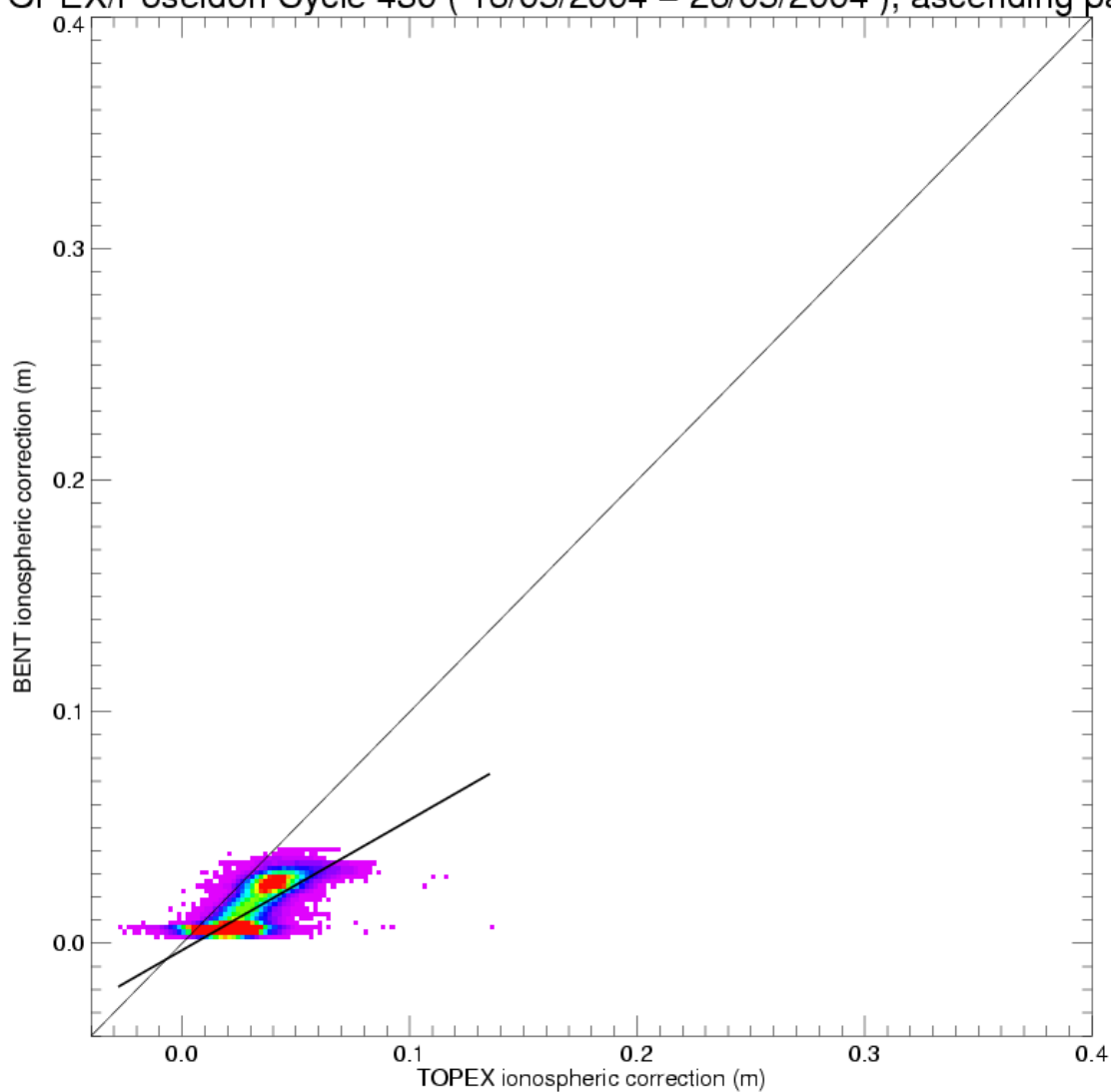
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.90394008$   
 $b = -0.00757667$

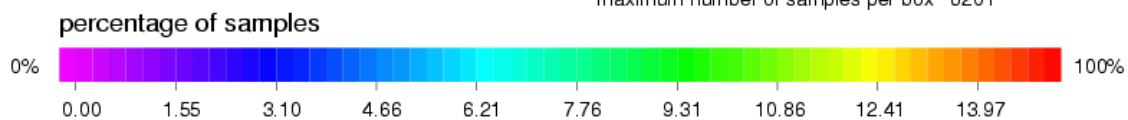
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 6201



**Statistics Y-X**

mean = -0.01389  
 rms = 0.01595  
 std = 0.00784

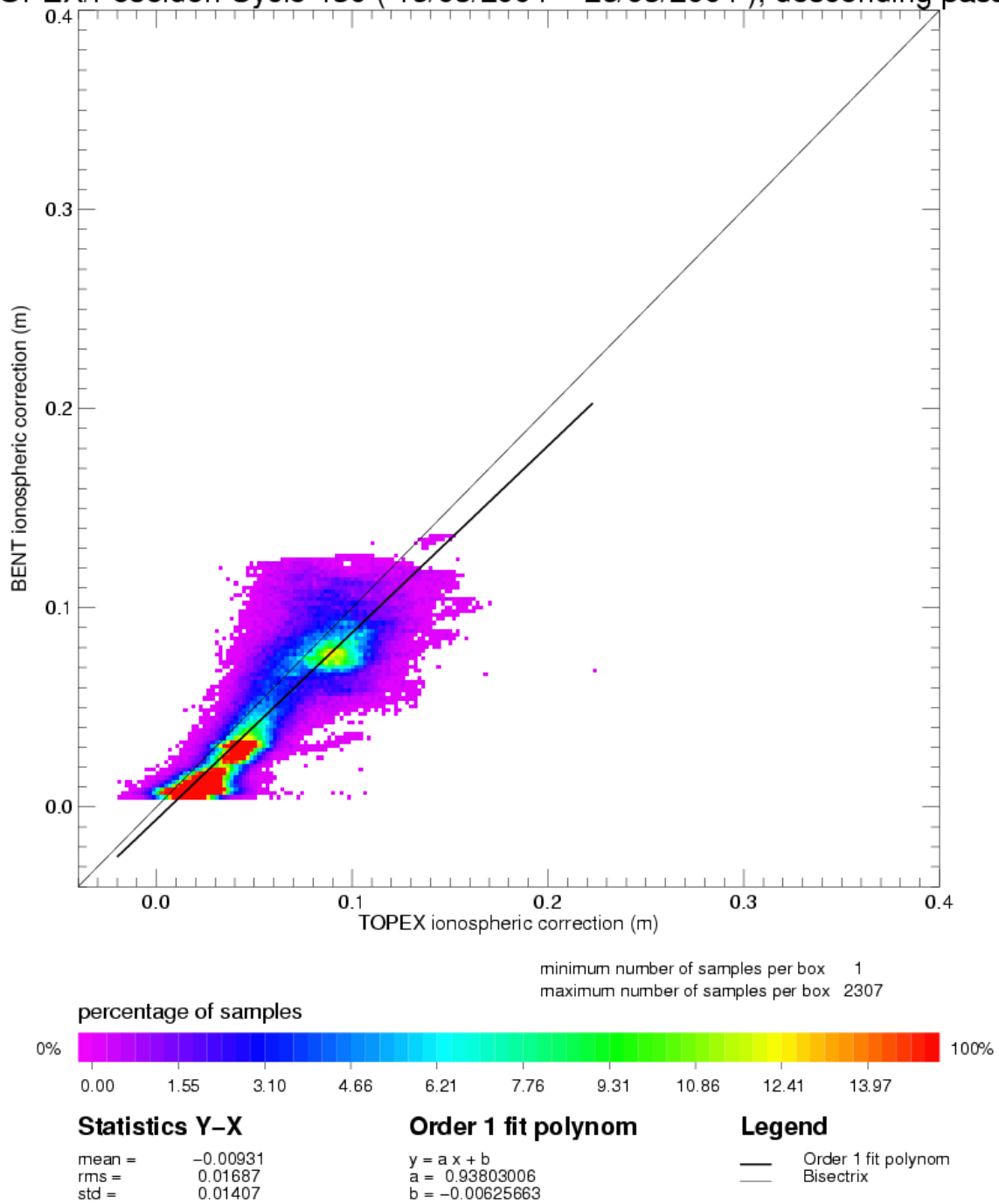
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.56337333$   
 $b = -0.00295394$

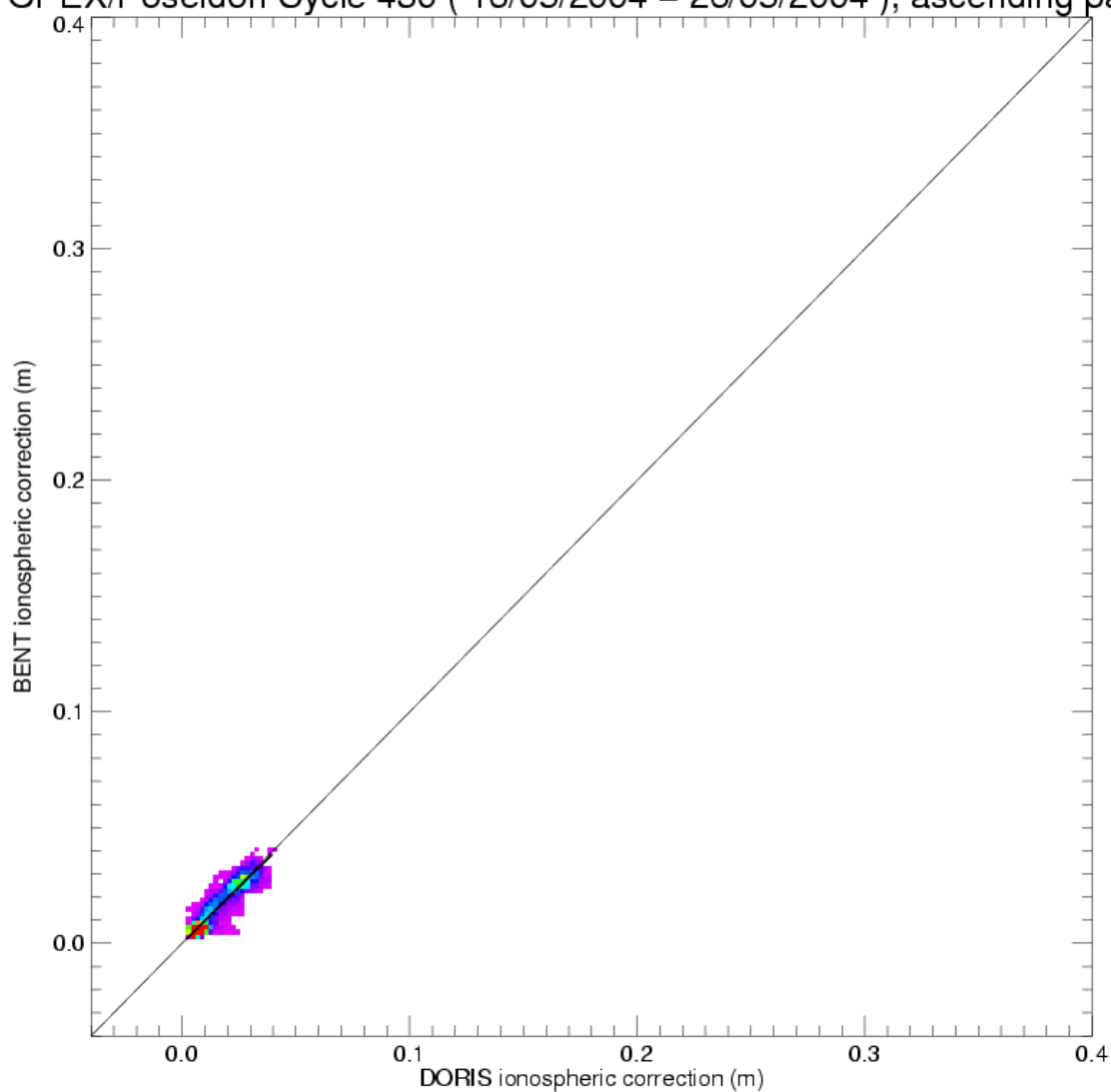
**Legend**

— Order 1 fit polynom  
 — Bisectrix

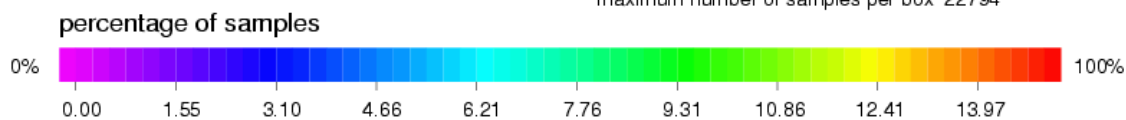
TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), descending passes



TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 22794



**Statistics Y-X**

mean = -0.00032  
 rms = 0.00317  
 std = 0.00316

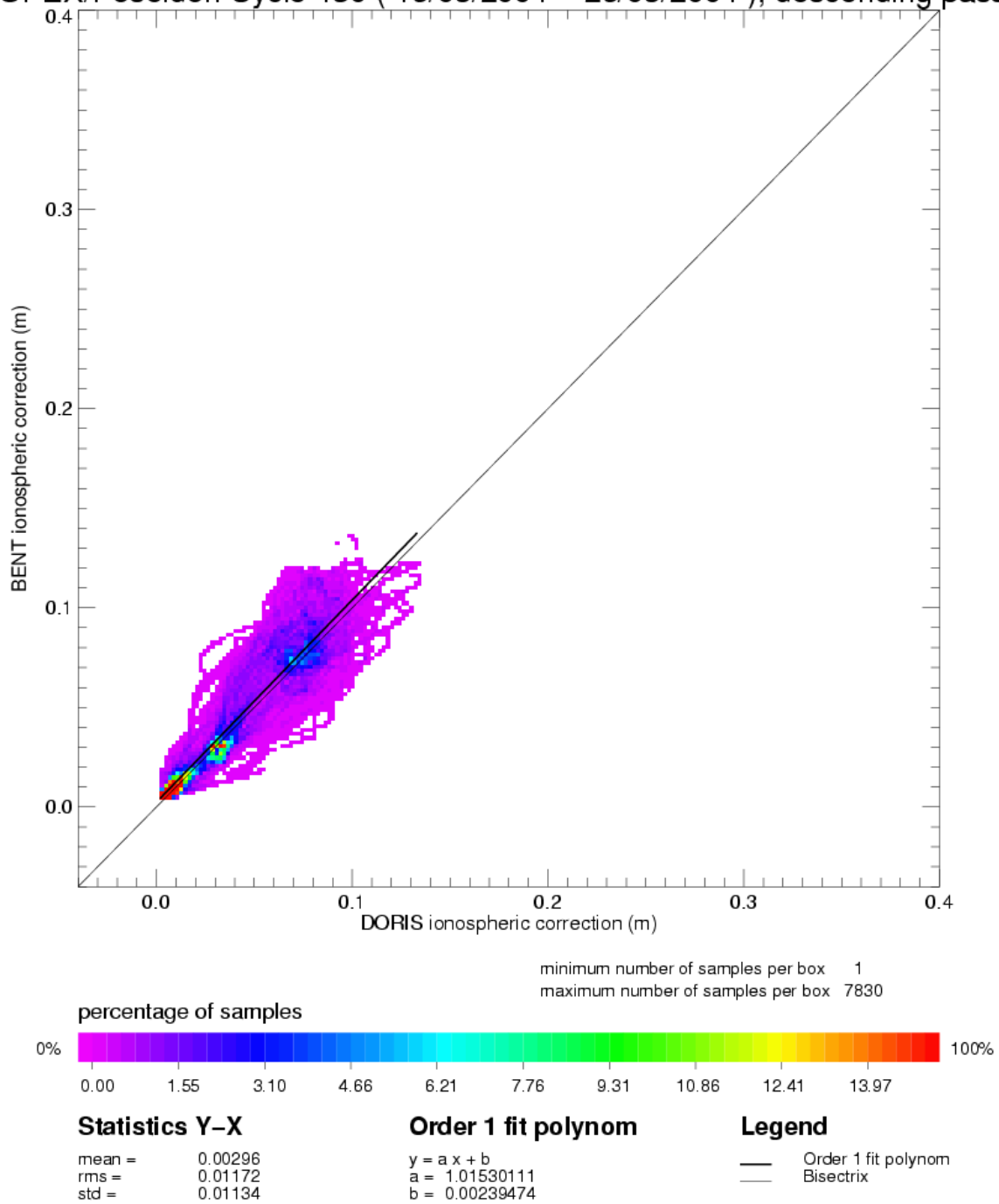
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.97077441$   
 $b = 0.00001552$

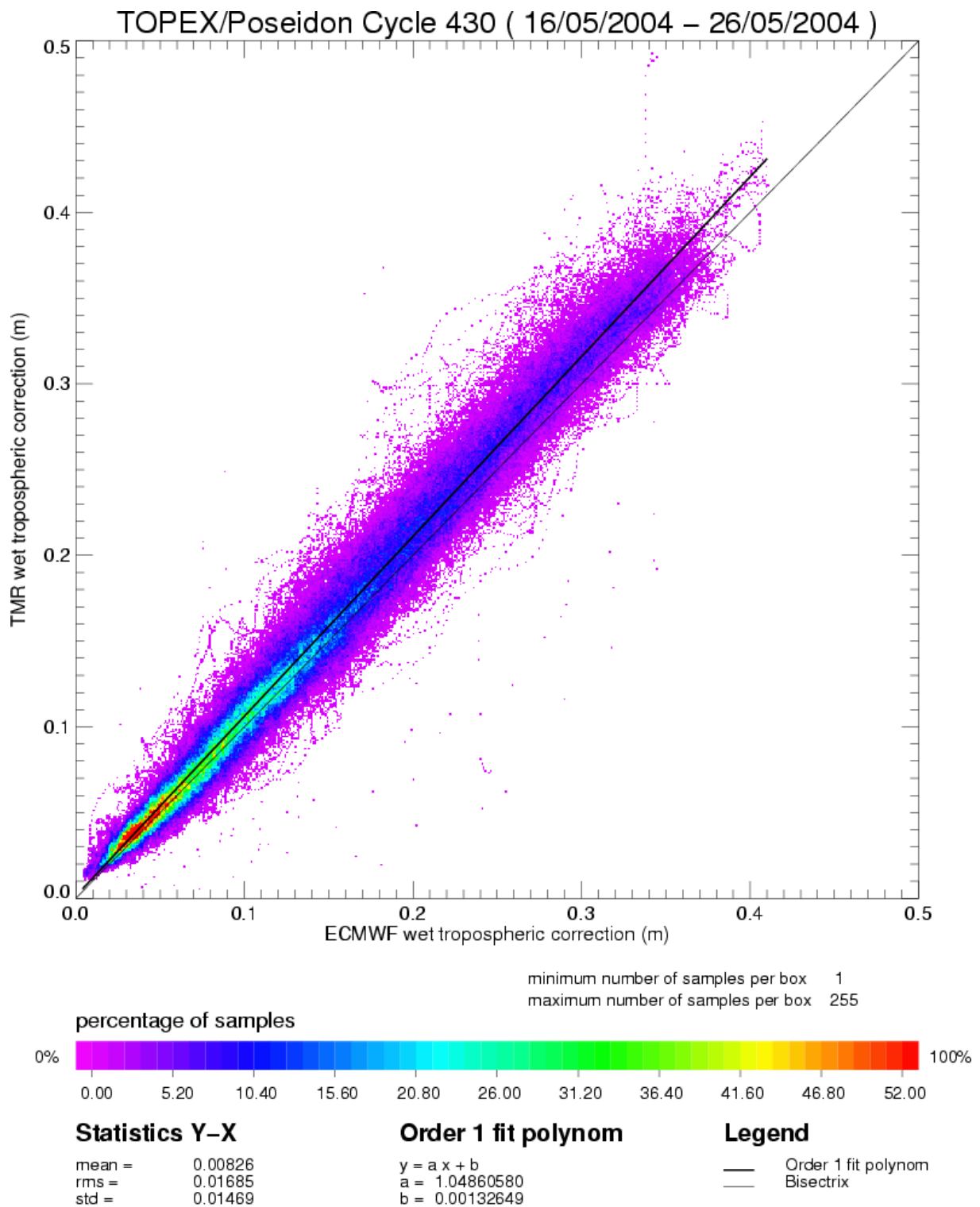
**Legend**

— Order 1 fit polynom  
 — Bisectrix

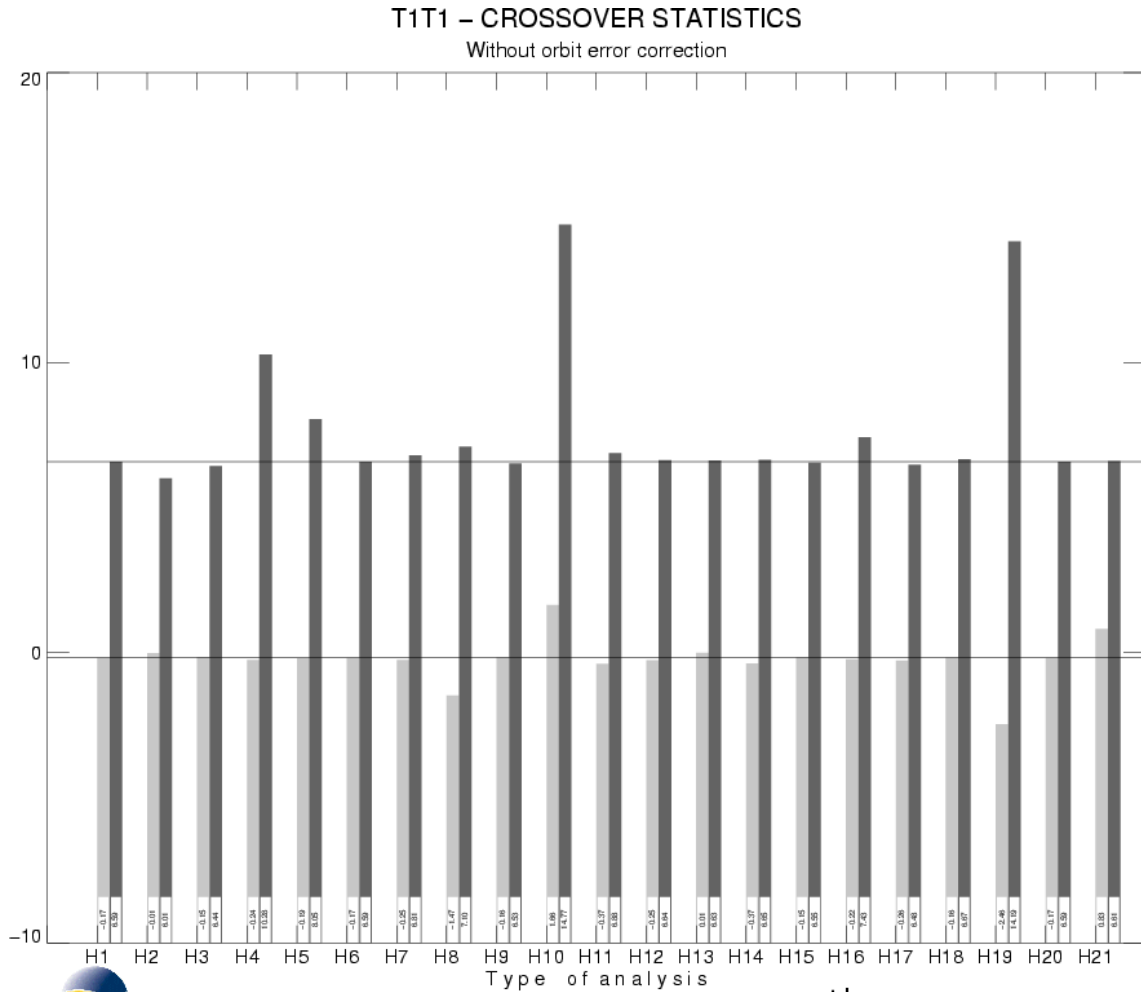
TOPEX/Poseidon Cycle 430 ( 16/05/2004 – 26/05/2004 ), descending passes



### 3.6 Wet tropospheric correction



### 3.7 Crossover statistics



differences threshold 30.

std  
mean

SSH = Corrected sea surface height	SSH with FES99 tide model instead of GOT99
SSH = Corrected sea surface height with orbit error	SSH with FES02 tide model instead of GOT99
SSH without dry thopospheric correction	SSH with CSR3 tide model instead of GOT99
SSH without inverse barometer correction	SSH with GOT002 tide model instead of GOT99
SSH without wet topospheric correction	SSH without BM4 SSB correction
SSH with corrected tropo instead of TMR tropo	SSH with no-parametric SSB correction instead of BM4 SSB correction
SSH with ECMWF tropo instead of TMR tropo	SSH with BM3 SSB correction instead of BM4 SSB correction
SSH without ionospheric correction filtered	SSH without solid earth tide correction
SSH with DORIS iono correction instead of iono filtered	SSH without polar tide correction
SSH without GOT99 tide model	SSH = Corrected sea surface height with CNES orbit
SSH with FES95 tide model instead of GOT99	



### T1T1 – CROSSOVER STATISTICS

Without orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

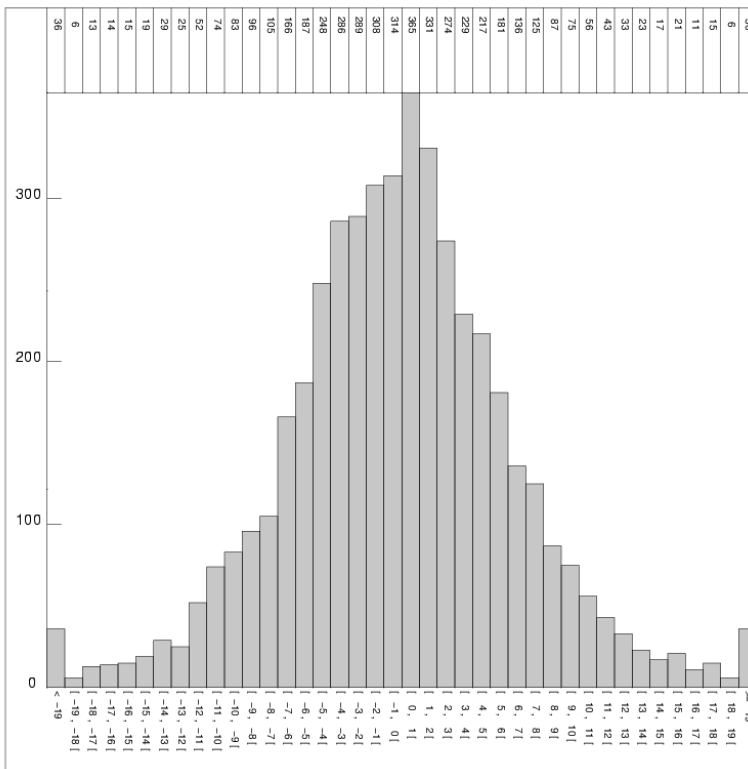
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse 0.00 (moy)  
 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.6000  
 Valeur maximale : 29.8400  
 Différence Max – Min: 59.4400  
 Nombre de points lus: 4752  
 Nombre de points sélectionnés: 4646  
 Moyenne : -0.173396  
 Ecart-type : 6.58982  
 Moyenne Quadratique : 6.59210

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### T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

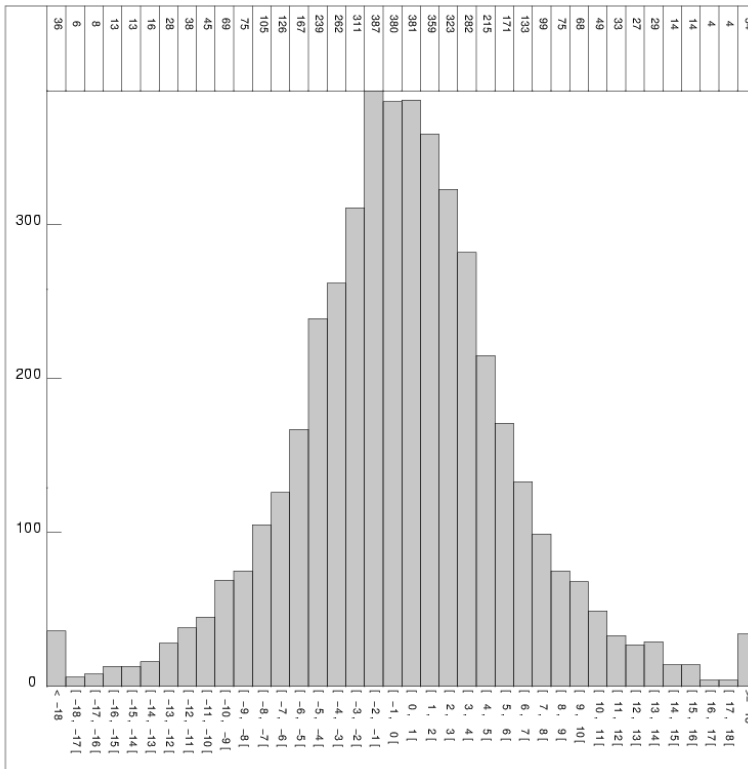
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse 0.00 (moy)  
 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.6400  
 Valeur maximale : 28.5700  
 Différence Max – Min: 58.2100  
 Nombre de points lus: 4752  
 Nombre de points sélectionnés: 4638  
 Moyenne : -0.00921700  
 Ecart-type : 6.01230  
 Moyenne Quadratique : 6.01231

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**T1T1 – CROSSOVER STATISTICS**  
**SSH, BATHY < -1000 m, VAR\_OCE < 20 cm, LAT [-50°, +50]**  
**SSH = Corrected sea surface height before orbit error**

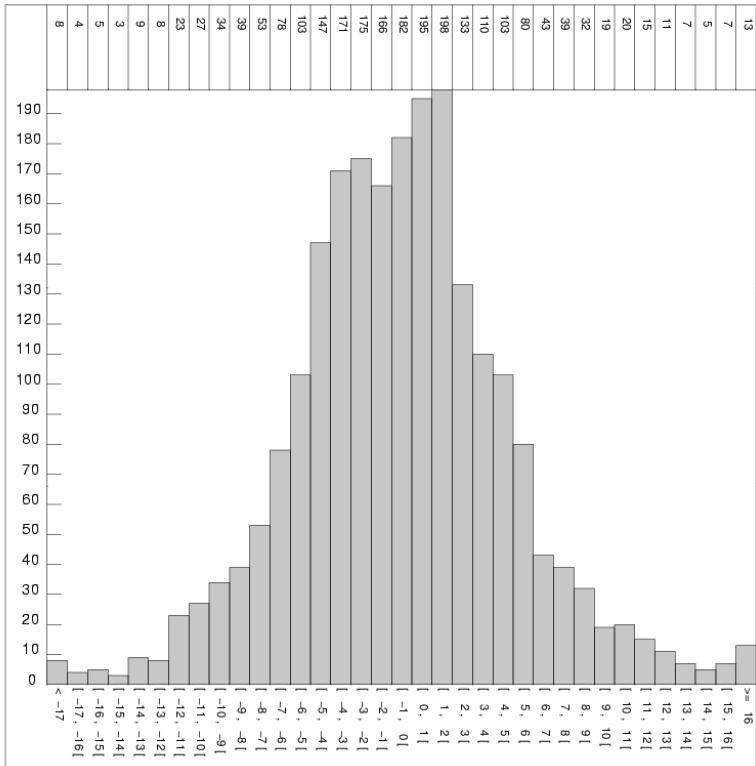
**RAPPEL DES SELECTIONS**

Type de points de croisement: T1T1  
 Zone géographique (deg): -50 / 50 , 0 / 360  
 Seuil sur les écarts d'analyse : aucun  
 Selection(s) sur les champs :  
 CL Arc 1 :=BATHY  
 CL Arc 2 :=BATHY  
 Seuil Min : aucun  
 Seuil Max : -100000.00  
 CL Arc 1 :=VAR\_OCE  
 CL Arc 2 :=VAR\_OCE  
 Seuil Min : aucun  
 Seuil Max : 20.000000  
 [...]
   
 Selection(s) sur les écarts :  
 Aucune

**RESULTATS STATISTIQUES**

Valeur minimale : -38.0000  
 Valeur maximale : 30.8800  
 Différence Max – Min: 68.8800  
 Nombre de points lus: 2465  
 Nombre de points sélectionnés: 2265  
 Moyenne : -0.543651  
 Écart-type : 5.52341  
 Moyenne Quadratique : 5.55010

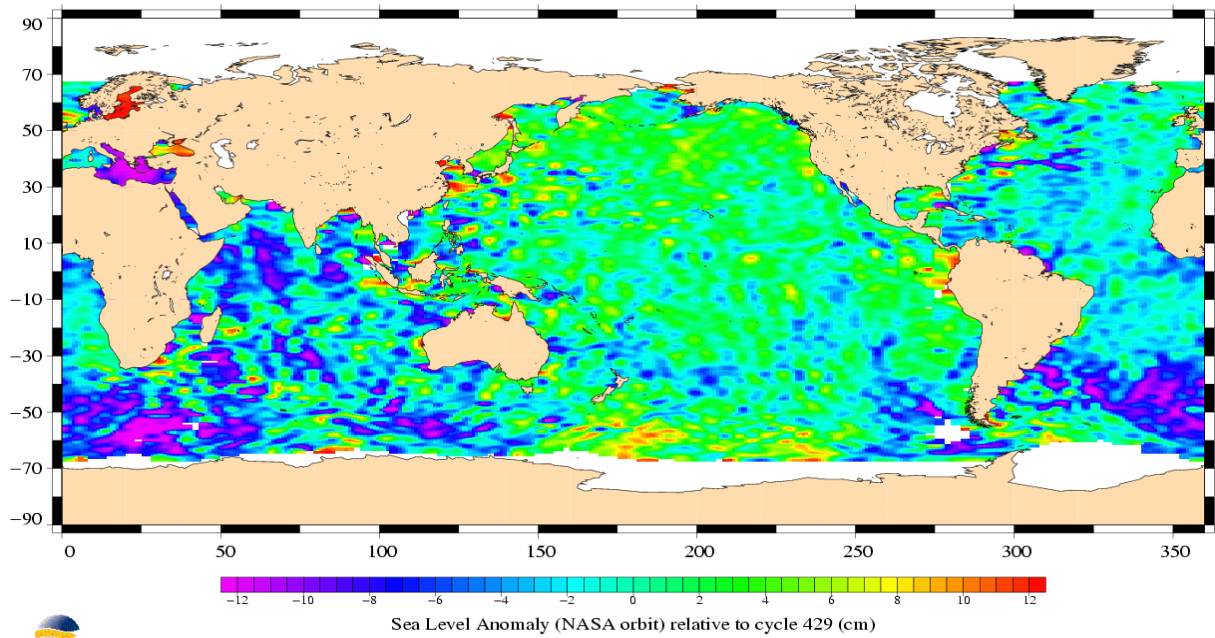
*CLS Space Oceanography Division*



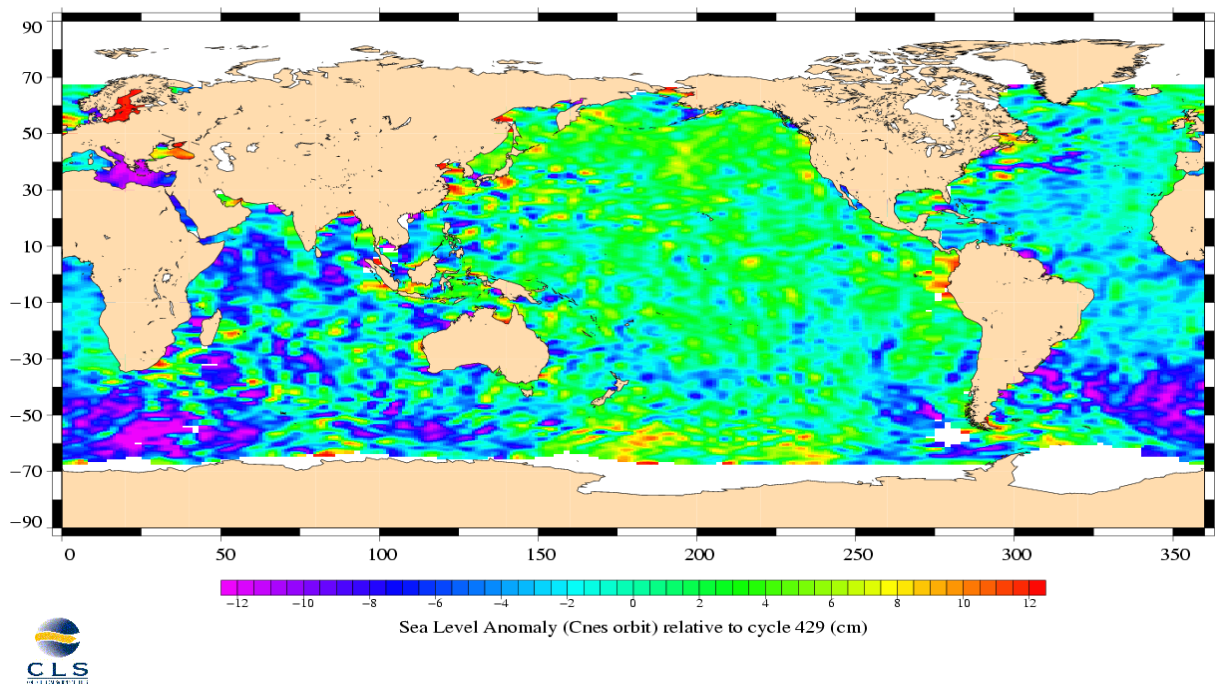
### 3.8 SSH variability

#### 3.8.1 Sea Level Anomaly

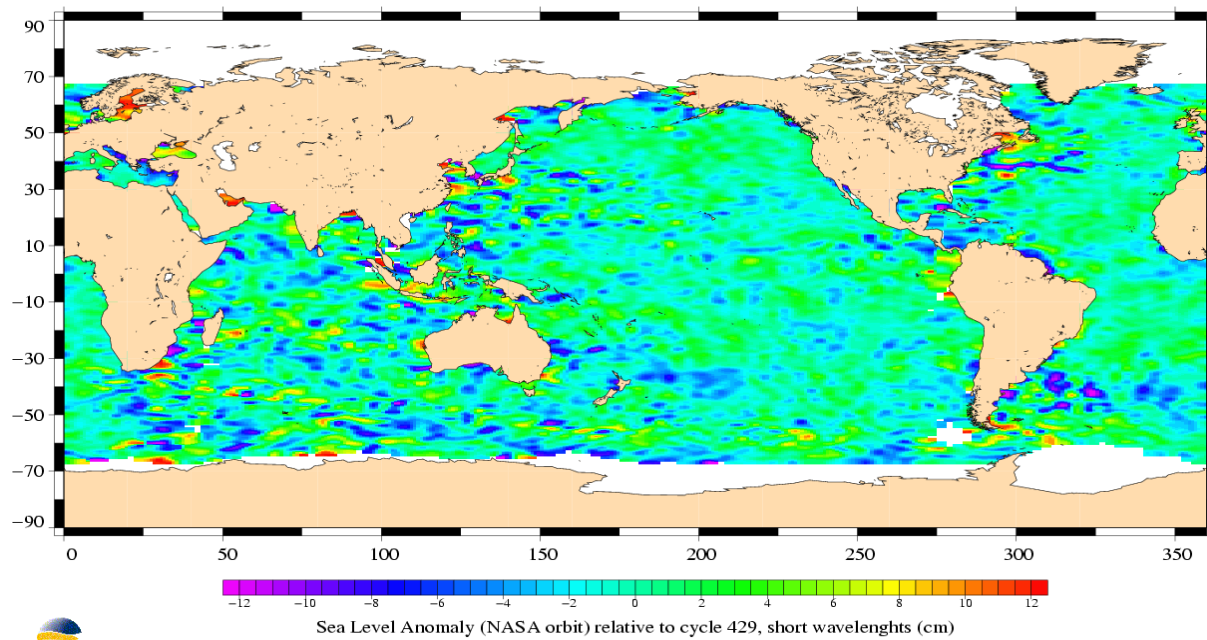
TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004



TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004



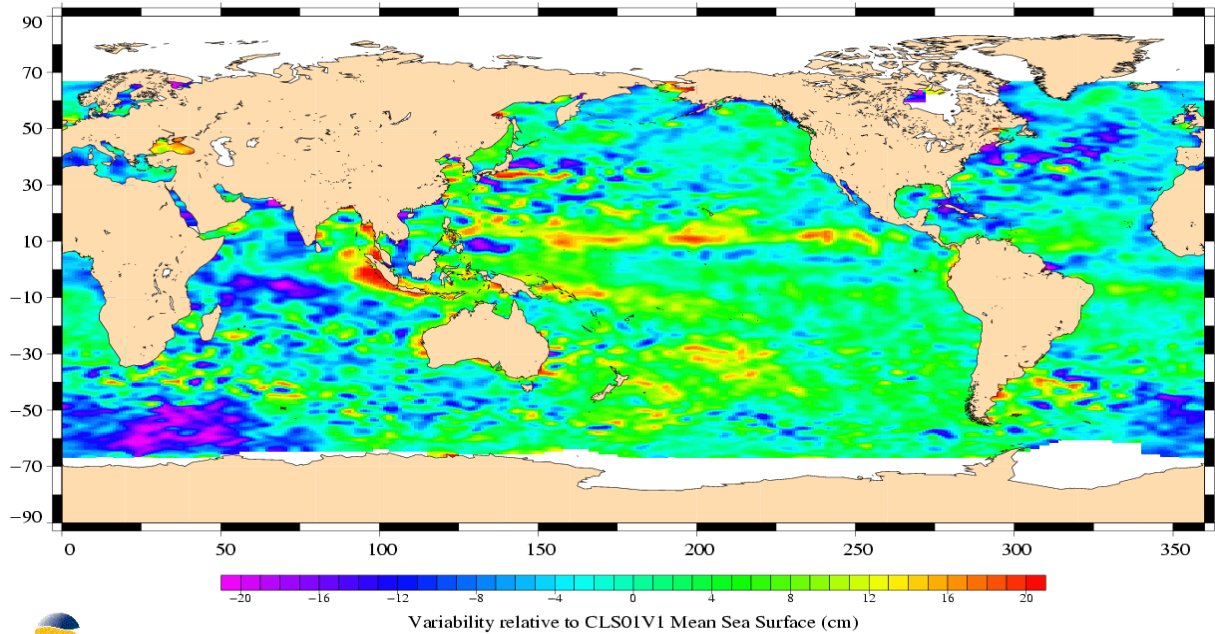
TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004



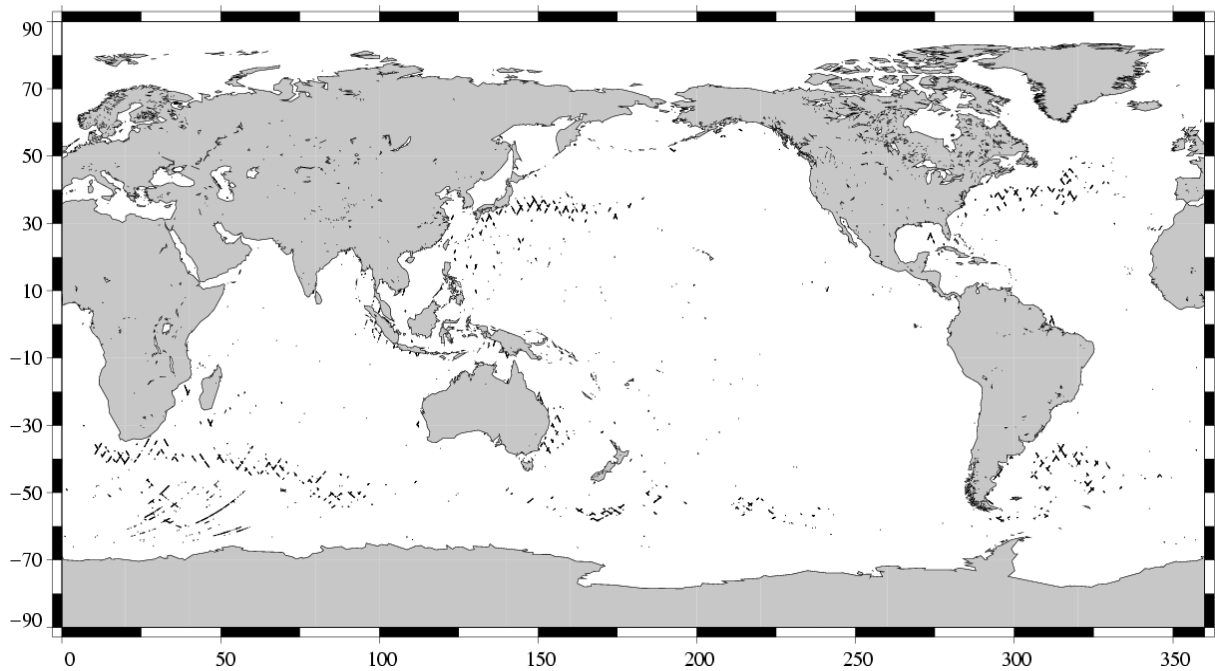
### 3.8.2 Comparison to a precise Mean Sea Surface

The CLS (2001) MSS model is used as a reference to compute SLA. The two following maps respectively show the map of Topex SLA relative to the MSS and differences higher than a 30 cm threshold (after centering the data). The latter figure shows that higher differences are located in high ocean variability areas, as expected.

TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004

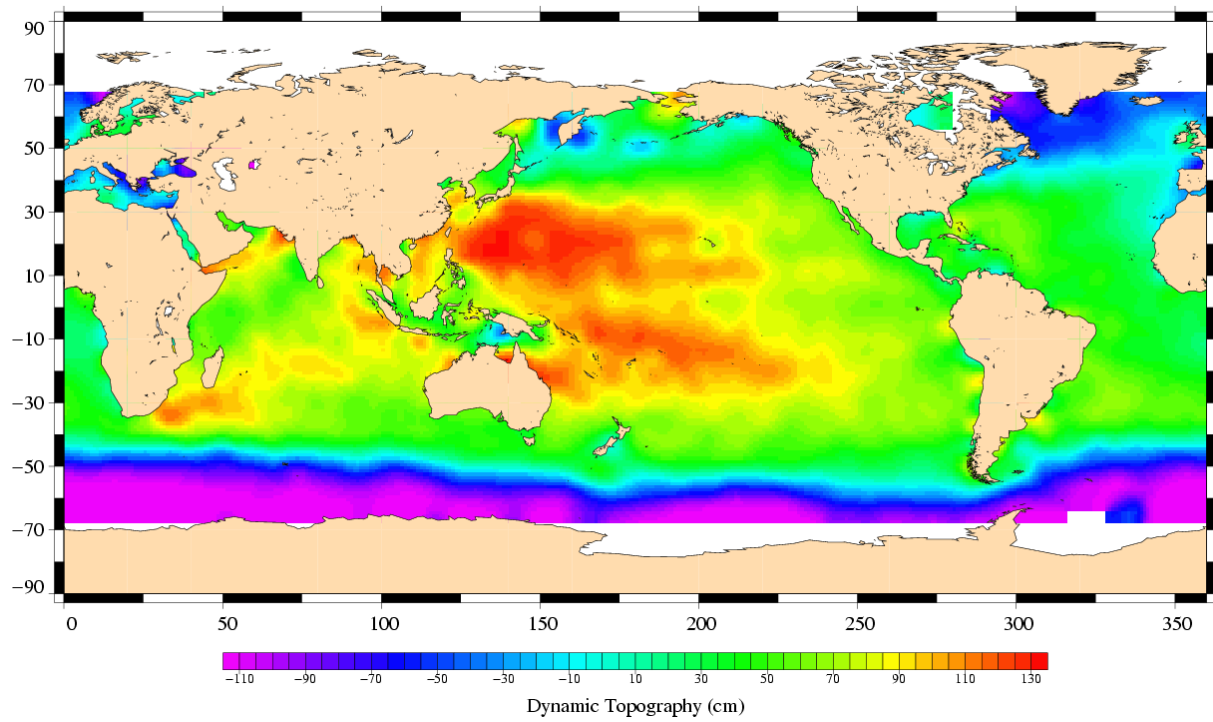


(SSH - MSS) differences greater than 0.3 m  
TOPEX/Poseidon Cycle 430 (16/05/2004 / 26/05/2004)



### 3.9 Dynamic topography

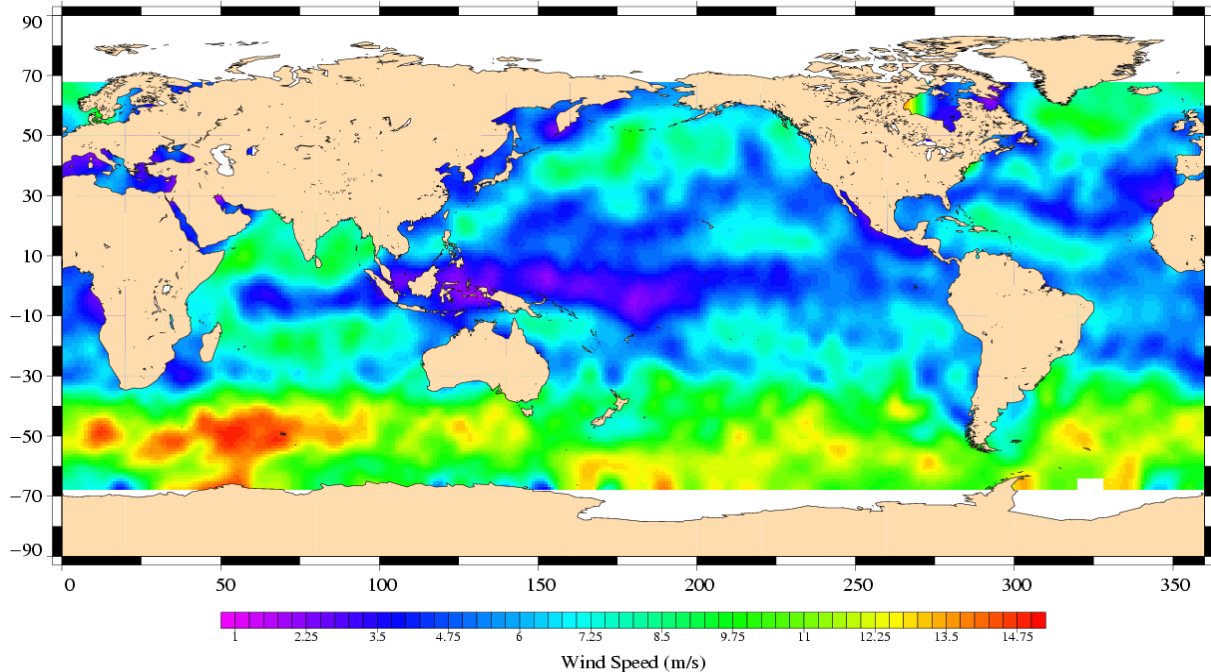
TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004



### 3.10 Wind and wave maps

These two figures show wind and wave estimations derived from 10 days of altimeter measurements.

TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004



TOPEX/Poseidon, cycle 430  
Period : 16/05/2004 – 26/05/2004

