



# TOPEX/Poseidon MGRD Quality Assessment Report

**Cycle 435**

**05-07-2004 13-07-2004**

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**SALP-RP-P2-EX-21120-CLS435**

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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 6.51 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.30 cm.

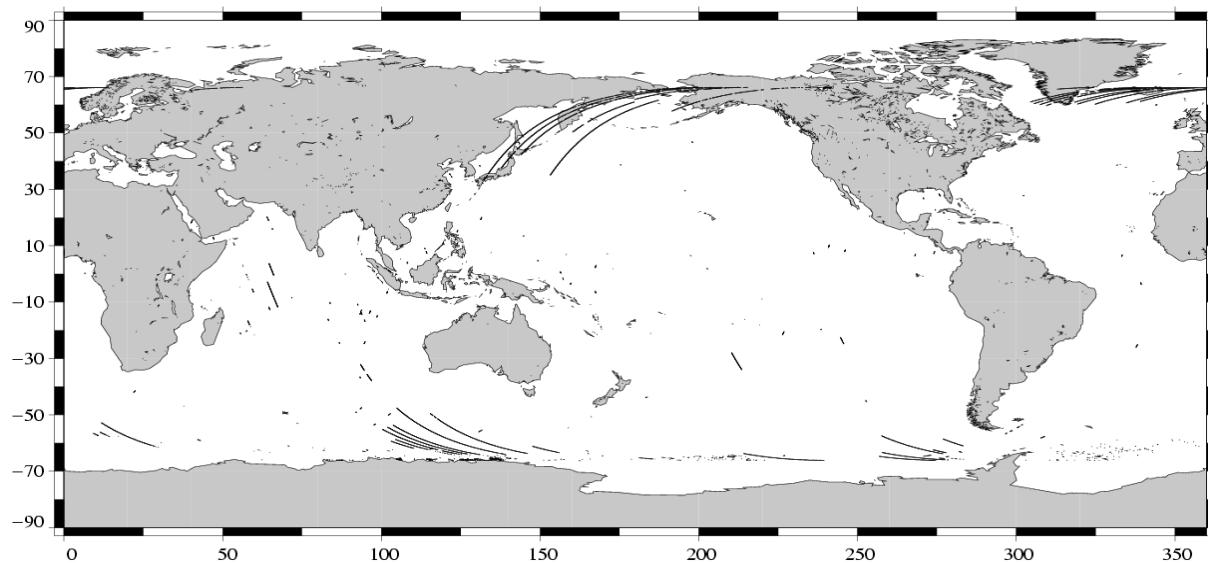
### 2.2 Warnings and recommendations

- 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 217 to 254 are missing due to interpolation errors.
- Doris ionospheric correction
  - The DORIS instrument experienced an incident on 09, July 2004, therefore there is no DORIS data available from 2004/07/09 (pass 90) to the end of the cycle. Only bent ionospheric correction is available during this period.
- Measurements edited on waveform attitude parameter :
  - 16.79% of the measurements are removed by the waveform attitude parameter. This is due to the pitch wheel event linked to the T/P safhold mode from cycle 430 to 432 (see electronic communication : T/P Daily Status (26/07/2004)).
- 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 :

  - 2.62% 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 435 (05/07/2004 / 13/07/2004)



### 3 CALVAL main results

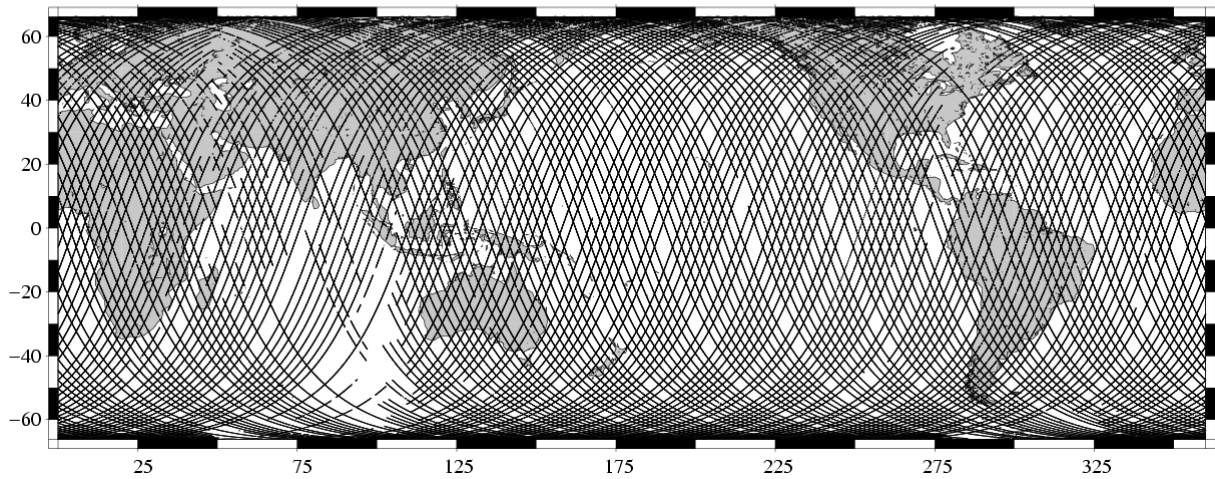
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

#### 3.1 Missing measurements

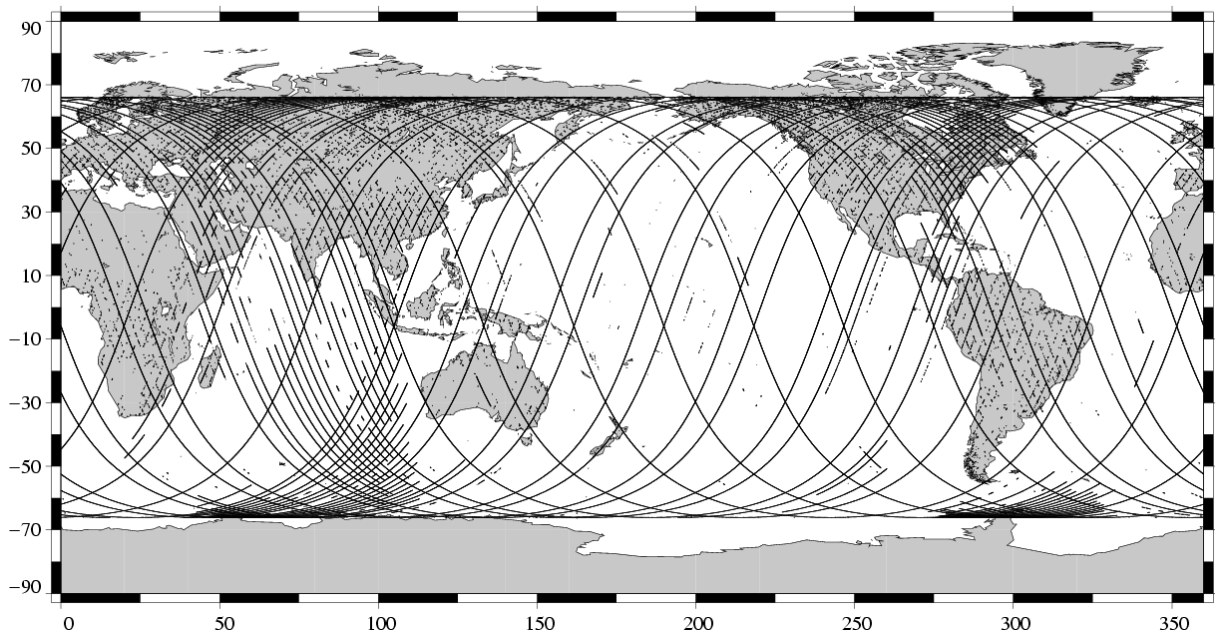
578397 altimeter measurements are present, and 216210 are missing.

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 435 (05/07/2004 / 13/07/2004)



Missing measurements  
TOPEX/Poseidon Cycle 435 (05/07/2004 / 13/07/2004)



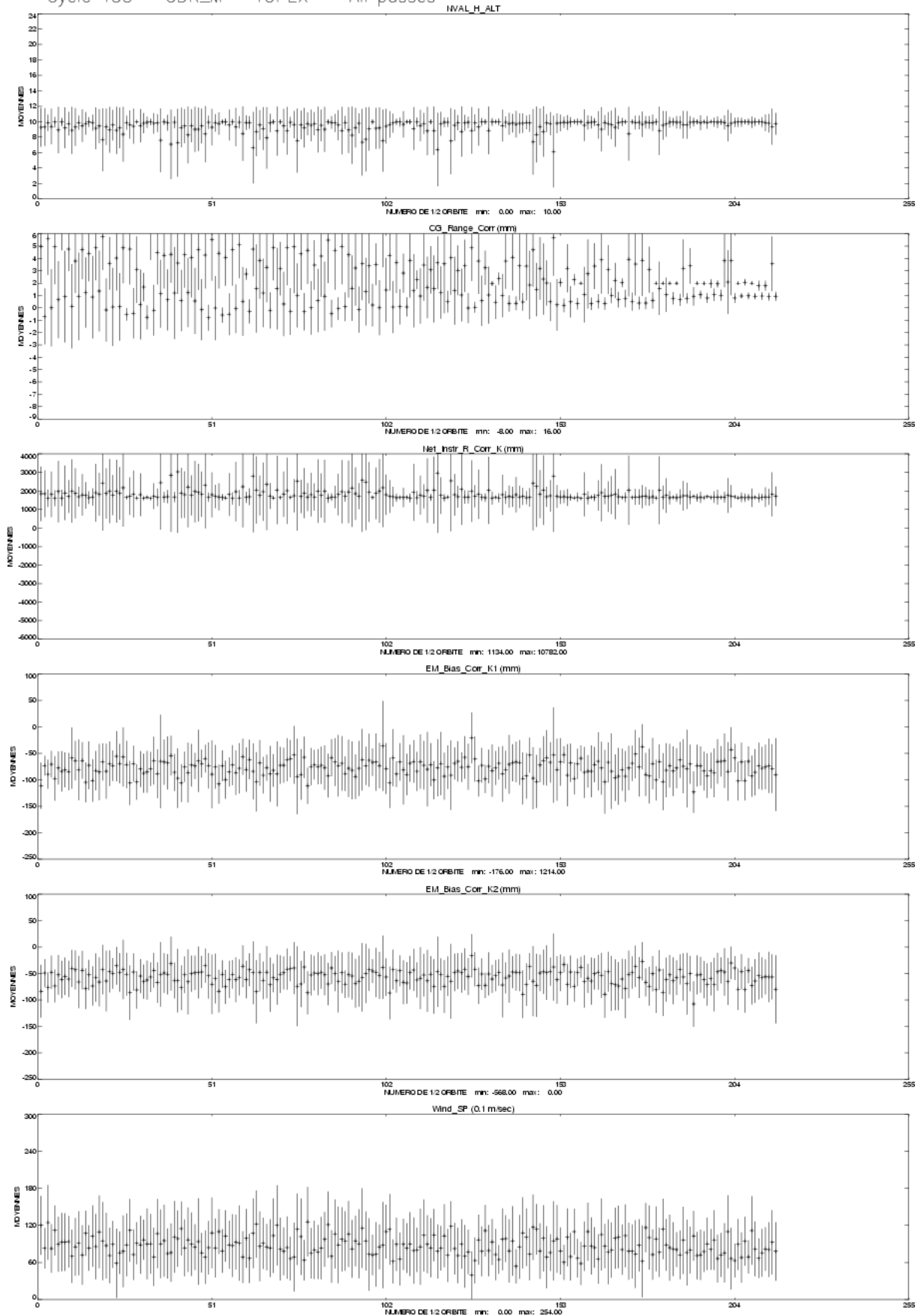
### 3.2 M-GDR quality flags

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

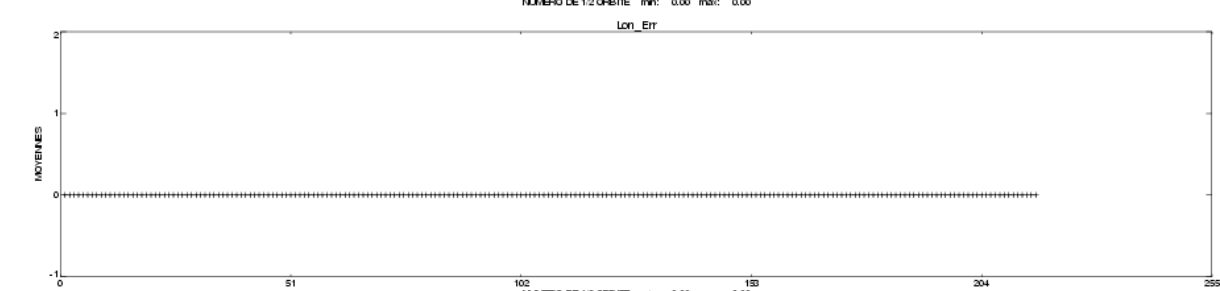
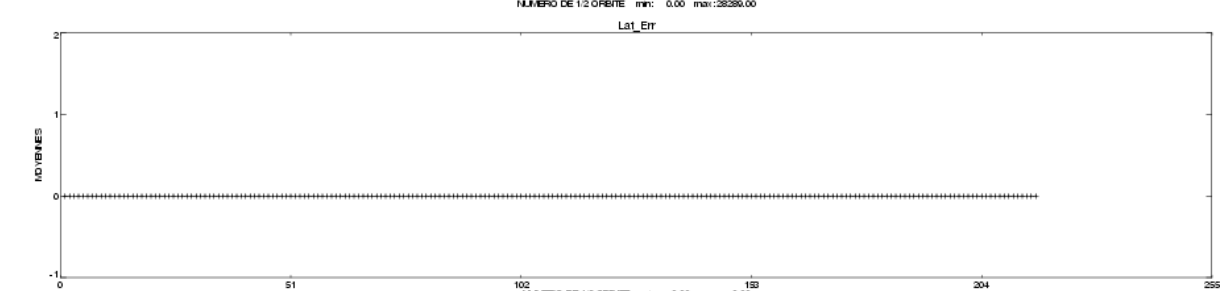
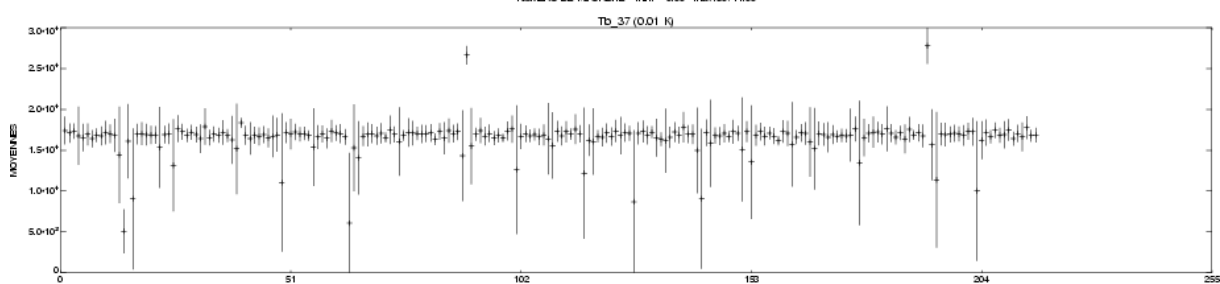
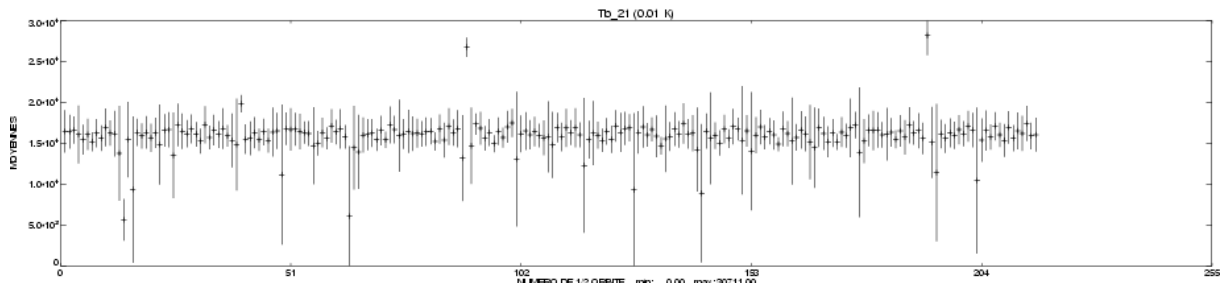
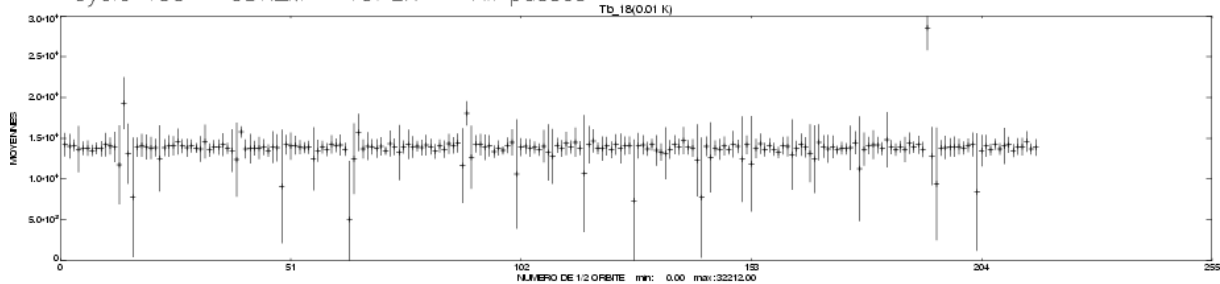
Name	Description	% bad
Geo_Bad_1	altimeter land flag	25.36
Geo_Bad_1	ice flag	7.65
Geo_Bad_1	radiometer land flag	27.74
Alt_Bad_1	conditions 1 altimeter	19.99
Alt_Bad_2	conditions 2 altimeter	15.82
Geo_Bad_2	rain (liquid water in excess)	6.21
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.44
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.84
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	5.83
DORIS	DORIS not valid	0.00

### 3.3 M-GDR parameter plots

Cycle 435 – GDR\_M – TOPEX – All passes –

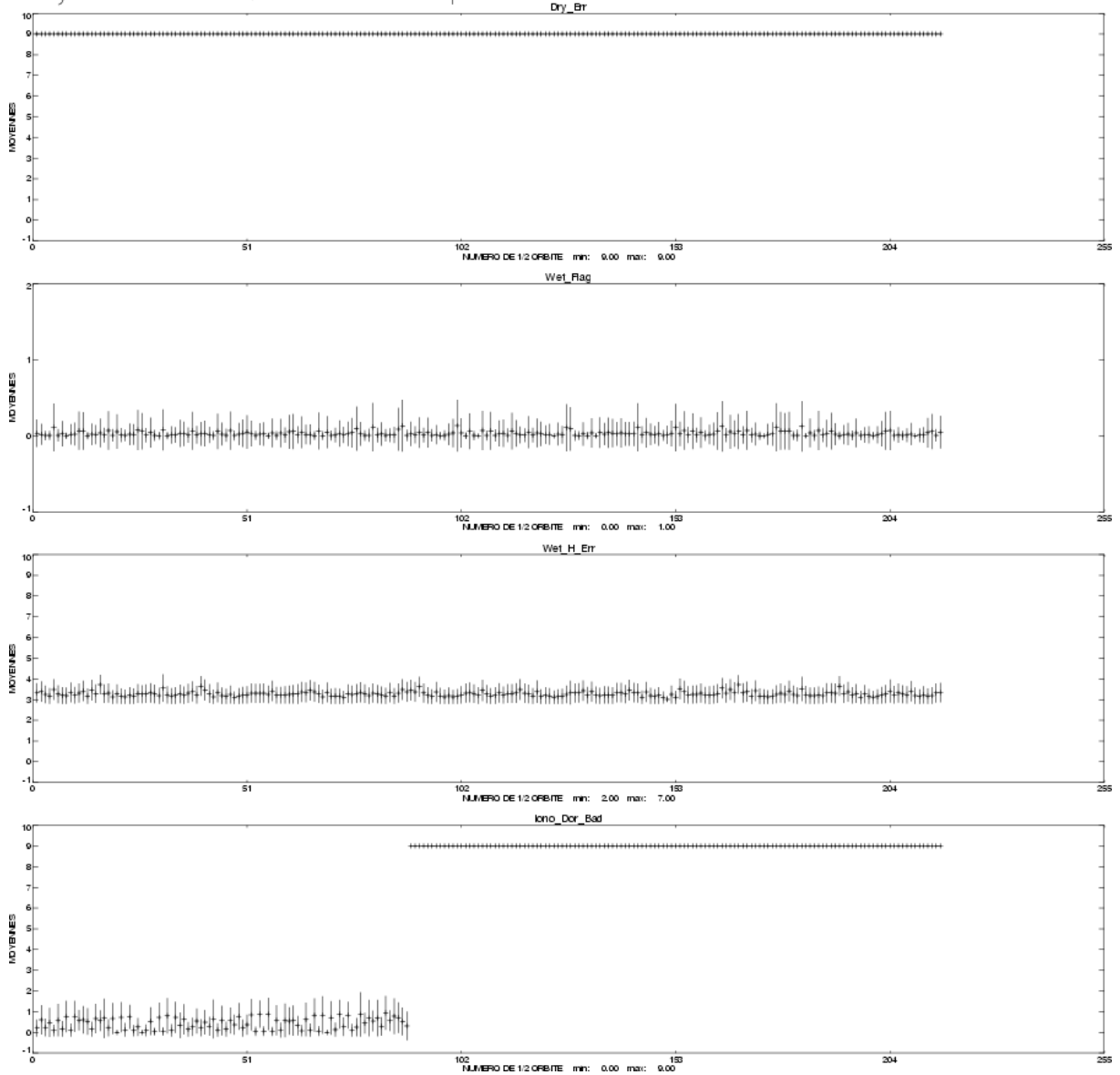


Cycle 435 - GDR\_M - TOPEX - All passes -

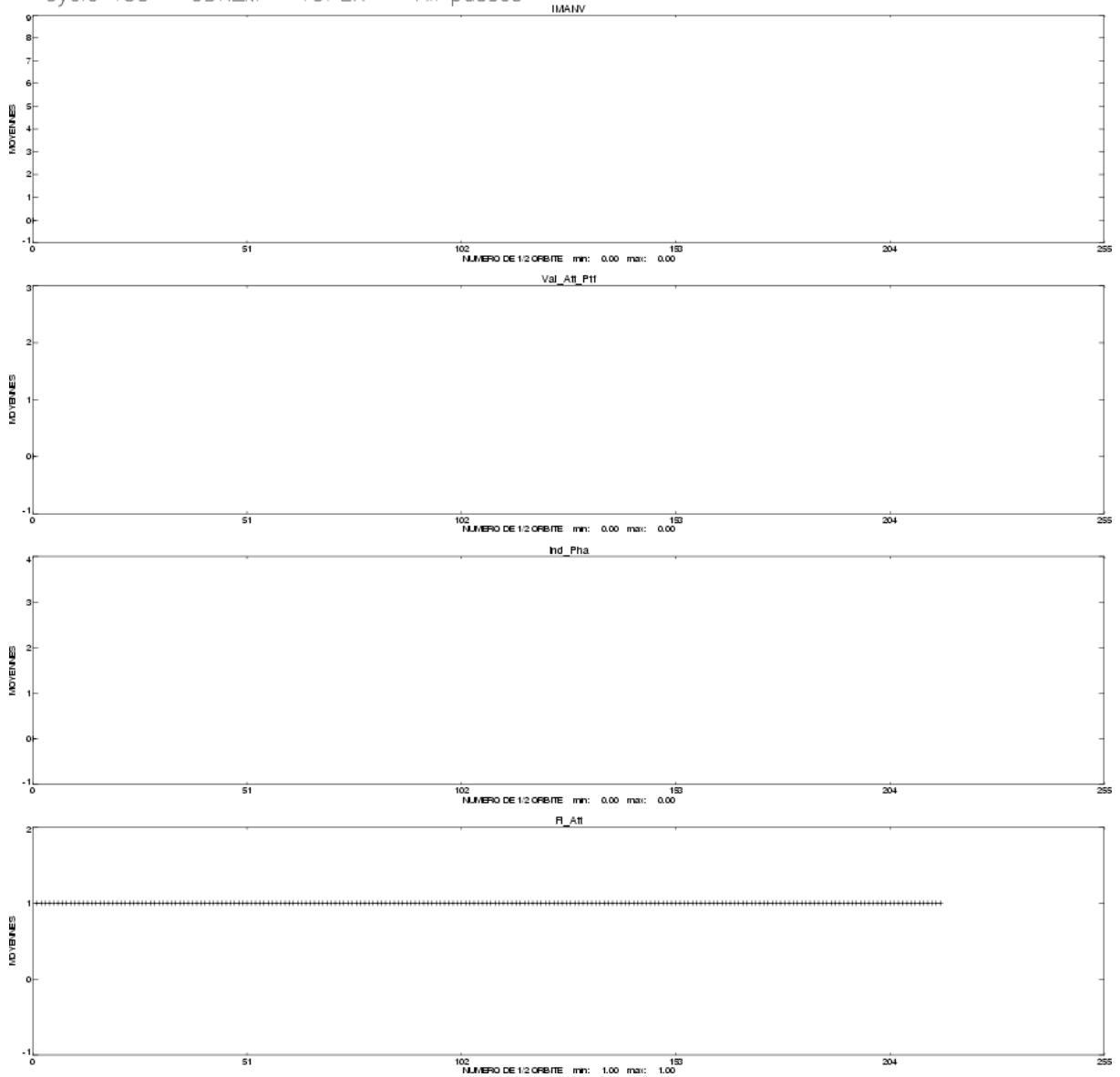


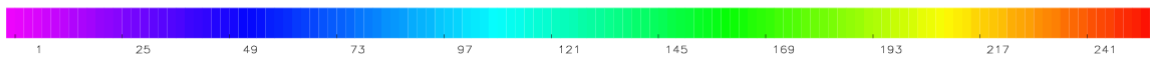
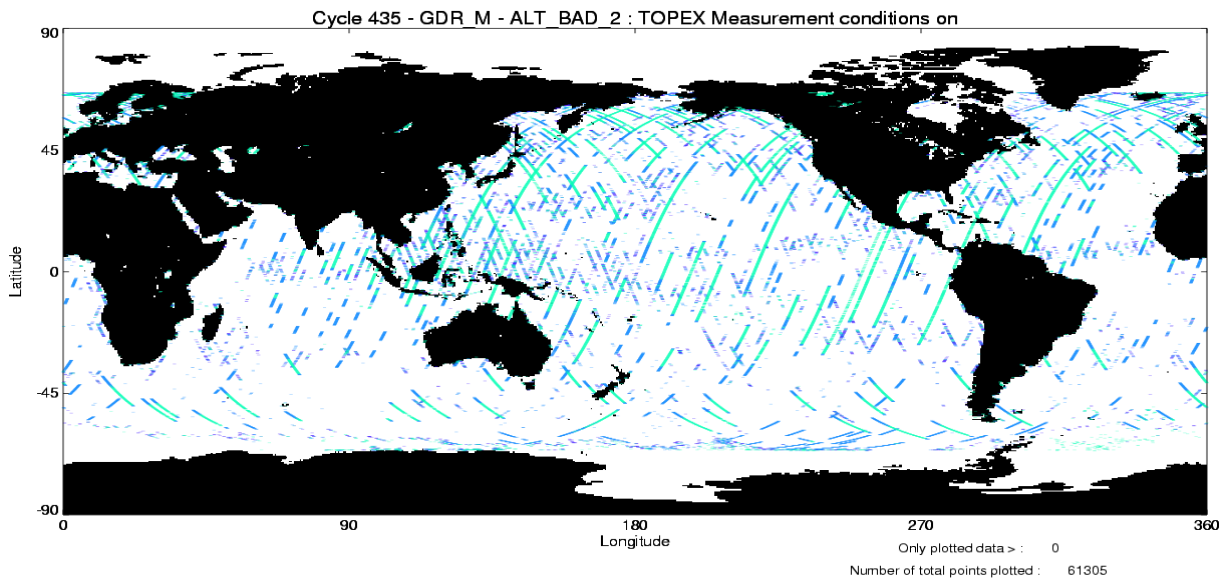
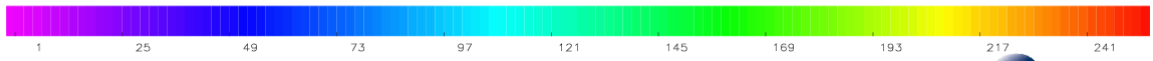
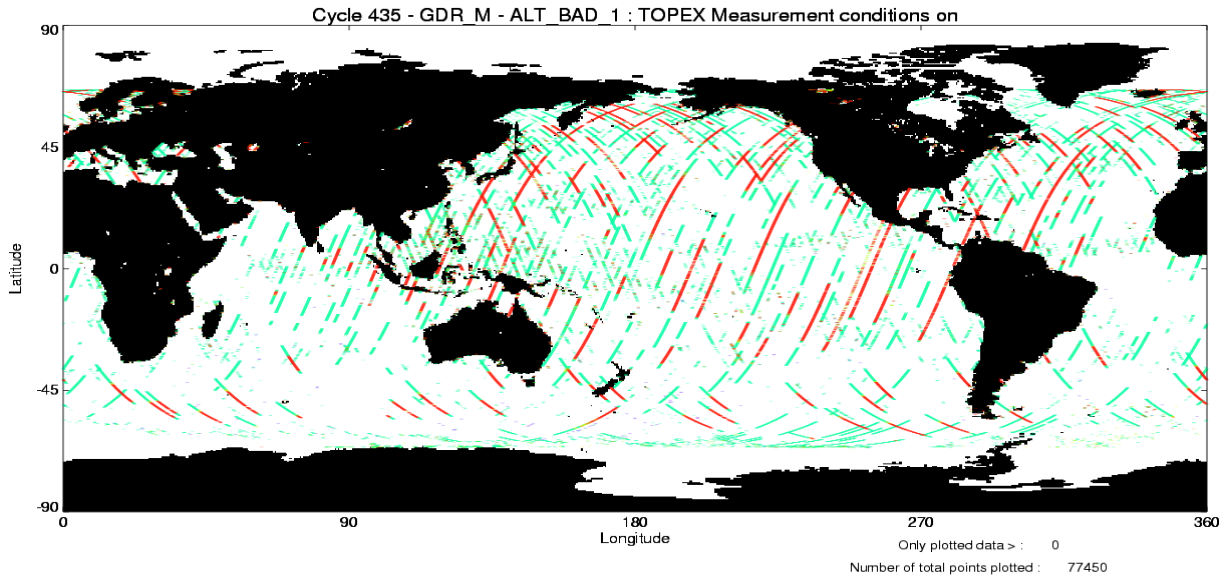


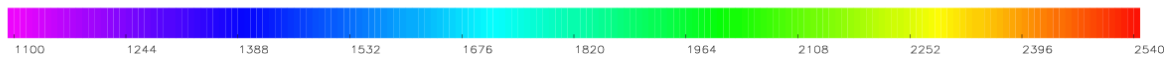
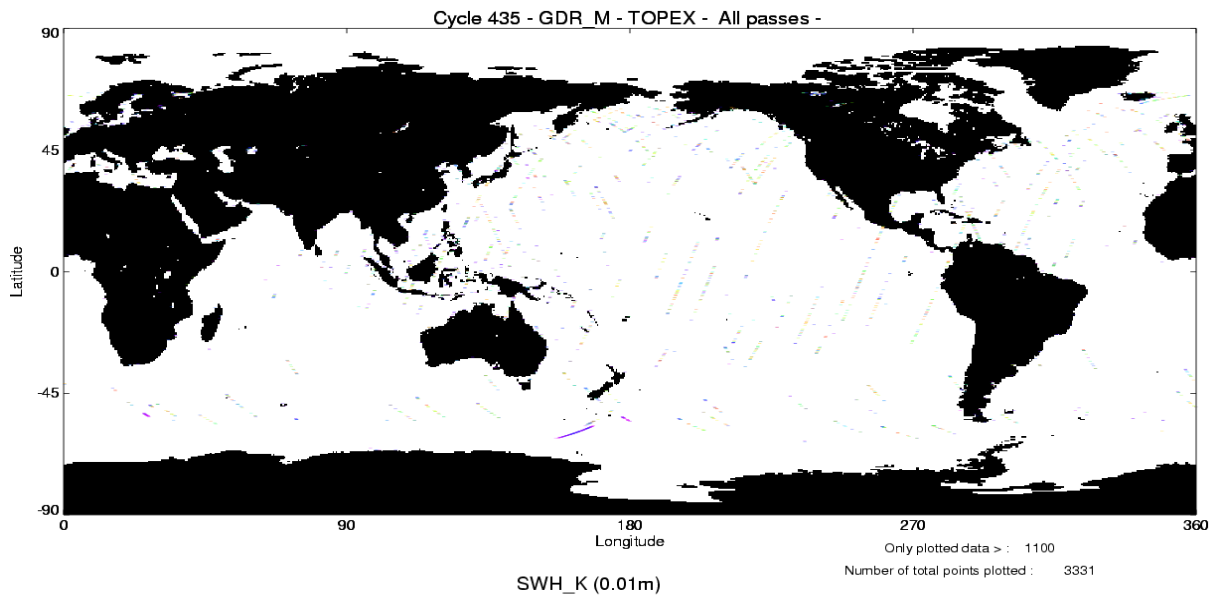
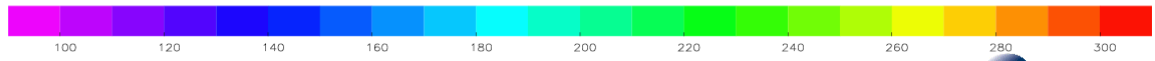
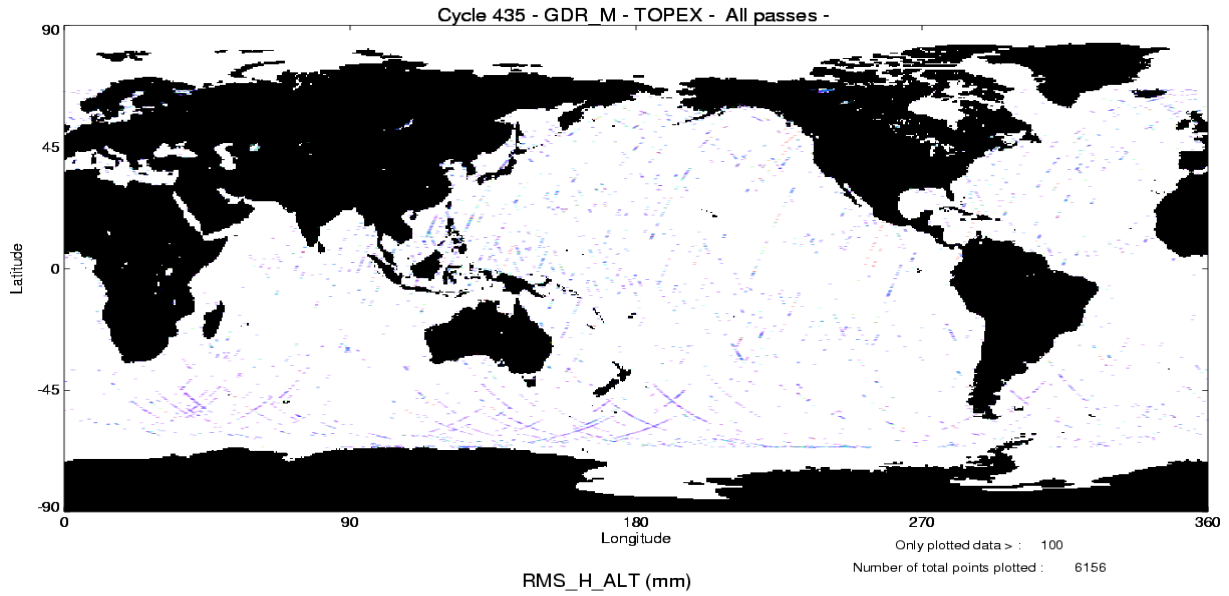
Cycle 435 – GDR\_M – TOPEX – All passes –

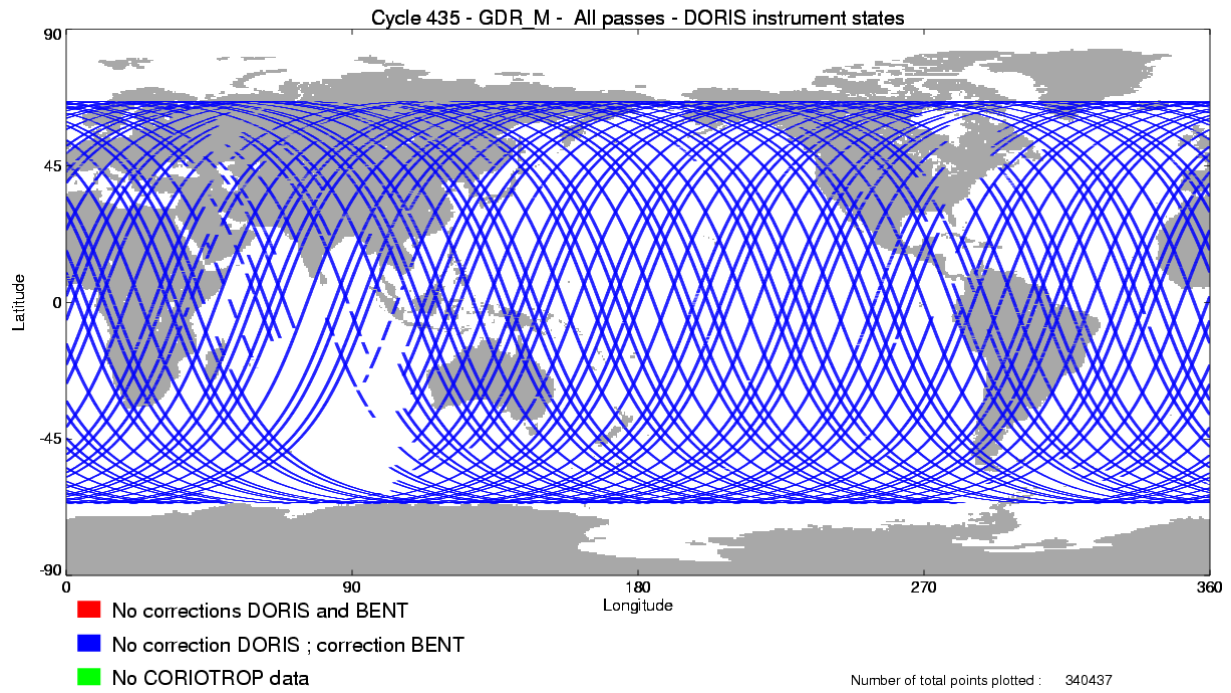


Cycle 435 – GDR\_M – TOPEX – All passes –









### 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.

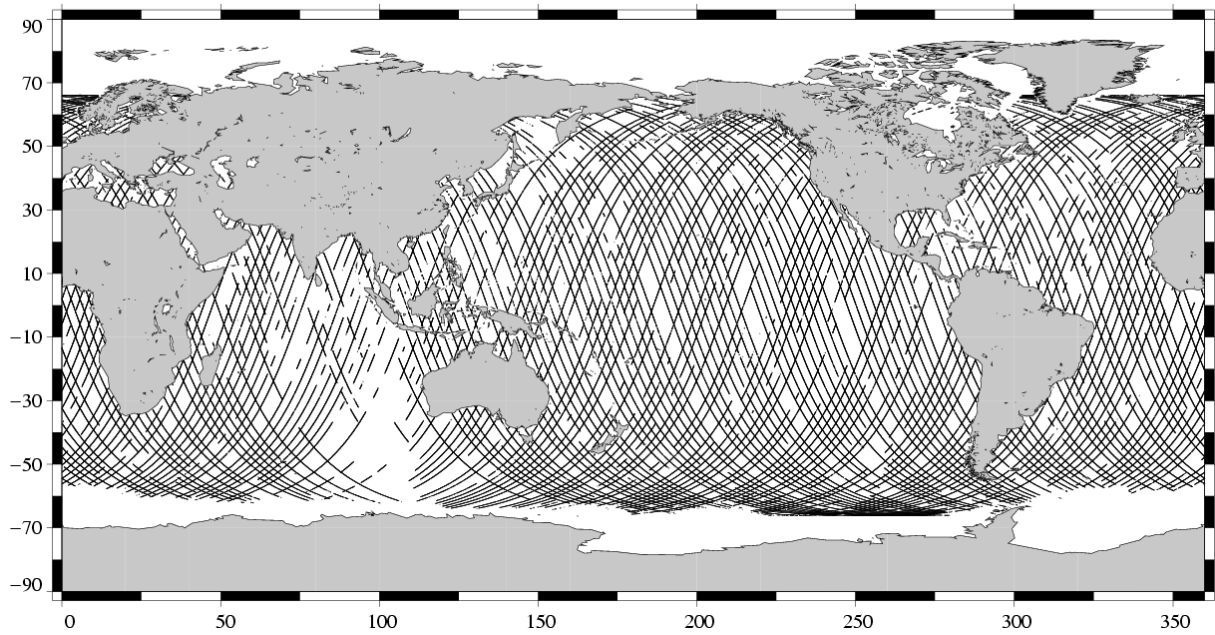
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (27.74 % of points removed) and ice flag ( 7.65 % of points removed).

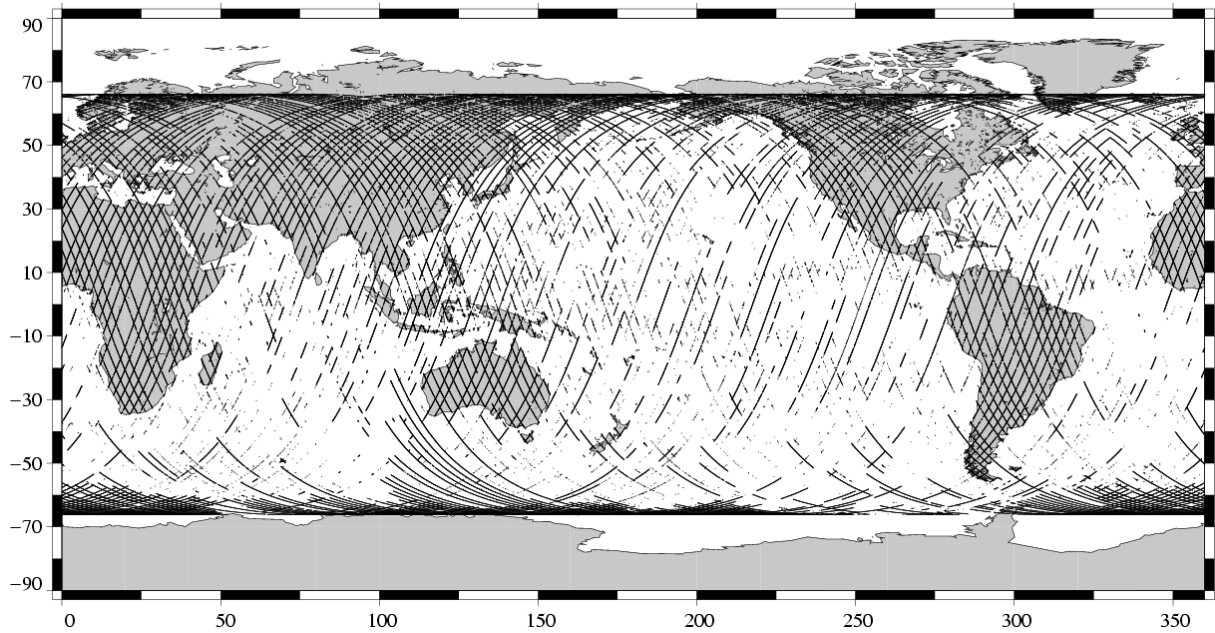
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	2.54
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	5.28
Std. deviation of range	0.000	0.100	m	1.85	6.41
Off nadir angle from waveform	0.000	0.400	deg	1.36	16.79
Dry tropospheric 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	2.62
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	5.13
Significant wave height	0.000	11.000	m	1.46	1.09
Sea state Bias	-0.500	0.000	m	1.39	8.56
Backscatter coefficient	7.000	30.000	dB	1.44	9.87
Ocean tide height	-5.000	5.000	m	0.01	0.13
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	0.53
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.

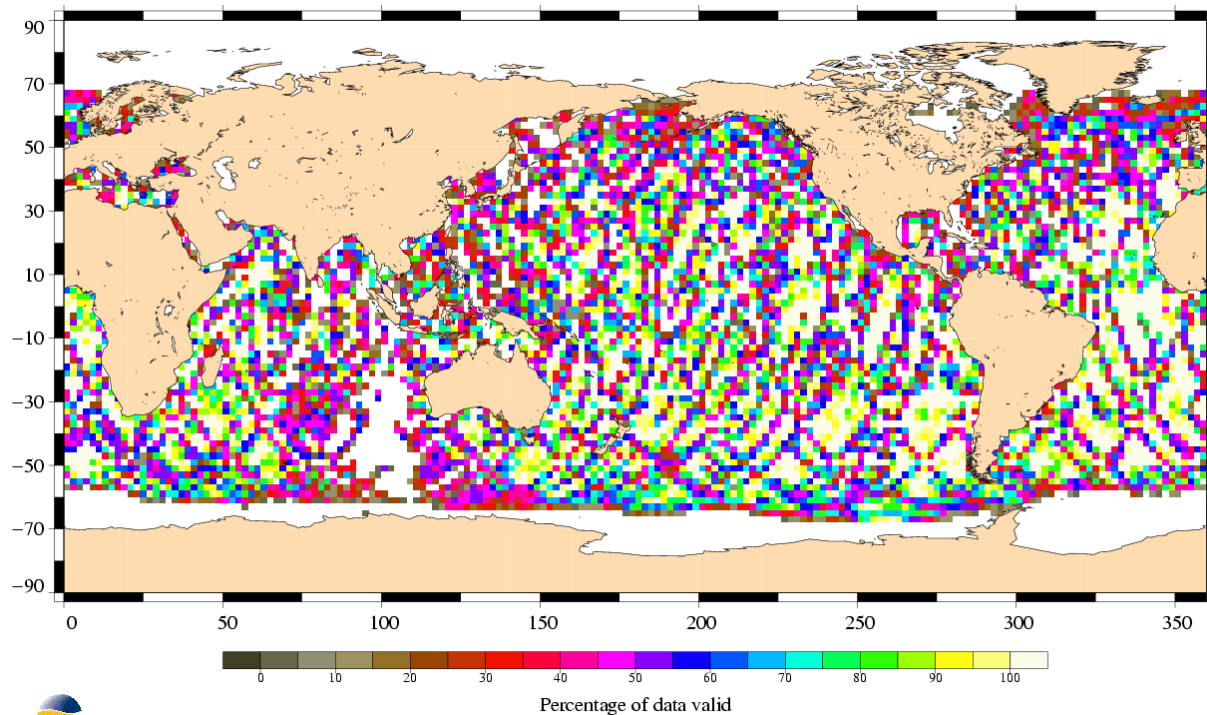
Valid data  
TOPEX/Poseidon Cycle 435 (05/07/2004 / 13/07/2004)



Edited measurements  
TOPEX Cycle 435 (05/07/2004 / 13/07/2004)



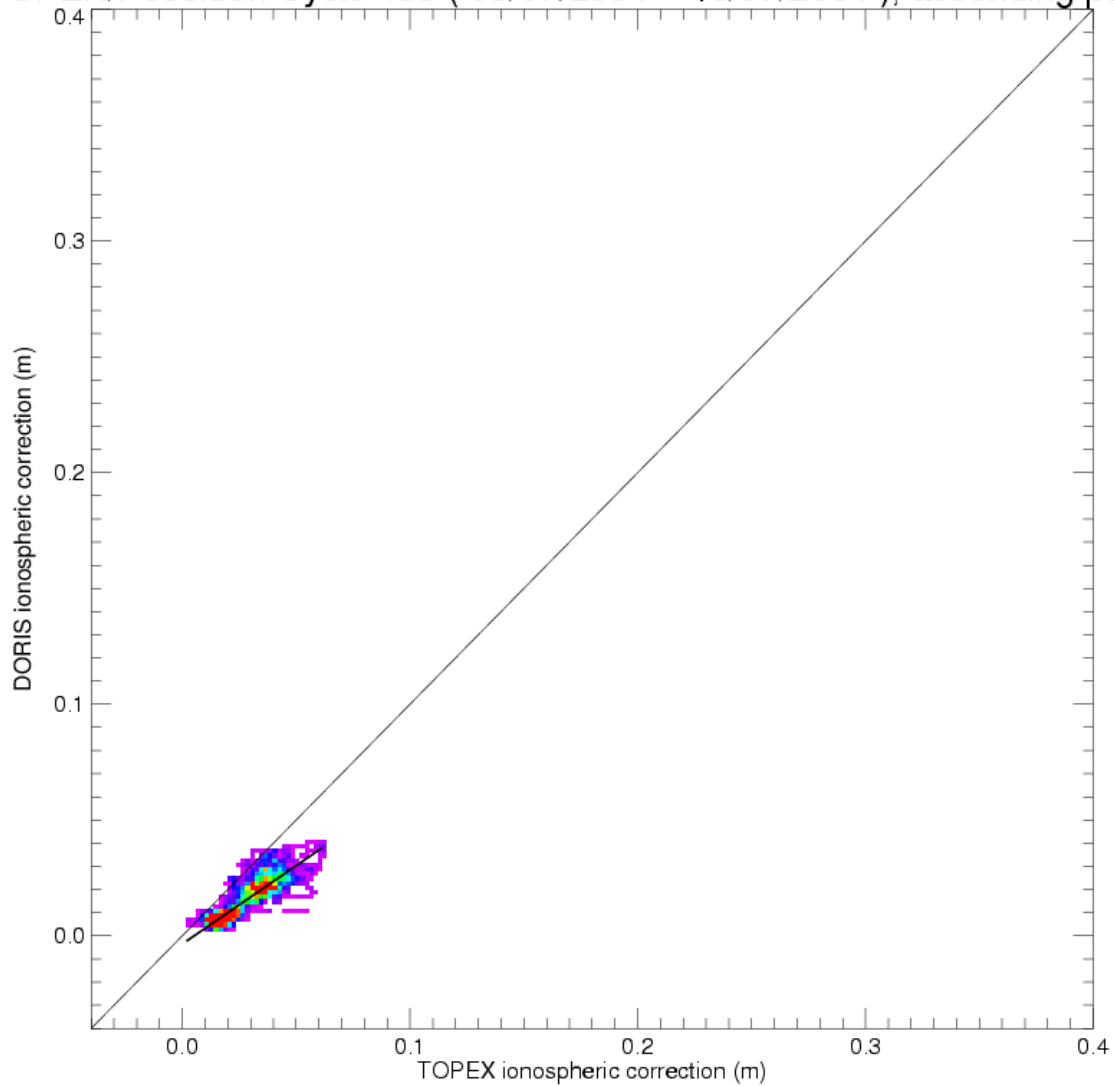
Percentage of valid data relative to the nominal pass  
TOPEX/Poseidon Cycle 435 (05/07/2004 / 13/07/2004)



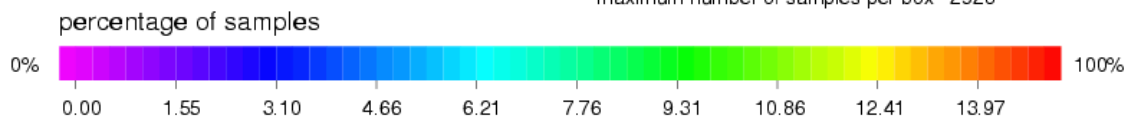


### 3.5 Ionospheric correction

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), ascending passes



minimum number of samples per box 1  
maximum number of samples per box 2928



#### Statistics Y-X

mean = -0.01160  
rms = 0.01272  
std = 0.00523

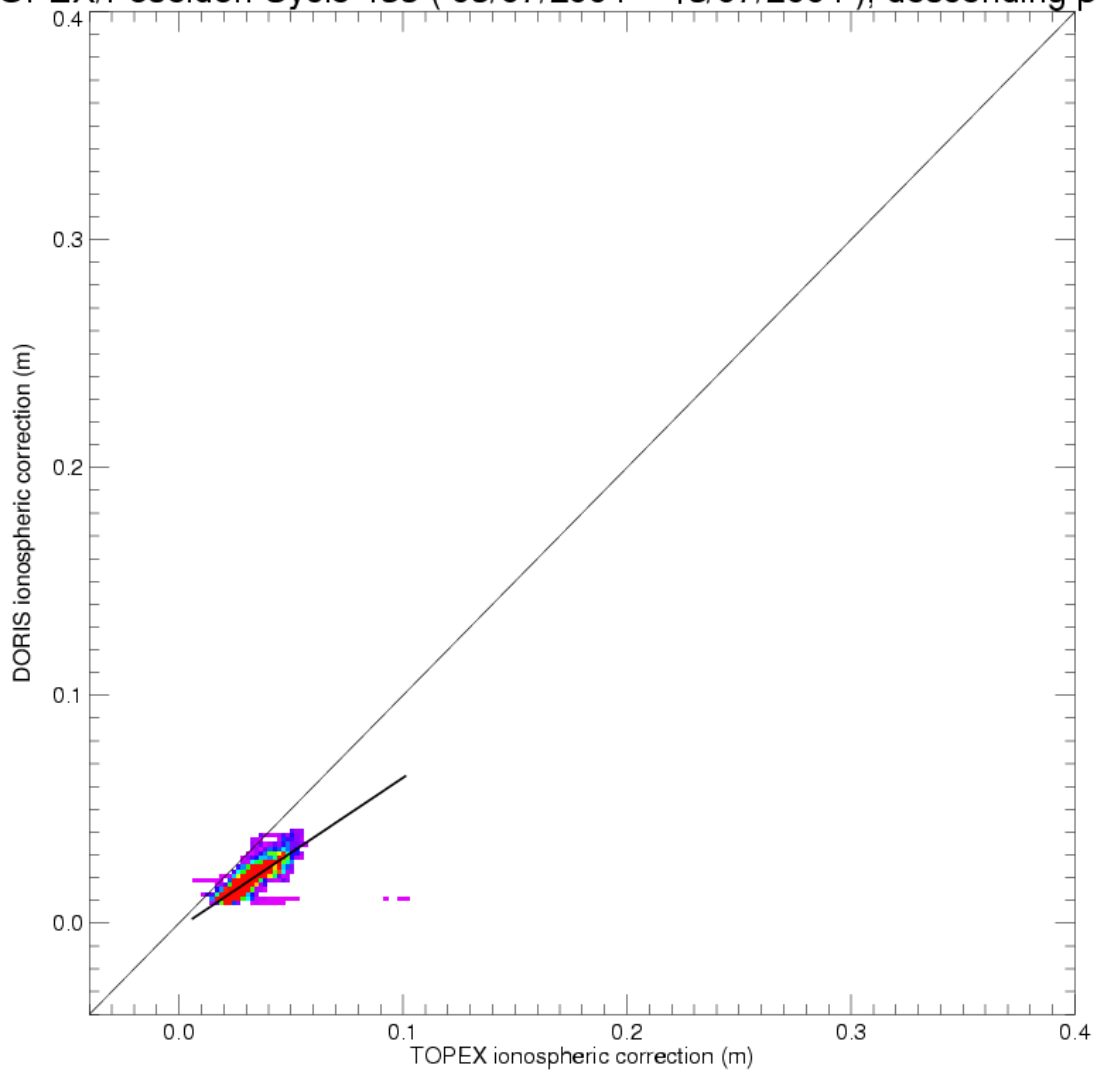
#### Order 1 fit polynomial

$y = a x + b$   
a = 0.67647296  
b = -0.00353709

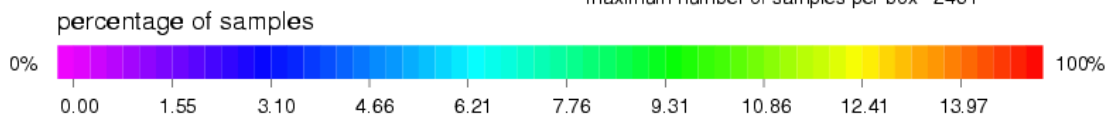
#### Legend

— Order 1 fit polynomial  
— Bisectrix

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 2461



**Statistics Y-X**

mean = -0.01225  
 rms = 0.01296  
 std = 0.00421

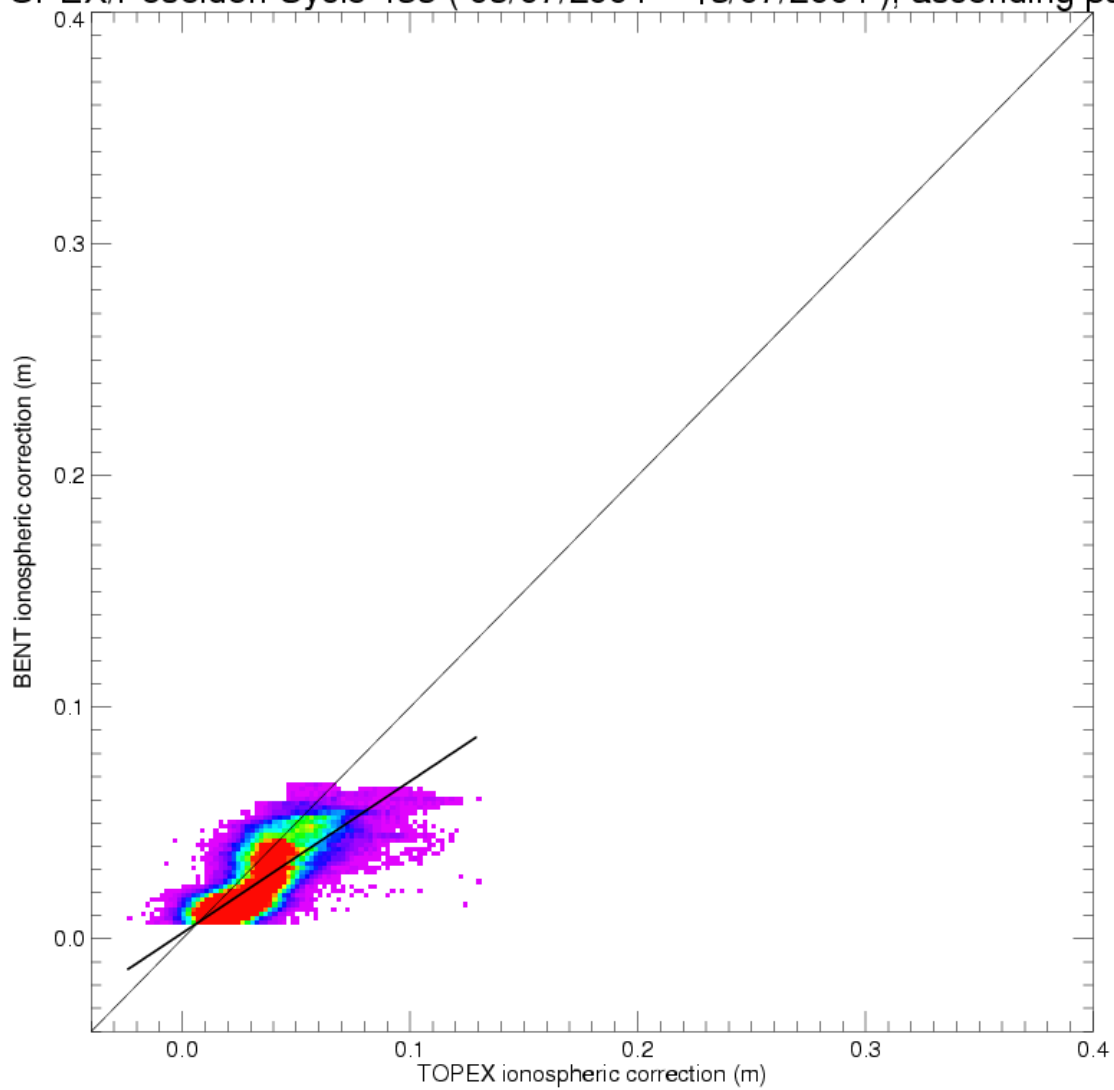
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.65843880$   
 $b = -0.00199703$

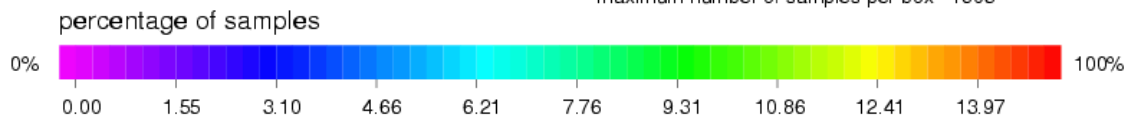
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 1603



**Statistics Y-X**

mean = -0.00796  
 rms = 0.01274  
 std = 0.00995

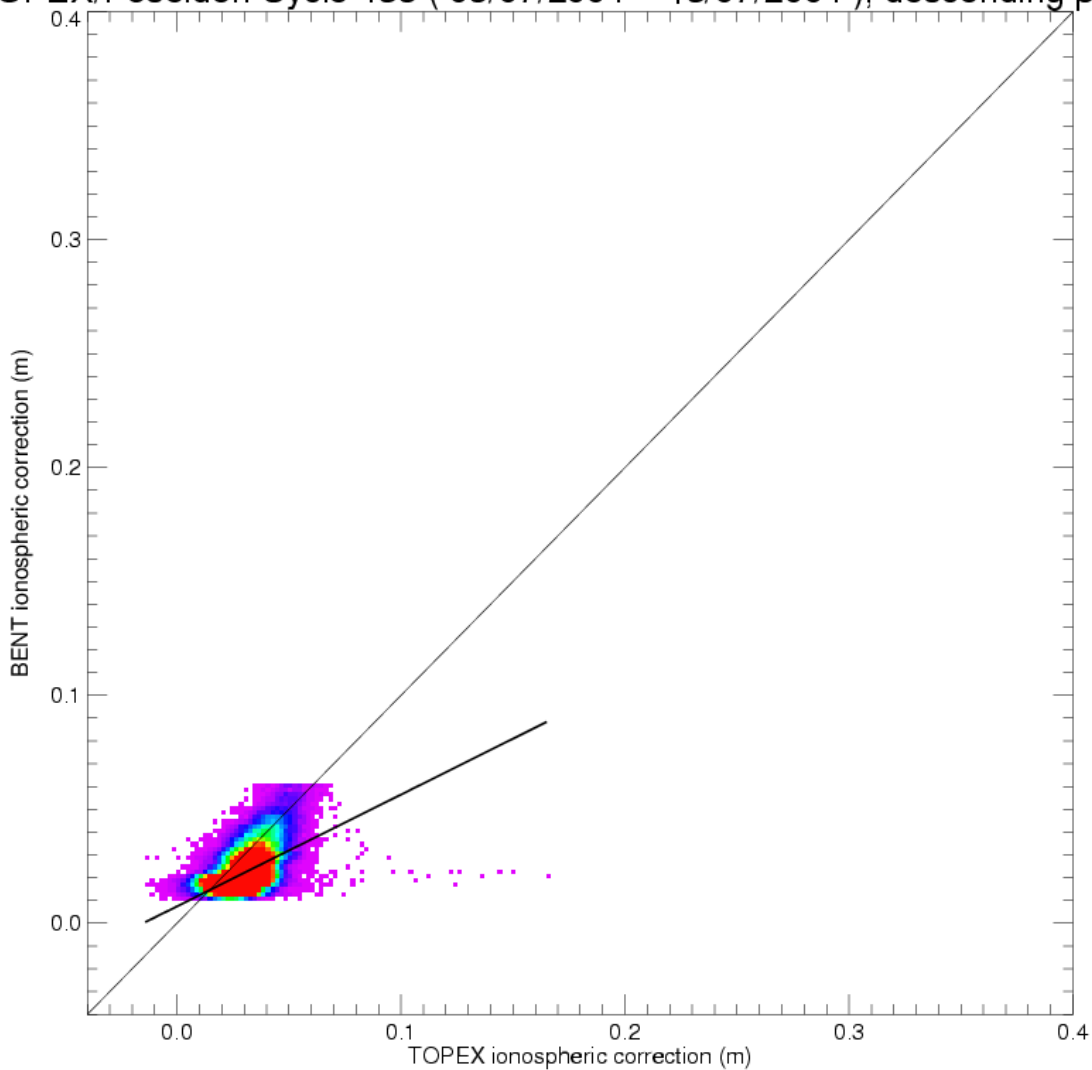
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.65525907$   
 $b = 0.00249835$

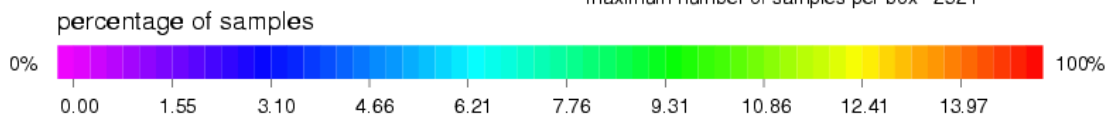
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 2521



**Statistics Y-X**

mean = -0.00740  
 rms = 0.01124  
 std = 0.00847

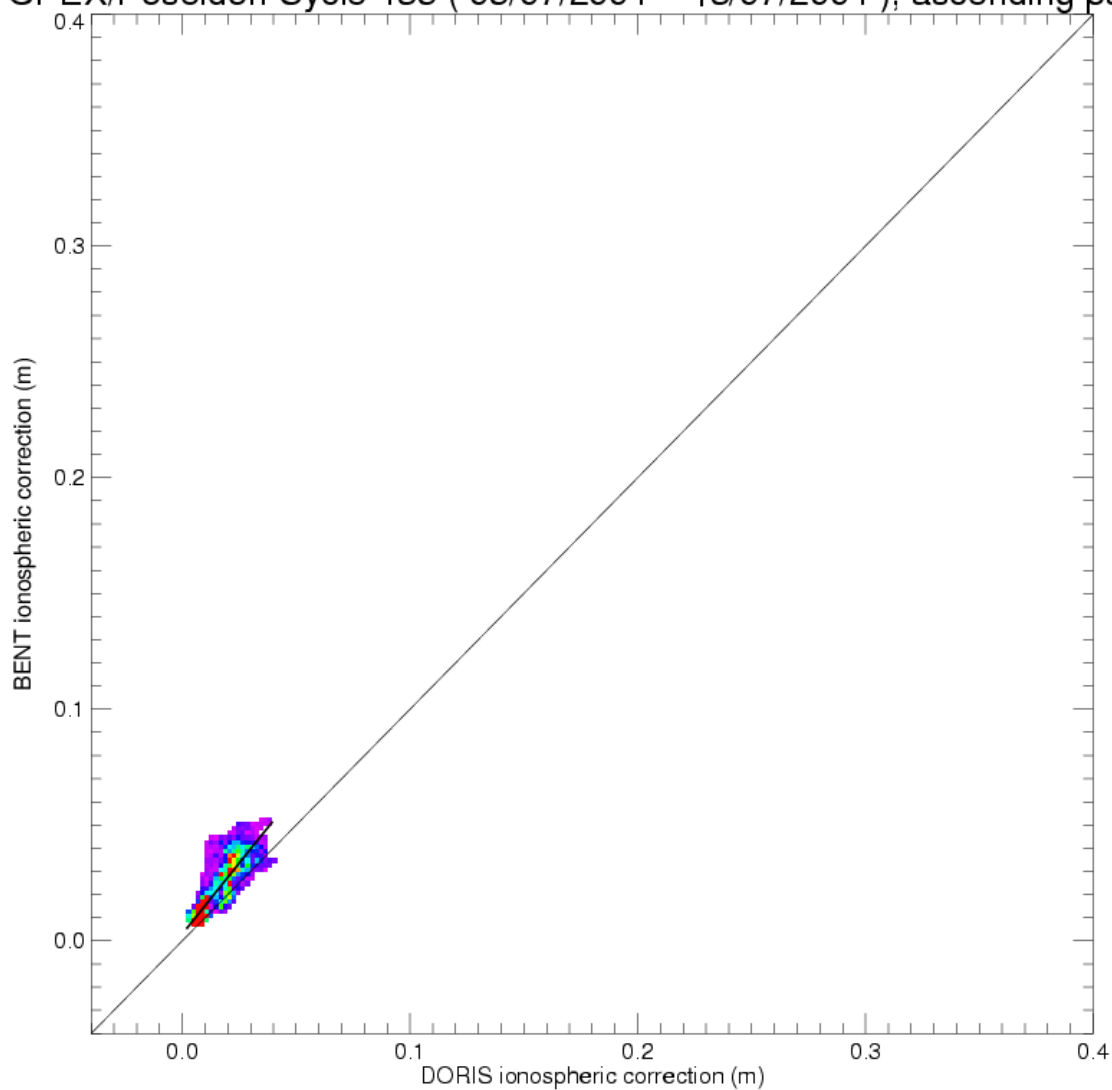
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.49061140$   
 $b = 0.00739618$

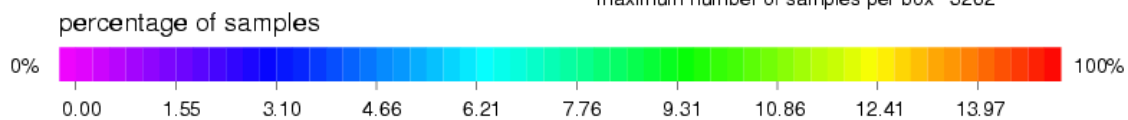
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 3262



**Statistics Y-X**

mean = 0.00594  
 rms = 0.00836  
 std = 0.00588

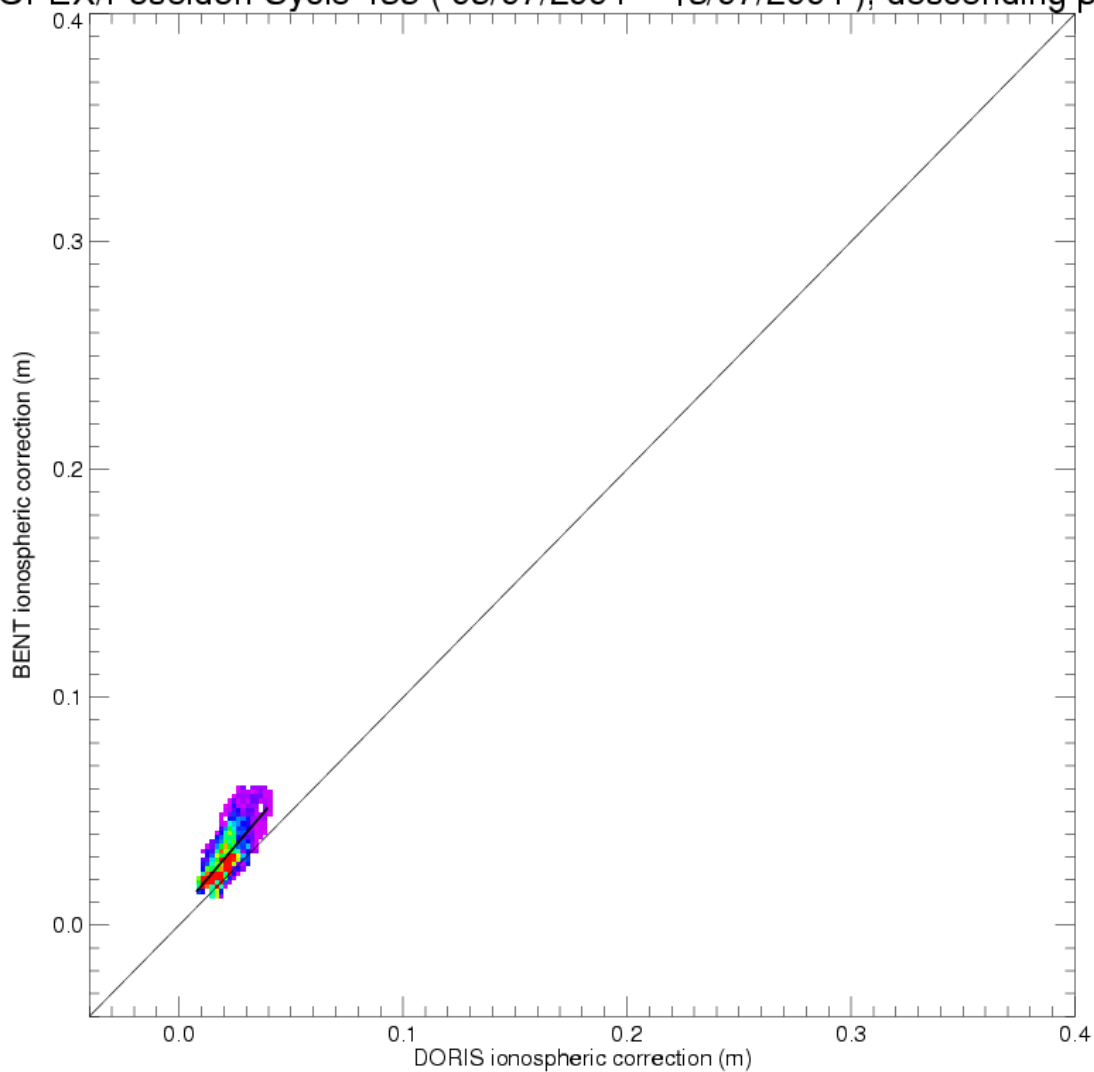
**Order 1 fit polynom**

$y = a x + b$   
 $a = 1.22338486$   
 $b = 0.00296921$

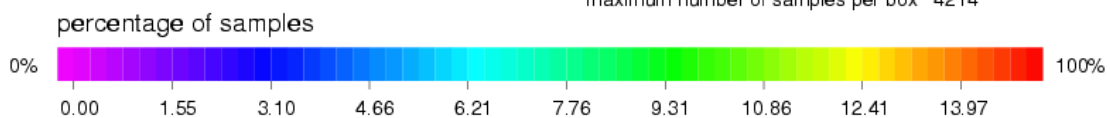
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 435 ( 05/07/2004 – 13/07/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 4214



**Statistics Y-X**

mean = 0.00850  
 rms = 0.01059  
 std = 0.00631

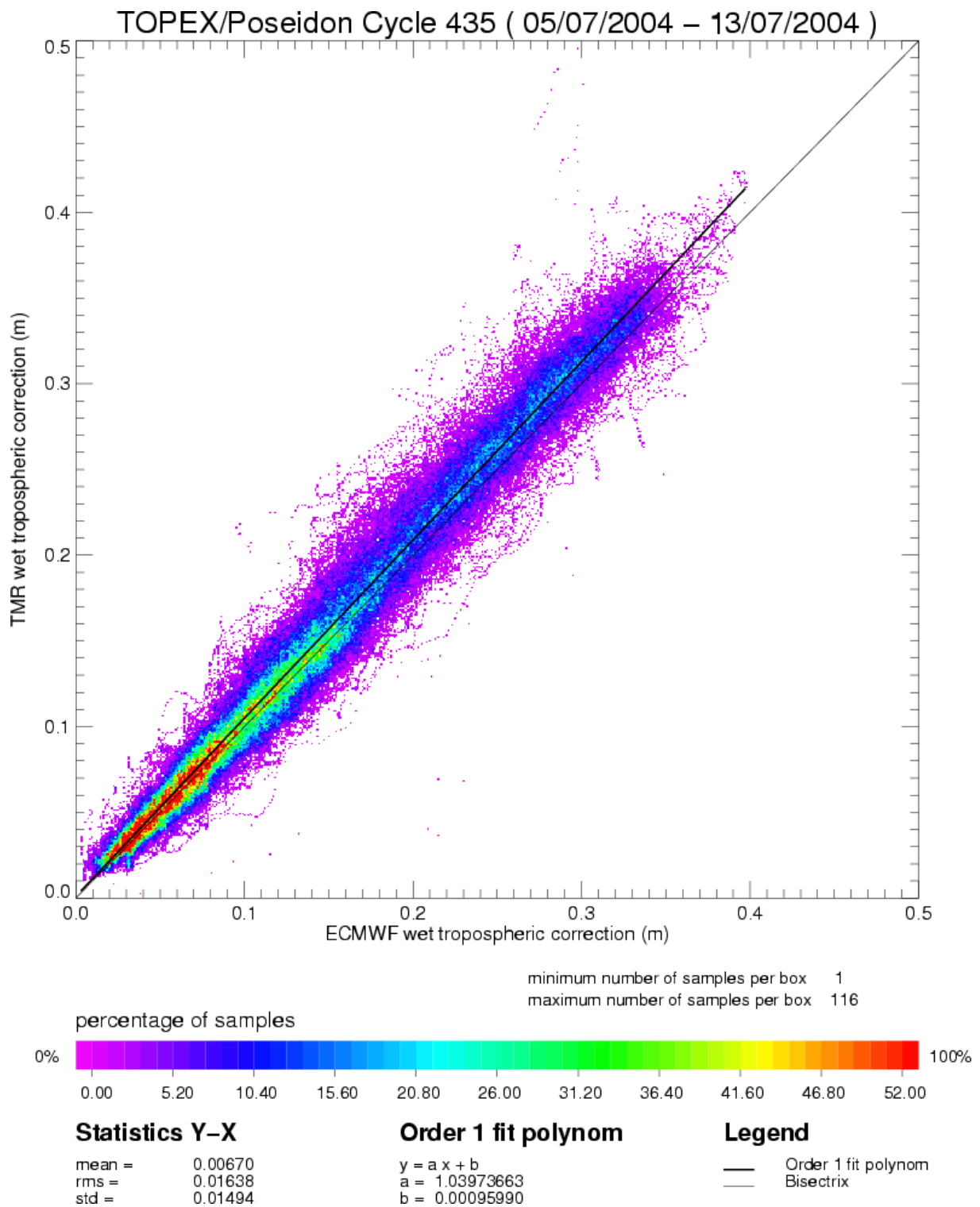
**Order 1 fit polynom**

$y = a x + b$   
 $a = 1.15574300$   
 $b = 0.00573585$

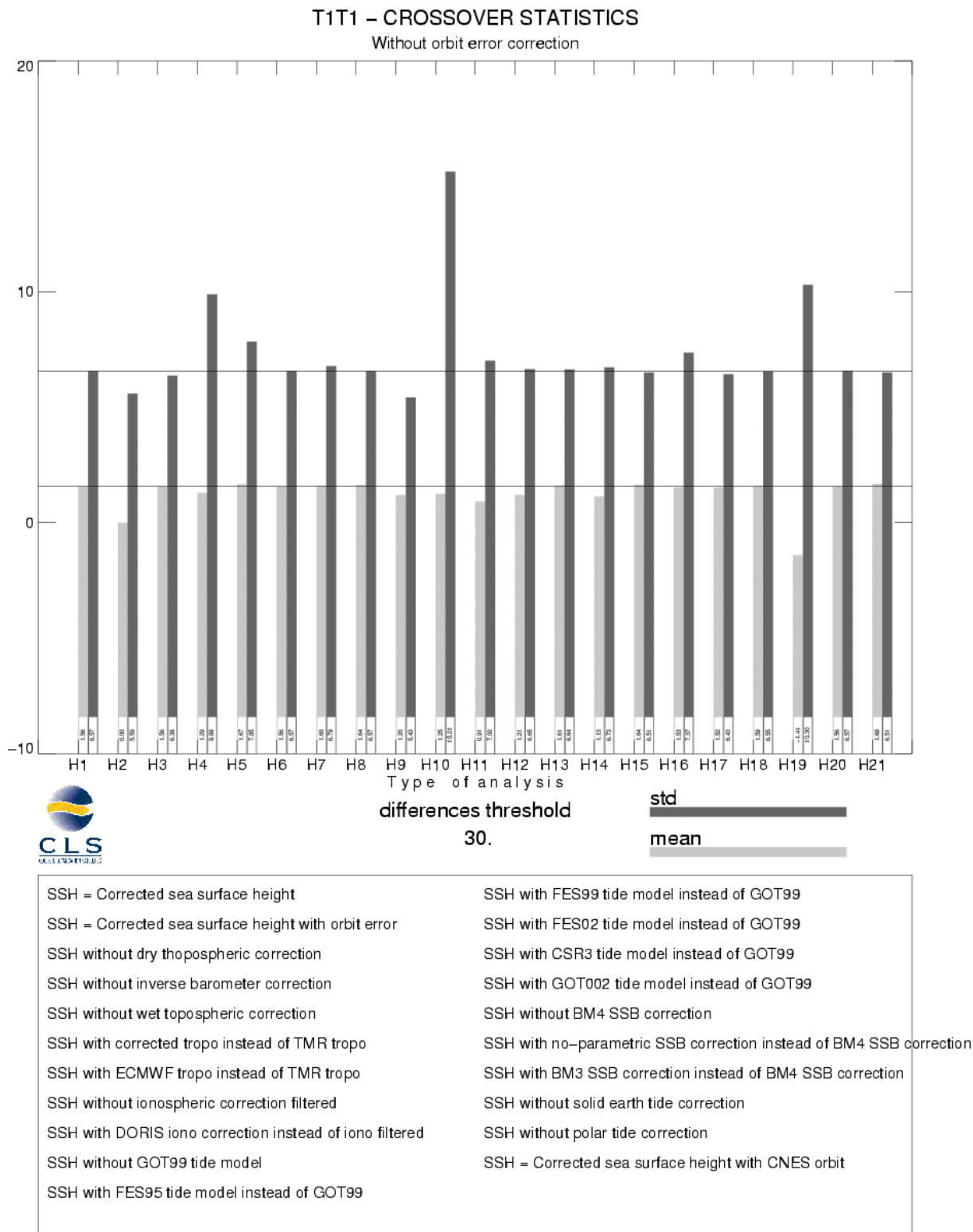
**Legend**

— Order 1 fit polynom  
 — Bisectrix

### 3.6 Wet tropospheric correction



### 3.7 Crossover statistics





### T1T1 – CROSSOVER STATISTICS

Without orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

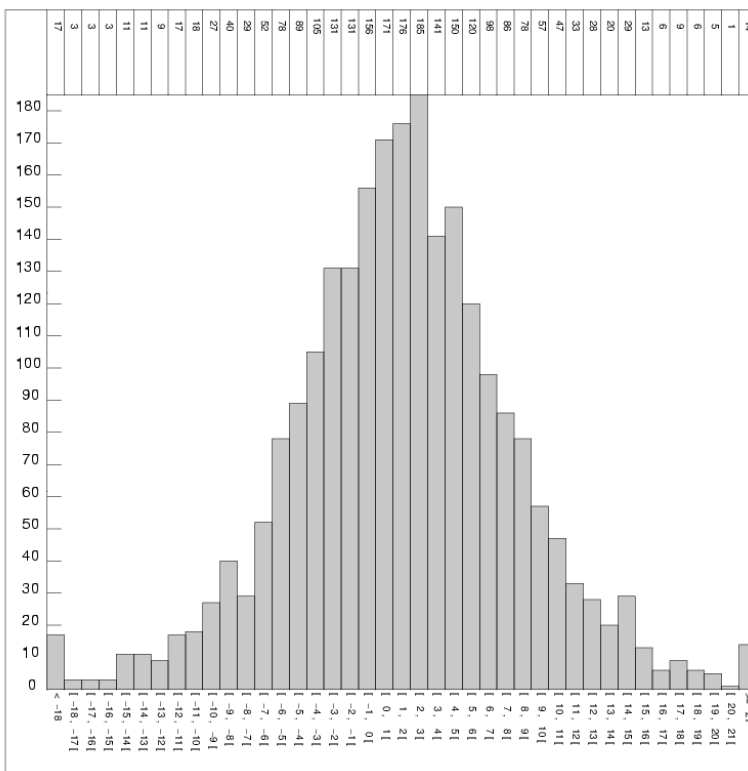
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.4500  
 Valeur maximale : 29.8900  
 Différence Max – Min: 59.3400  
 Nombre de points lus: 2461  
 Nombre de points sélectionnés: 2402  
 Moyenne : 1.55957  
 Écart-type : 6.56687  
 Moyenne Quadratique : 6.74952

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### T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

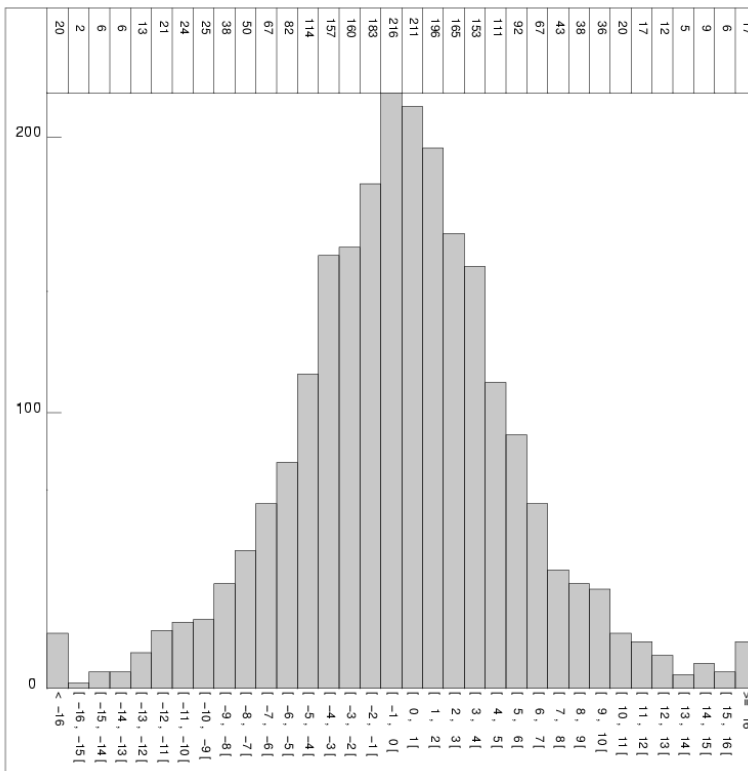
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -27.4100  
 Valeur maximale : 25.9400  
 Différence Max – Min: 53.3500  
 Nombre de points lus: 2461  
 Nombre de points sélectionnés: 2381  
 Moyenne : 0.00458631  
 Écart-type : 5.59416  
 Moyenne Quadratique : 5.59416

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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**

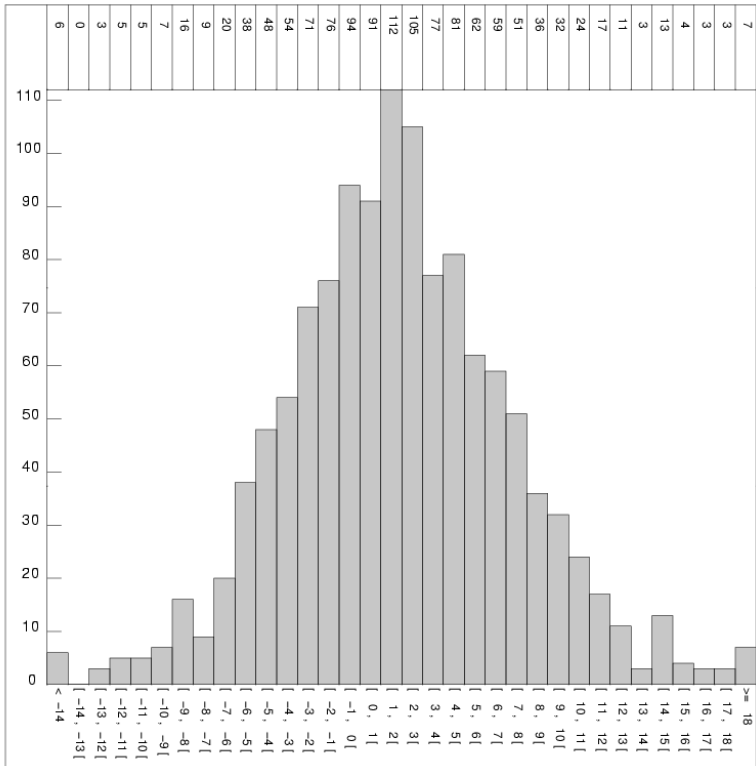
**RAPPEL DES SELECTIONS**

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 : -21.0000  
 Valeur maximale : 25.6200  
 Différence Max – Min: 46.6200  
 Nombre de points lus: 1791  
 Nombre de points selectionnes: 1243  
 Moyenne : 1.87795  
 Ecart-type : 5.50197  
 Moyenne Quadratique : 5.81363

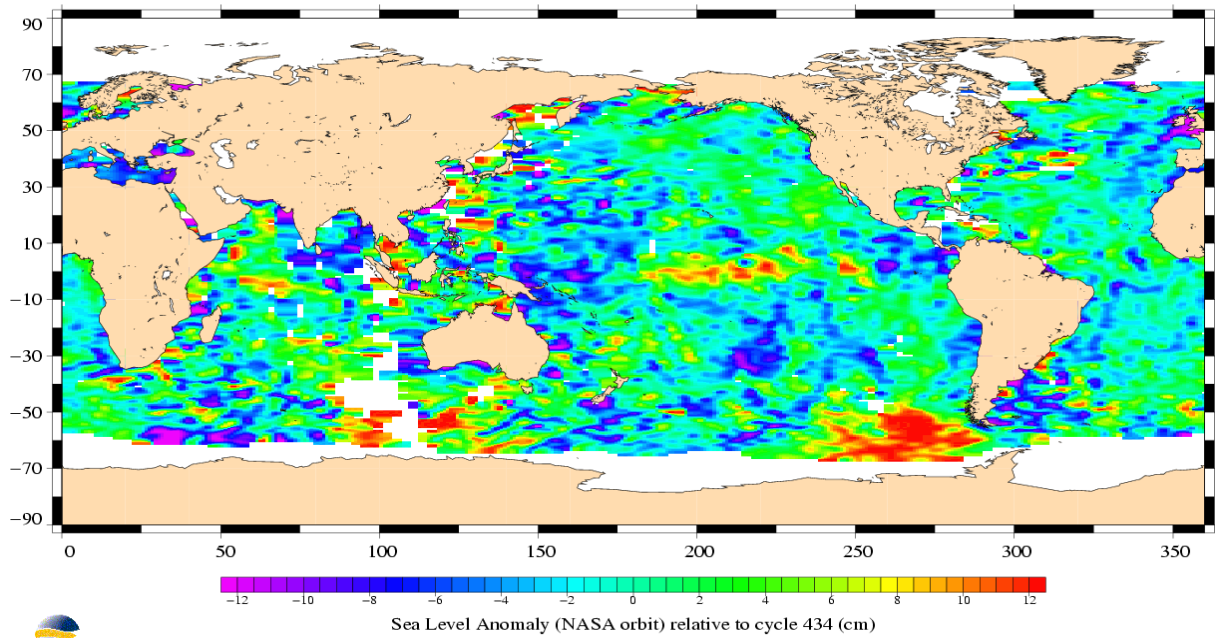
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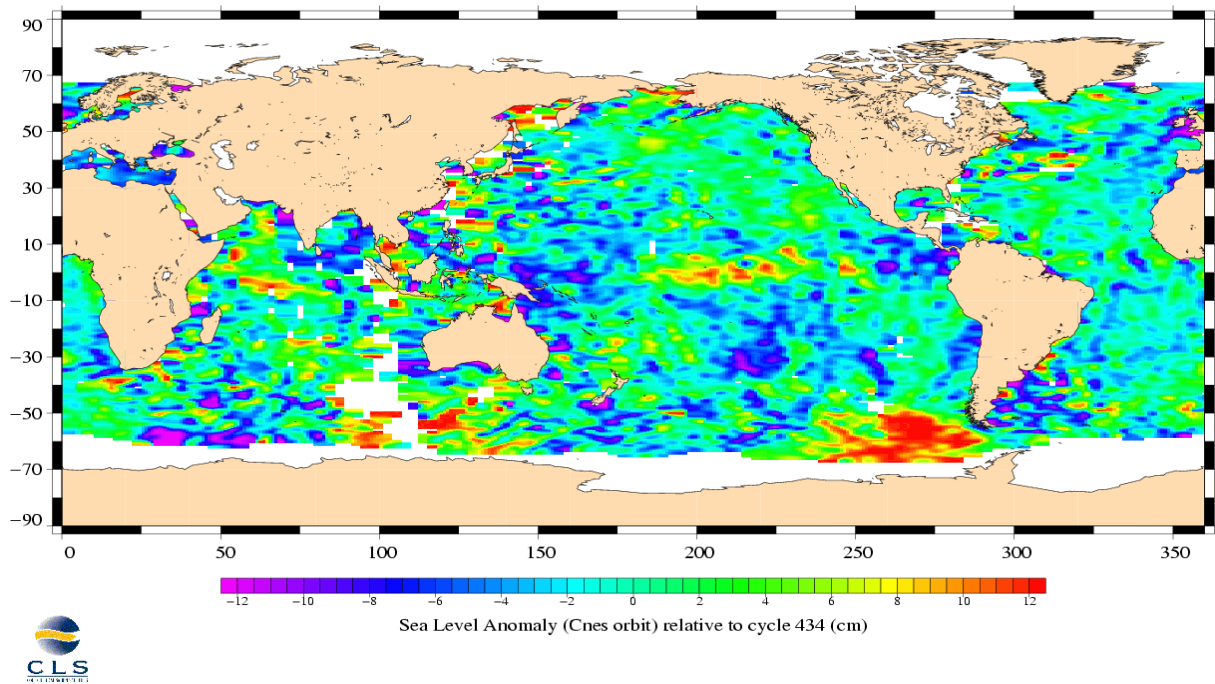
### 3.8 SSH variability

#### 3.8.1 Sea Level Anomaly

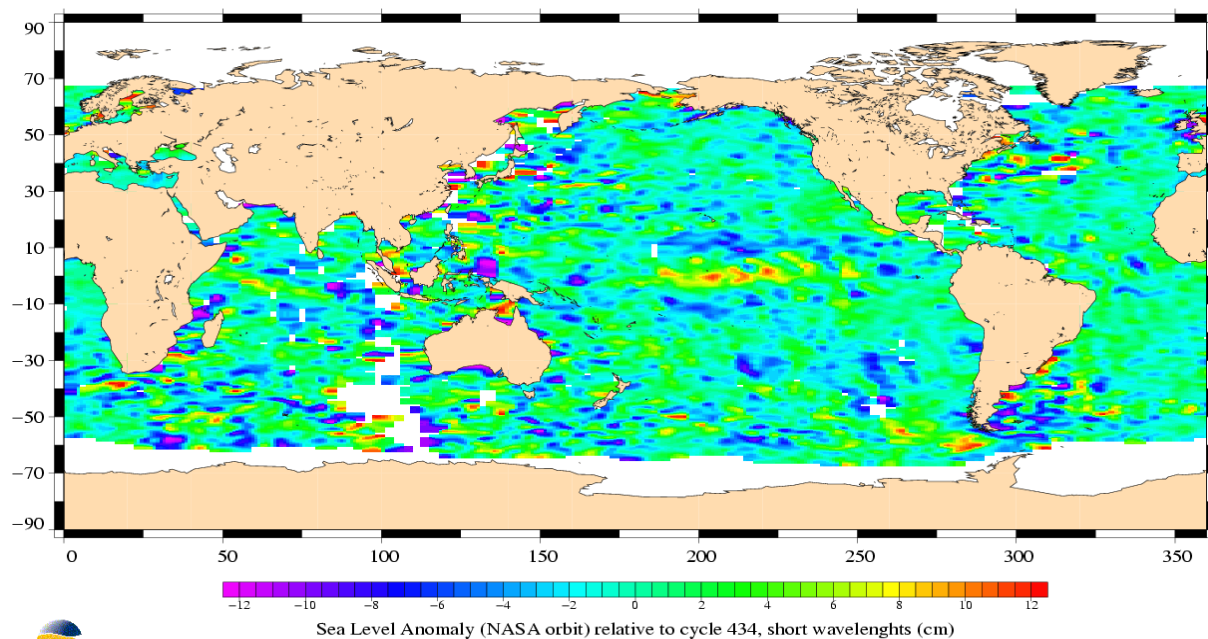
TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004



TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004



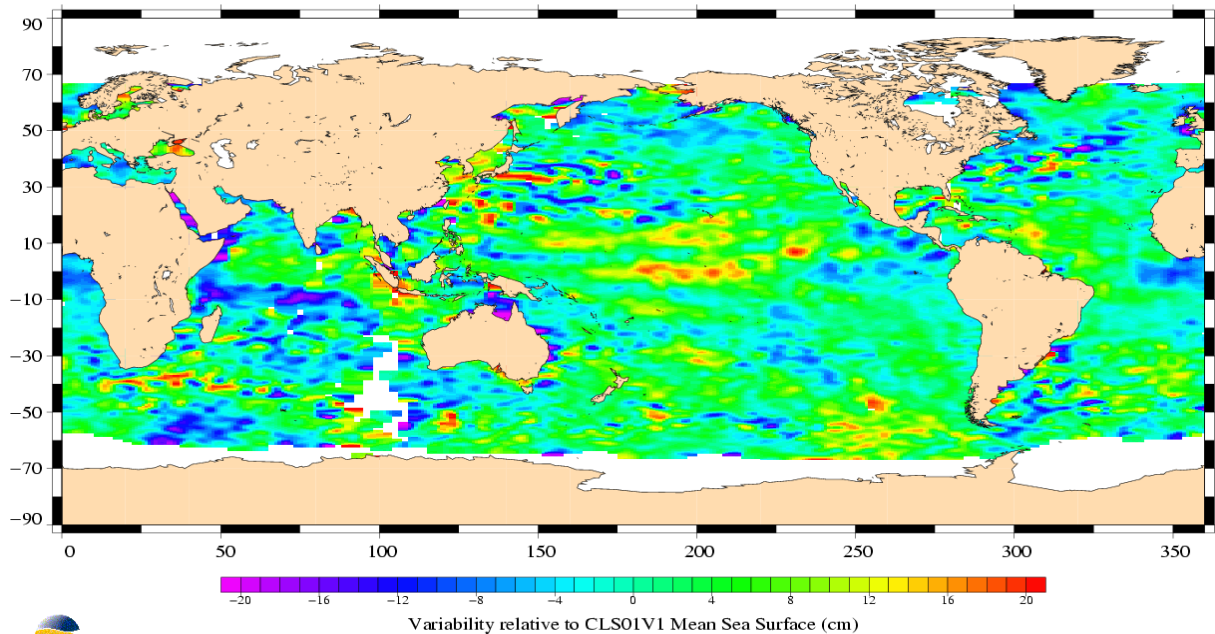
TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004



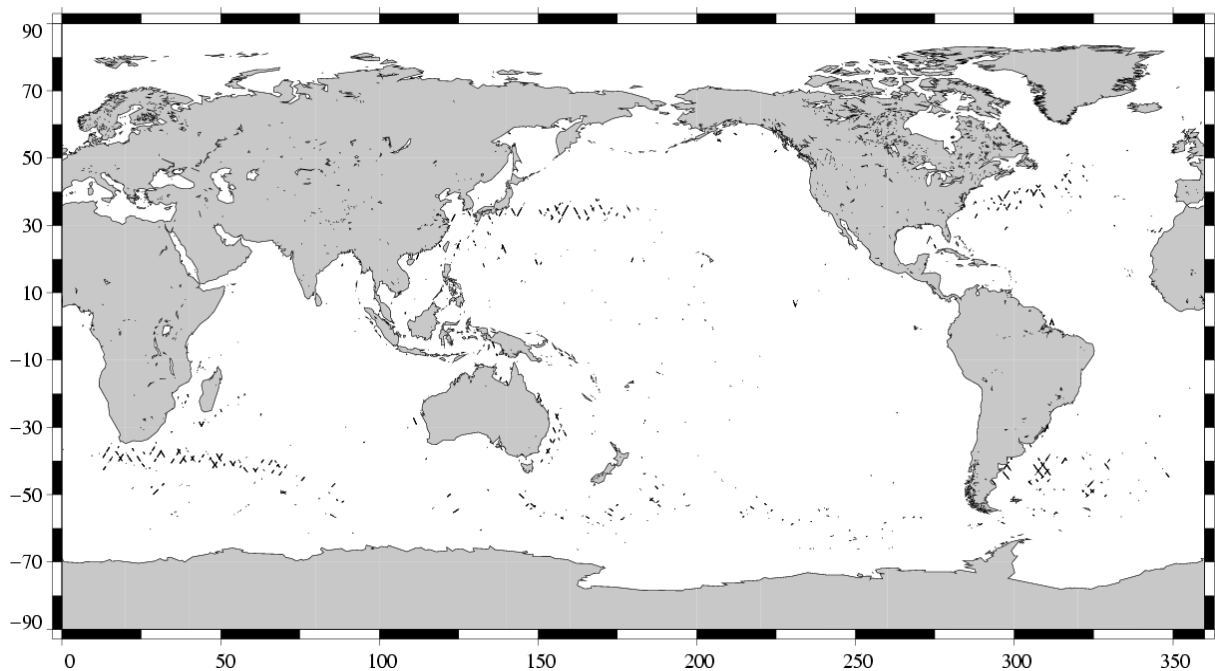
### 3.8.2 Comparison to a precise Mean Sea Surface

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 435  
Period : 05/07/2004 – 13/07/2004

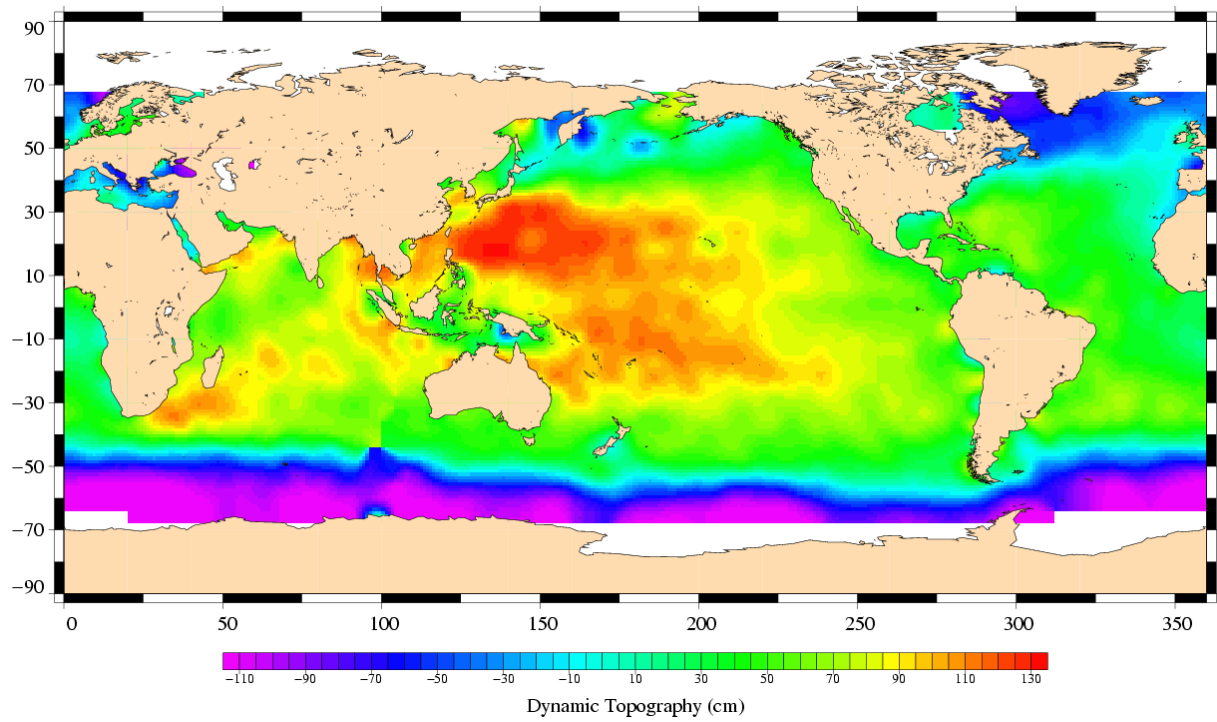


(SSH - MSS) differences greater than 0.3 m  
TOPEX/Poseidon Cycle 435 (05/07/2004 / 13/07/2004)



### 3.9 Dynamic topography

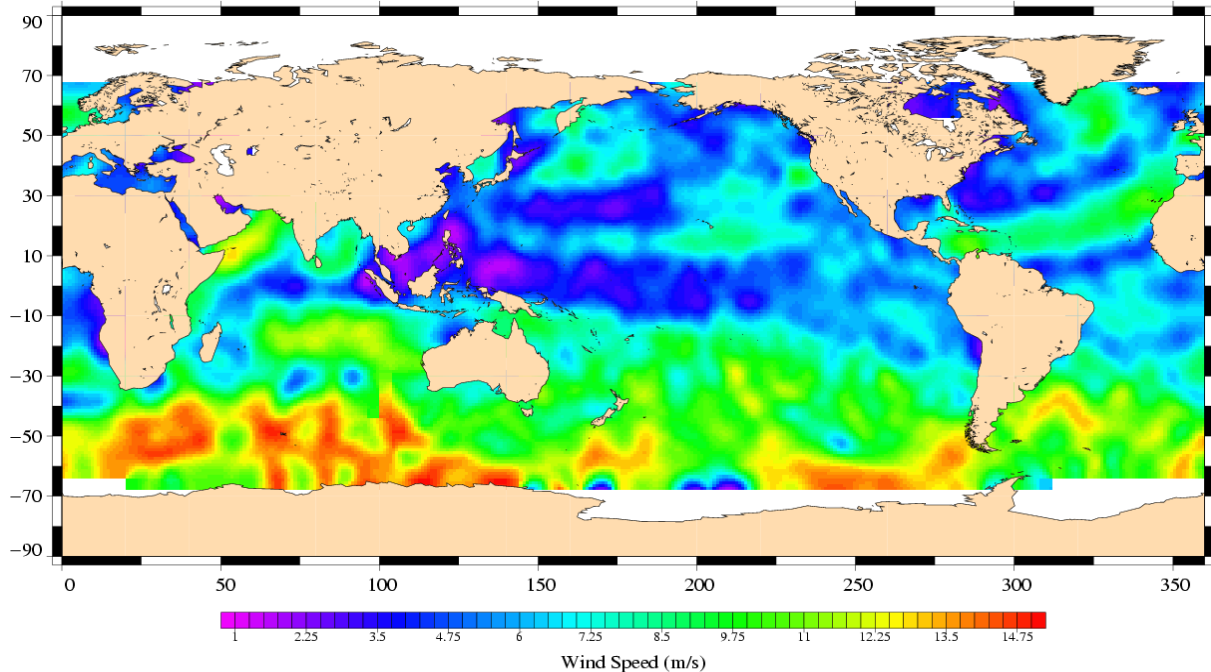
TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004



### 3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004



TOPEX/Poseidon, cycle 435  
Period : 05/07/2004 – 13/07/2004

