



# TOPEX/Poseidon MGRD Quality Assessment Report

**Cycle 444**

**02-10-2004 12-10-2004**

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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 6.80 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.55 cm.

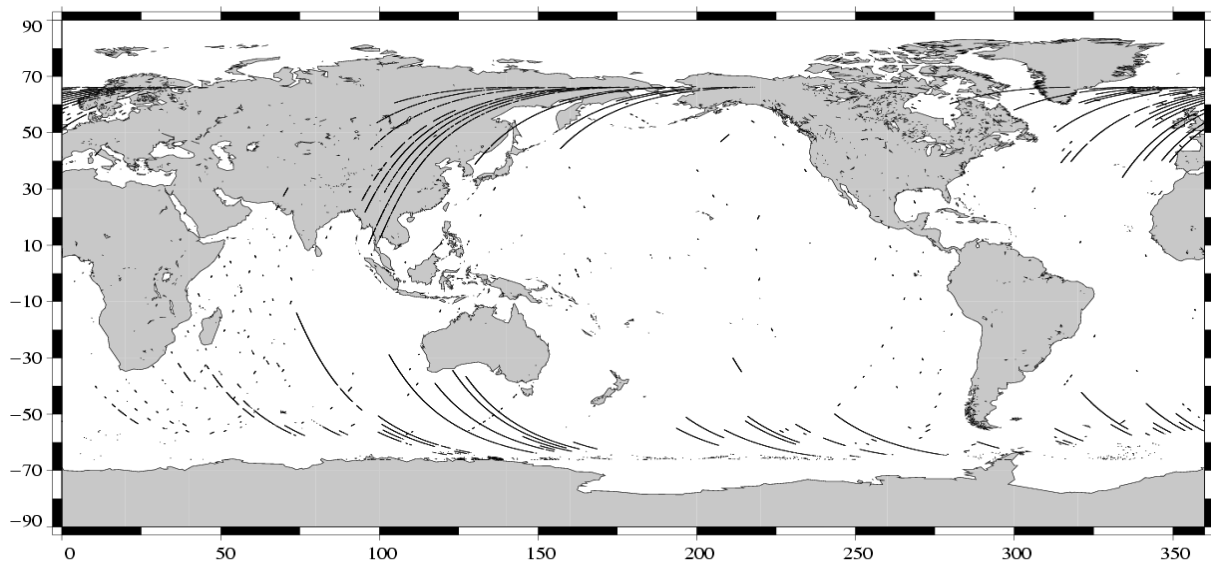
### 2.2 Warnings and recommendations

- Missing measurements :
  - Tape recorder operations have been suspended due to the units declining performance factors, on October 08 th. From that moment all mission data recovery requirements will be met via TDRSS real time contacts.  
Therefore there is a lot of data gaps, especially in the Indian Ocean, between the East and Southeast Pacific basin, in the South Pacific Ocean close to the South and Central America coasts and below the Groenland coasts.
- 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 :

  - 4.62% 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 444 (02/10/2004 / 12/10/2004)



### 3 CALVAL main results

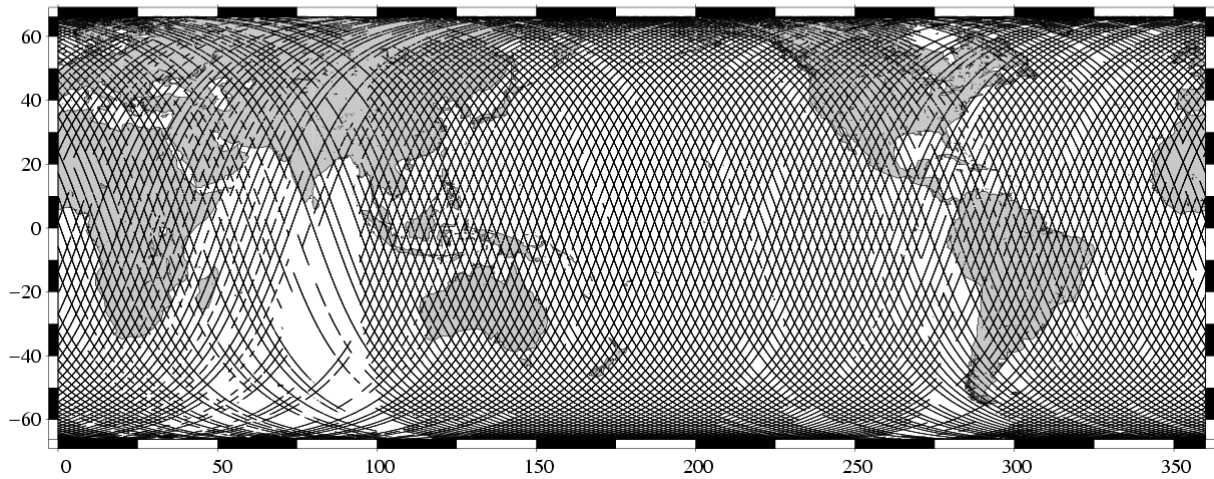
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

#### 3.1 Missing measurements

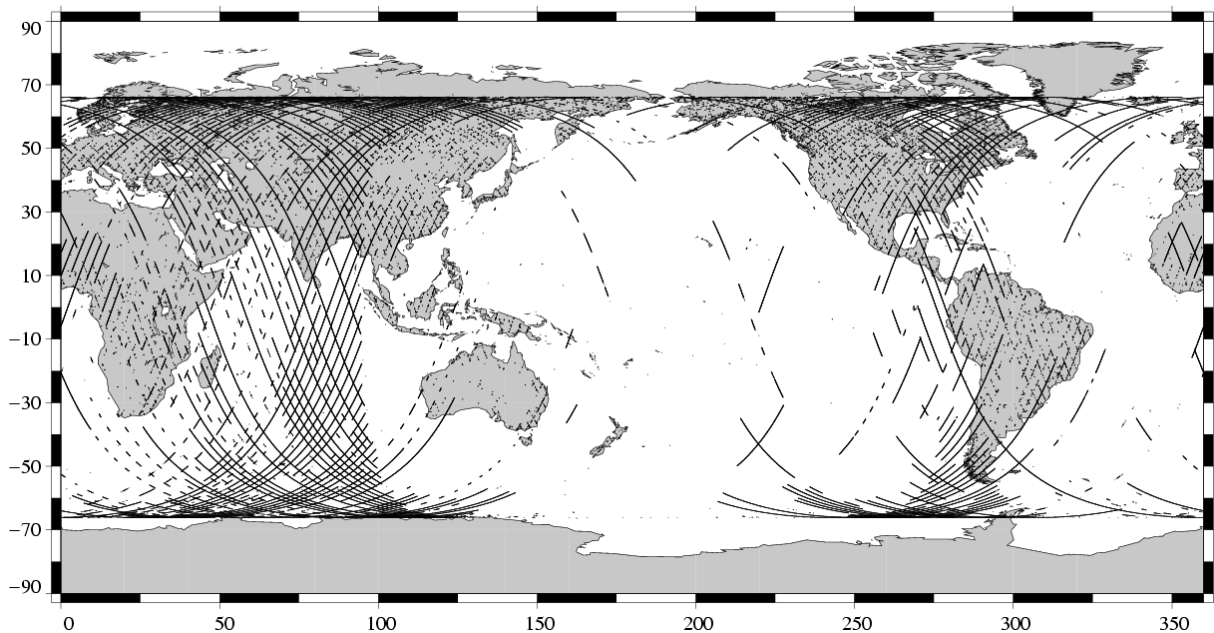
635032 altimeter measurements are present, and 159635 are missing.

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 444 (02/10/2004 / 12/10/2004)



Missing measurements  
TOPEX/Poseidon Cycle 444 (02/10/2004 / 12/10/2004)



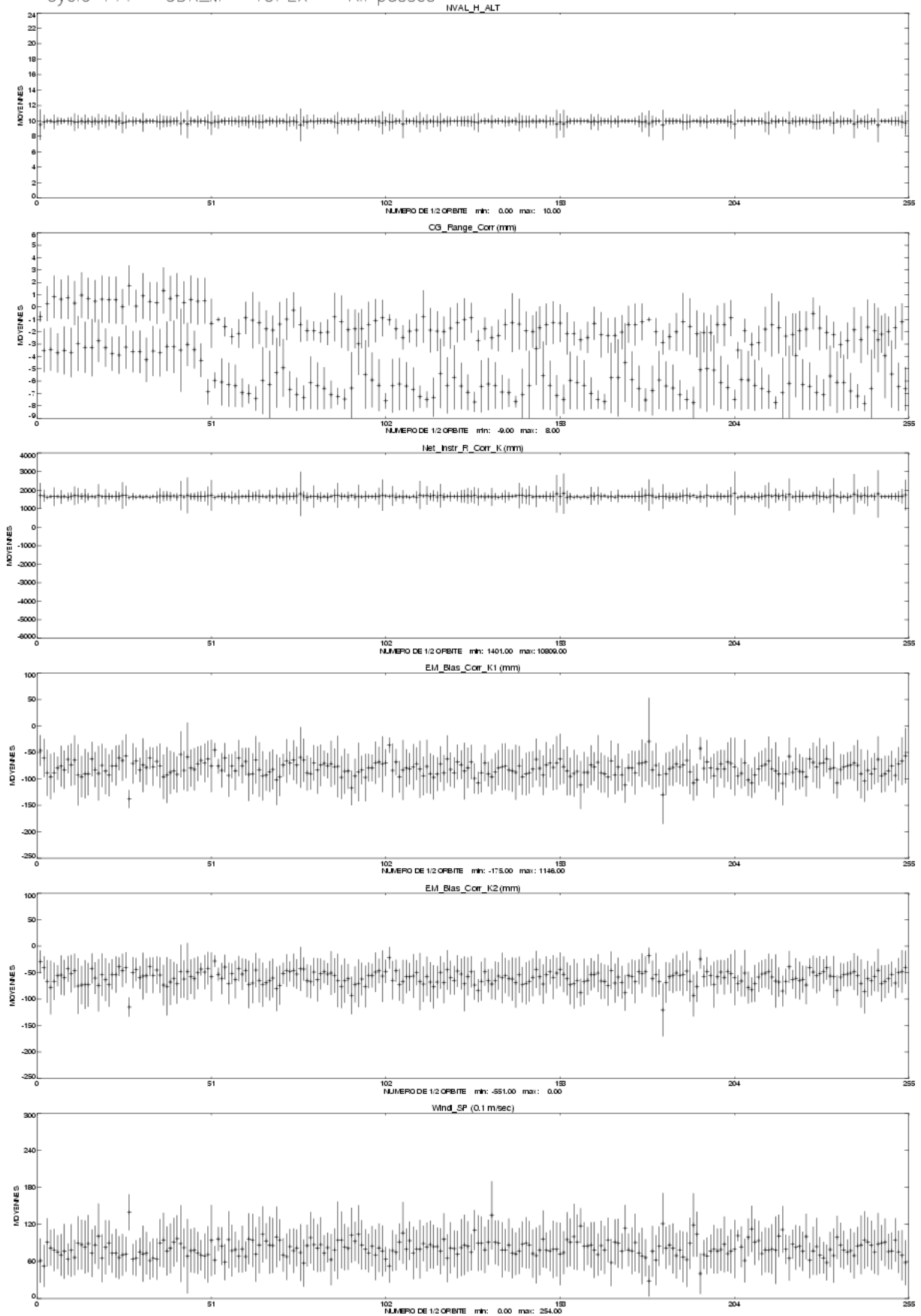
### 3.2 M-GDR quality flags

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

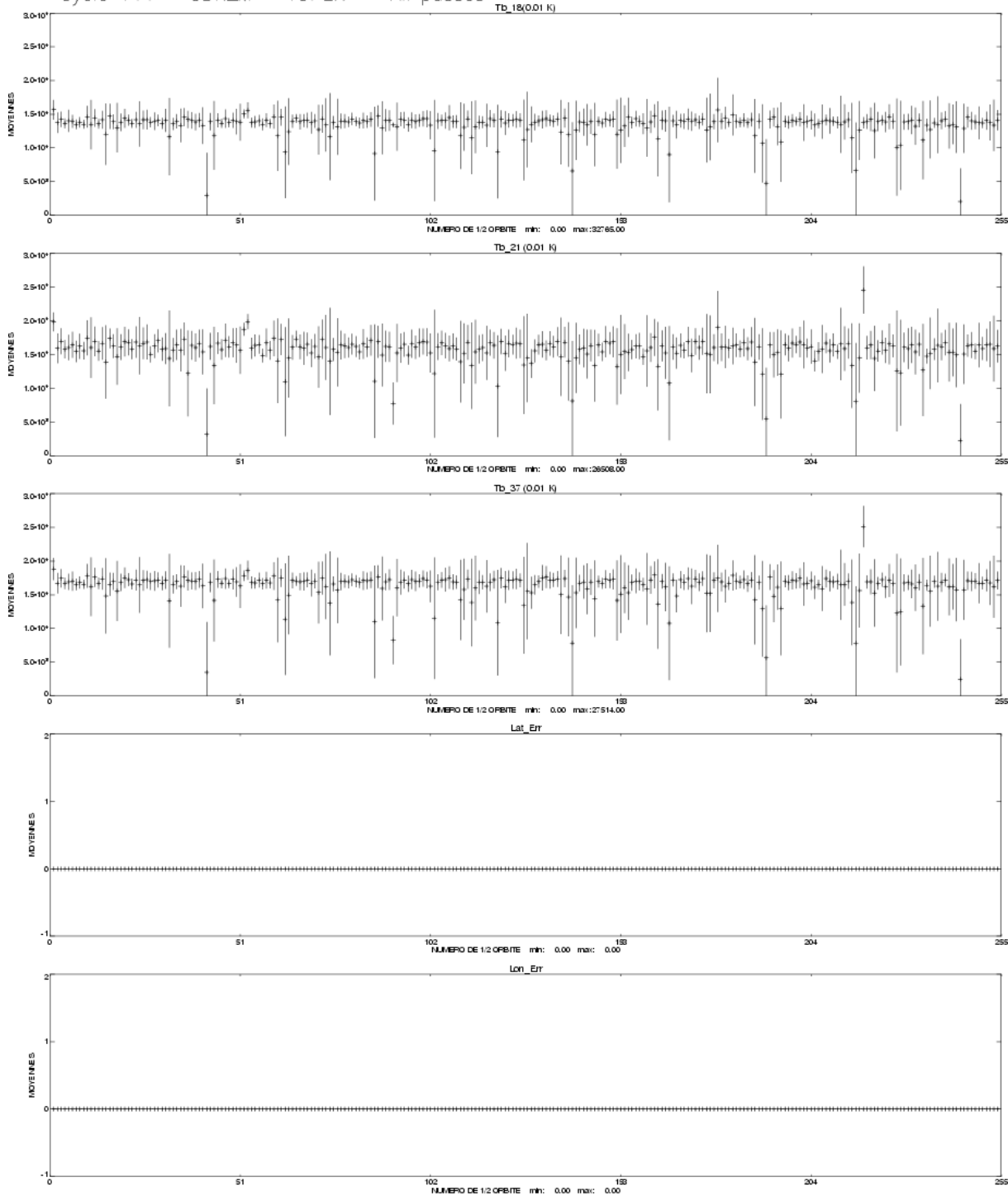
Name	Description	% bad
Geo_Bad_1	altimeter land flag	24.80
Geo_Bad_1	ice flag	8.16
Geo_Bad_1	radiometer land flag	26.11
Alt_Bad_1	conditions 1 altimeter	4.62
Alt_Bad_2	conditions 2 altimeter	4.49
Geo_Bad_2	rain (liquid water in excess)	8.21
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.43
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.99
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	9.11
DORIS	DORIS not valid	0.00

### 3.3 M-GDR parameter plots

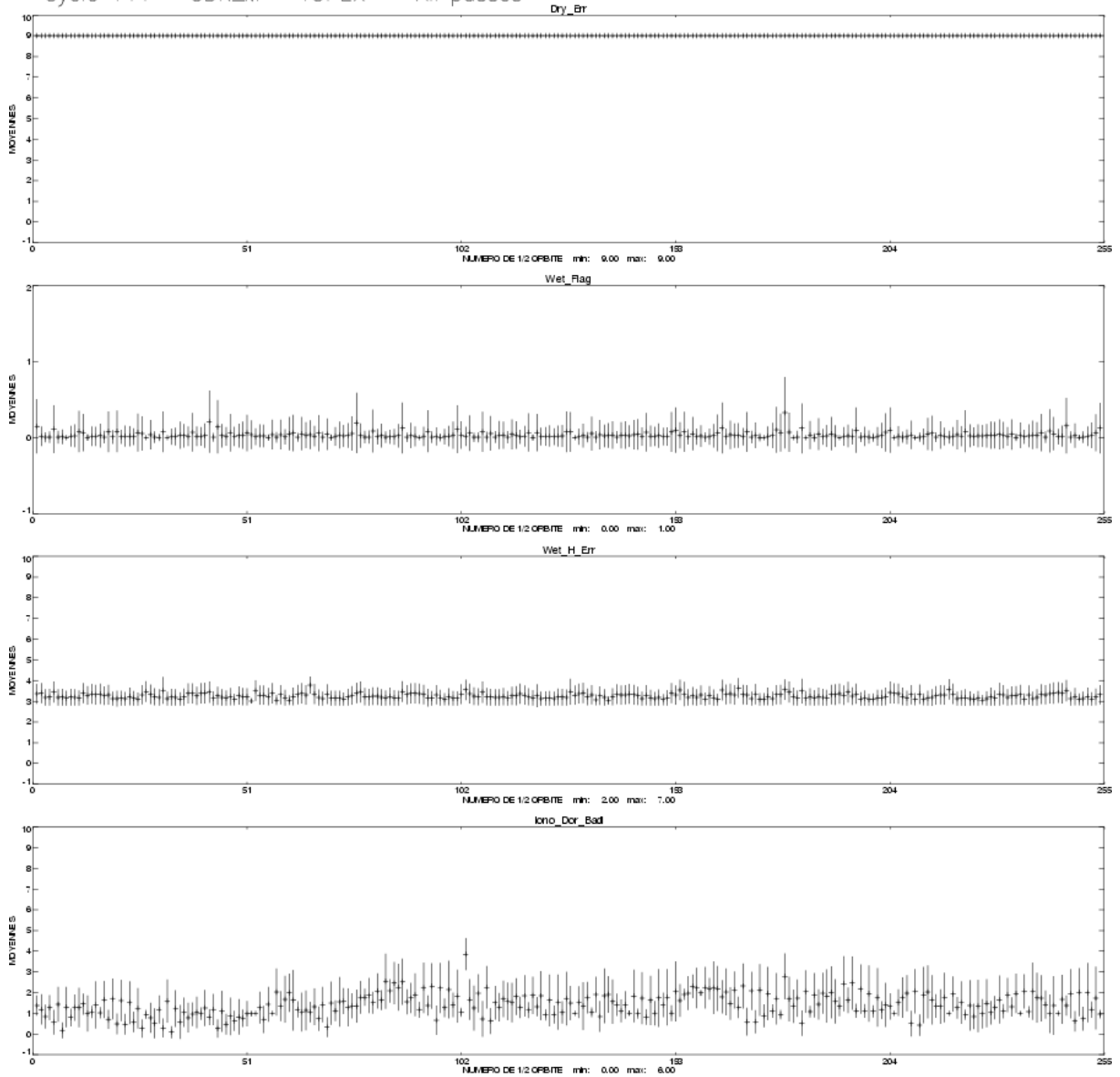
Cycle 444 – GDR\_M – TOPEX – All passes –



Cycle 444 – GDR\_M – TOPEX – All passes –

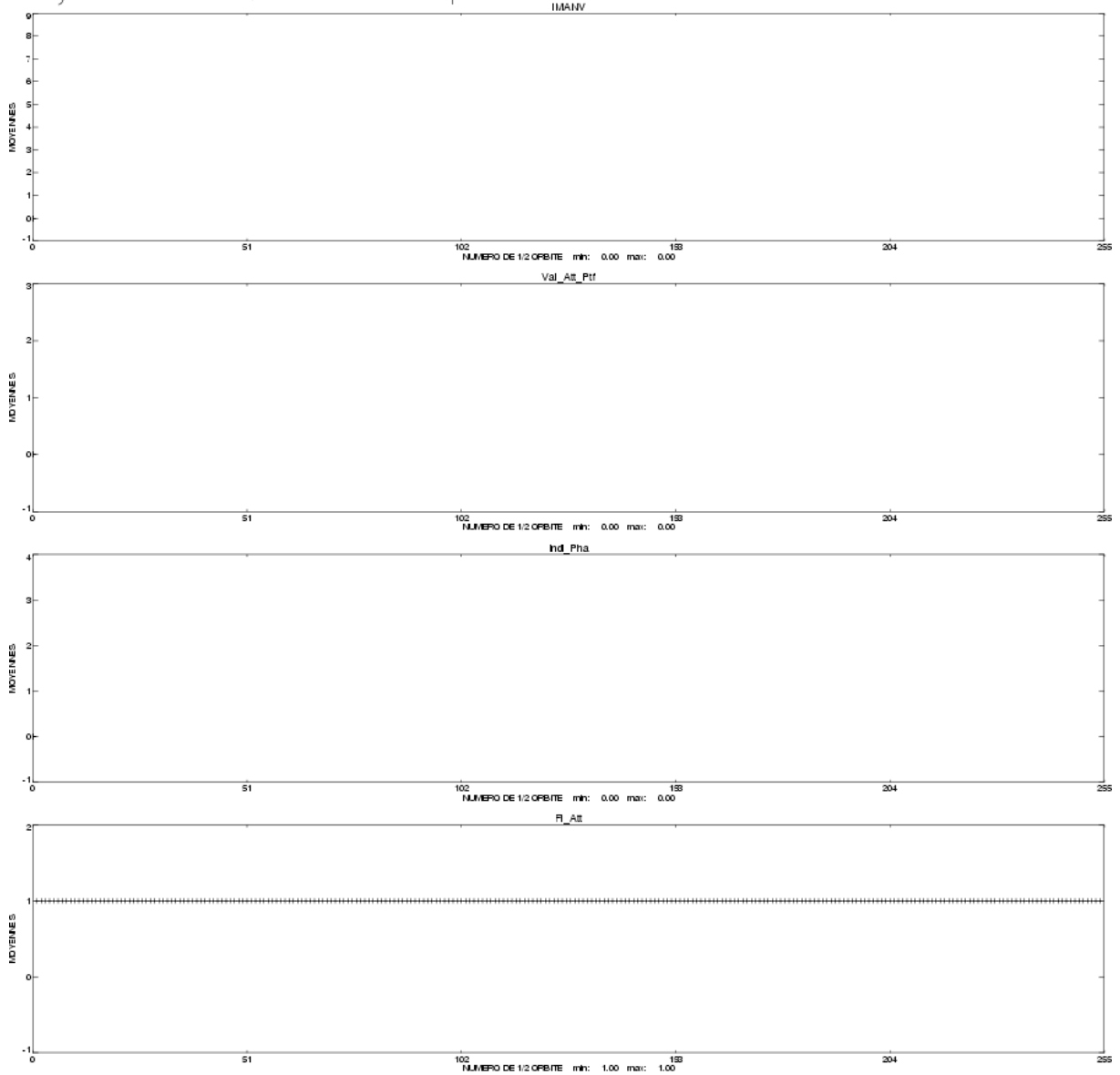


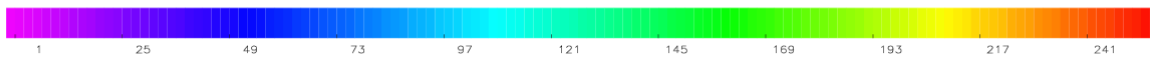
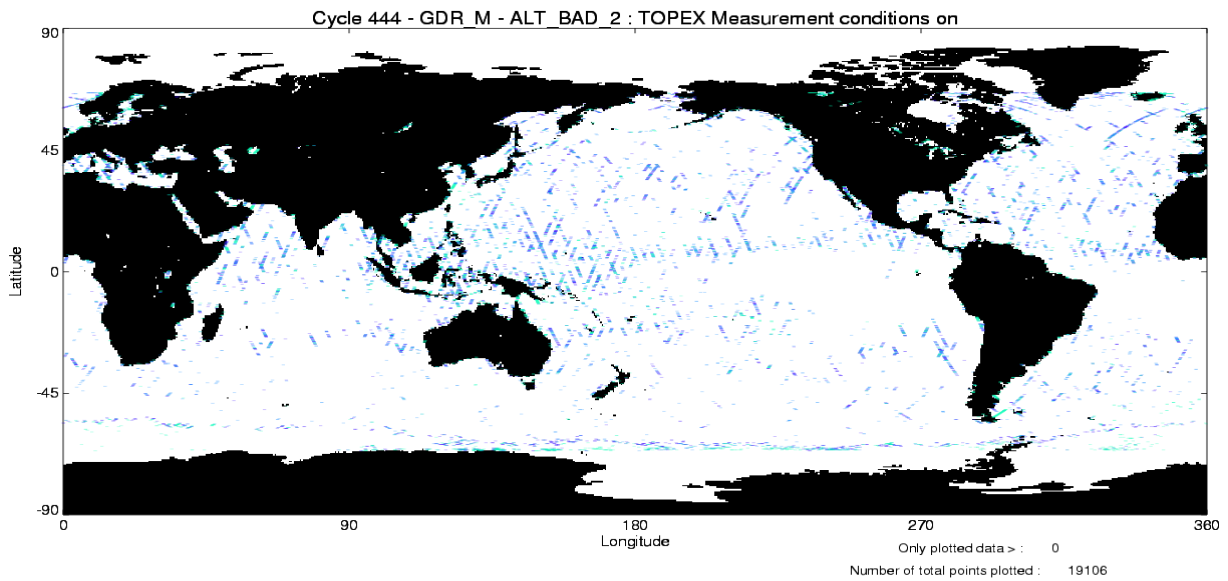
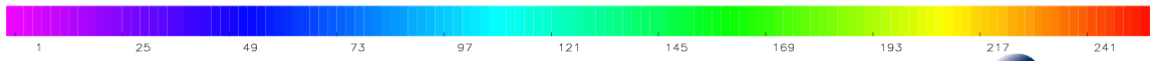
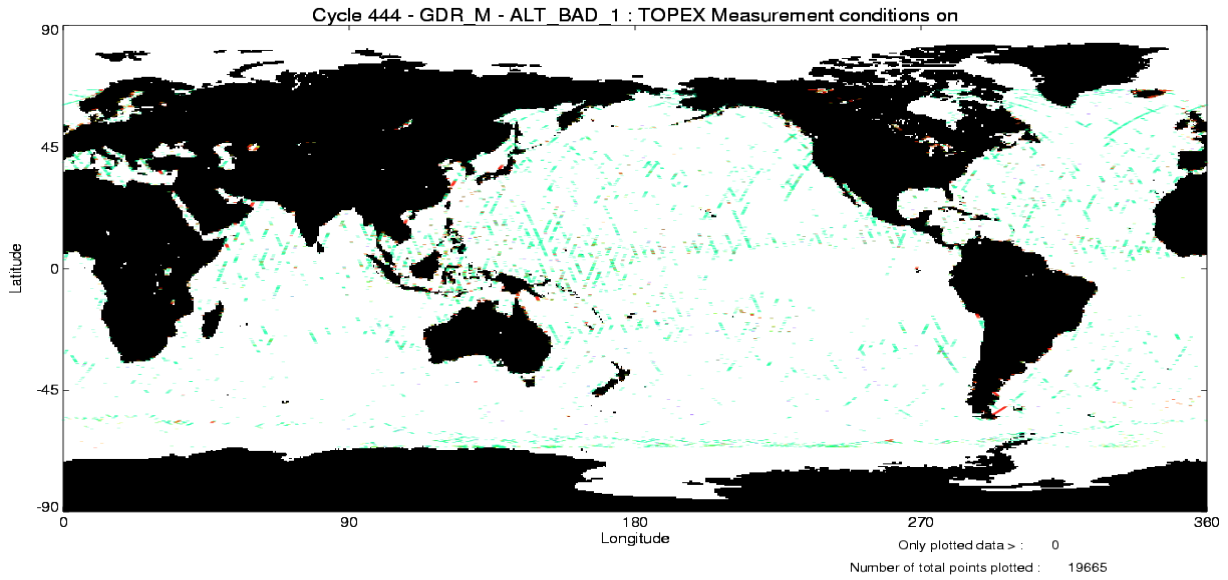
Cycle 444 – GDR\_M – TOPEX – All passes –

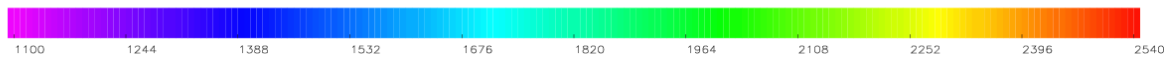
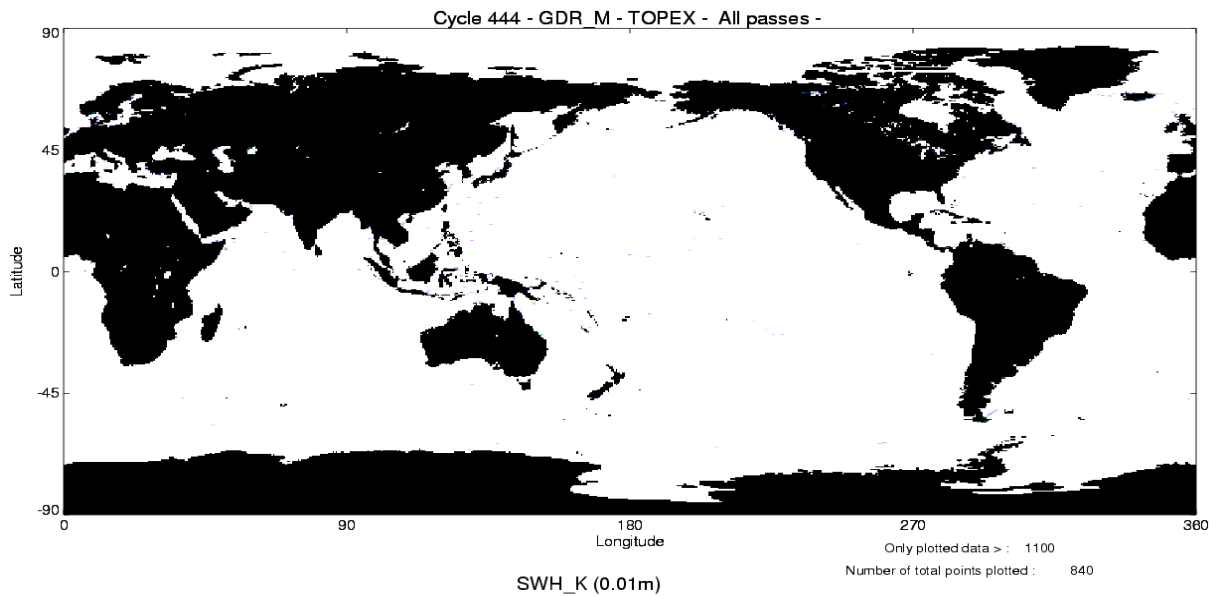
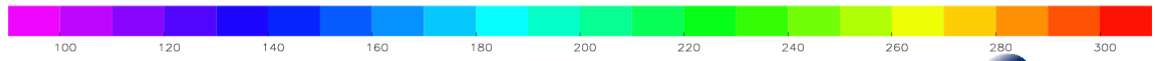
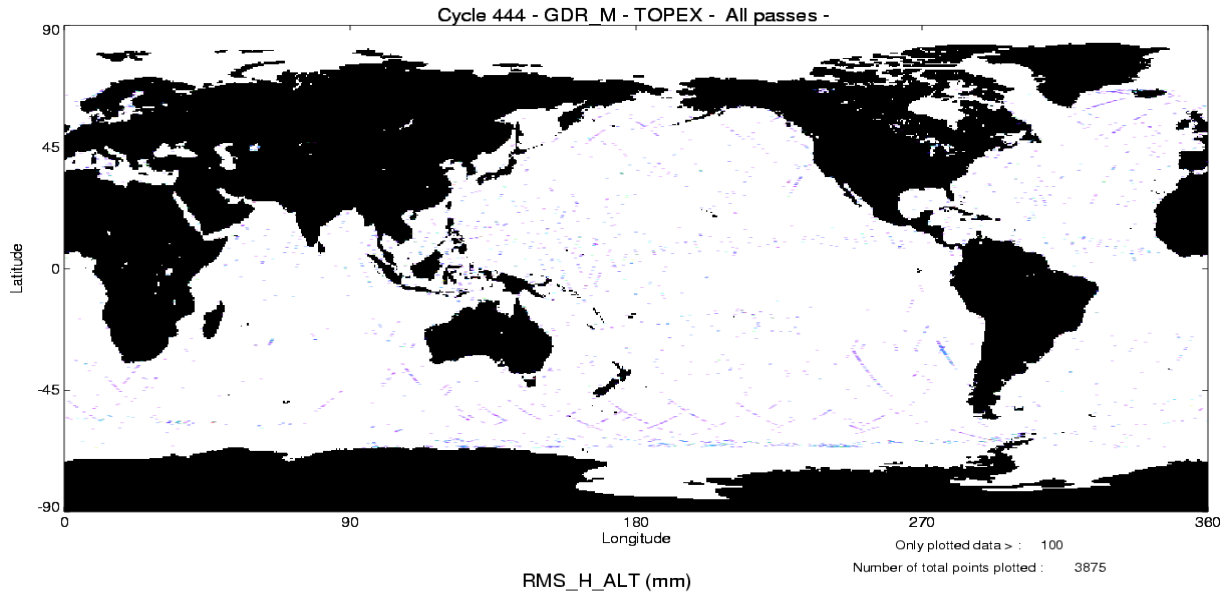


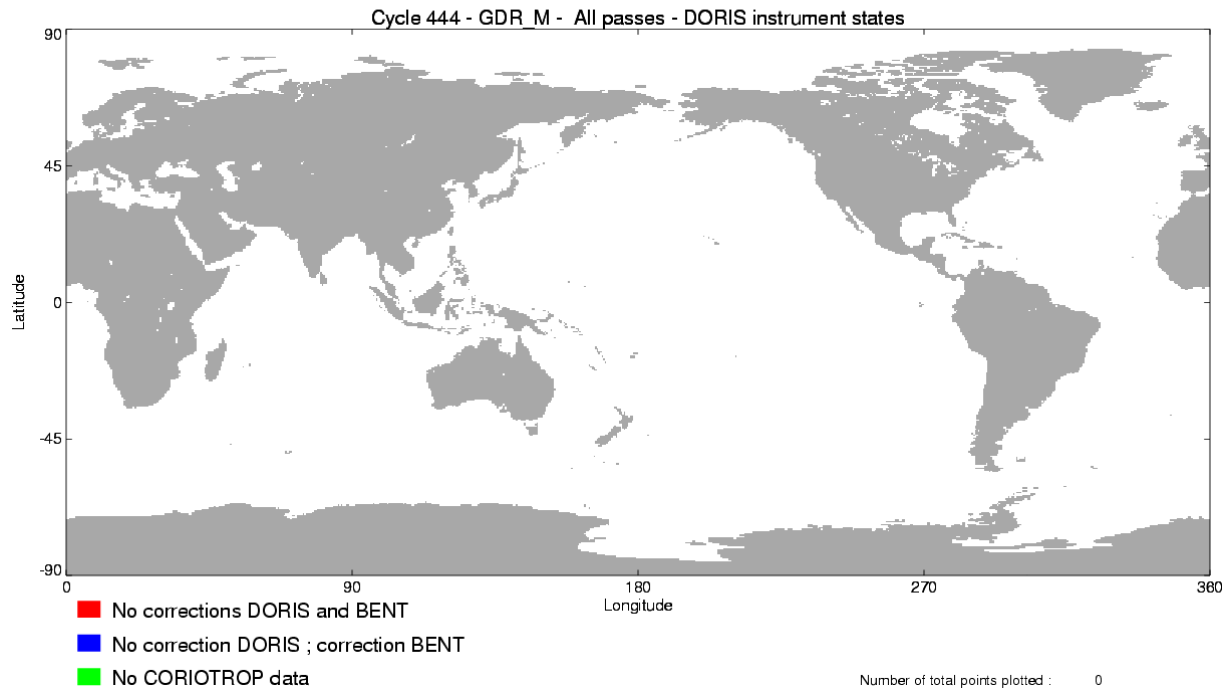


Cycle 444 - GDR\_M - TOPEX - All passes -









### 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.

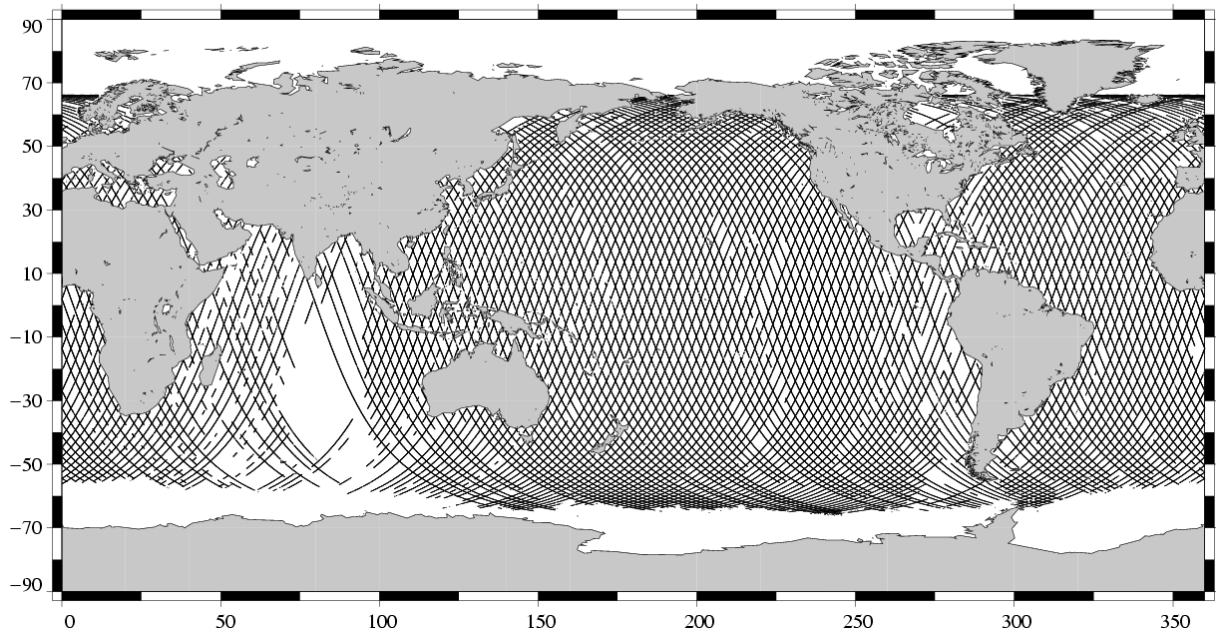
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (26.11 % of points removed) and ice flag ( 8.16 % of points removed).

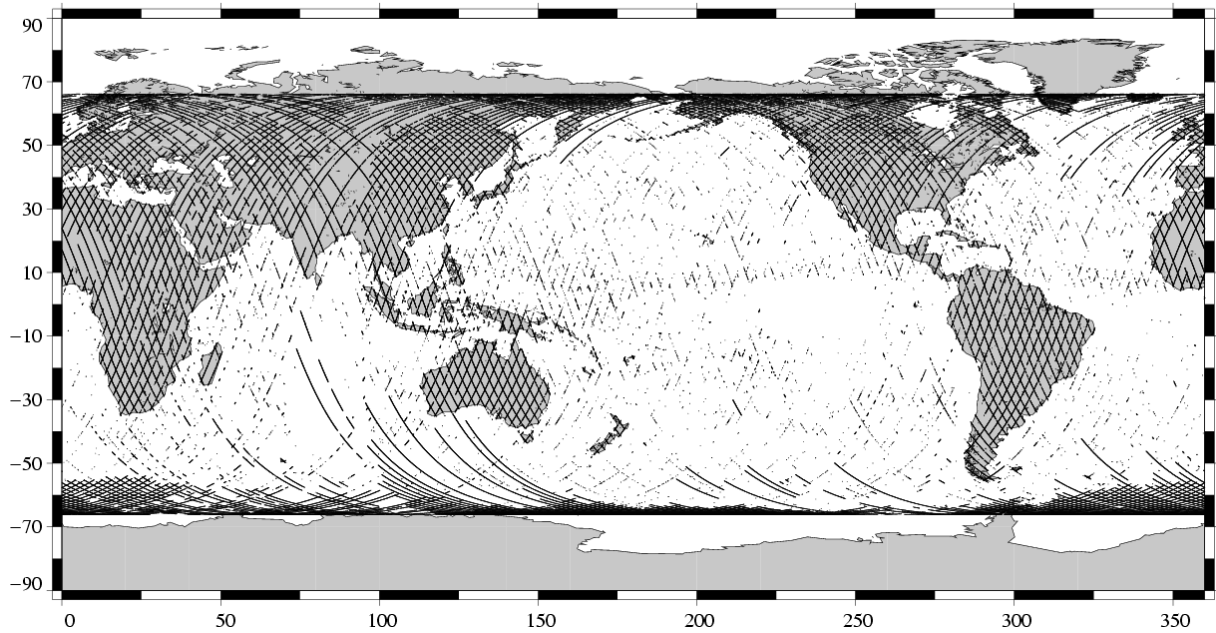
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	0.20
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	0.26
Std. deviation of range	0.000	0.100	m	1.85	0.96
Off nadir angle from waveform	0.000	0.400	deg	1.36	3.16
Dry tropospheric 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	4.62
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	0.28
Significant wave height	0.000	11.000	m	1.46	0.08
Sea state Bias	-0.500	0.000	m	1.39	0.20
Backscatter coefficient	7.000	30.000	dB	1.44	0.21
Ocean tide height	-5.000	5.000	m	0.01	0.16
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	0.28
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.

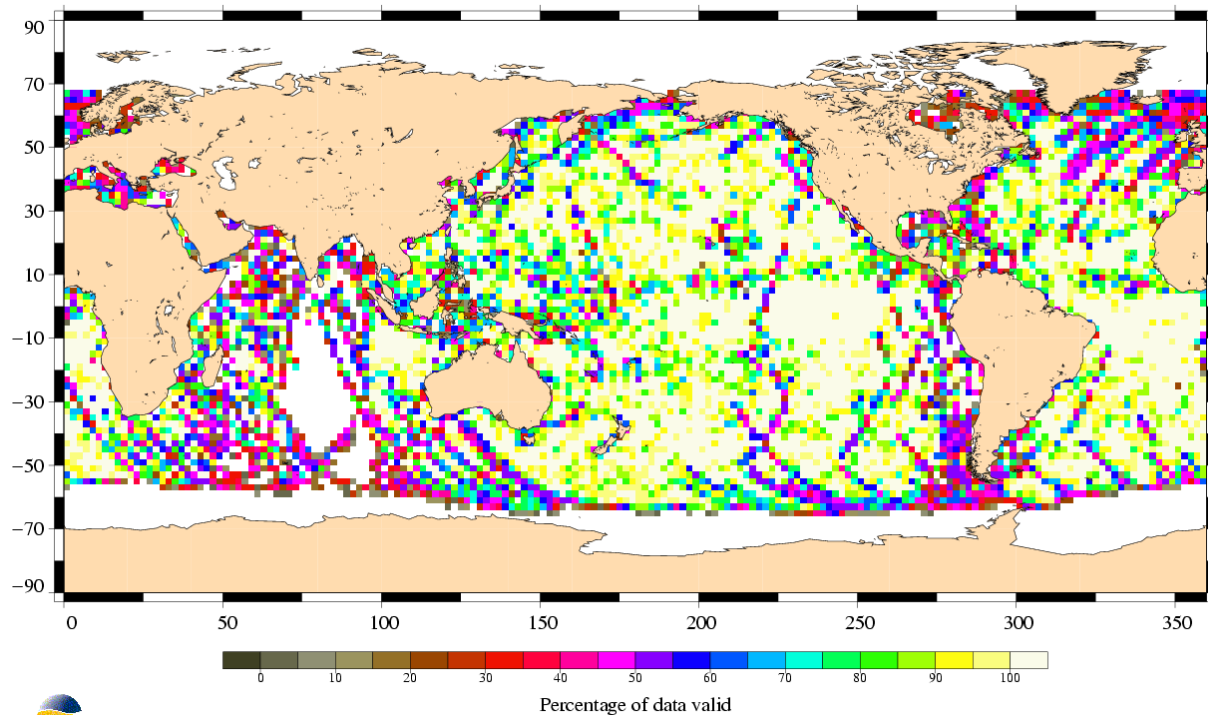
Valid data  
TOPEX/Poseidon Cycle 444 (02/10/2004 / 12/10/2004)



Edited measurements  
TOPEX Cycle 444 (02/10/2004 / 12/10/2004)

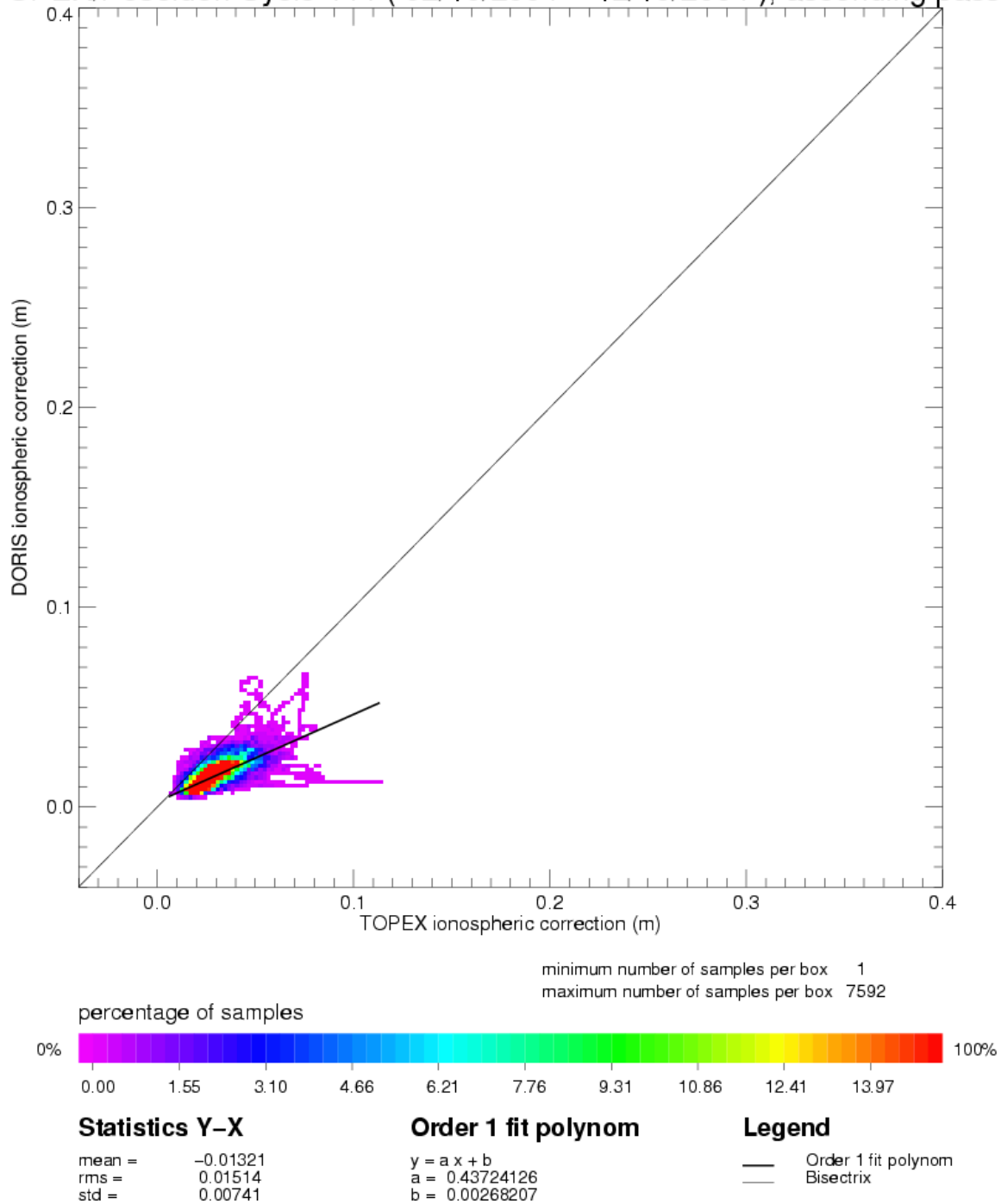


Percentage of valid data relative to the nominal pass  
TOPEX/Poseidon Cycle 444 (02/10/2004 / 12/10/2004)



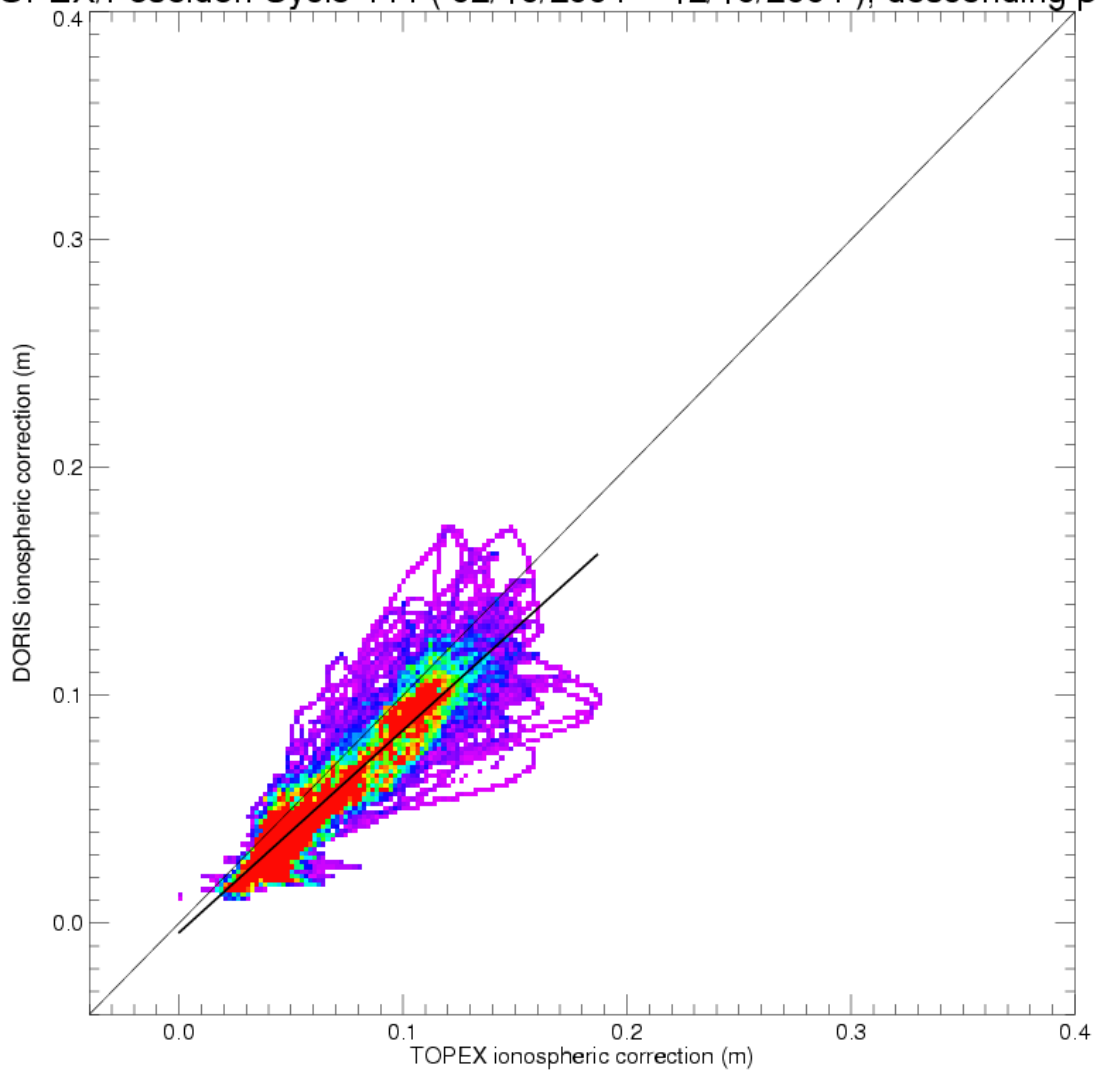
### 3.5 Ionospheric correction

TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), ascending passes

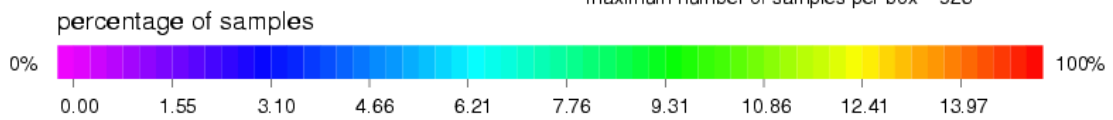




TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 923



**Statistics Y-X**

mean = -0.01198  
 rms = 0.01739  
 std = 0.01260

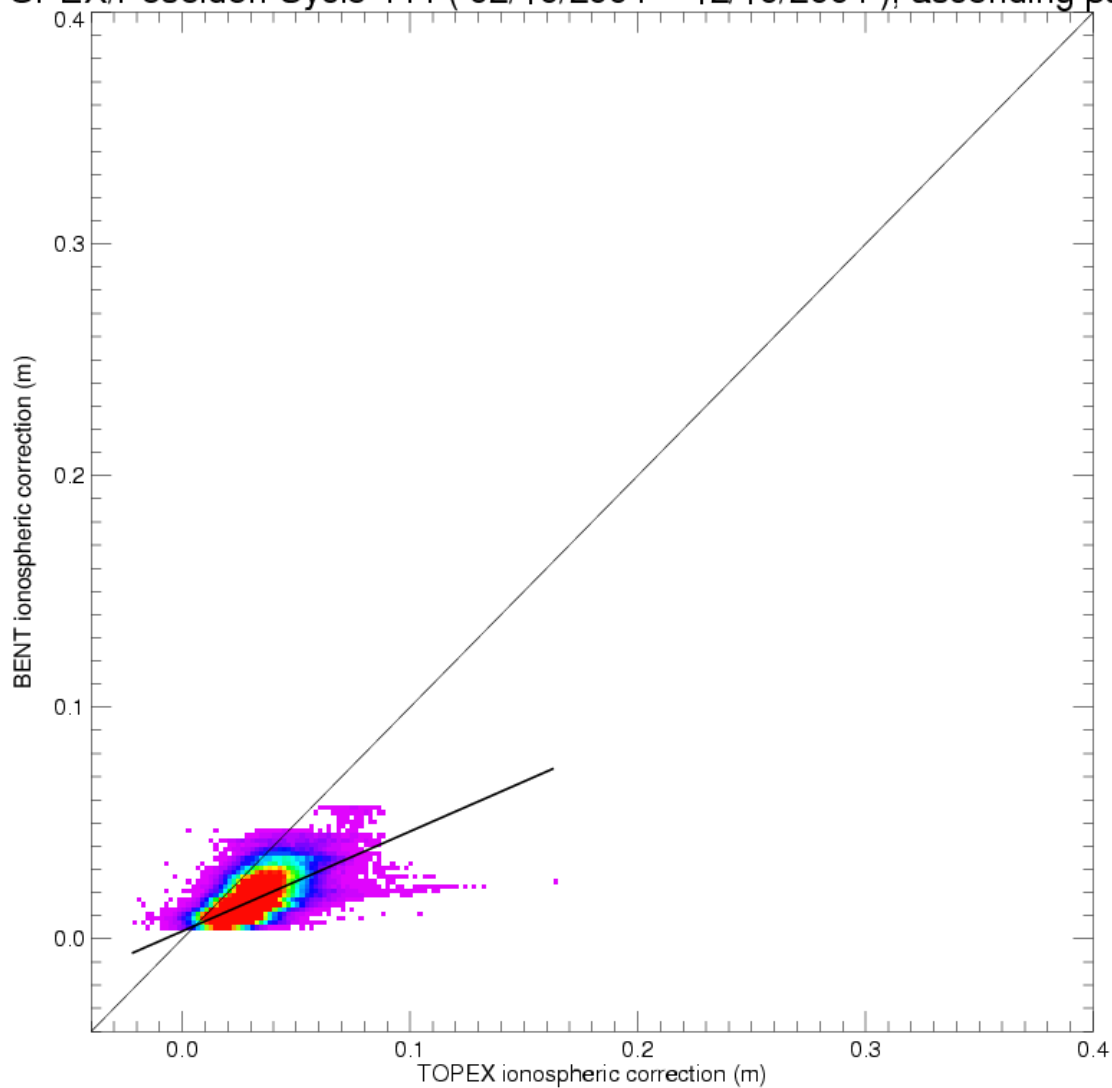
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.88864982$   
 $b = -0.00413242$

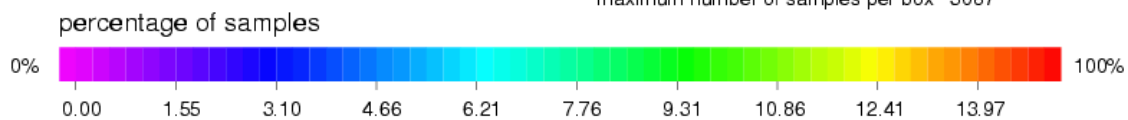
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 3087



**Statistics Y-X**

mean = -0.01304  
 rms = 0.01603  
 std = 0.00933

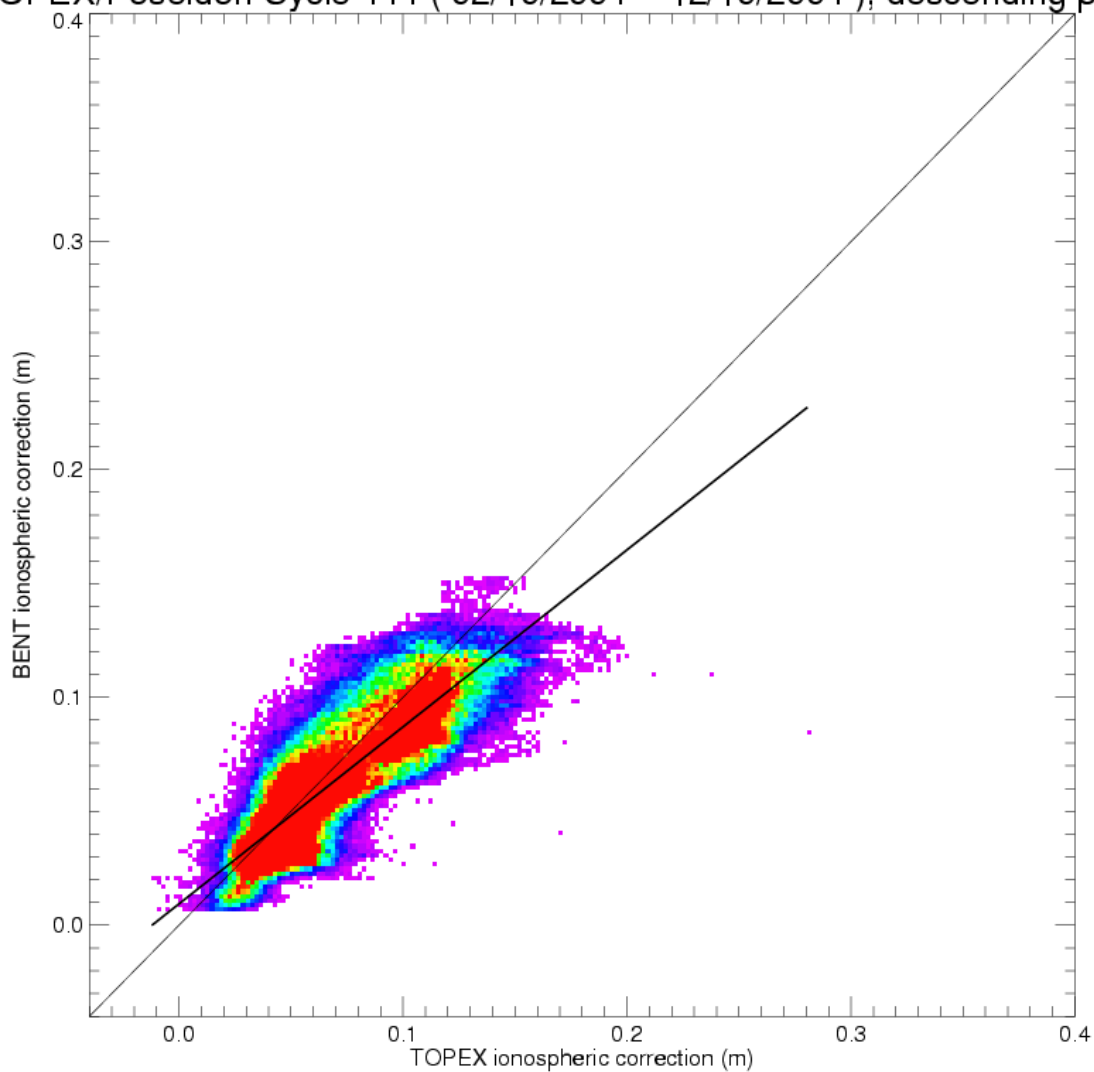
**Order 1 fit polynom**

$y = a x + b$   
 a = 0.43078575  
 b = 0.00330069

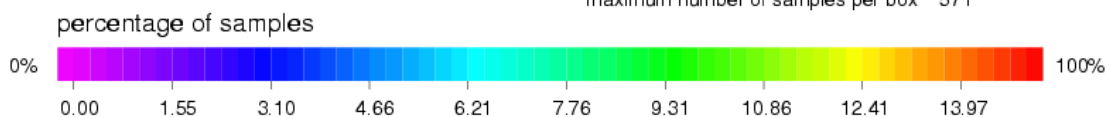
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 571



**Statistics Y-X**

mean = -0.00646  
 rms = 0.01779  
 std = 0.01657

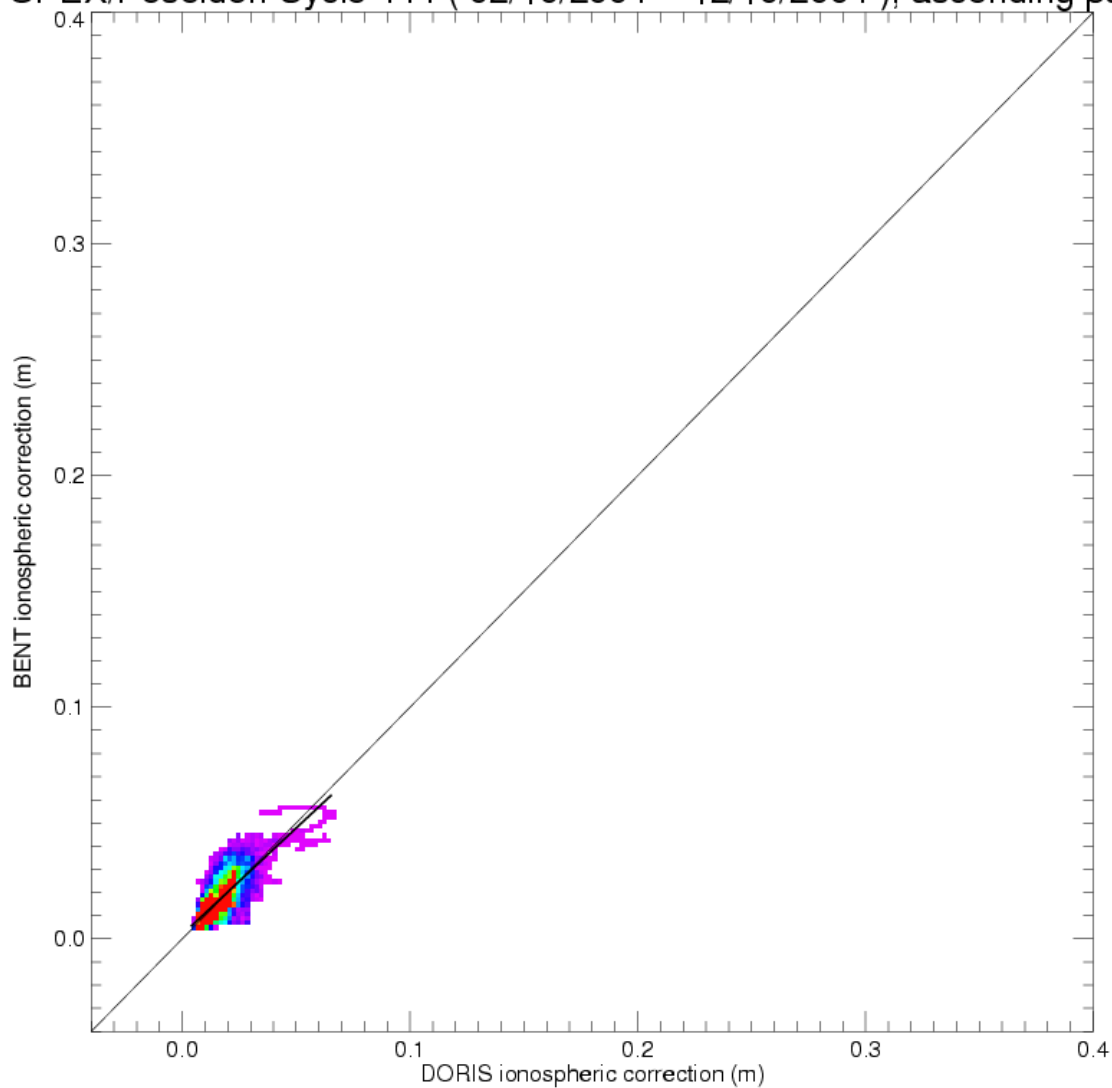
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.77688807$   
 $b = 0.00935931$

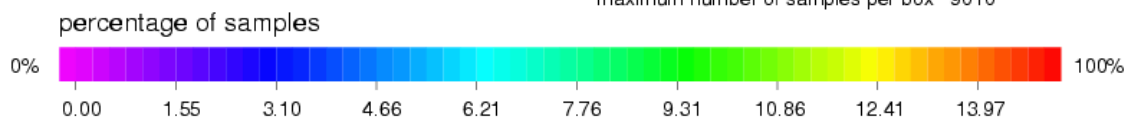
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 9010



**Statistics Y-X**

mean = 0.00064  
 rms = 0.00572  
 std = 0.00568

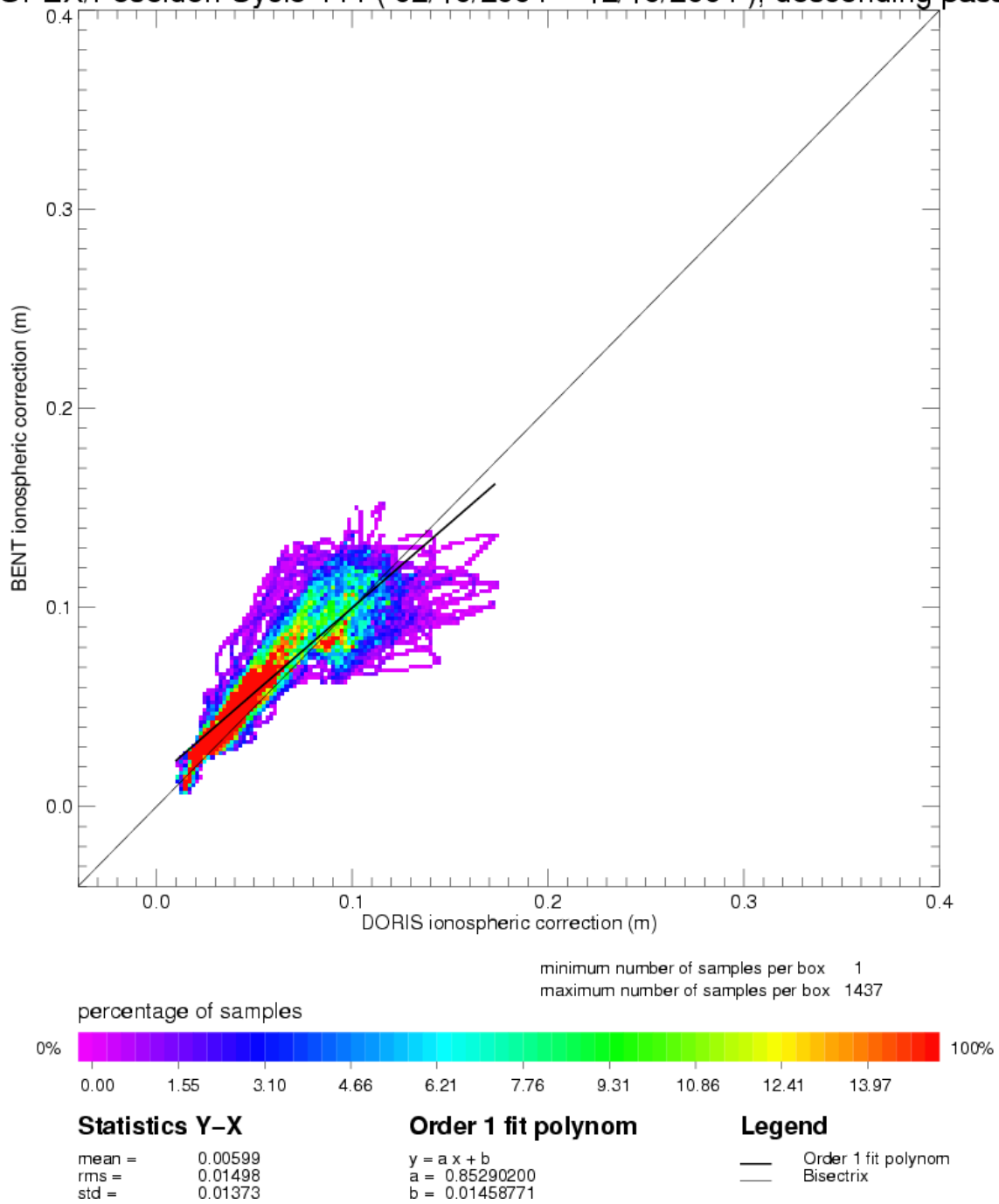
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.91954327$   
 $b = 0.00184914$

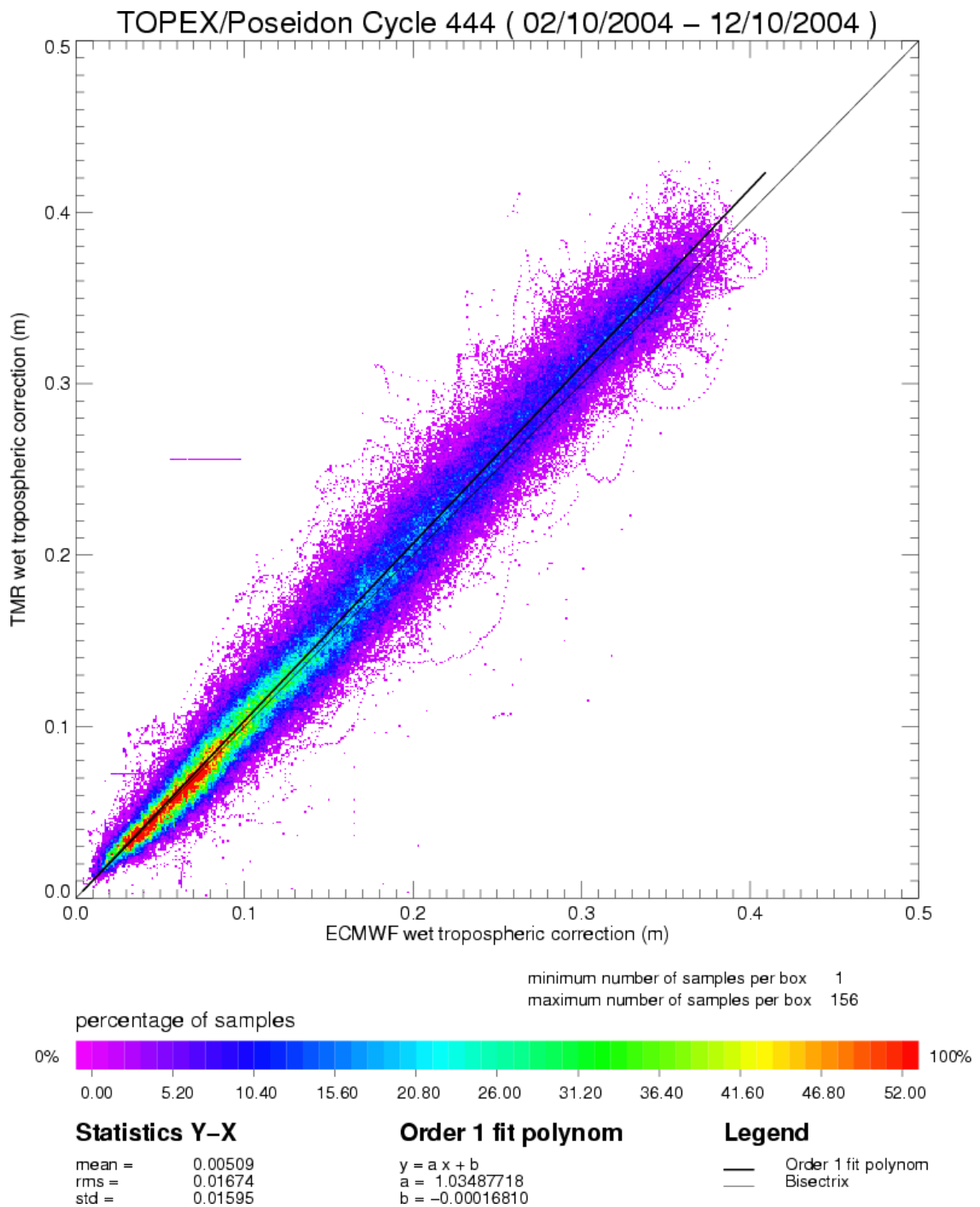
**Legend**

— Order 1 fit polynom  
 — Bisectrix

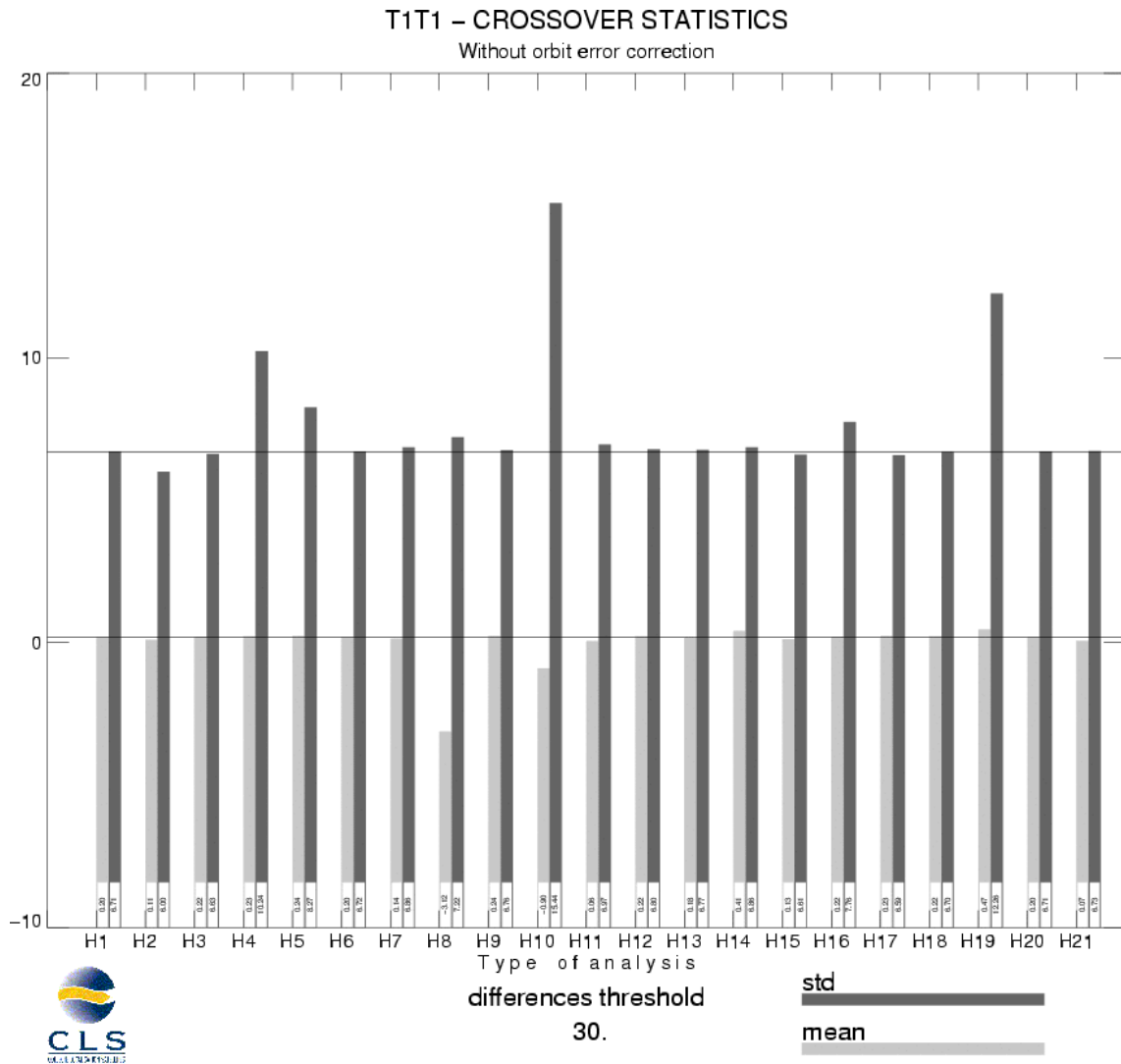
TOPEX/Poseidon Cycle 444 ( 02/10/2004 – 12/10/2004 ), descending passes



### 3.6 Wet tropospheric corection



### 3.7 Crossover statistics



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

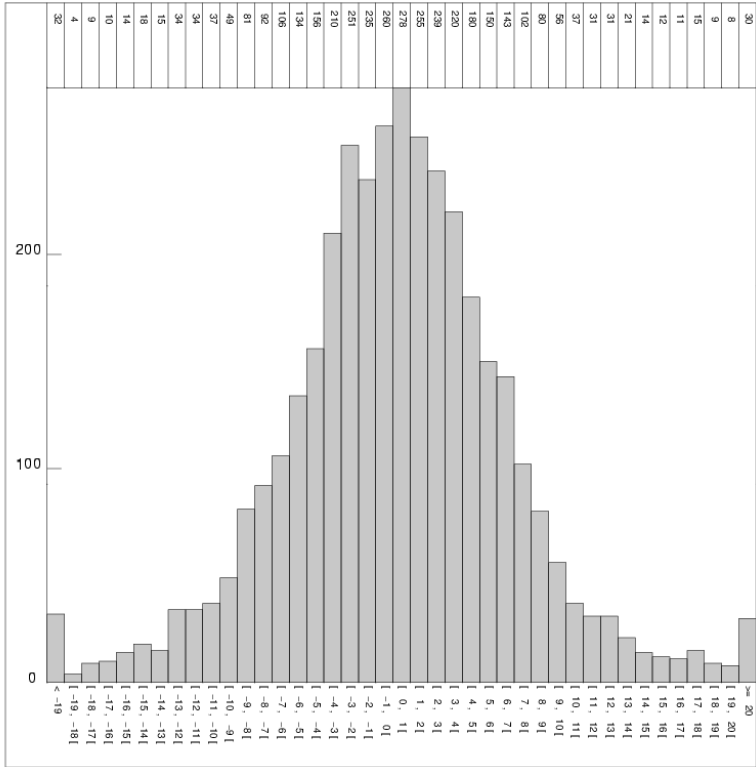
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.6900  
 Valeur maximale : 29.5200  
 Différence Max – Min: 59.2100  
 Nombre de points lus: 3791  
 Nombre de points sélectionnés: 3699  
 Moyenne : 0.201706  
 Écart-type : 6.71428  
 Moyenne Quadratique : 6.71731

CLS Space Oceanography Division



### T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

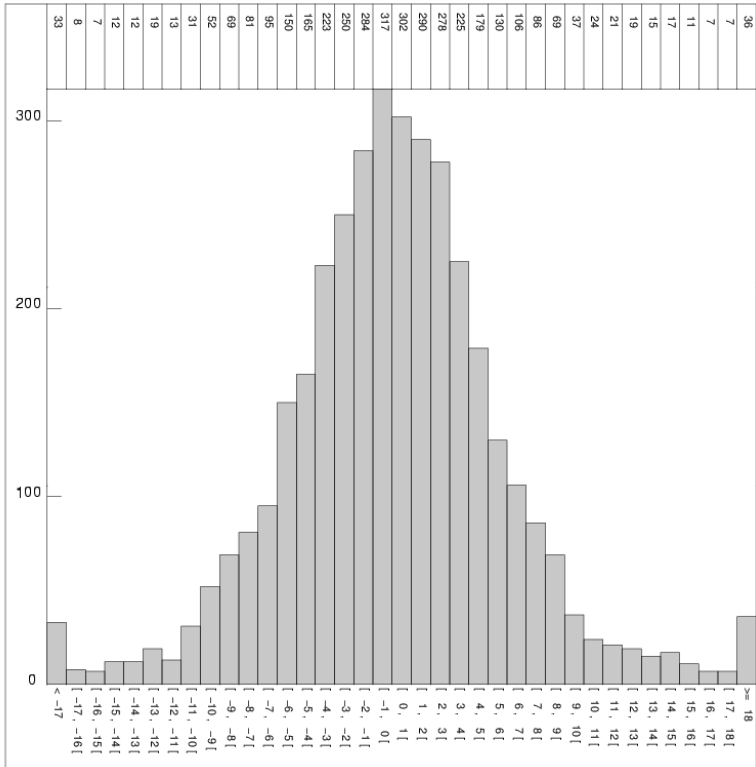
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -28.6500  
 Valeur maximale : 29.8600  
 Différence Max – Min: 58.5100  
 Nombre de points lus: 3791  
 Nombre de points sélectionnés: 3677  
 Moyenne : 0.105698  
 Écart-type : 6.00488  
 Moyenne Quadratique : 6.00581

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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**

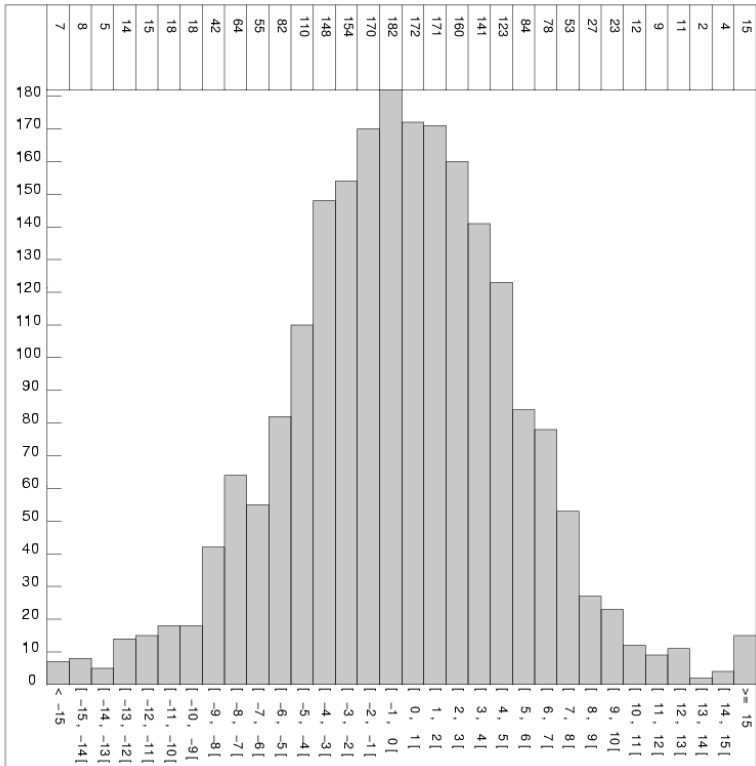
**RAPPEL DES SELECTIONS**

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 : -27.0200  
 Valeur maximale : 34.4800  
 Différence Max – Min: 61.5000  
 Nombre de points lus: 2383  
 Nombre de points selectionnes: 2177  
 Moyenne : -0.0391640  
 Ecart-type : 5.21789  
 Moyenne Quadratique : 5.21803

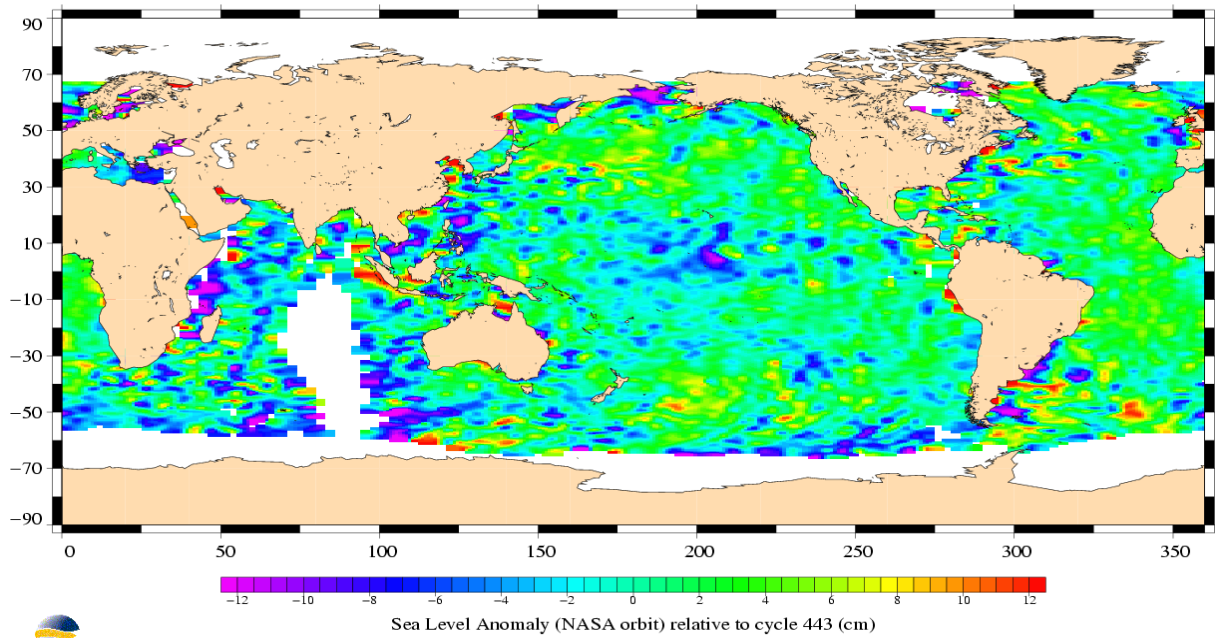
*CLS Space Oceanography Division*



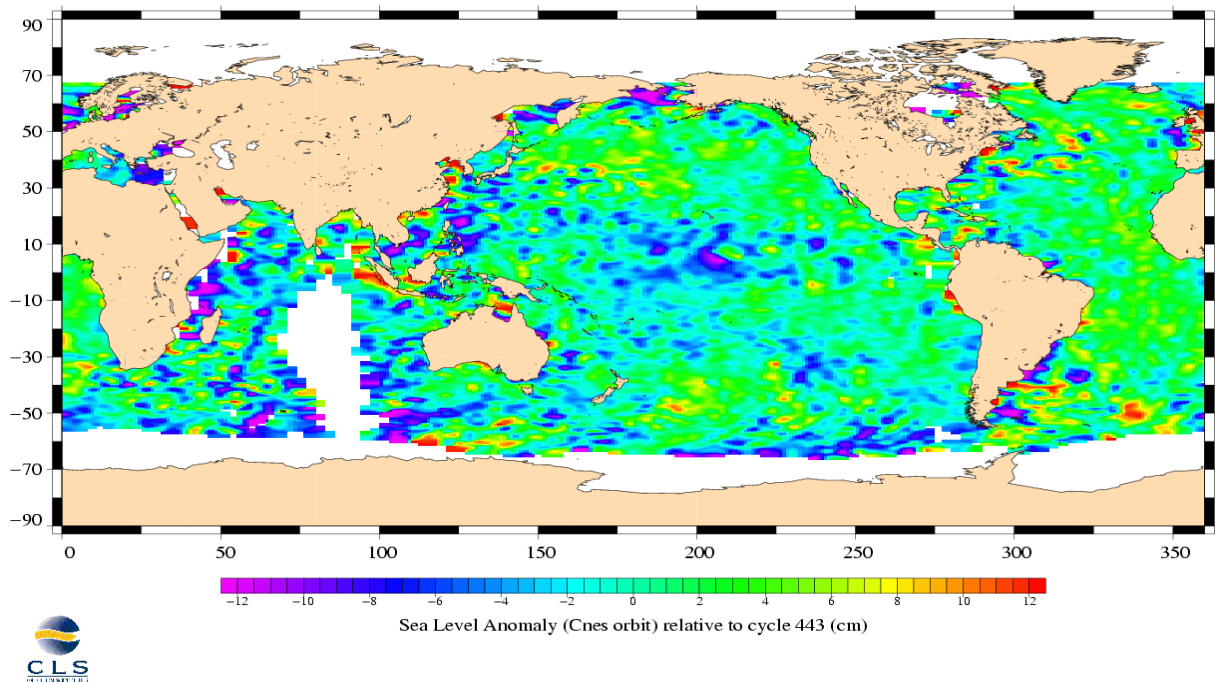
### 3.8 SSH variability

#### 3.8.1 Sea Level Anomaly

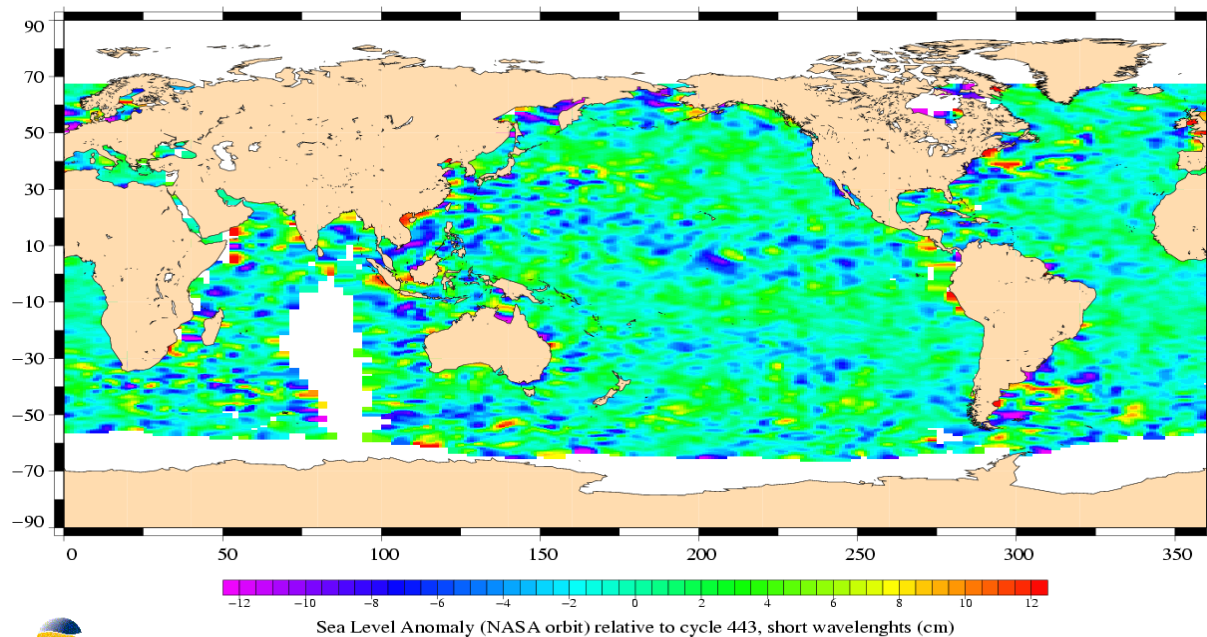
TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004



TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004



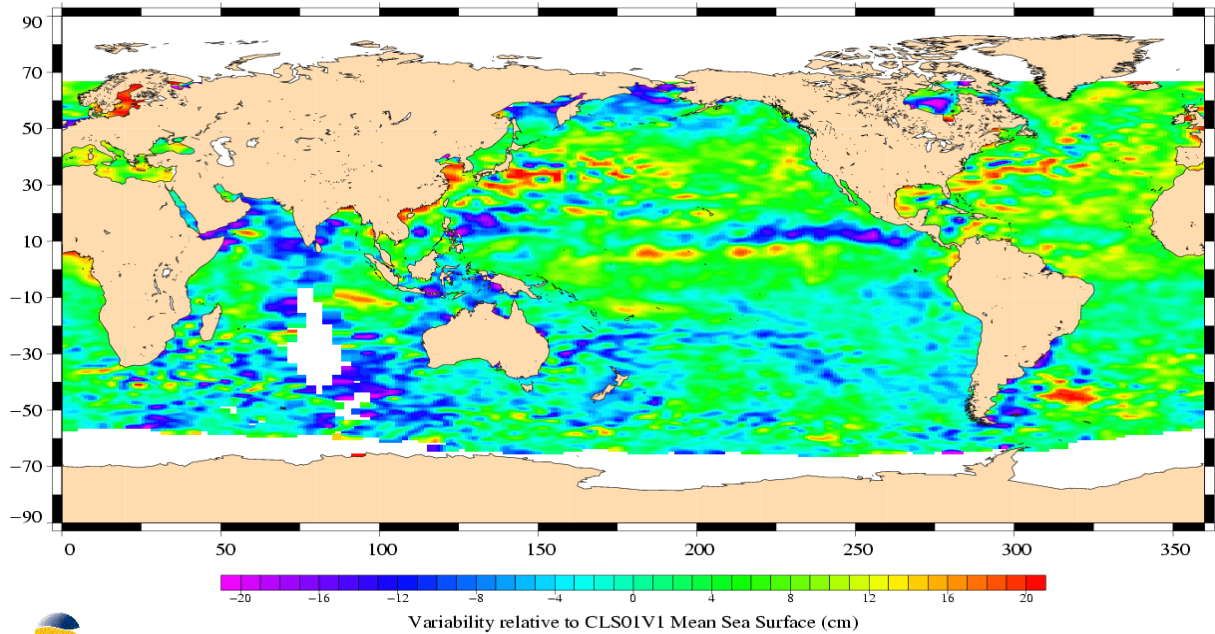
TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004



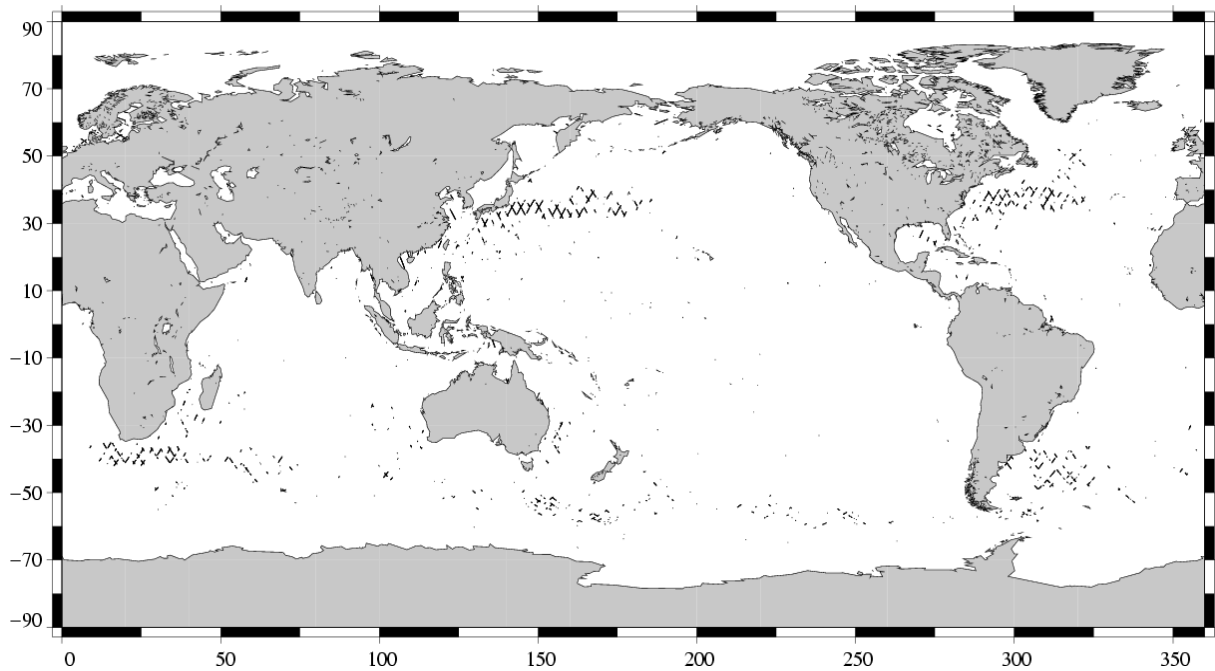
### 3.8.2 Comparison to a precise Mean Sea Surface

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 444  
Period : 02/10/2004 – 12/10/2004

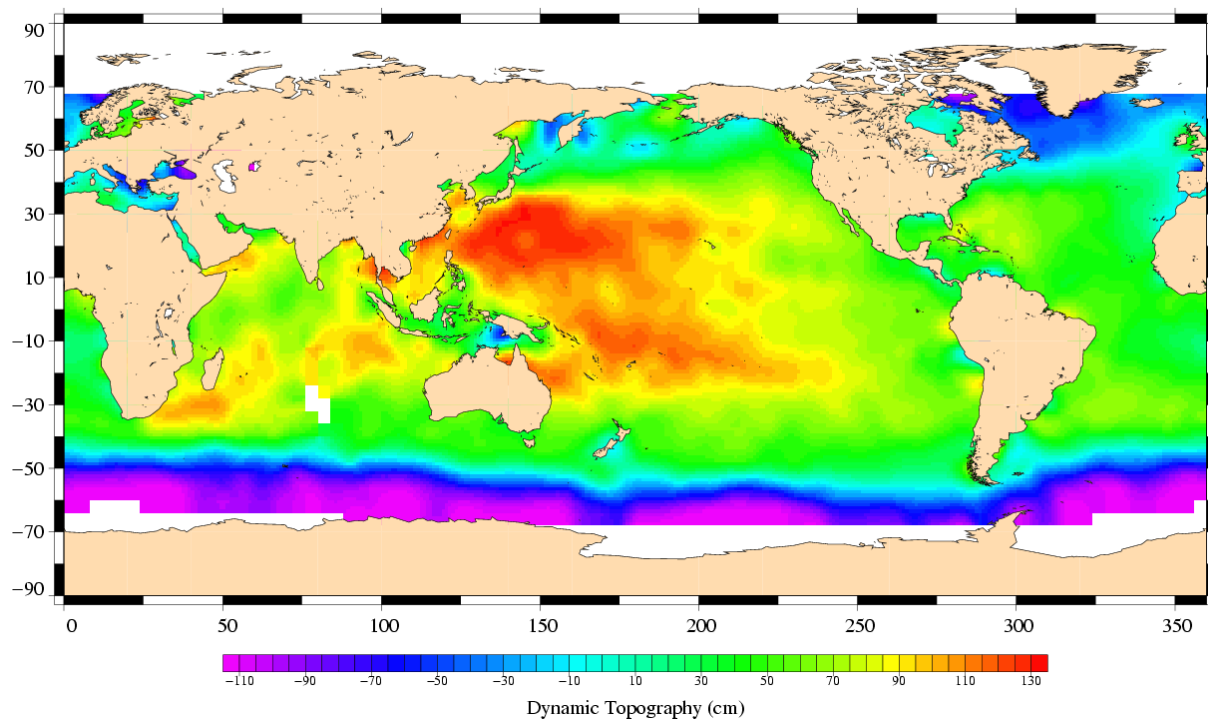


(SSH - MSS) differences greater than 0.3 m  
TOPEX/Poseidon Cycle 444 (02/10/2004 / 12/10/2004)



### 3.9 Dynamic topography

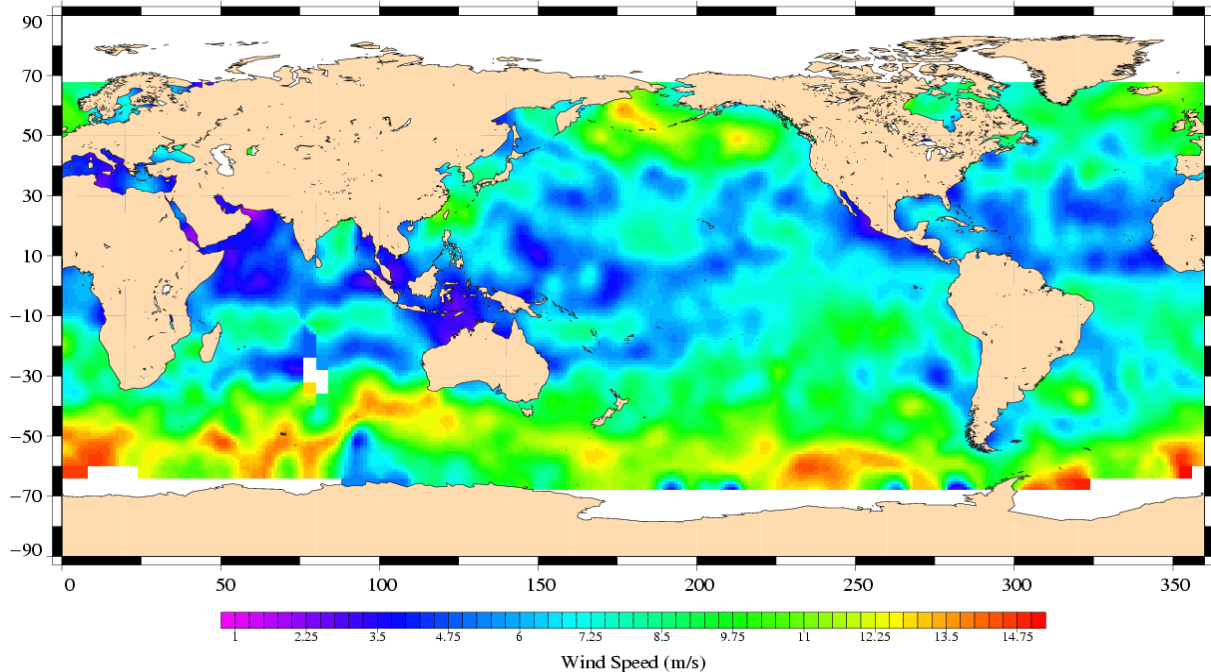
TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004



### 3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004



TOPEX/Poseidon, cycle 444  
Period : 02/10/2004 – 12/10/2004

