



# TOPEX/Poseidon MGRD Quality Assessment Report

Cycle 451

11-12-2004 / 21-12-2004

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SALP-RP-P2-EX-21120-CLS451

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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 is nominal.

For this cycle, the crossover standard deviation is 6.46 cm rms. When using a selection to remove shallow waters (1000 m), areas of high ocean variability and high latitudes ( $> |50|$  deg.) it decreases down to 6.05 cm rms.

The standard deviation of Sea Level Anomalies (SLA) relative to a 7-year Mean Sea Surface is 11.49 cm. When using a selection to remove shallow waters (1000 m), areas of high ocean variability and high latitudes ( $> |50|$  deg), it lowers to 9.62 cm .

### 2.2 Missing measurements

Passes 169-195 are missing, 196-254 not disseminated because of poor data quality during this period.

### 2.3 Warnings and recommendations

- Missing measurements :
  - Since October 08th all mission data recovery requirements have been 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.
  - The satellite experienced a pitch reaction wheel halt on 17, December, resulting in loss of Earth-Pointing. After several attempts pitch wheel operation was finally restored and the Satellite was commanded back to the Fine Pointing Normal Mission Mode on 21,December.  
Therefore passes 169-195 are missing, and all measurements of passes 196 to 254 are removed by the quality flags.  
Thus only passes 1 to 168 will be disseminated to the scientific community.
- Doris switch off :  
The DORIS instrument was switched off since the incident on 01, November 2004. All the POE requirements are now met using lasernet tracking data. Only bent ionospheric correction is available.
- 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 :
  - 7.09% of the measurements are removed by the TMR correction criterion.
  - 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](#)) .

### 3 CALVAL main results

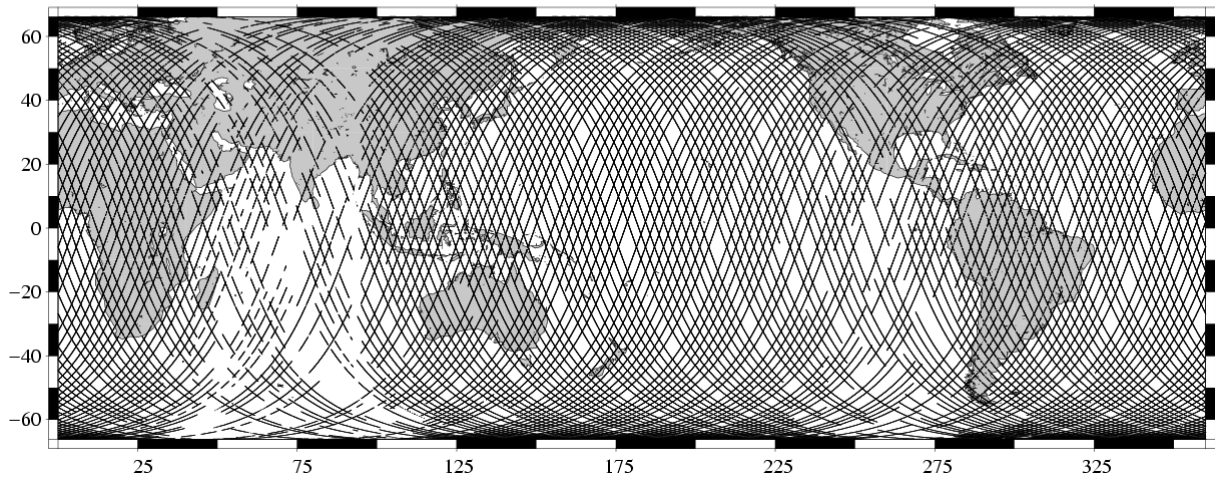
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

#### 3.1 Missing measurements

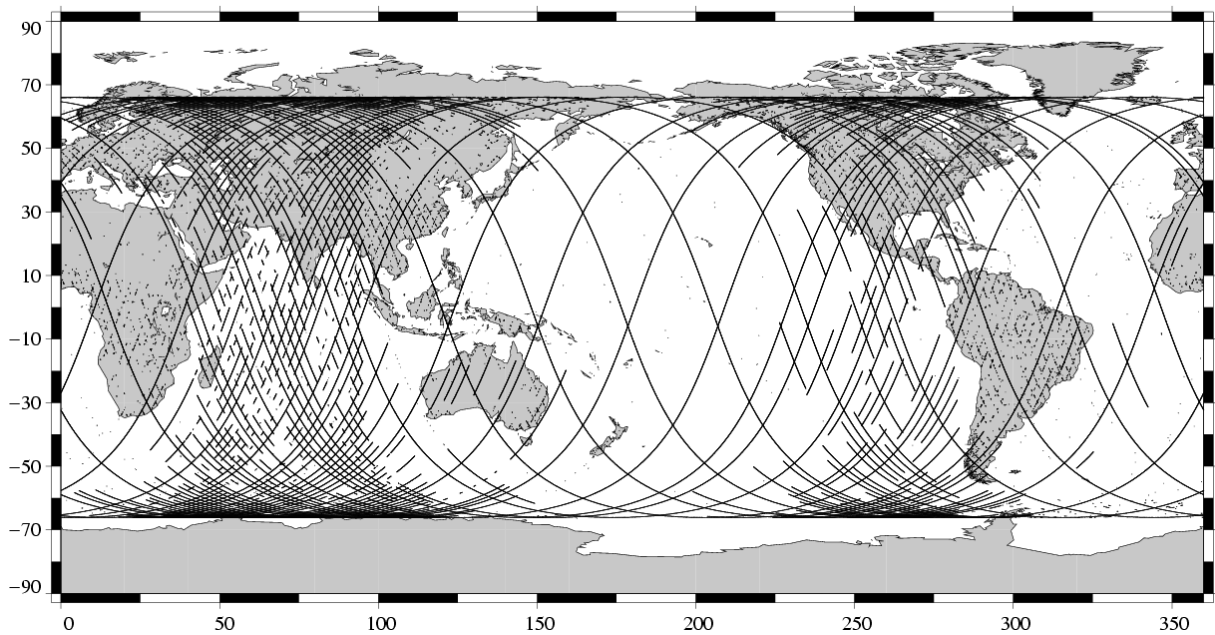
558583 altimeter measurements are present, and 236087 are missing.

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 451 (11/12/2004 / 21/12/2004)



Missing measurements  
TOPEX/Poseidon Cycle 451 (11/12/2004 / 21/12/2004)



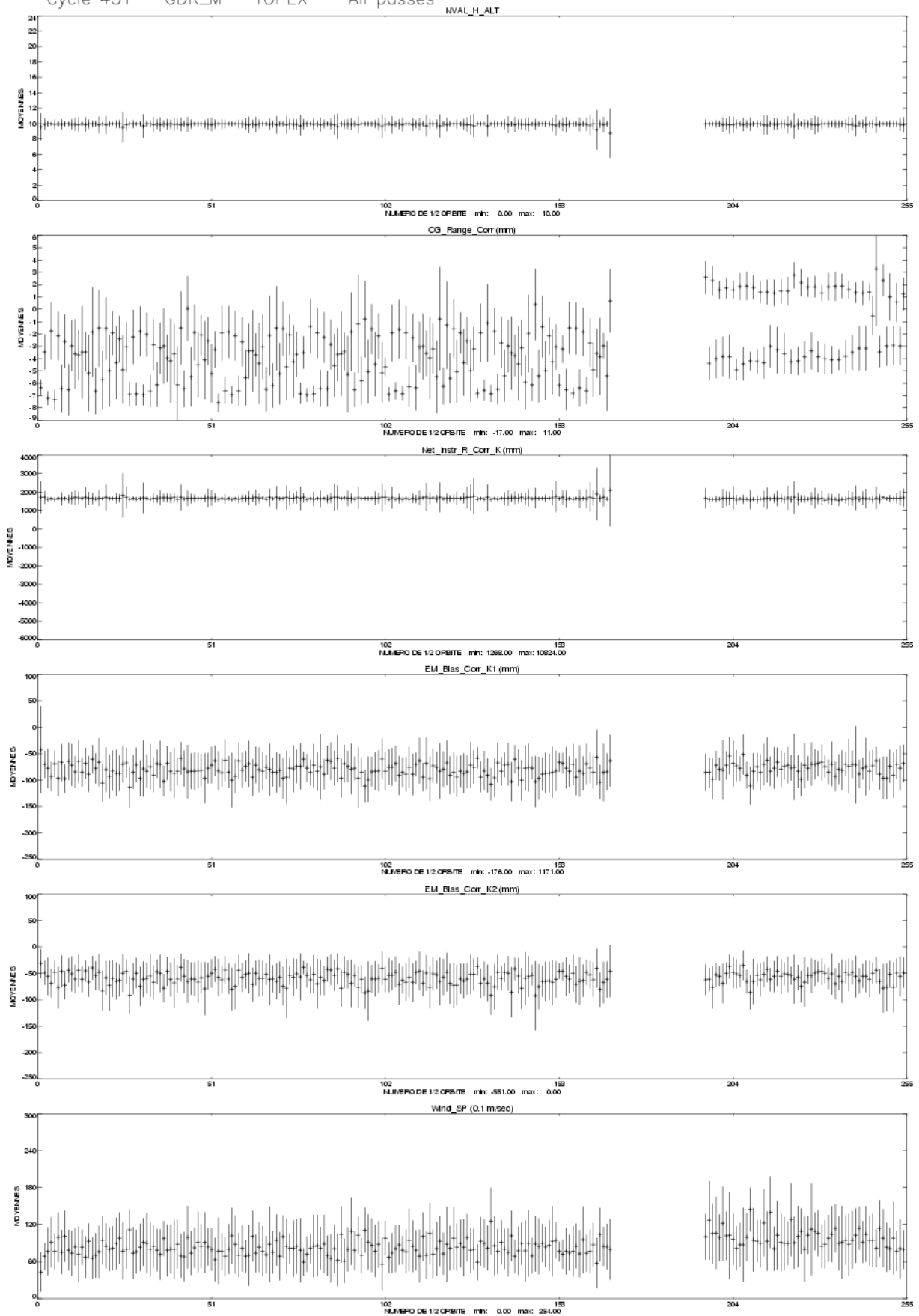
### 3.2 M-GDR quality flags

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

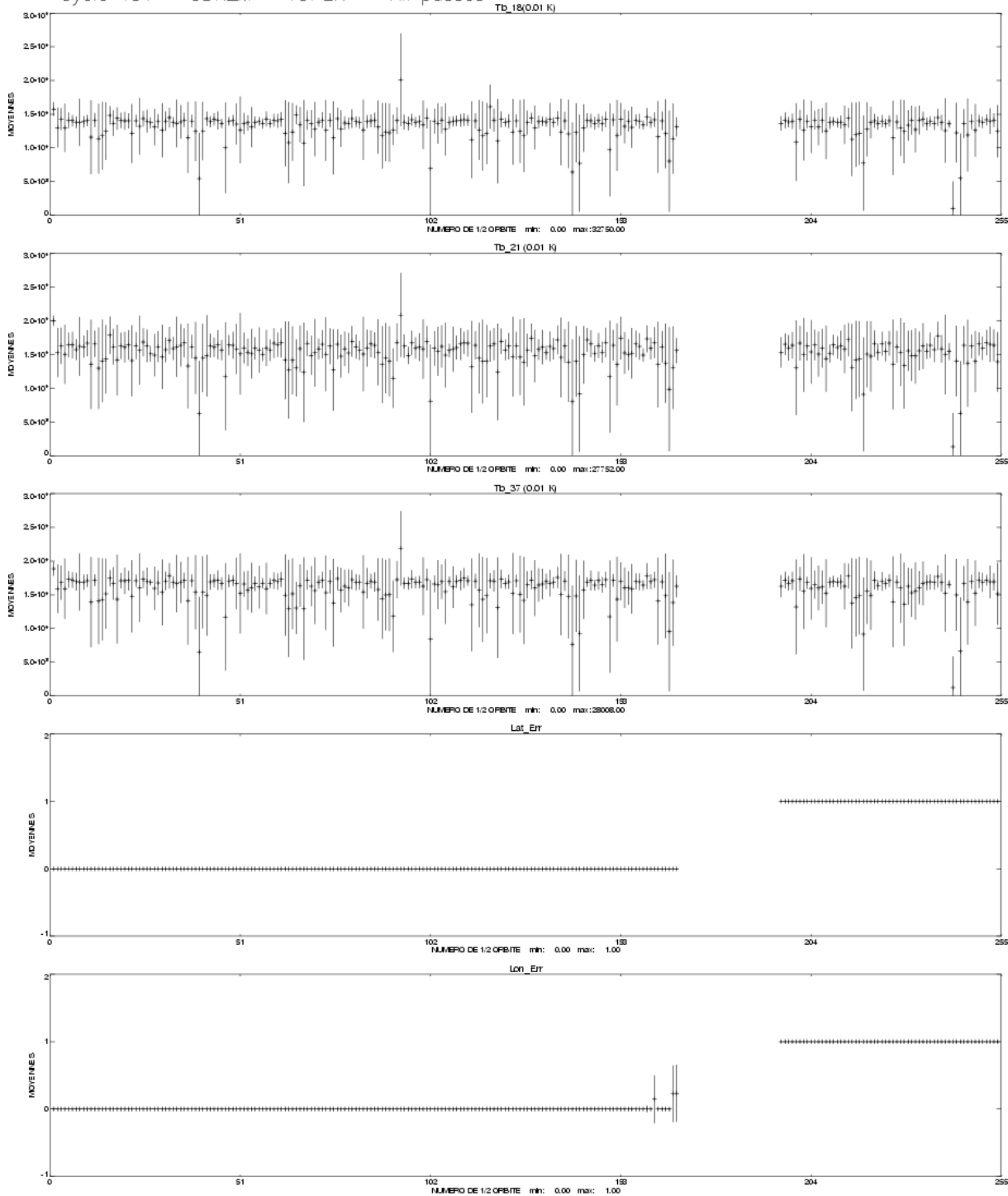
Name	Description	% bad
Geo_Bad_1	altimeter land flag	25.47
Geo_Bad_1	ice flag	5.57
Geo_Bad_1	radiometer land flag	26.51
Alt_Bad_1	conditions 1 altimeter	26.11
Alt_Bad_2	conditions 2 altimeter	5.91
Geo_Bad_2	rain (liquid water in excess)	10.03
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.37
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.63
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	11.52
DORIS	DORIS not valid	0.00

### 3.3 M-GDR parameter plots

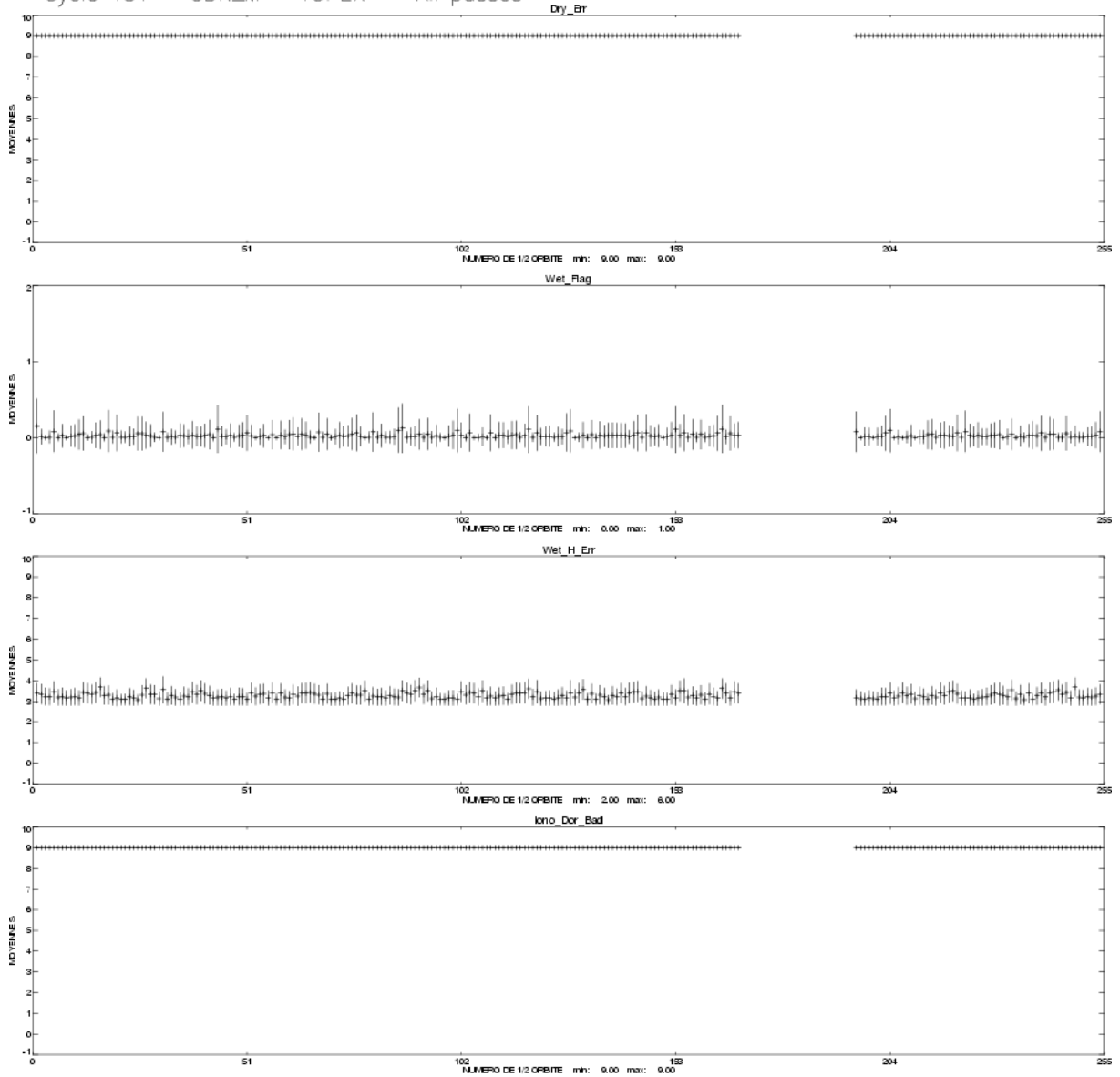
Cycle 451 – GDR\_M – TOPEX – All passes –



Cycle 451 – GDR\_M – TOPEX – All passes –

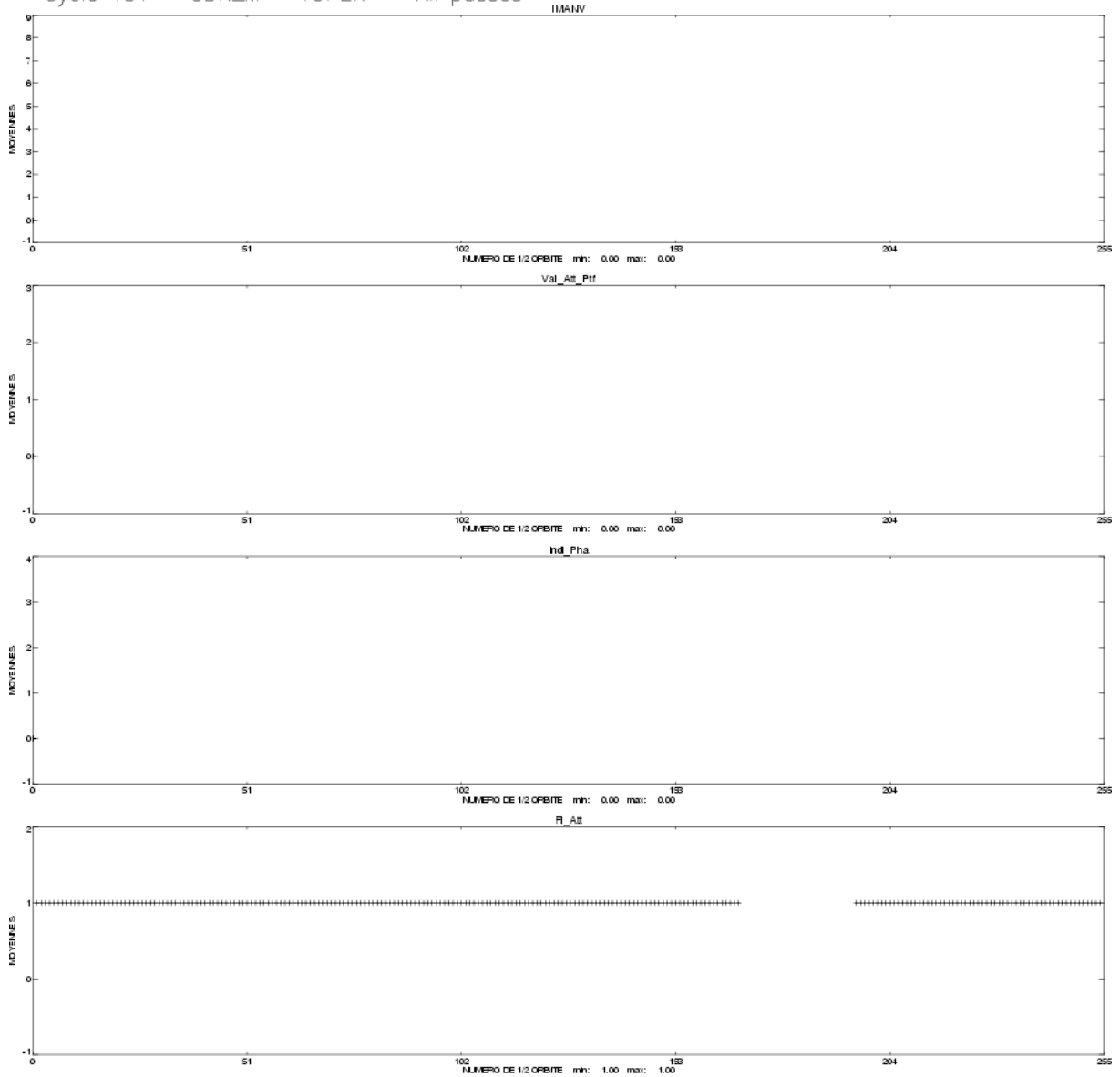


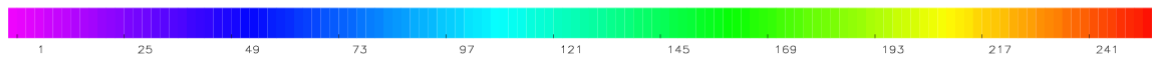
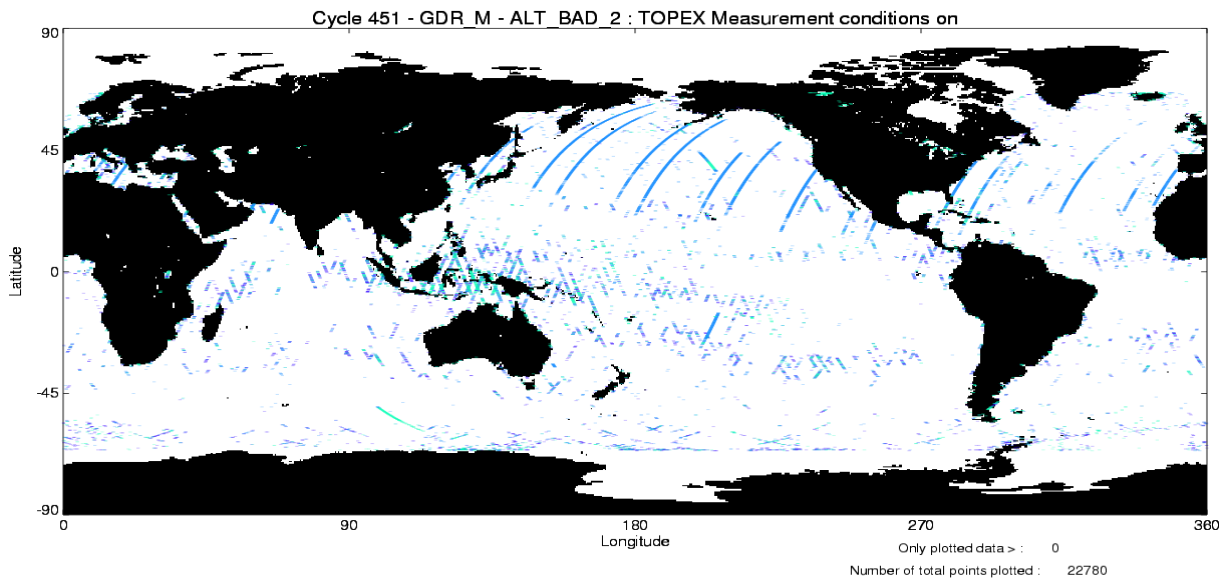
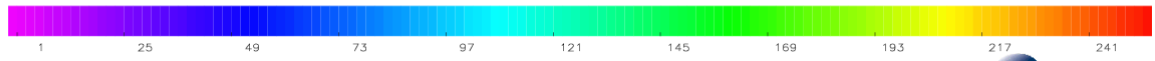
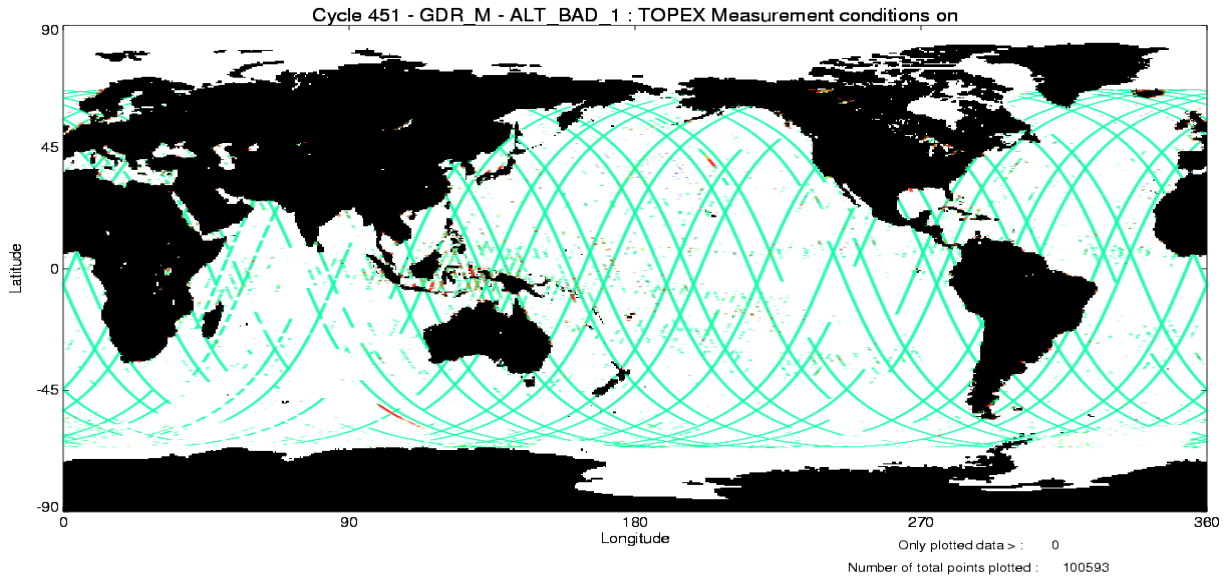
Cycle 451 – GDR\_M – TOPEX – All passes –

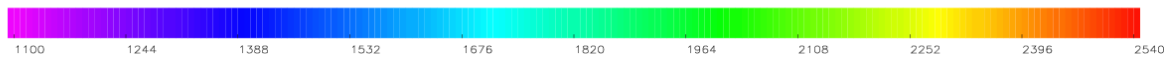
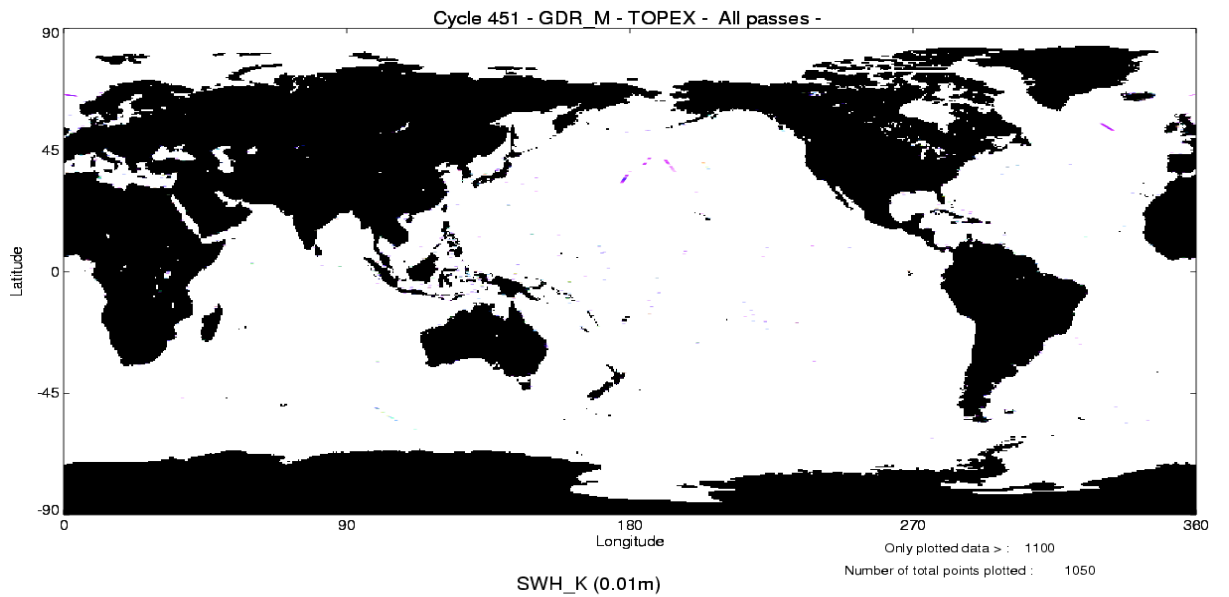
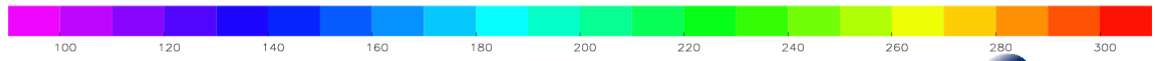
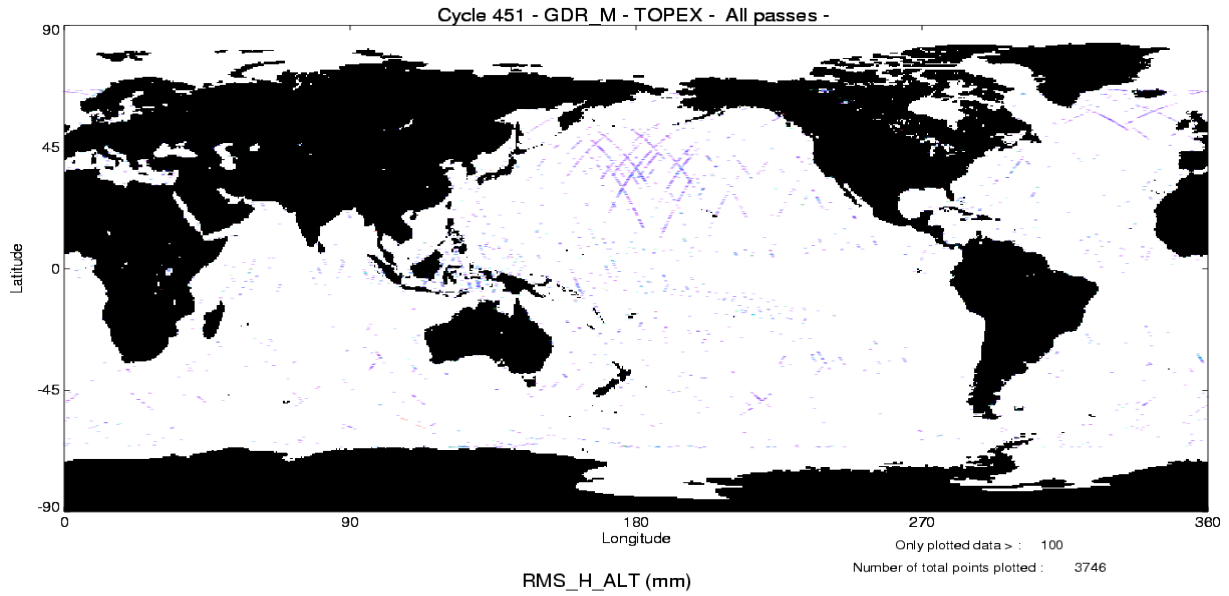


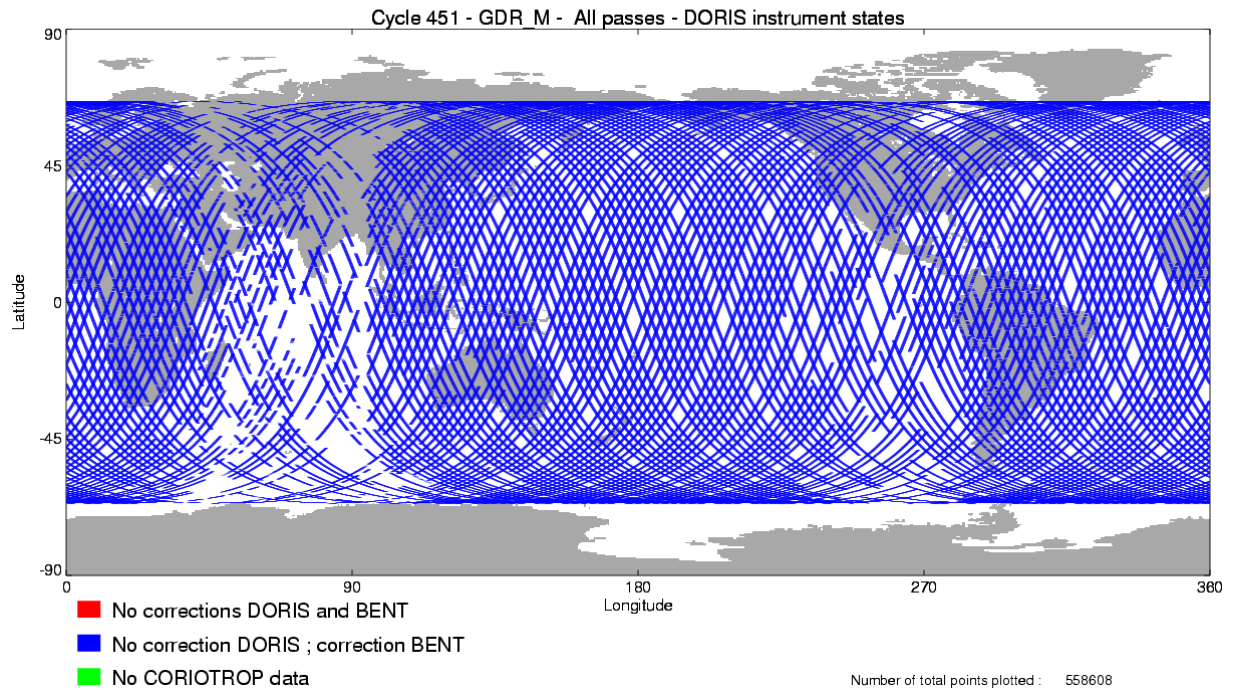


Cycle 451 – GDR\_M – TOPEX – All passes –









### 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.

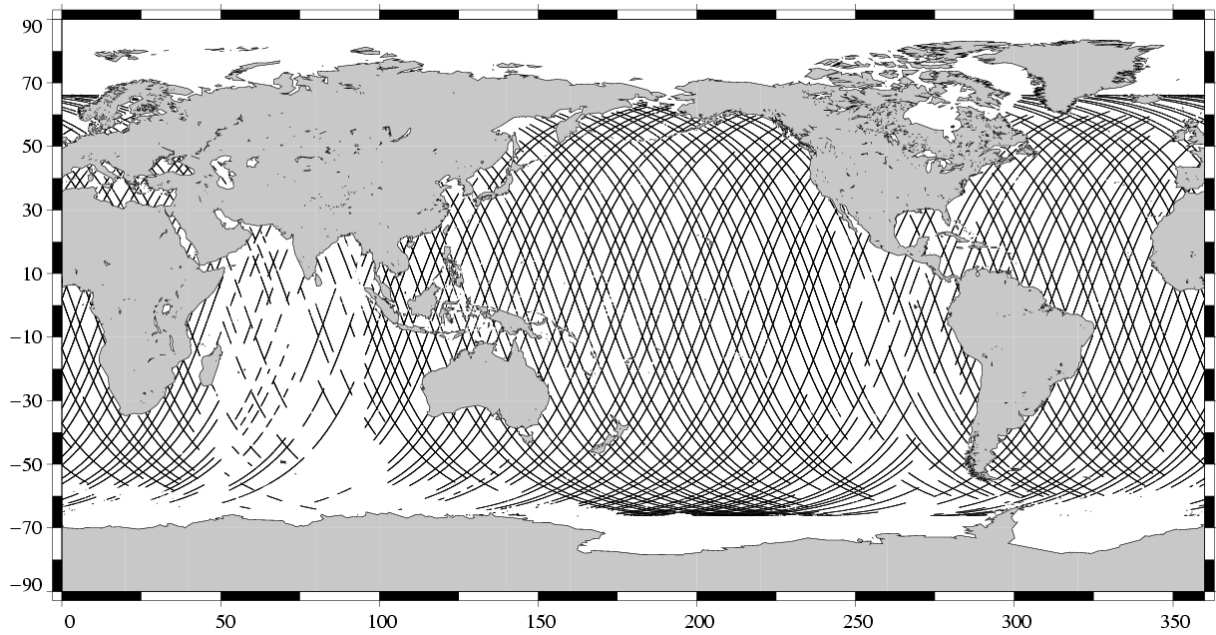
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (26.51 % of points removed) and ice flag ( 5.57 % of points removed).

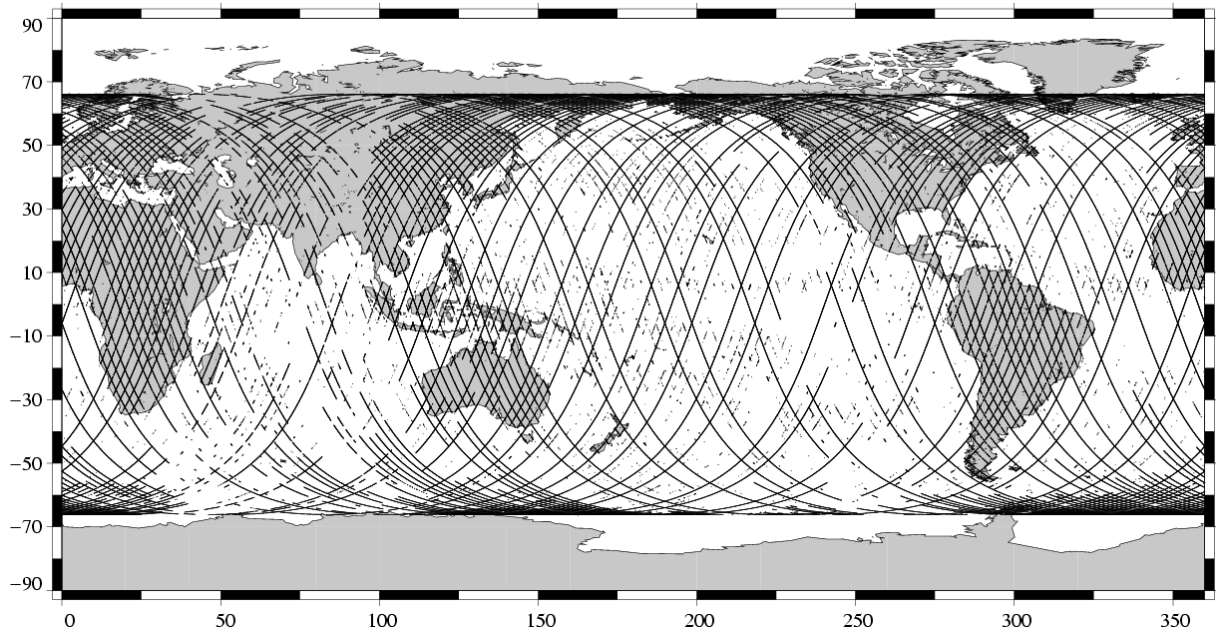
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	26.84
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	0.30
Std. deviation of range	0.000	0.100	m	1.85	1.08
Off nadir angle from waveform	0.000	0.400	deg	1.36	9.08
Dry tropospheric 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	7.09
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	0.32
Significant wave height	0.000	11.000	m	1.46	0.16
Sea state Bias	-0.500	0.000	m	1.39	0.98
Backscatter coefficient	7.000	30.000	dB	1.44	1.75
Ocean tide height	-5.000	5.000	m	0.01	0.14
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	0.48
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.

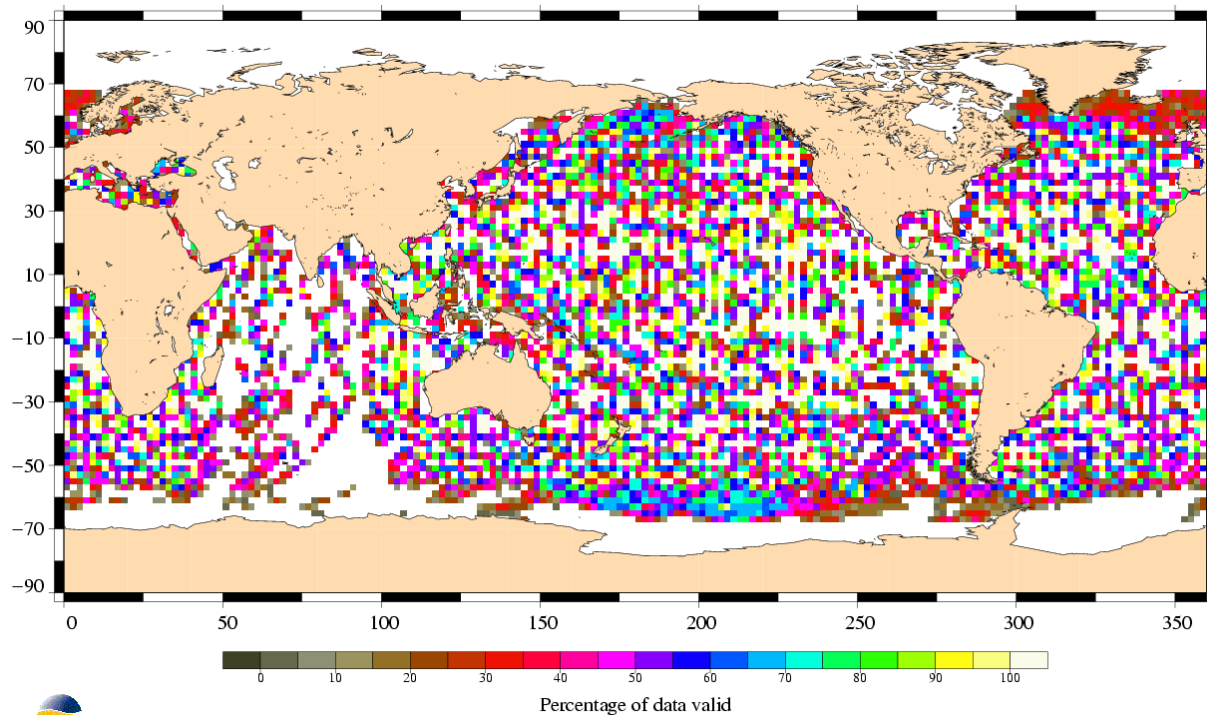
Valid data  
TOPEX/Poseidon Cycle 451 (11/12/2004 / 21/12/2004)



Edited measurements  
TOPEX Cycle 451 (11/12/2004 / 21/12/2004)

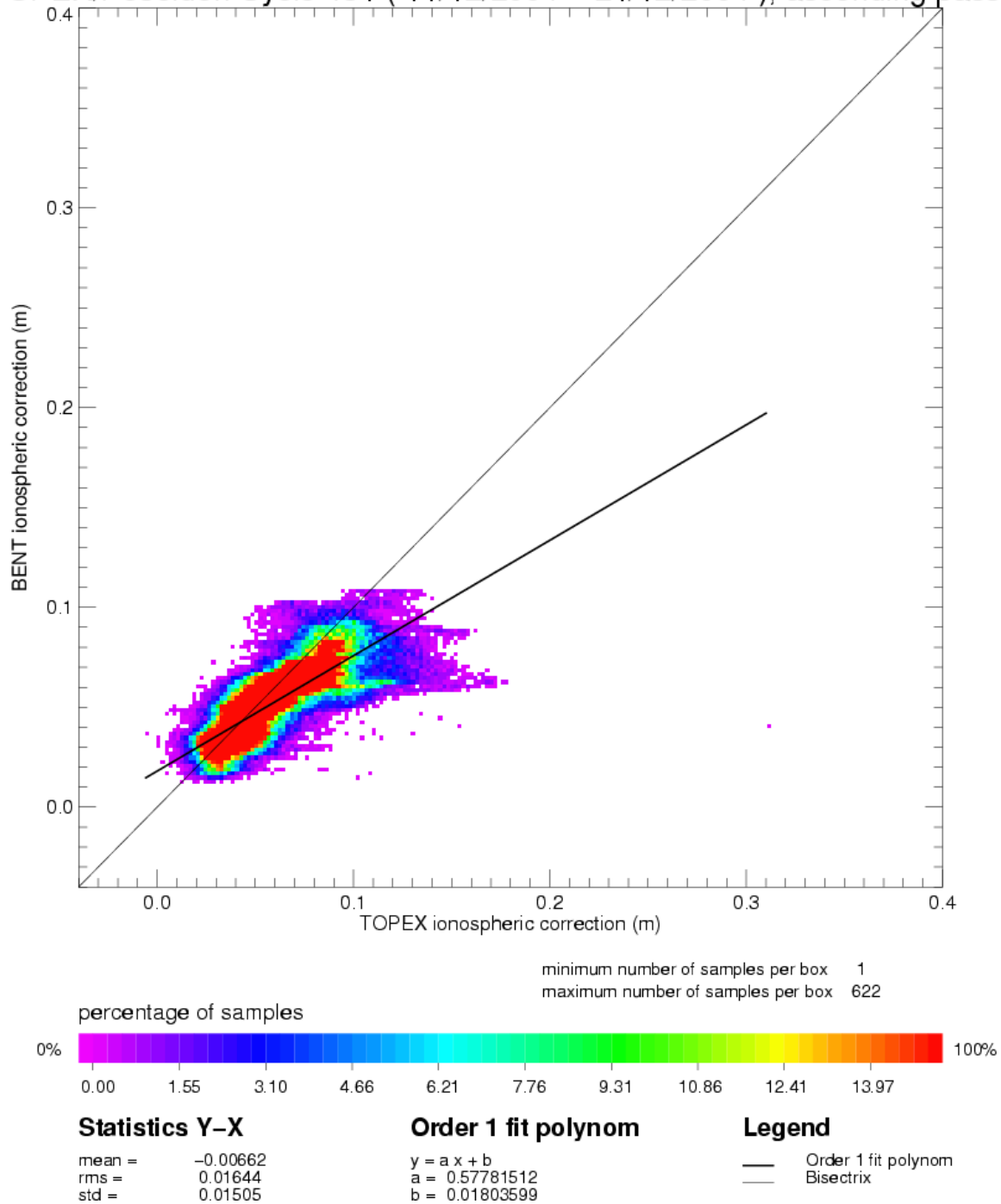


Percentage of valid data relative to the nominal pass  
TOPEX/Poseidon Cycle 451 (11/12/2004 / 21/12/2004)



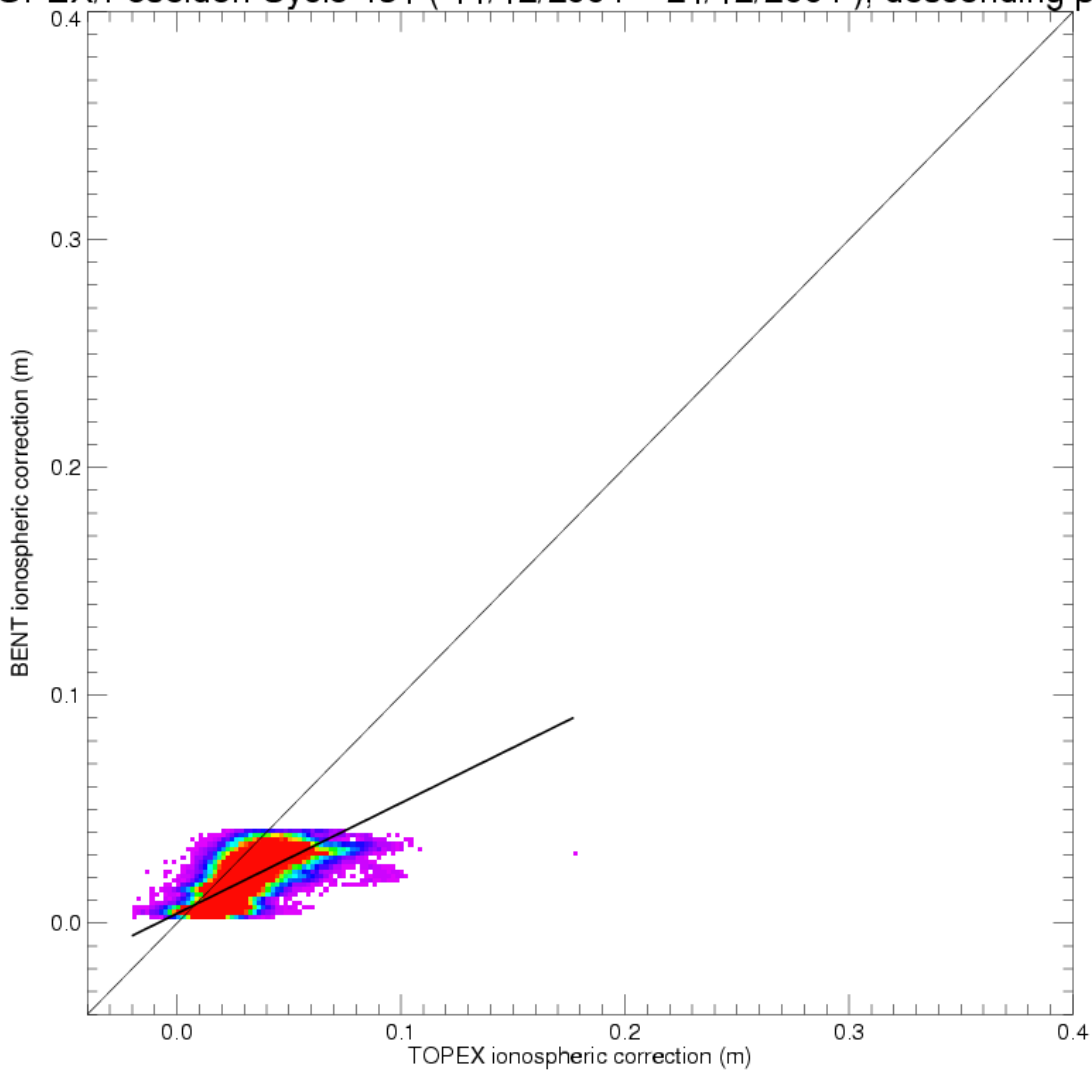
### 3.5 Ionospheric correction

TOPEX/Poseidon Cycle 451 ( 11/12/2004 – 21/12/2004 ), ascending passes

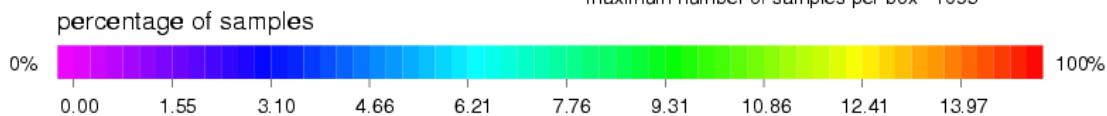




TOPEX/Poseidon Cycle 451 ( 11/12/2004 – 21/12/2004 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 1095



**Statistics Y-X**

mean = -0.01123  
 rms = 0.01553  
 std = 0.01072

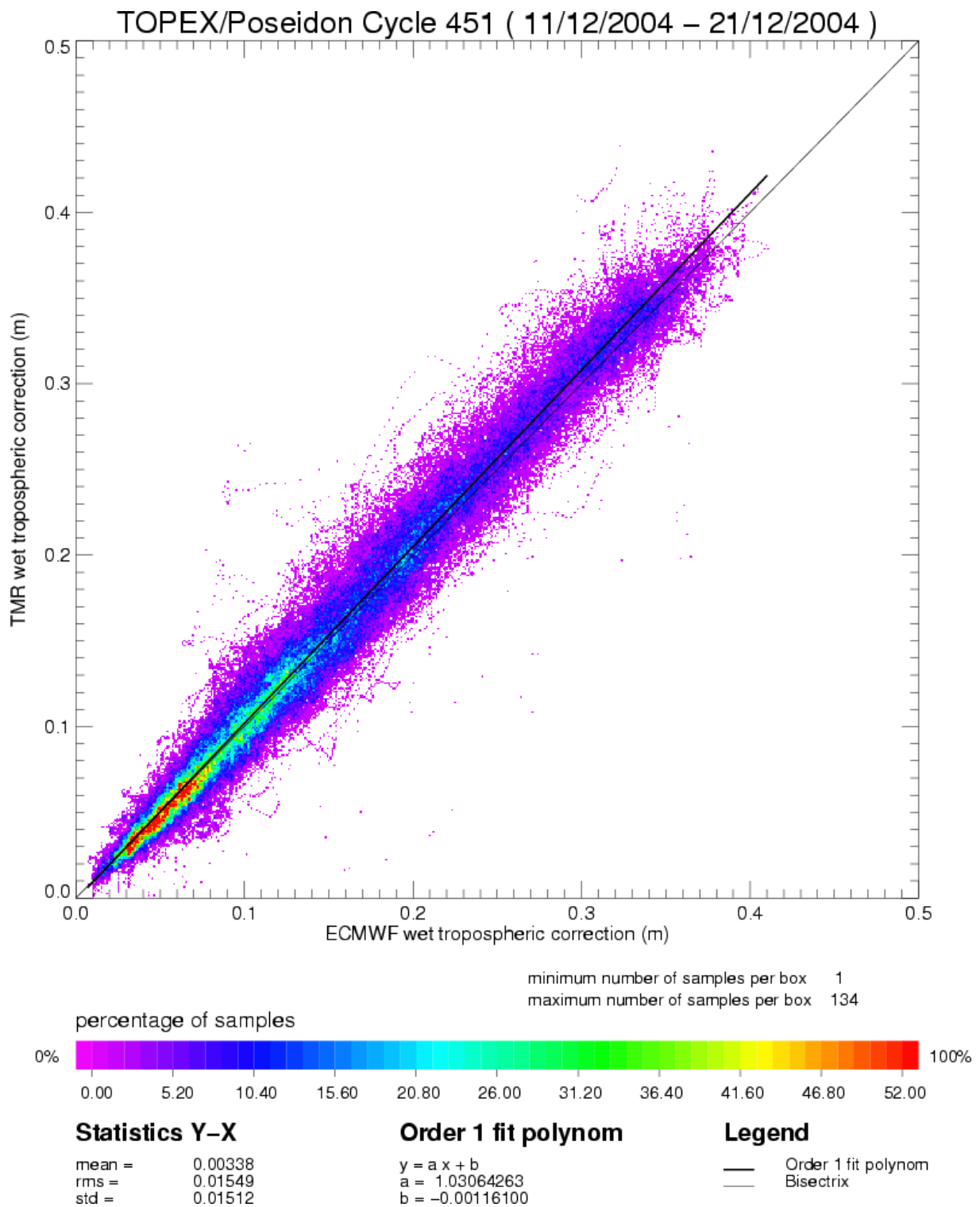
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.48567030$   
 $b = 0.00422750$

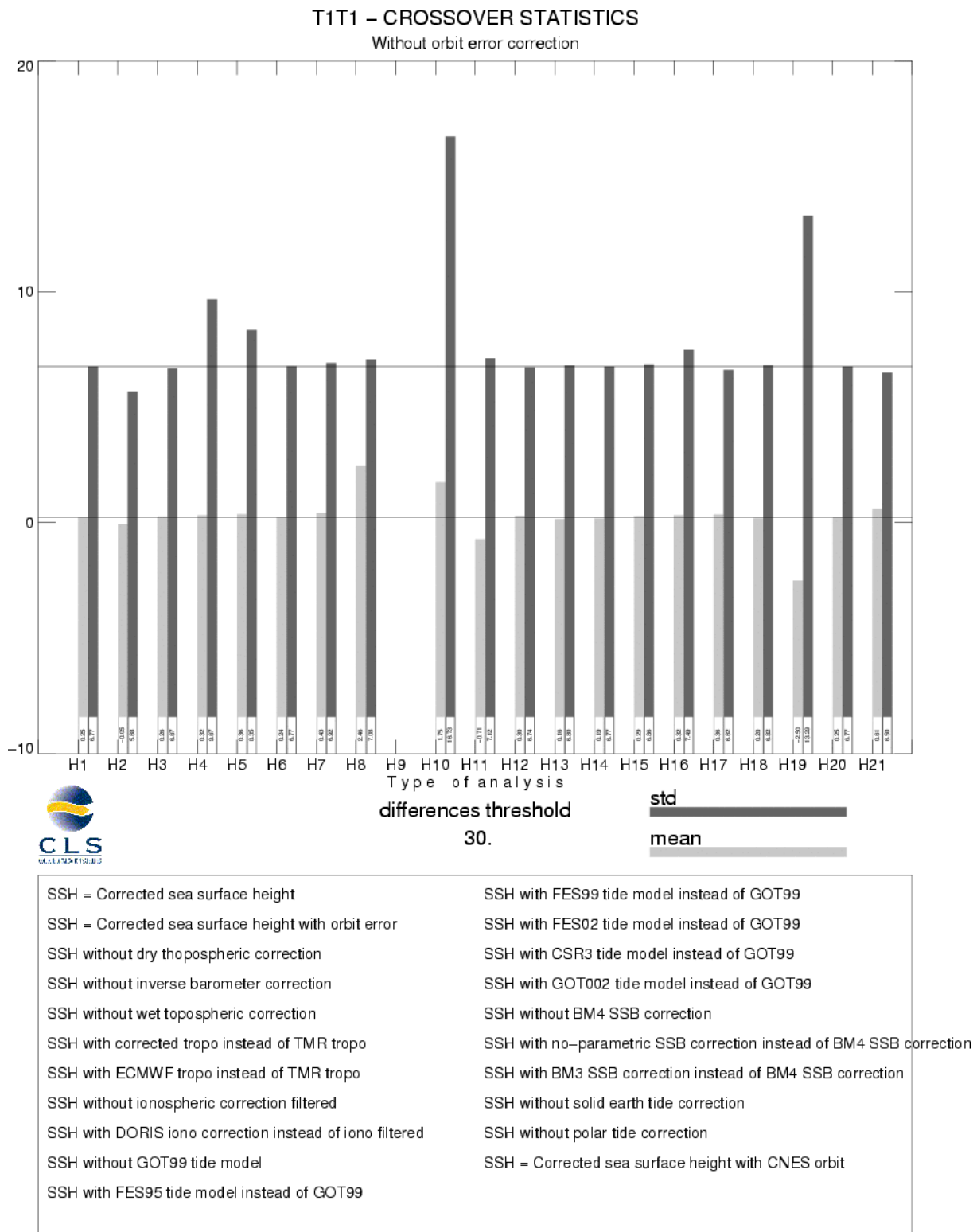
**Legend**

— 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

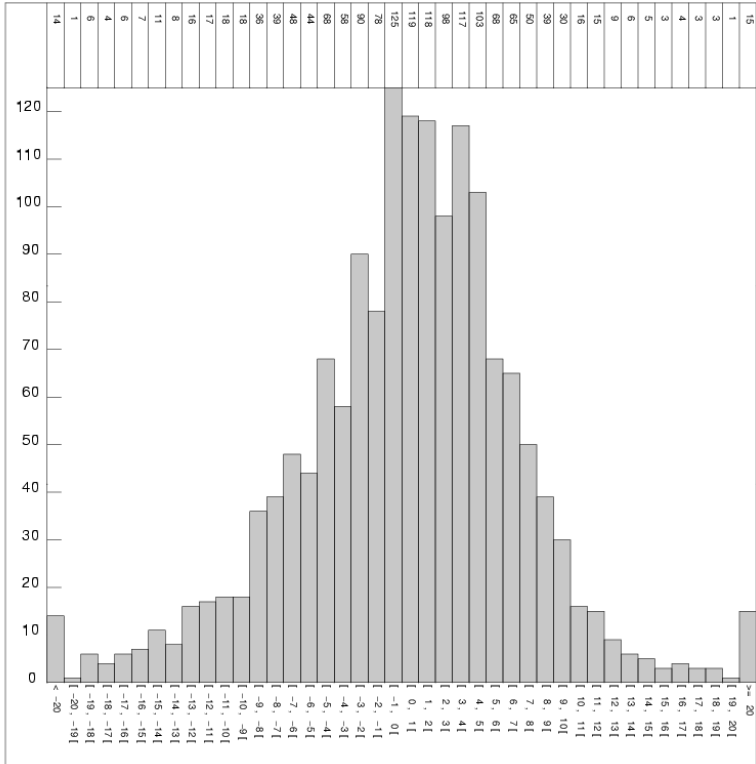
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.4400  
 Valeur maximale : 27.3900  
 Différence Max – Min: 56.8300  
 Nombre de points lus: 1631  
 Nombre de points sélectionnés: 1594  
 Moyenne : 0.246343  
 Écart-type : 6.76850  
 Moyenne Quadratique : 6.77298

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### T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

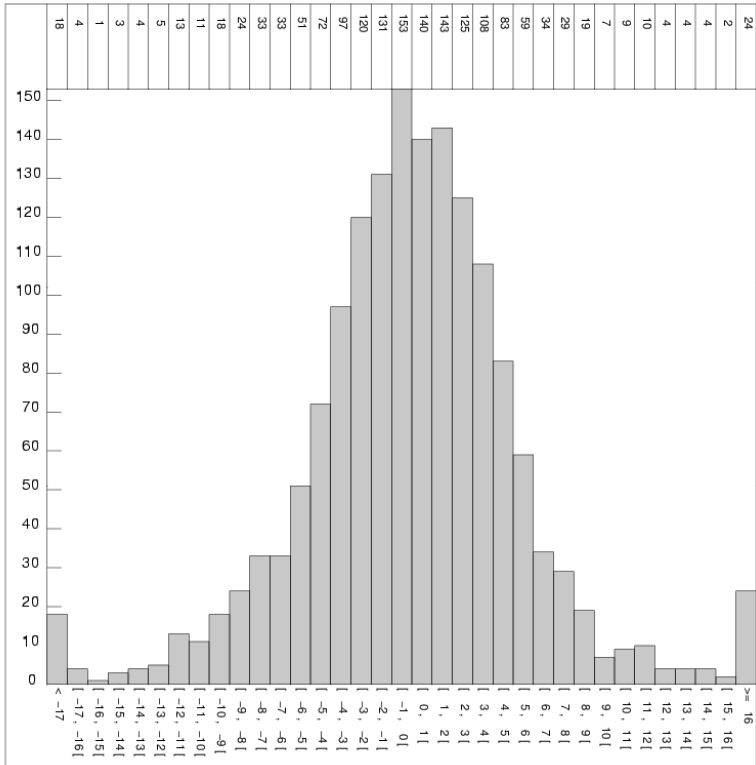
Type de points de croisement: T1T1  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -28.5700  
 Valeur maximale : 28.2500  
 Différence Max – Min: 56.8200  
 Nombre de points lus: 1631  
 Nombre de points sélectionnés: 1592  
 Moyenne : -0.0542462  
 Écart-type : 5.68275  
 Moyenne Quadratique : 5.68301

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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**

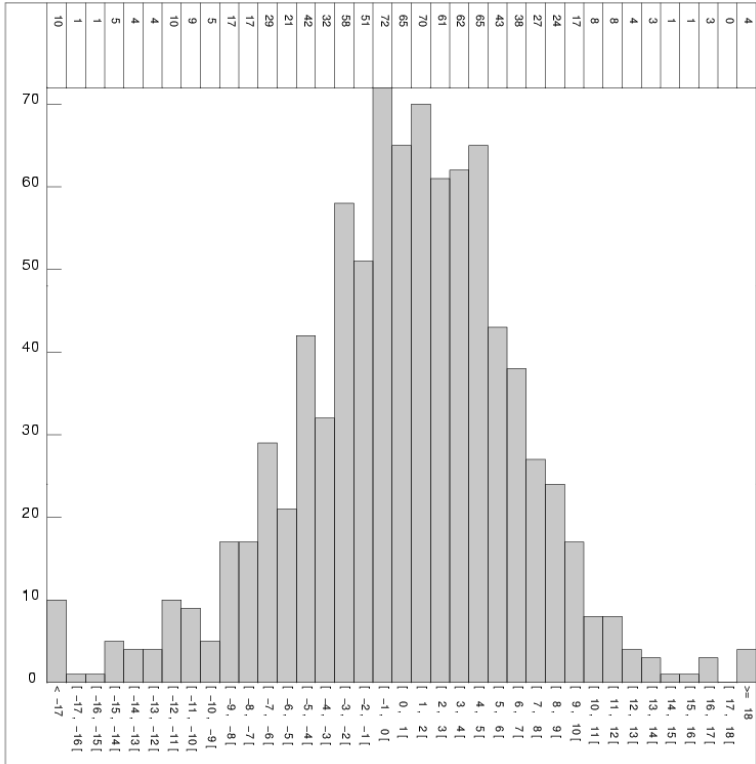
**RAPPEL DES SELECTIONS**

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 : -29.2800  
 Valeur maximale : 27.3900  
 Différence Max – Min: 56.6700  
 Nombre de points lus: 996  
 Nombre de points selectionnes: 892  
 Moyenne : 0.529204  
 Ecart-type : 6.05191  
 Moyenne Quadratique : 6.07501

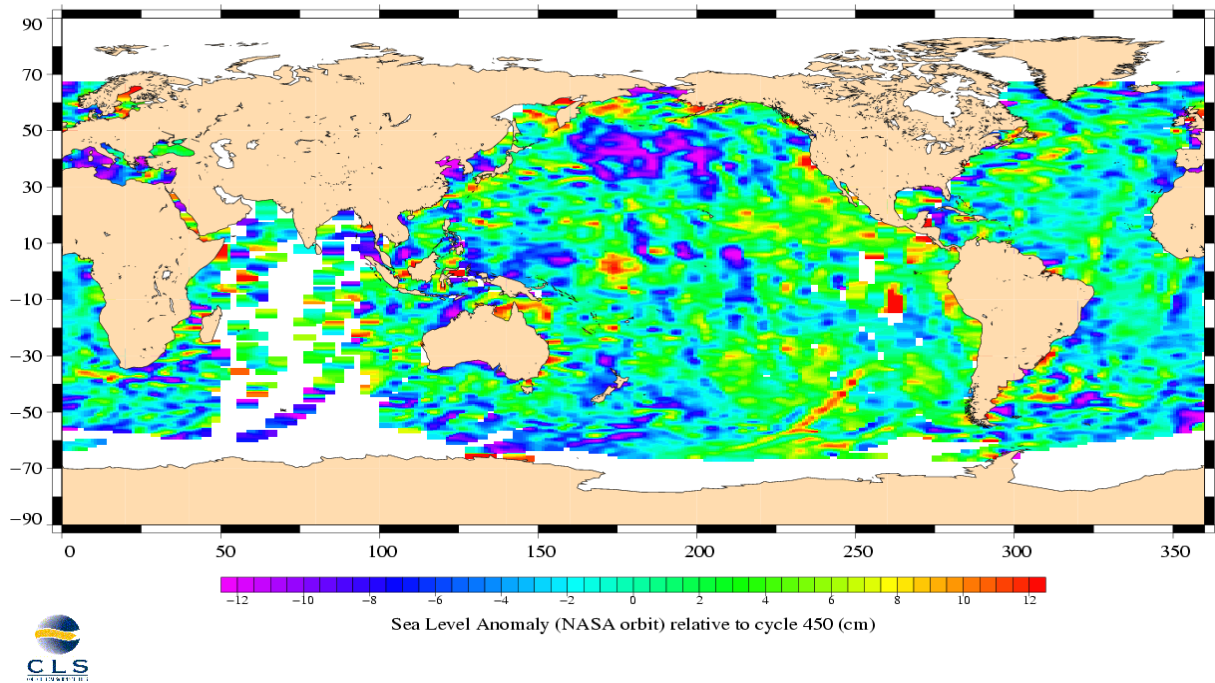
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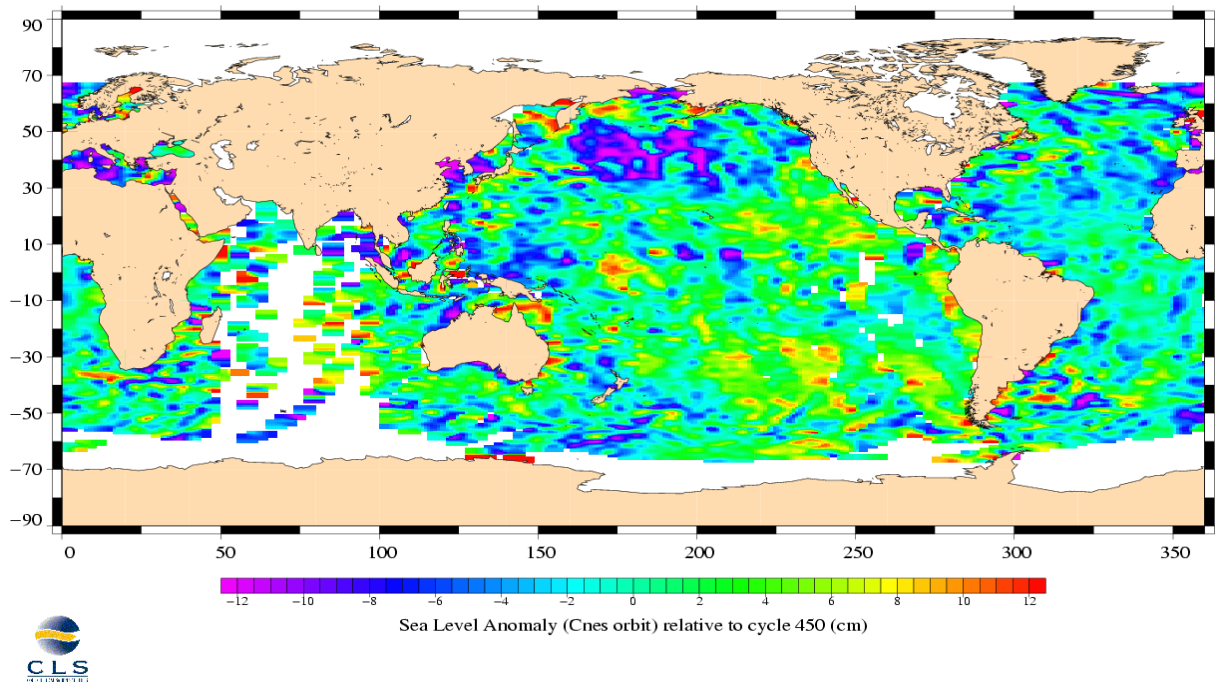
### 3.8 SSH variability

#### 3.8.1 Sea Level Anomaly

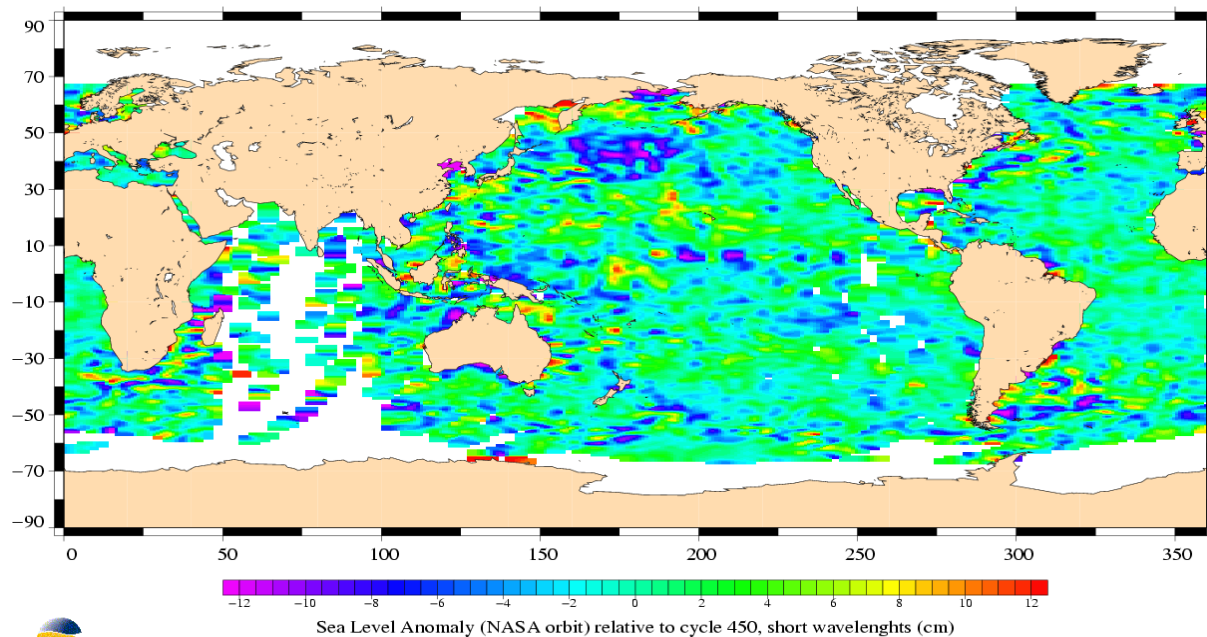
TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004



TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004



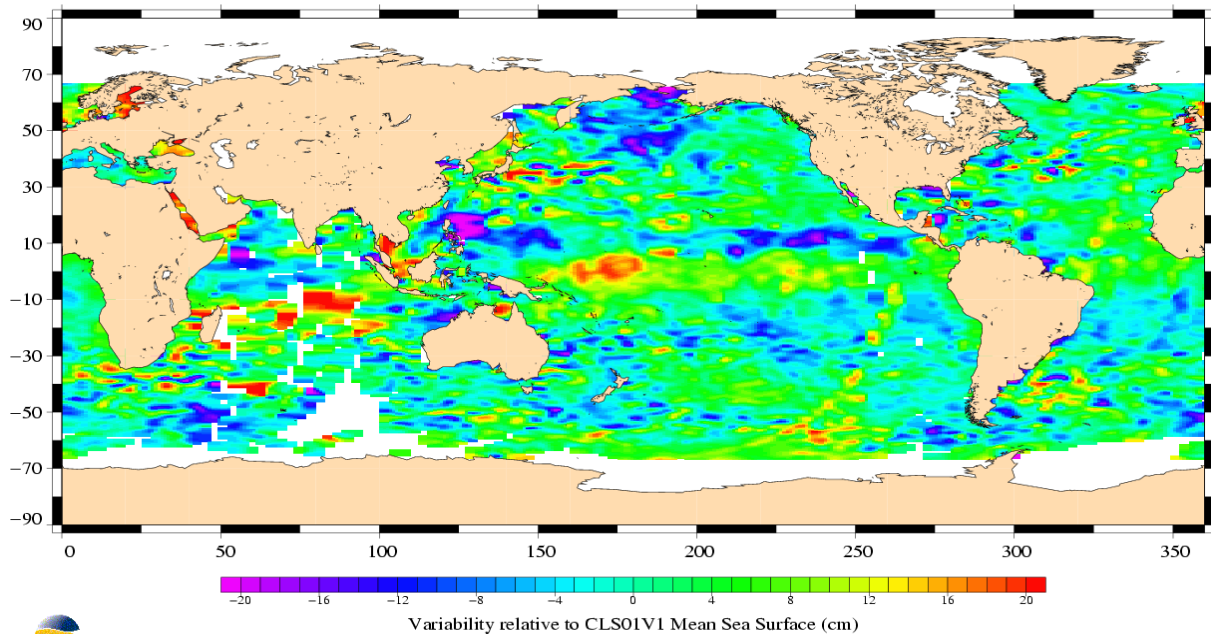
TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004



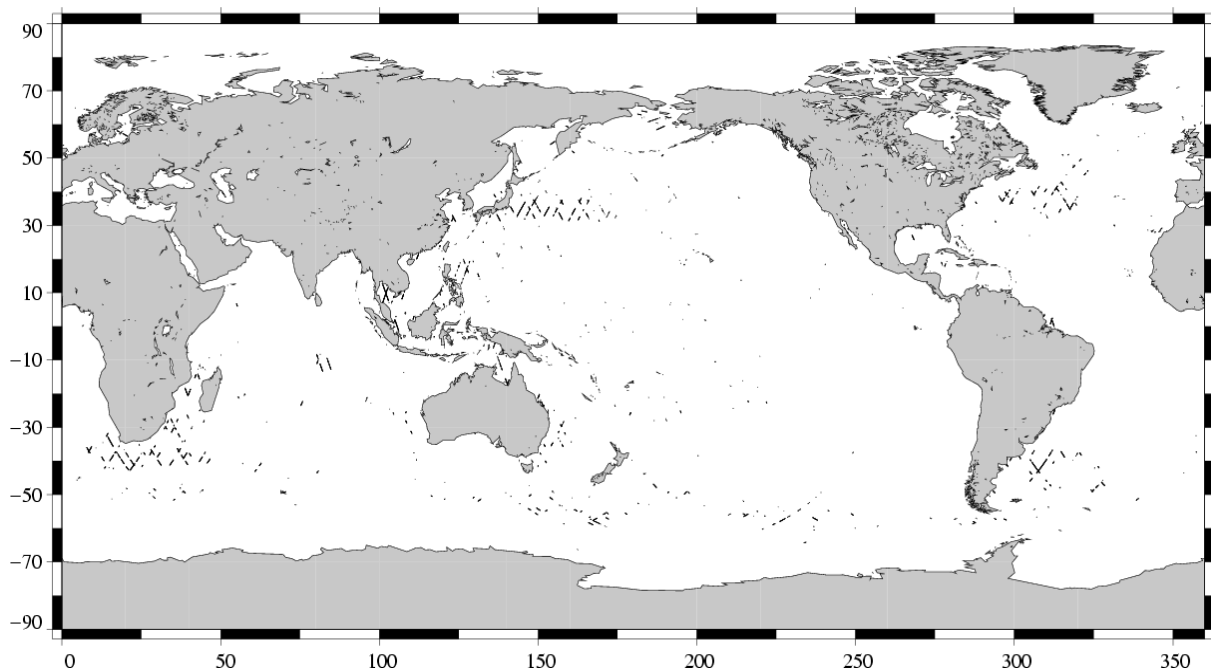
### 3.8.2 Comparison to a precise Mean Sea Surface

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 451  
Period : 11/12/2004 – 21/12/2004



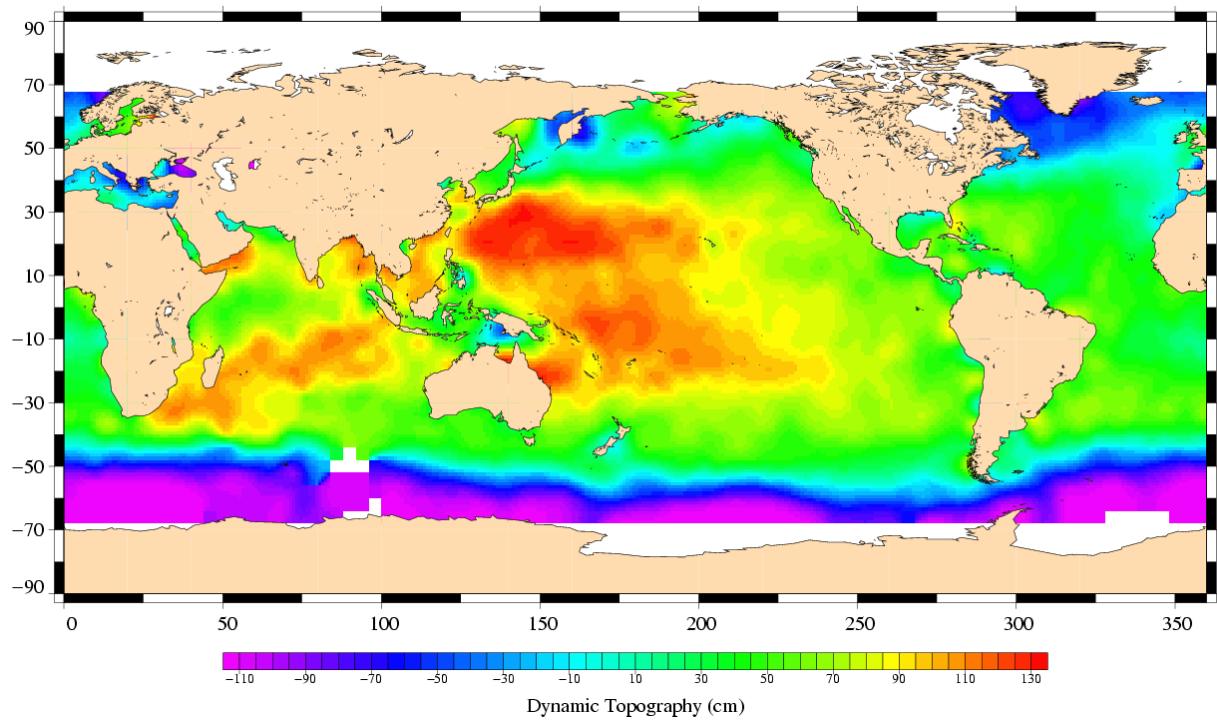
(SSH - MSS) differences greater than 0.3 m  
TOPEX/Poseidon Cycle 451 (11/12/2004 / 21/12/2004)





### 3.9 Dynamic topography

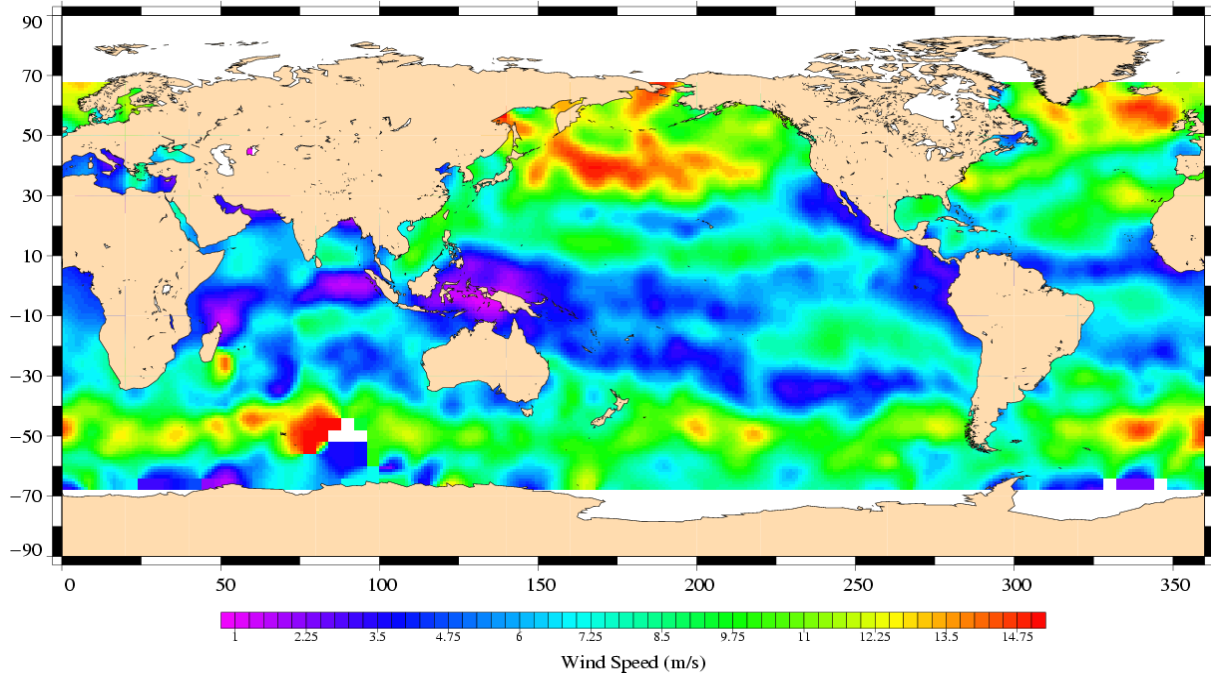
TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004



### 3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004



TOPEX/Poseidon, cycle 451  
Period : 11/12/2004 – 21/12/2004

