



# TOPEX/Poseidon MGRD Quality Assessment Report

**Cycle 378**

**18-12-2002 28-12-2002**

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**SALP-RP-P2-EX-21120-CLS378**

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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

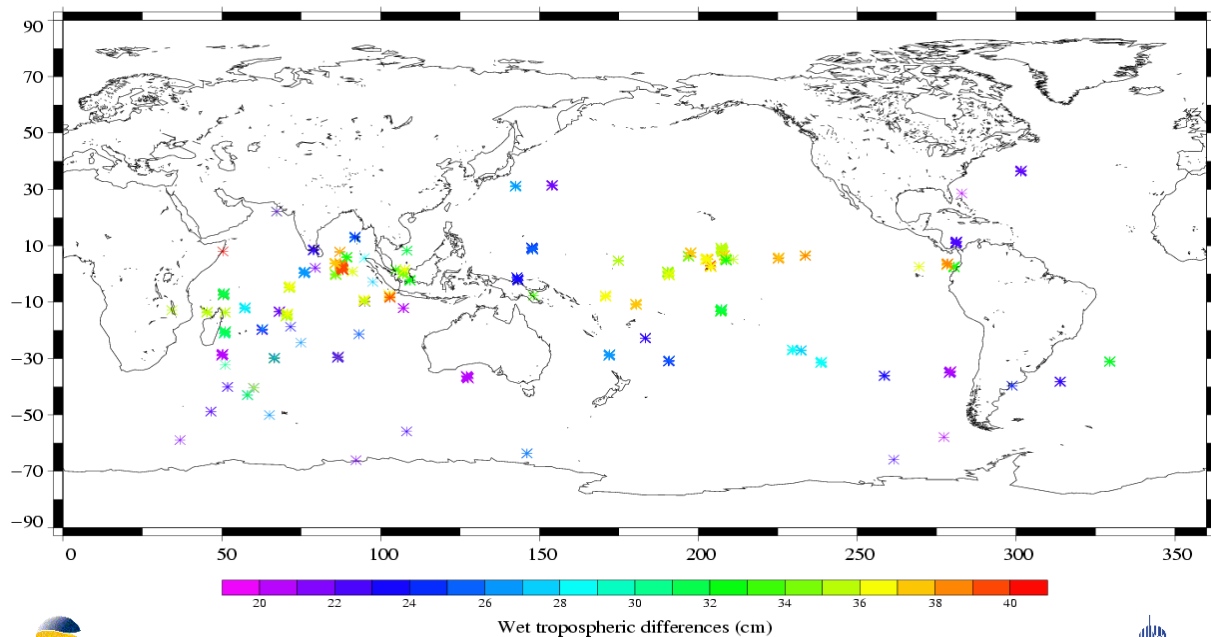
### 2.1 Cycle quality and performances

Data quality for this cycle appears to be nominal. For this cycle, the crossover standard deviation is 5.97 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.95 cm.

### 2.2 Warnings and recommendations

- Missing measurements :  
The pass 53 is missing due to small size.
- Tape recorder failures :  
There is a lot of data gaps due to tape recorder anomalies, especially in the Indian Ocean.
- CNES POE orbit :  
Due to the OMM maneuver at the end of the cycle 377 it is recommended to use NASA POE orbit instead of CNES orbit for passes 1 to 4.
- Editing measurements (a) :  
Problems in the interpolation of the TMR parameters occur when there are missing measurements (tape recorder failures). As a result 4.08% of the measurements are removed by the TMR correction criterion.
- Editing measurements (b) :  
A new criterion has been added to the editing procedure since cycle 376 (See [Editing](#)). The measurements removed by this criterion for the current cycle are plotted on the following figure.

Edited parameter : Radiometer and ECMWF wet tropospheric differences  
T/P Cycle 378 (18/12/2002 / 28/12/2002)



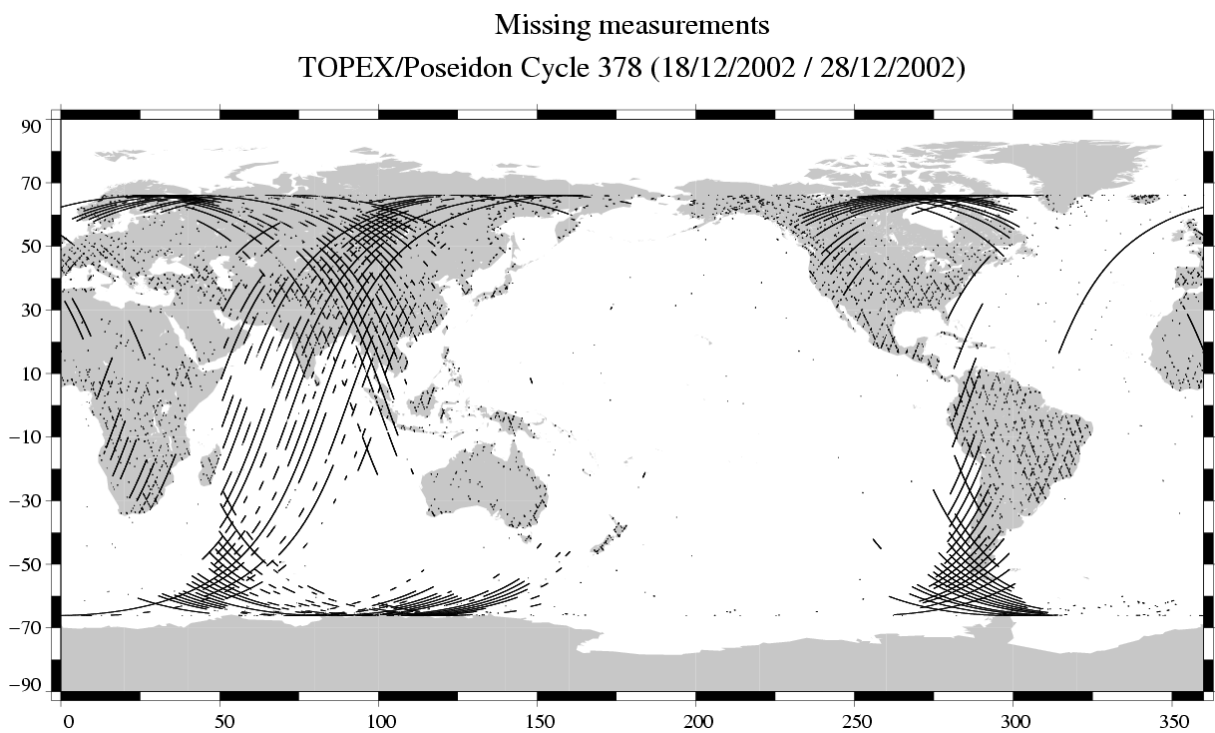
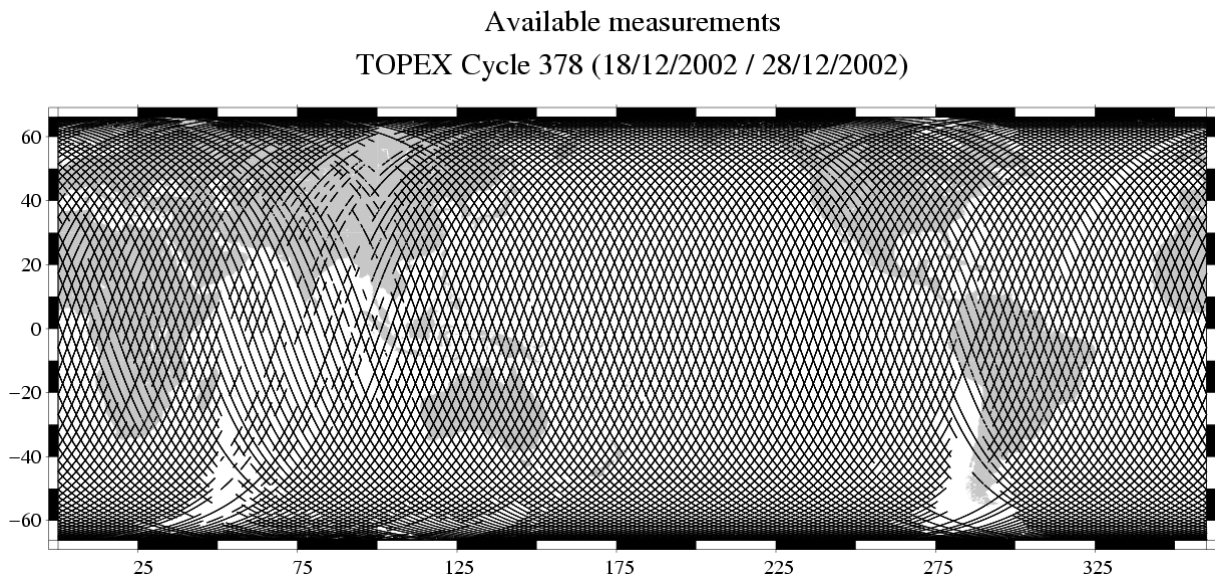
### 3 CALVAL main results

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

709625 altimeter measurements are present, and 84887 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.



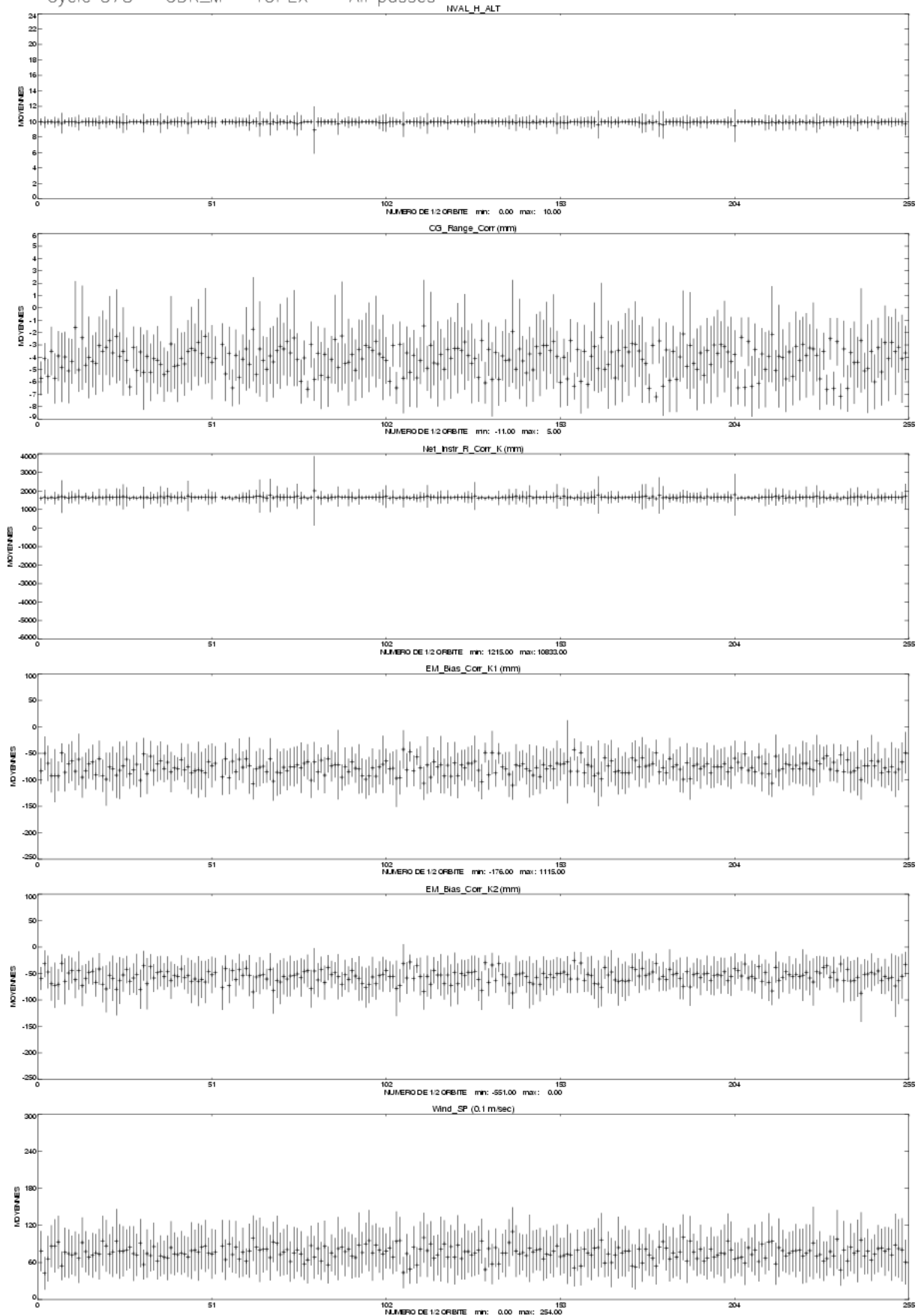
### 3.2 M-GDR quality flags

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

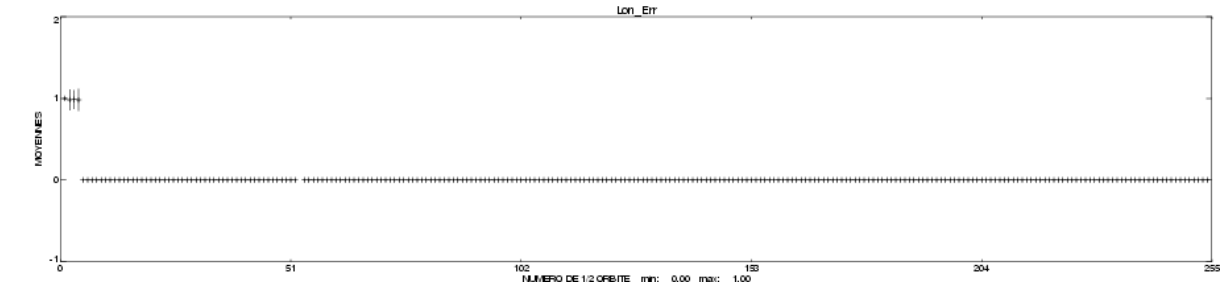
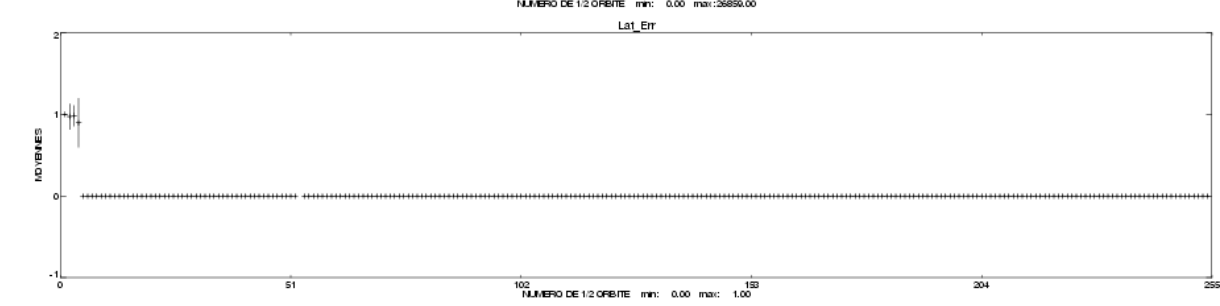
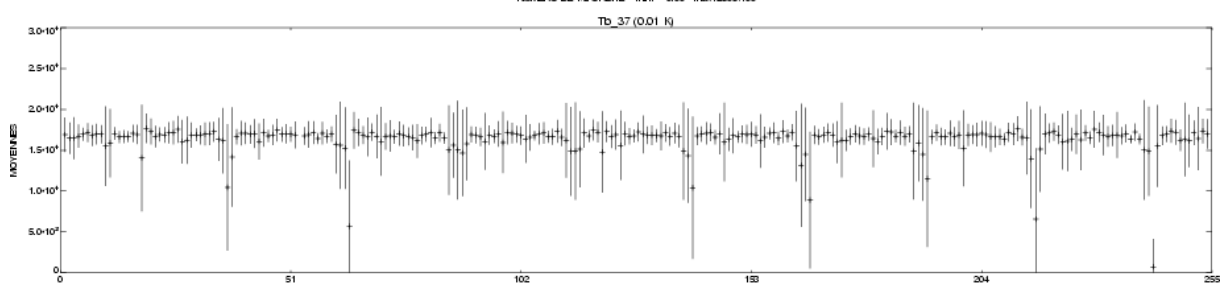
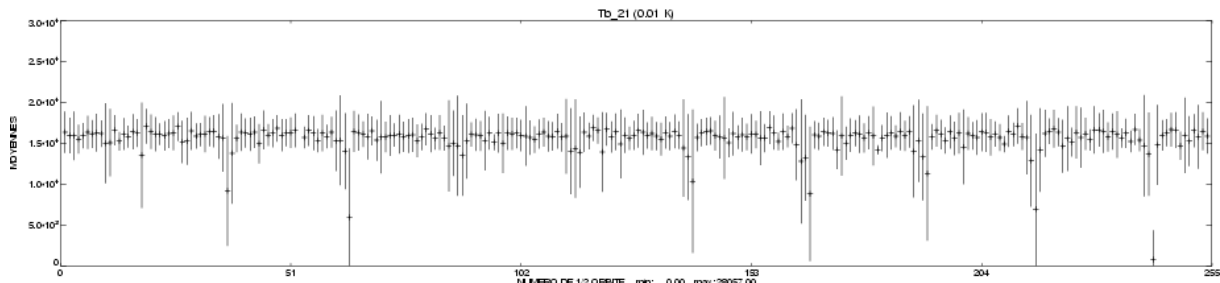
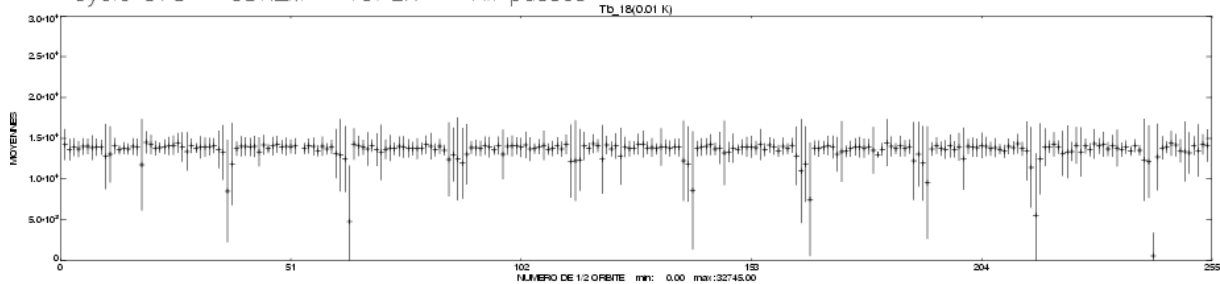
Name	Description	% bad
Geo_Bad_1	altimeter land flag	26.58
Geo_Bad_1	ice flag	5.47
Geo_Bad_1	radiometer land flag	28.00
Alt_Bad_1	conditions 1 altimeter	4.64
Alt_Bad_2	conditions 2 altimeter	4.54
Geo_Bad_2	rain (liquid water in excess)	5.83
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.36
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.56
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	5.17
DORIS	DORIS not valid	0.00

### 3.3 M-GDR parameter plots

Cycle 378 – GDR\_M – TOPEX – All passes –

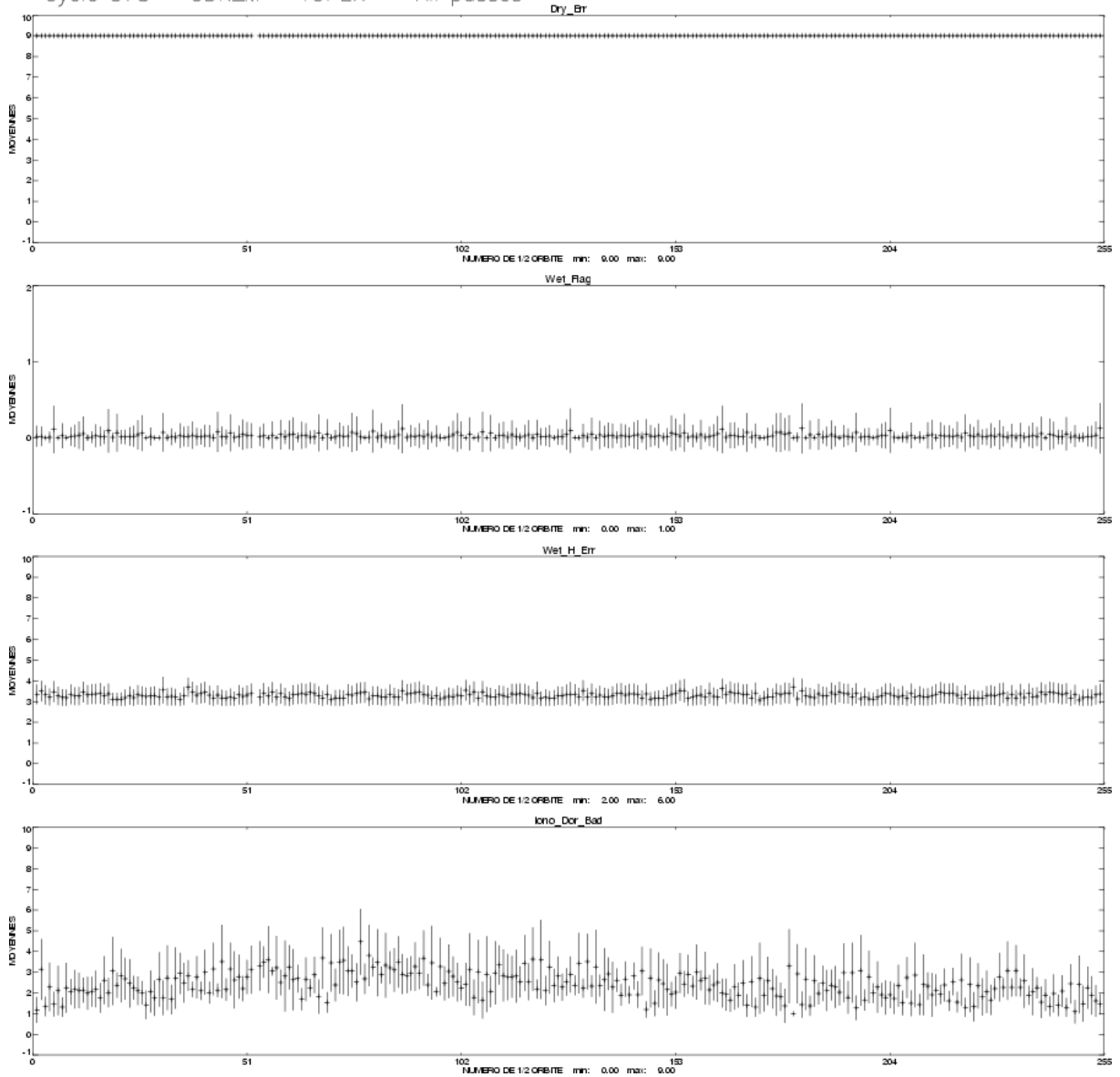


Cycle 378 – GDR\_M – TOPEX – All passes –

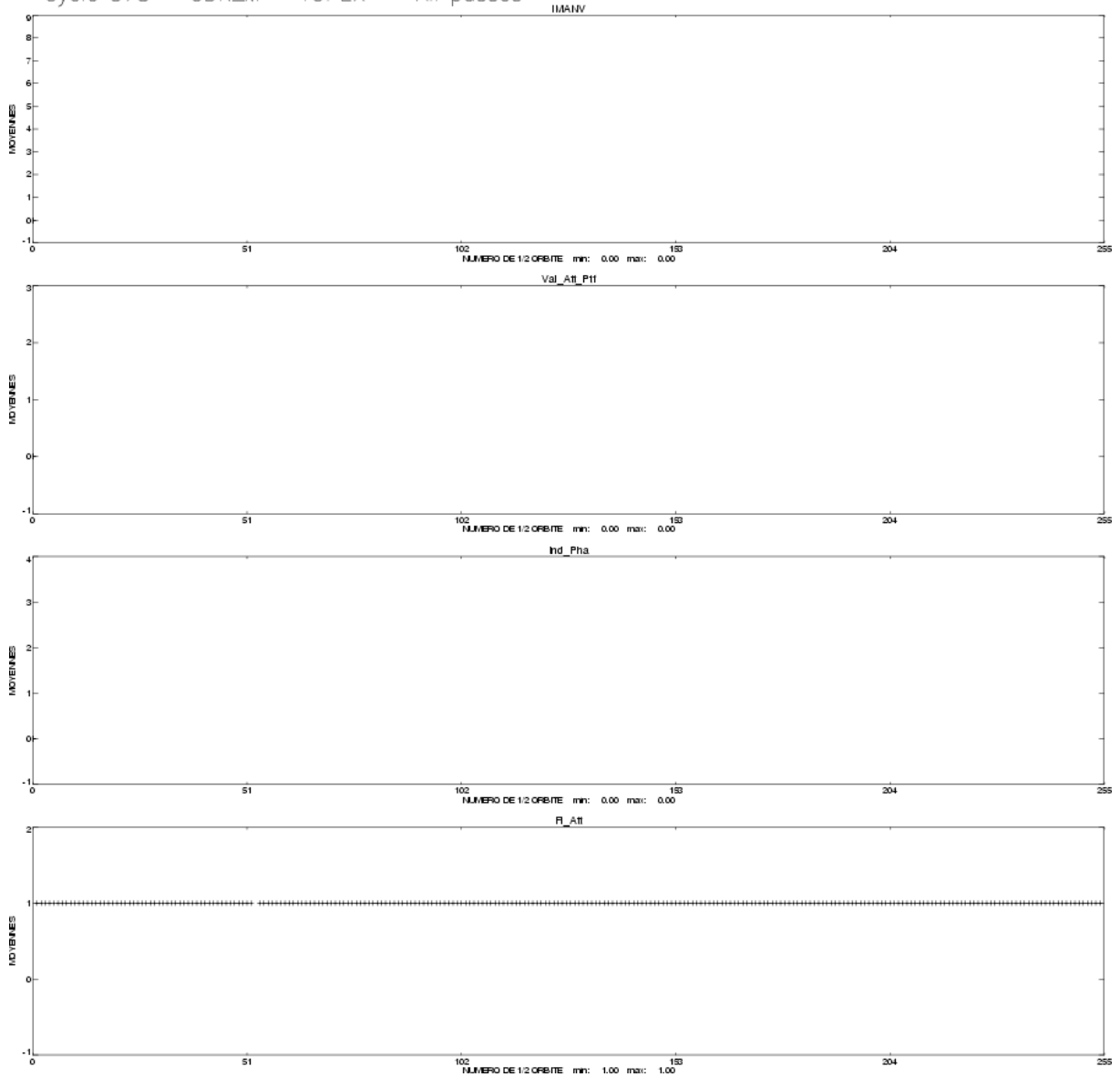


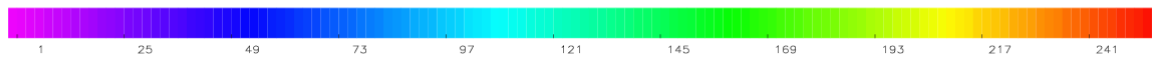
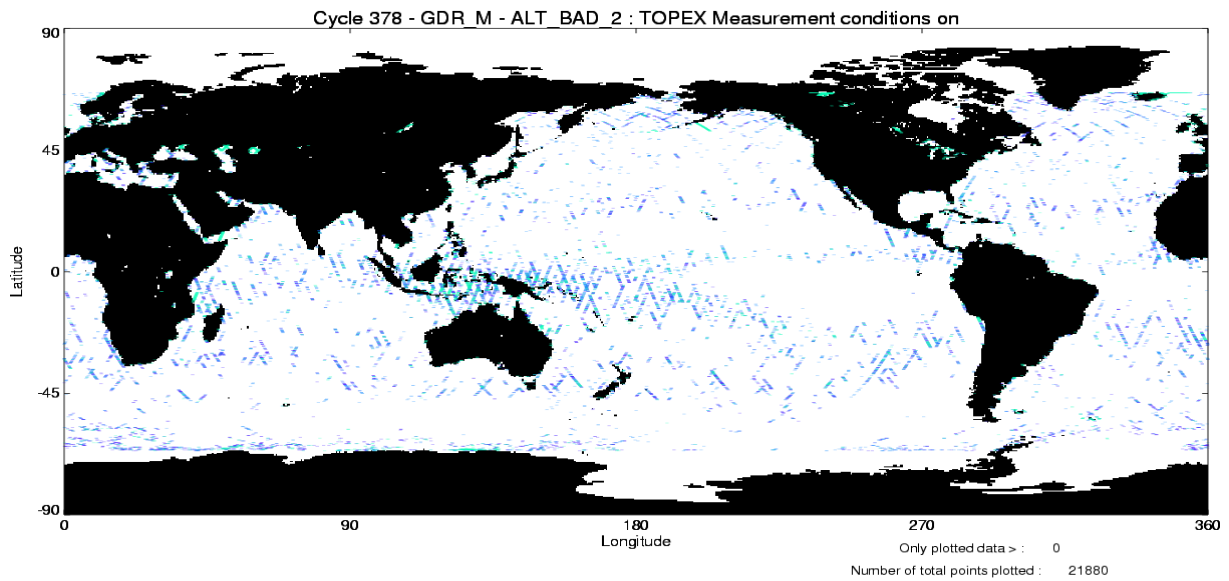
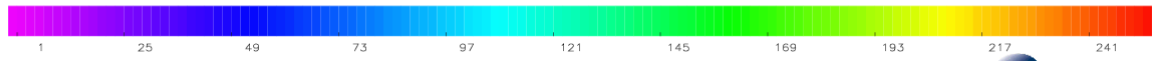
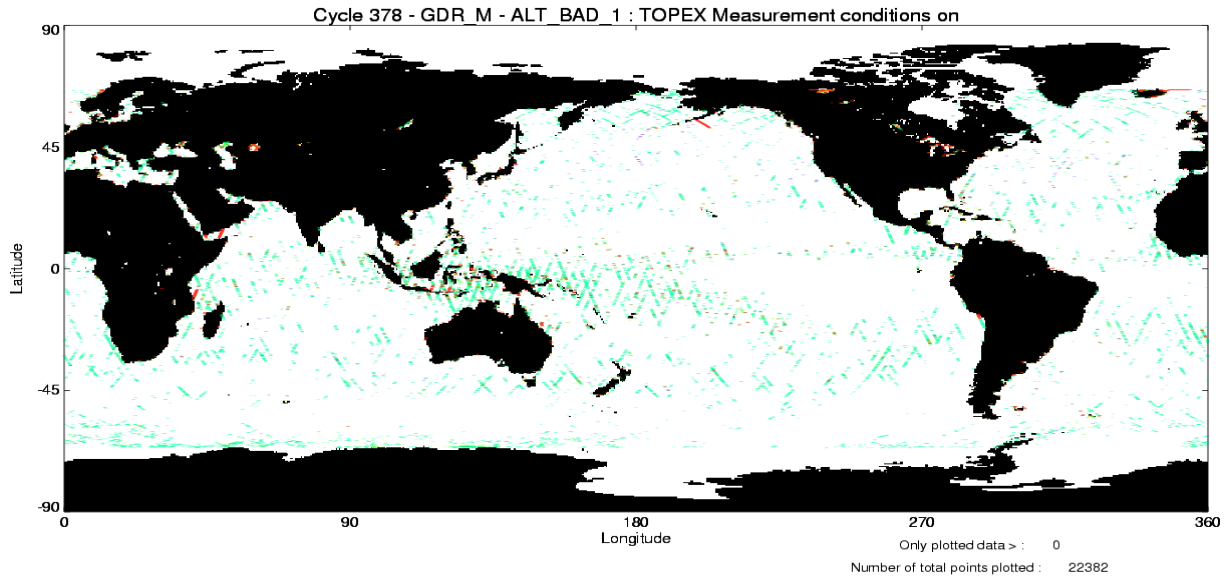


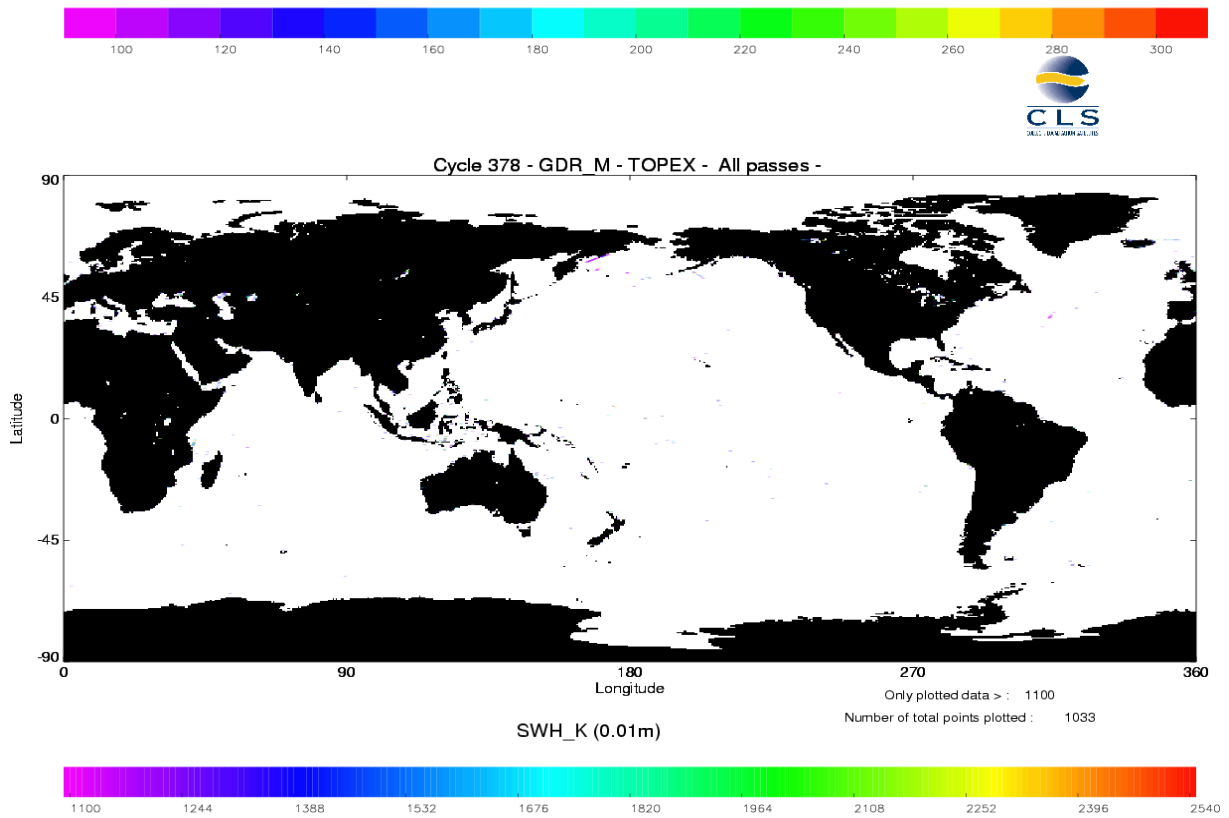
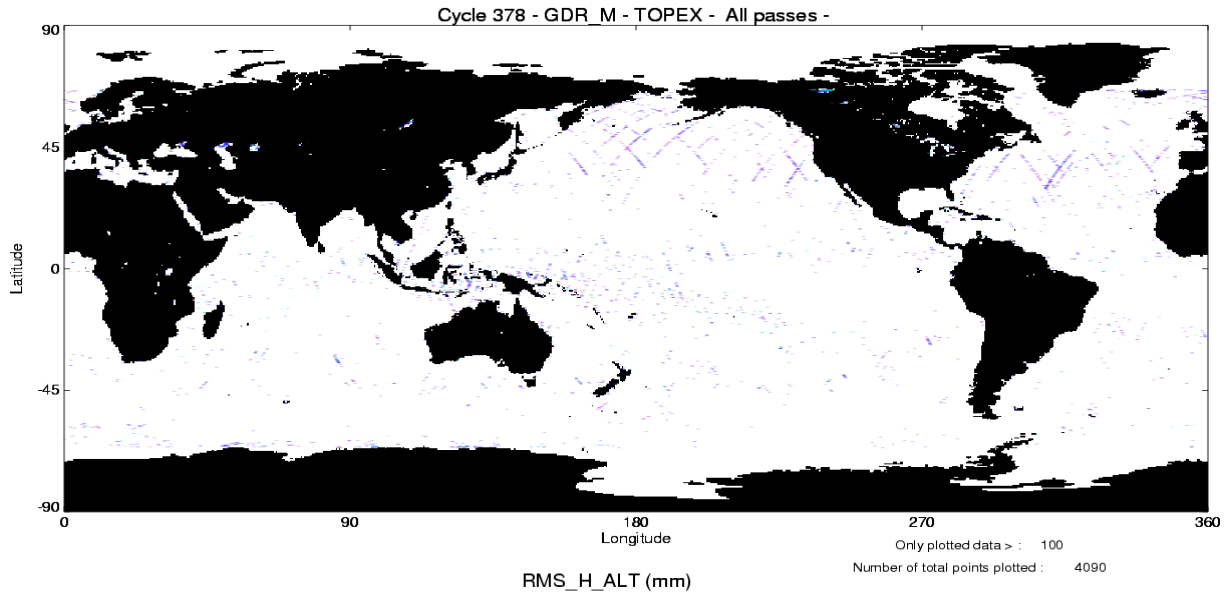
Cycle 378 – GDR\_M – TOPEX – All passes –

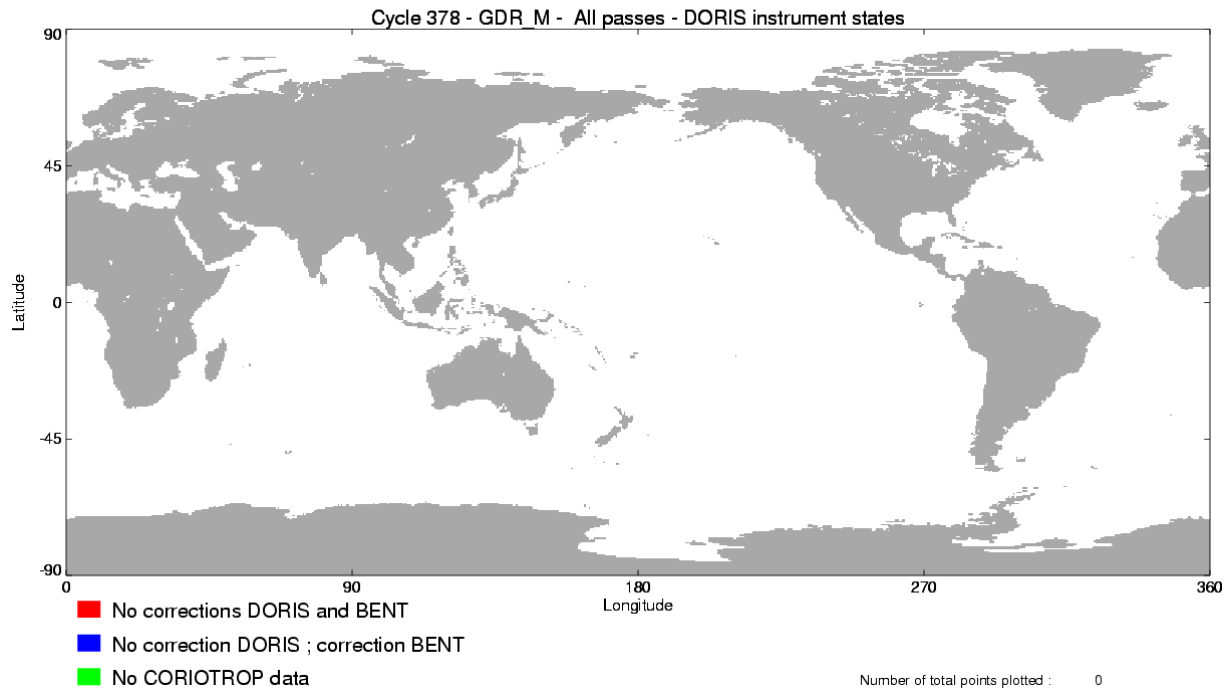


Cycle 378 – GDR\_M – TOPEX – All passes –









### 3.4 Editing

The following table gives for each tested parameter, minimum and maximum thresholds, the number and the percentage of points removed.

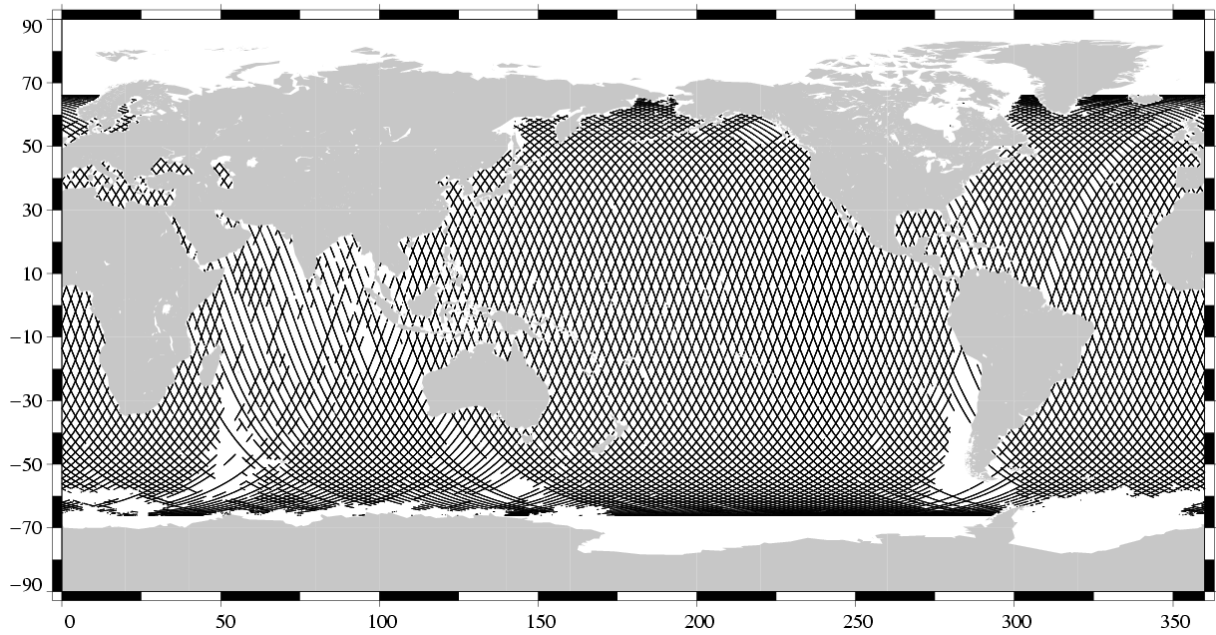
As a comparison, the mean percentage over one year (1997) is also given.

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.

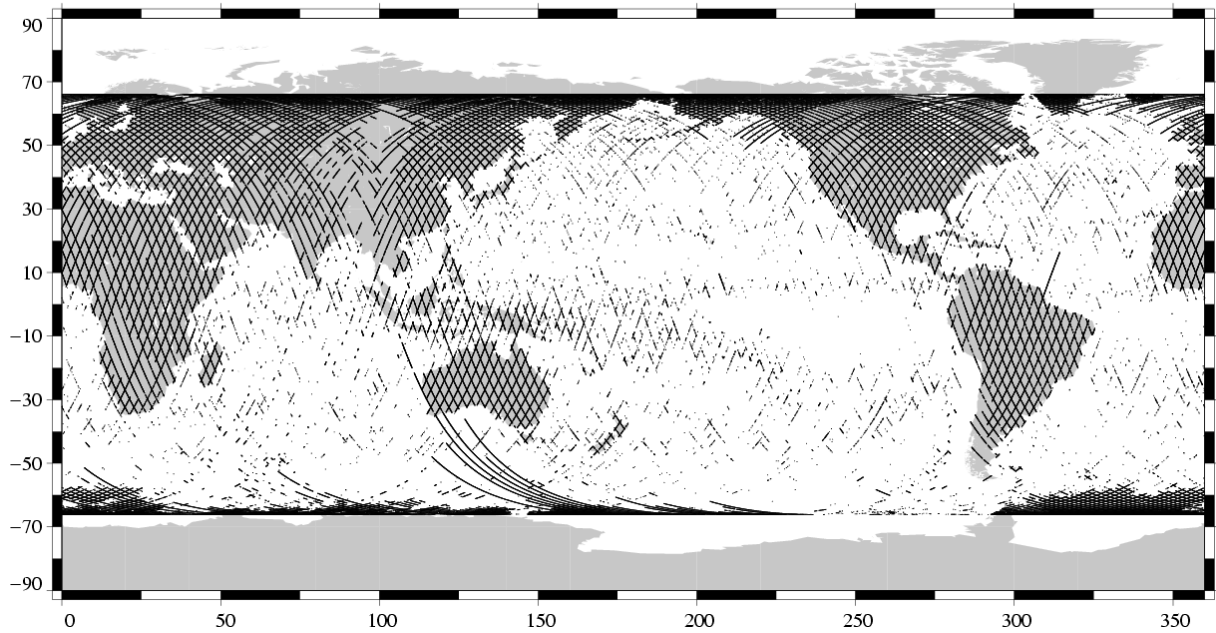
Parameters	Min Thres.	Max Thres.	Unit	Mean removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	1.03
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	1.25
Std. deviation of range	0.000	0.100	m	1.85	1.95
Off nadir angle from waveform	0.000	0.400	deg	1.36	4.49
Dry tropospheric 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	4.08
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	0.00
Significant wave height	0.000	11.000	m	1.46	0.46
Sea state Bias	-0.500	0.000	m	1.39	0.83
Backscatter coefficient	7.000	30.000	dB	1.44	0.78
Ocean tide height	-5.000	5.000	m	0.01	1.12
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	1.05
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.

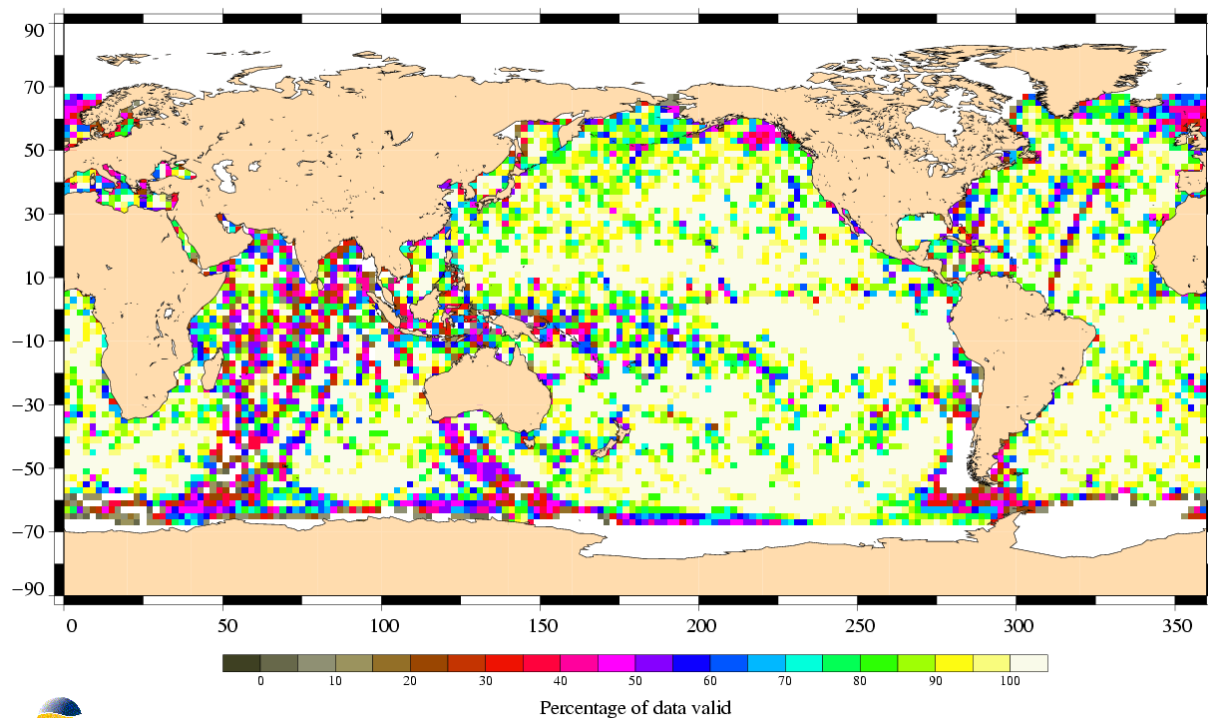
Valid data  
TOPEX/Poseidon Cycle 378 (18/12/2002 / 28/12/2002)



Edited measurements  
TOPEX Cycle 378 (18/12/2002 / 28/12/2002)



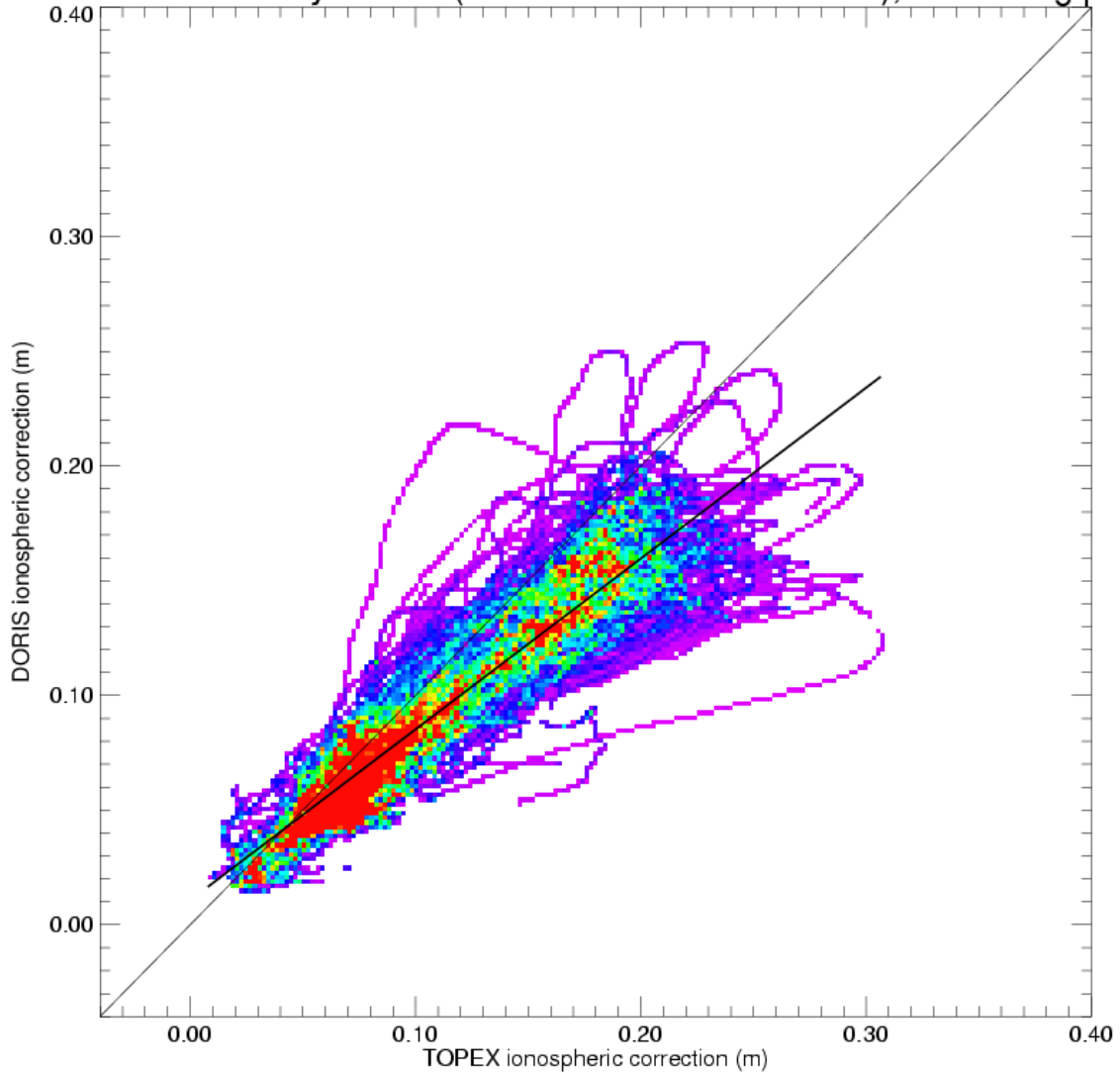
Percentage of valid data relative to the nominal pass  
TOPEX/Poseidon Cycle 378 (18/12/2002 / 28/12/2002)



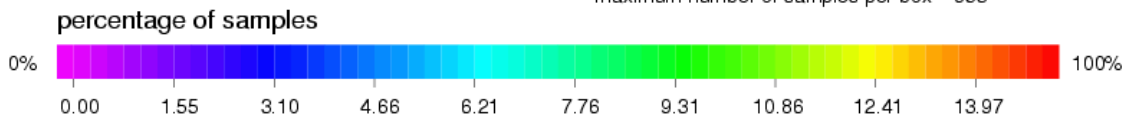


### 3.5 Ionospheric correction

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), ascending passes



minimum number of samples per box 1  
maximum number of samples per box 653



#### Statistics Y-X

mean = -0.01816  
rms = 0.02921  
std = 0.02288

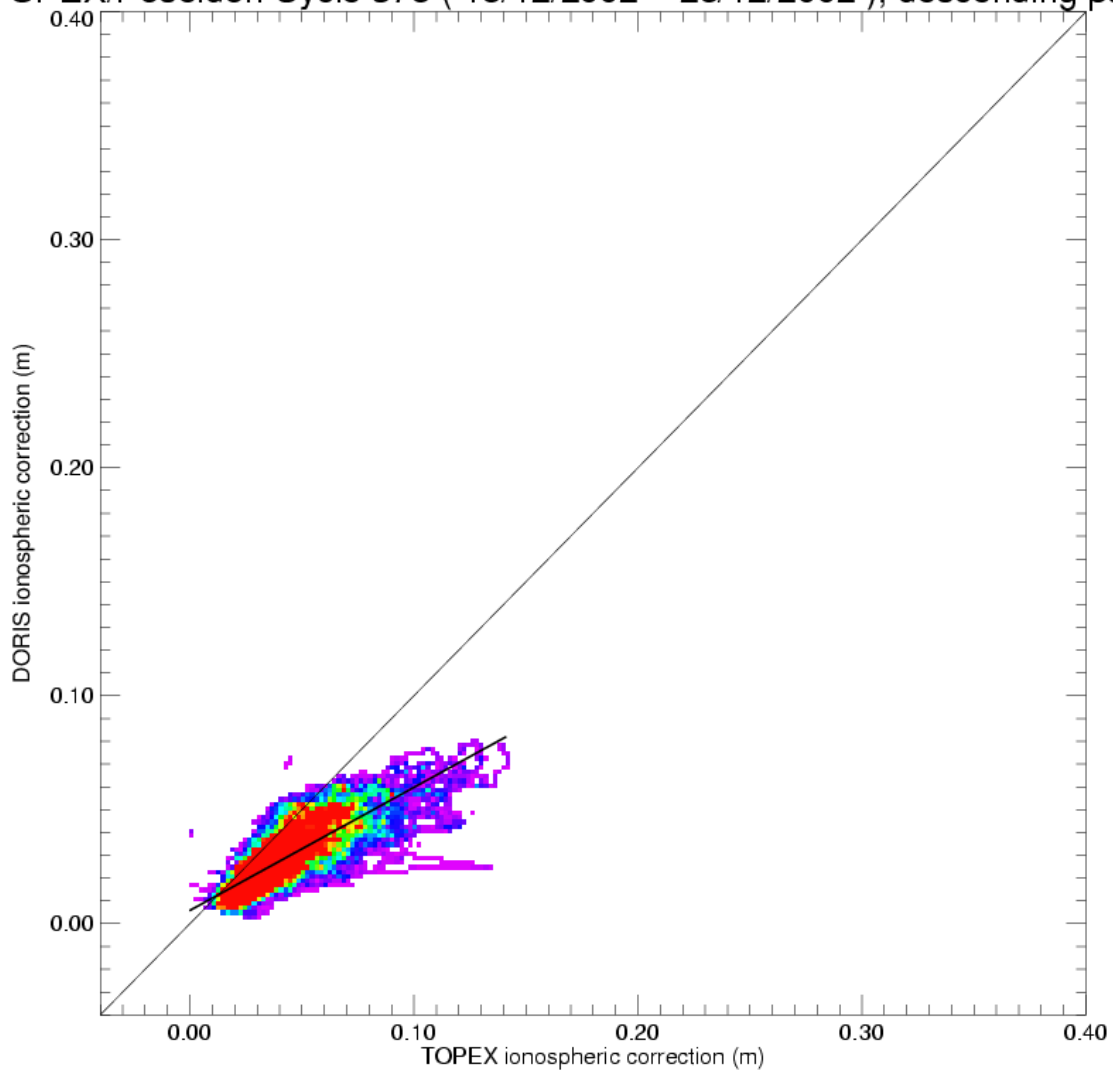
#### Order 1 fit polynomial

$y = a x + b$   
a = 0.74491858  
b = 0.01070594

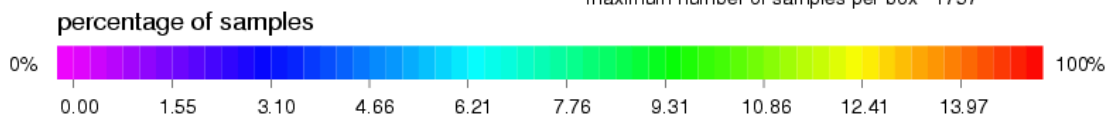
#### Legend

— Order 1 fit polynomial  
— Bisectrix

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 1757



**Statistics Y-X**

mean = -0.01442  
 rms = 0.01945  
 std = 0.01306

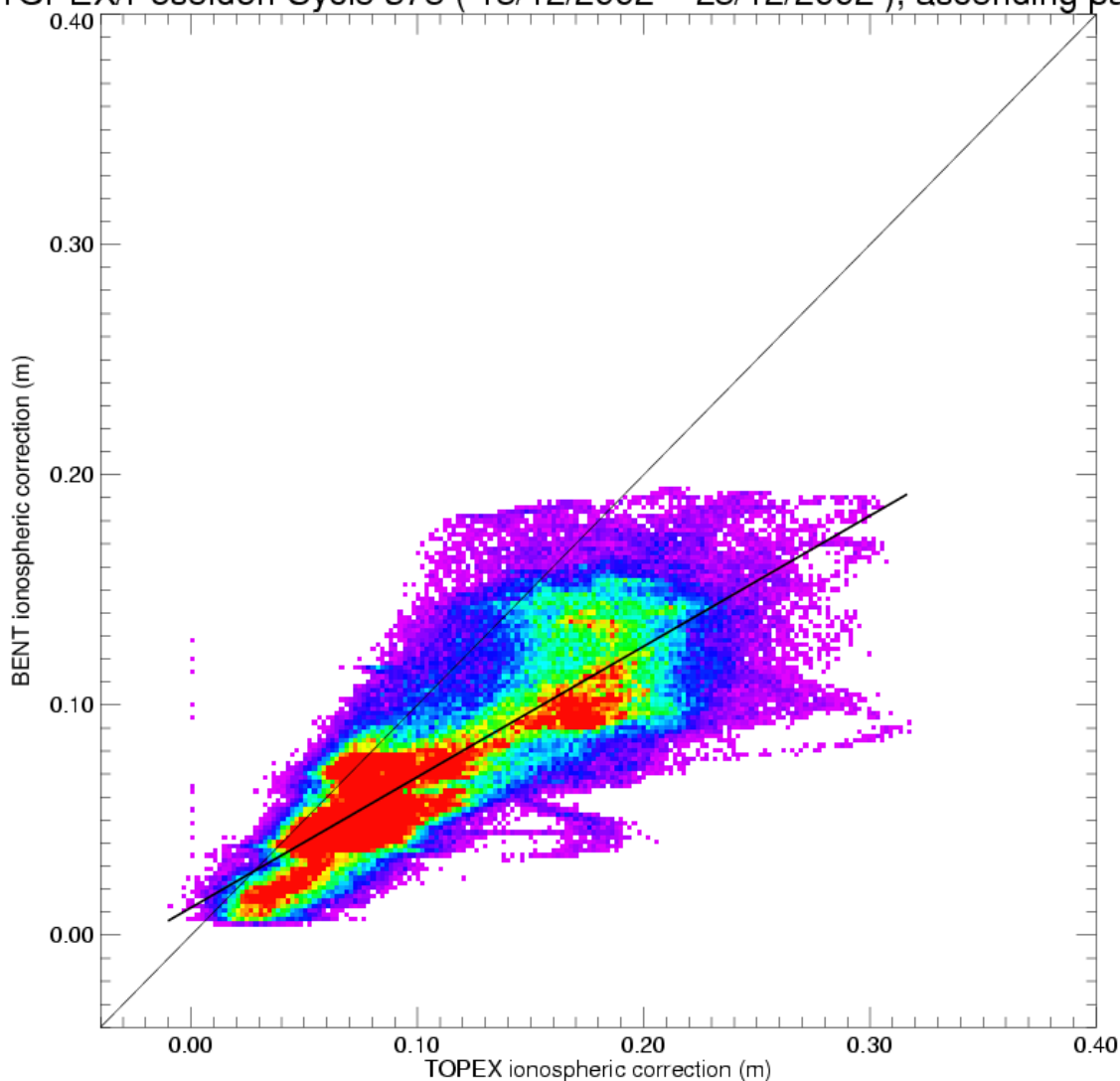
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.53970933$   
 $b = 0.00581647$

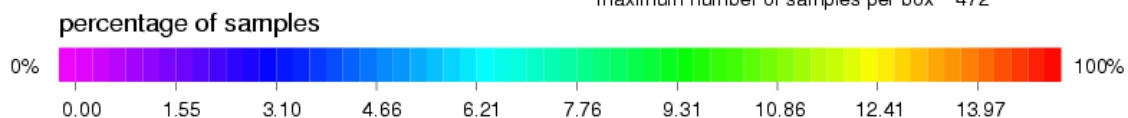
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 472



**Statistics Y-X**

mean = -0.03715  
 rms = 0.04925  
 std = 0.03234

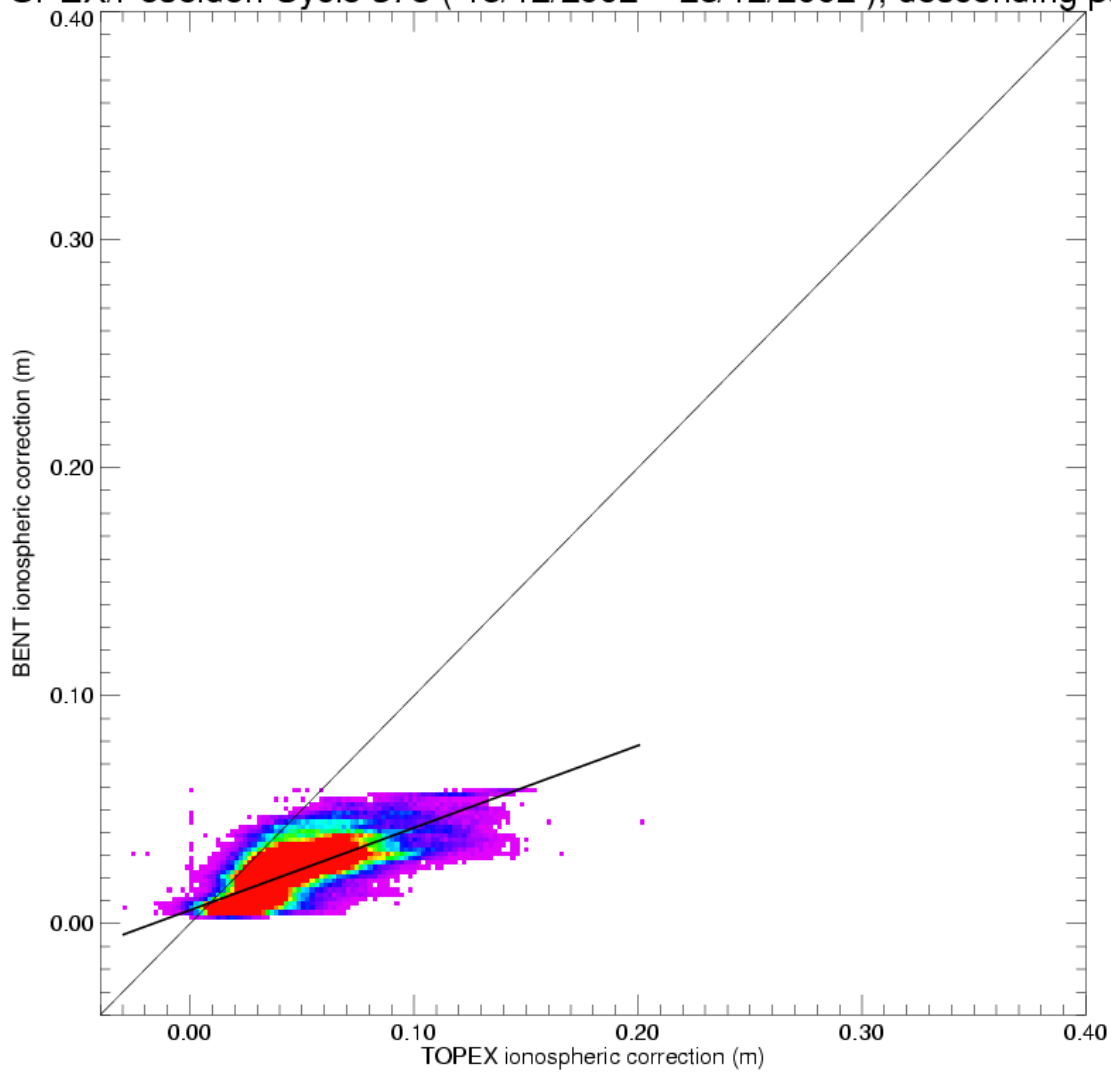
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.56750077$   
 $b = 0.01198893$

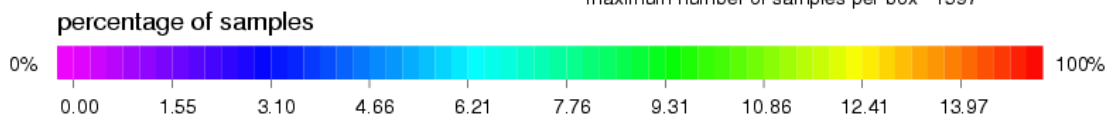
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 1597



**Statistics Y-X**

mean = -0.02247  
 rms = 0.02772  
 std = 0.01623

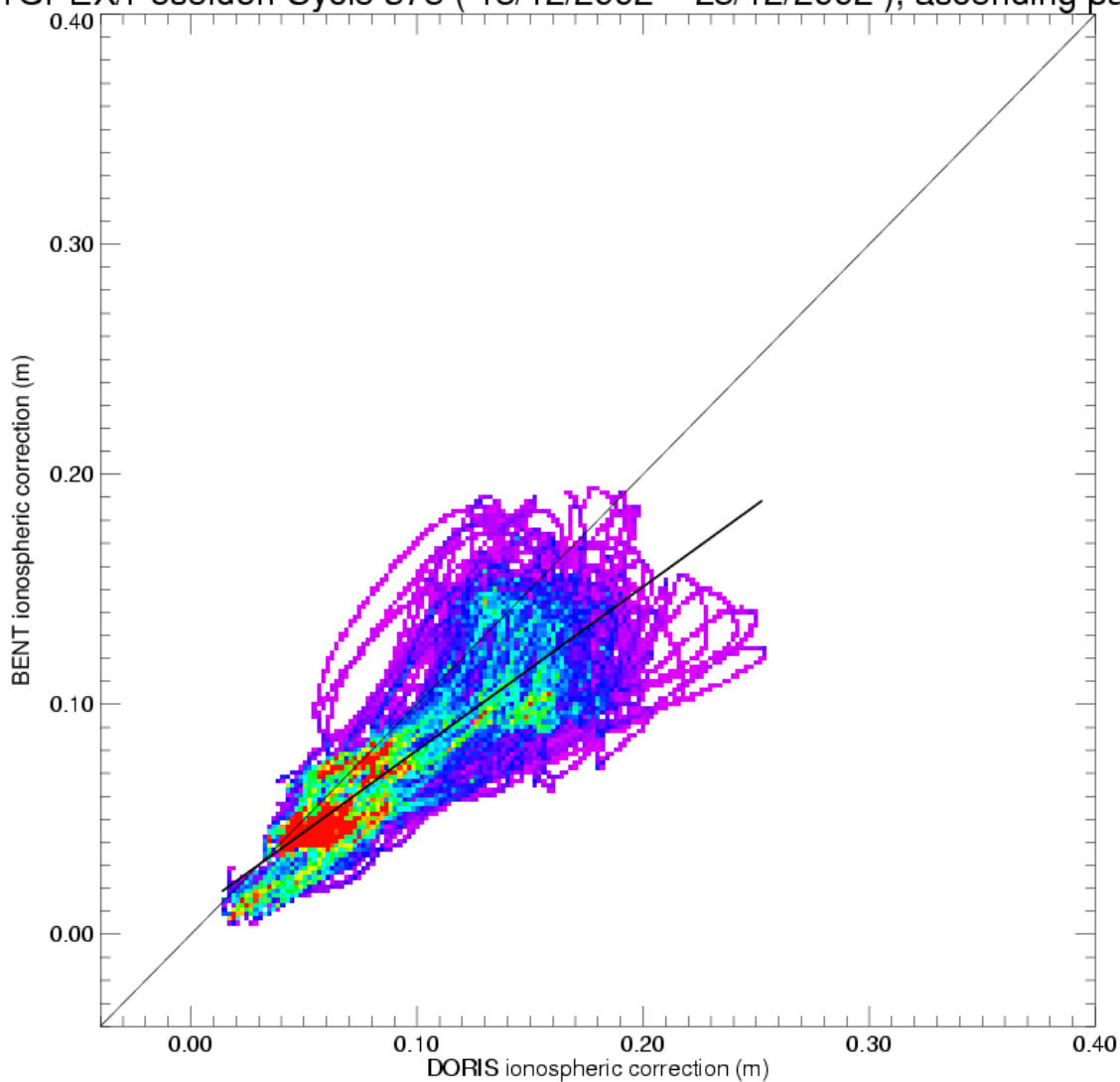
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.36109200$   
 $b = 0.00593206$

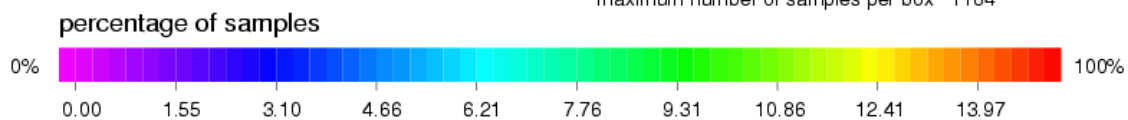
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), ascending passes



minimum number of samples per box 1  
 maximum number of samples per box 1184



**Statistics Y-X**

mean = -0.01854  
 rms = 0.03078  
 std = 0.02457

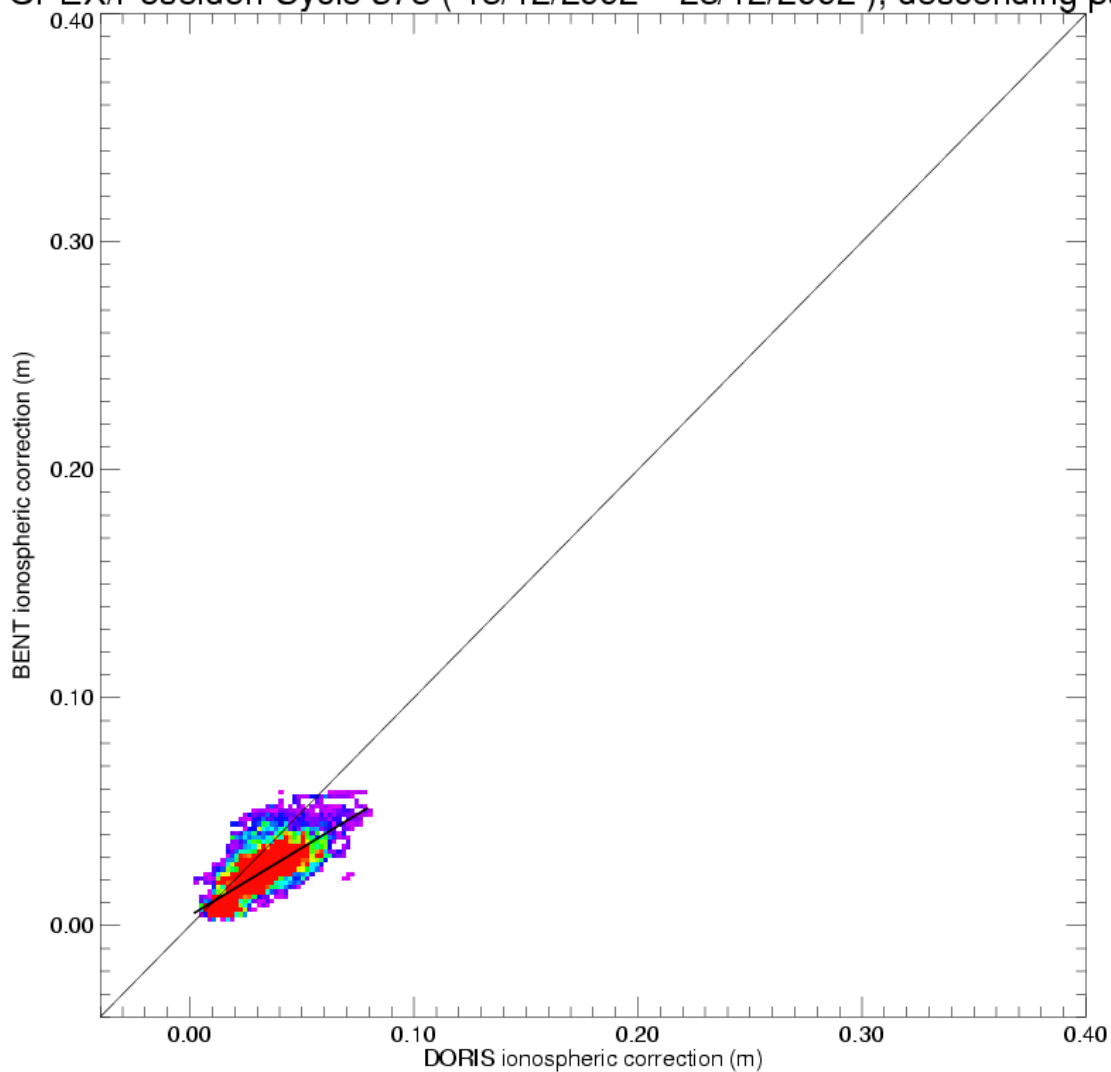
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.71114749$   
 $b = 0.00890347$

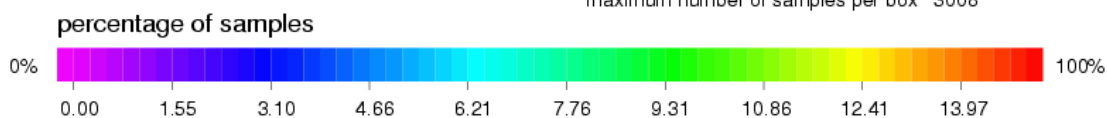
**Legend**

— Order 1 fit polynom  
 — Bisectrix

TOPEX/Poseidon Cycle 378 ( 18/12/2002 – 28/12/2002 ), descending passes



minimum number of samples per box 1  
 maximum number of samples per box 3008



**Statistics Y-X**

mean = -0.00756  
 rms = 0.01191  
 std = 0.00920

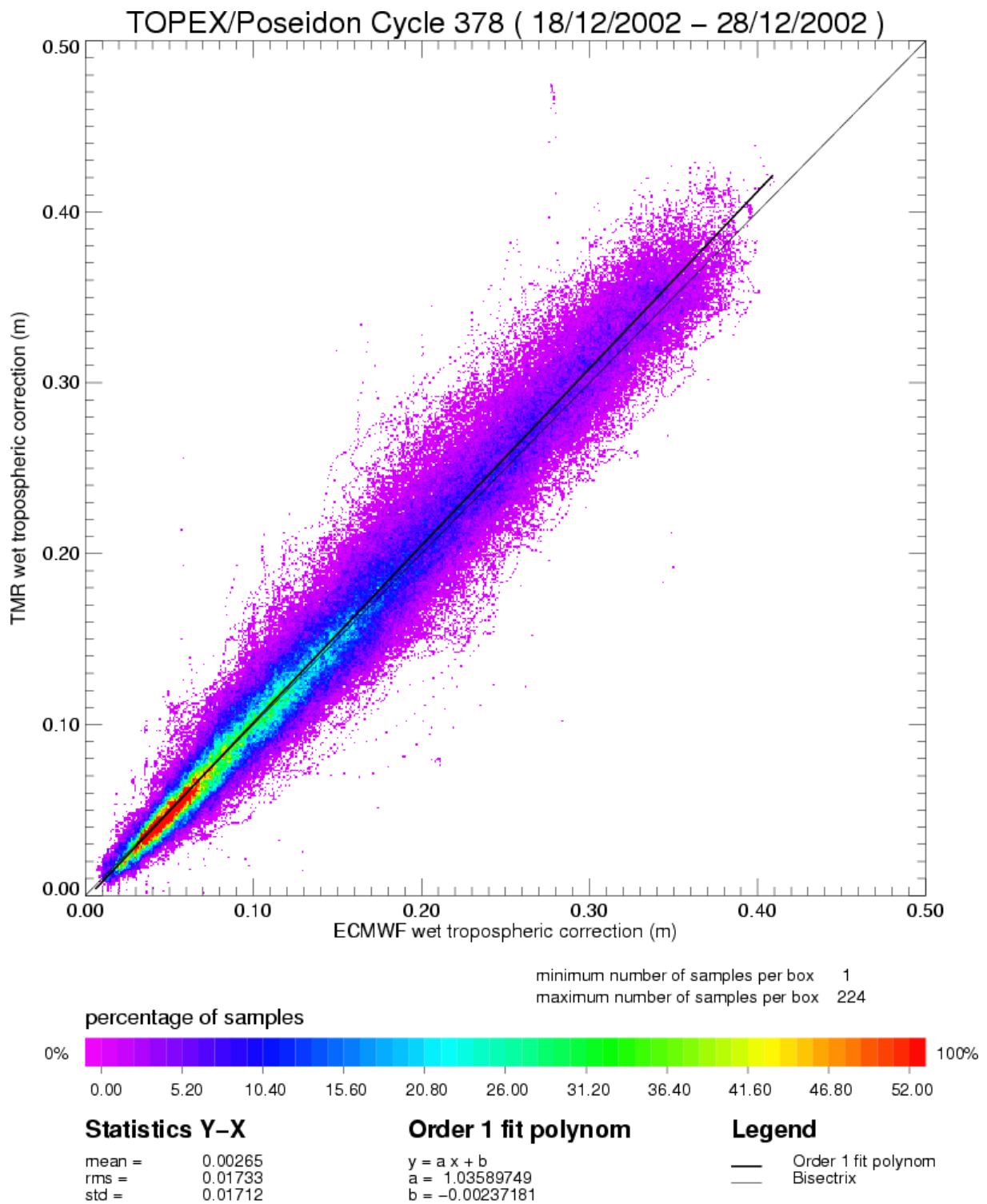
**Order 1 fit polynom**

$y = a x + b$   
 $a = 0.59504652$   
 $b = 0.00440252$

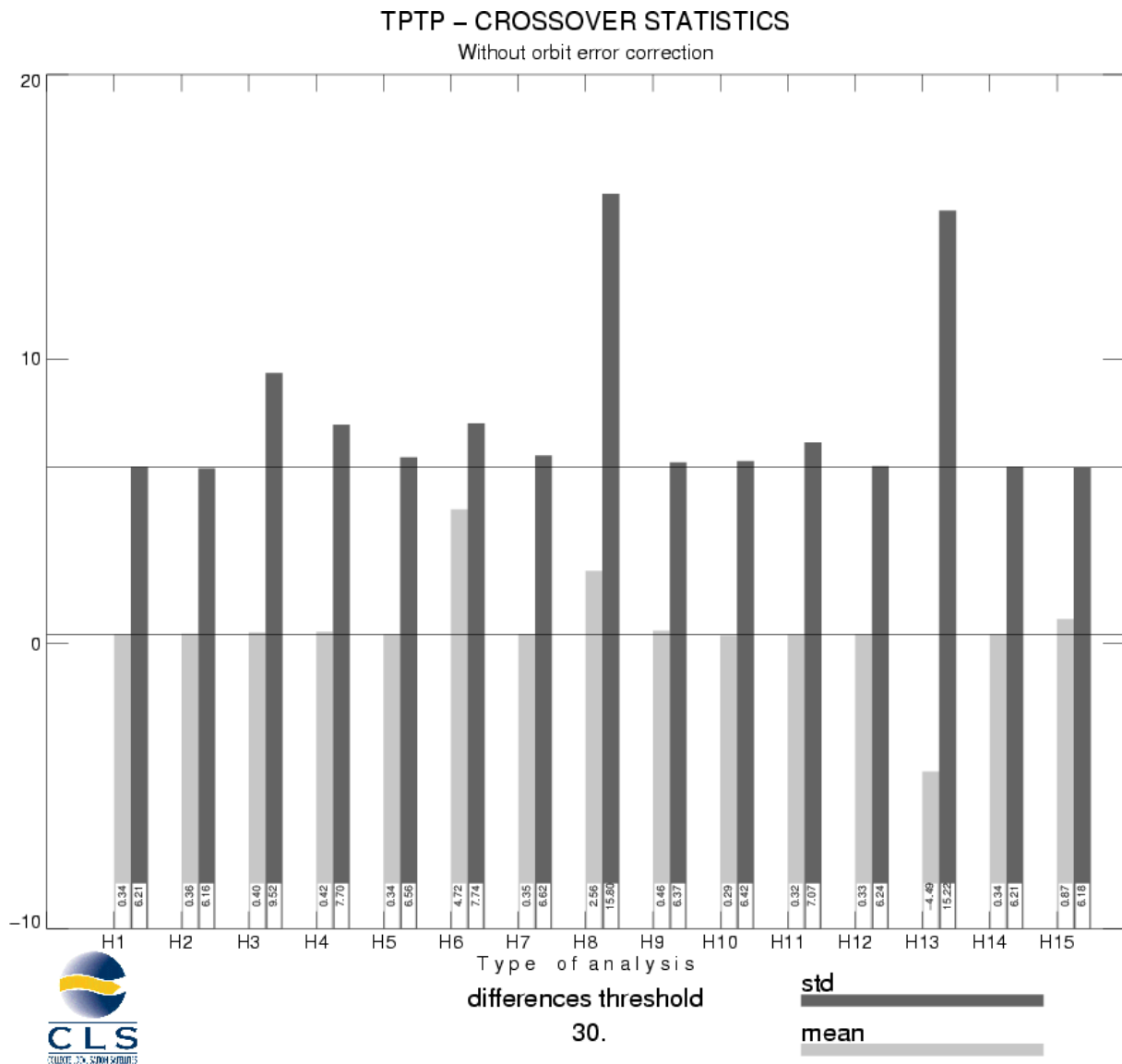
**Legend**

— Order 1 fit polynom  
 — Bisectrix

### 3.6 Wet tropospheric correction



### 3.7 Crossover statistics



SSH = Corrected sea surface height	SSH with FES95 tide model instead of GOT99
SSH without dry topospheric correction	SSH with CSR3 tide model instead of GOT99
SSH without inverse barometer correction	SSH without BM4 SSB correction
SSH without wet topospheric correction	SSH with BM3 SSB correction instead of BM4 SSB correction
SSH with ECMWF tropo instead of TMR tropo	SSH without solid earth tide correction
SSH without ionospheric correction filtered	SSH without polar tide correction
SSH with DORIS iono correction instead of iono filtered	SSH = Corrected sea surface height with CNES orbit
SSH without GOT99 tide model	



### TPTP – CROSSOVER STATISTICS

Without orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

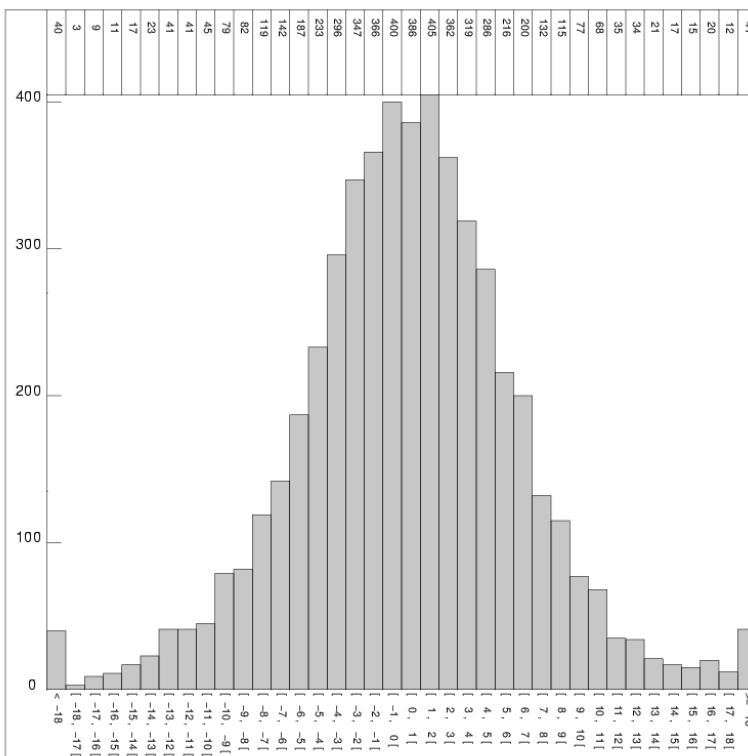
Type de points de croisement: TPTP  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse 0.00 (moy)  
 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.0600  
 Valeur maximale : 28.5100  
 Différence Max – Min: 57.5700  
 Nombre de points lus: 5351  
 Nombre de points sélectionnés: 5242  
 Moyenne : 0.338594  
 Ecart-type : 6.21269  
 Moyenne Quadratique : 6.22191

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### TPTP – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

#### RAPPEL DES SELECTIONS

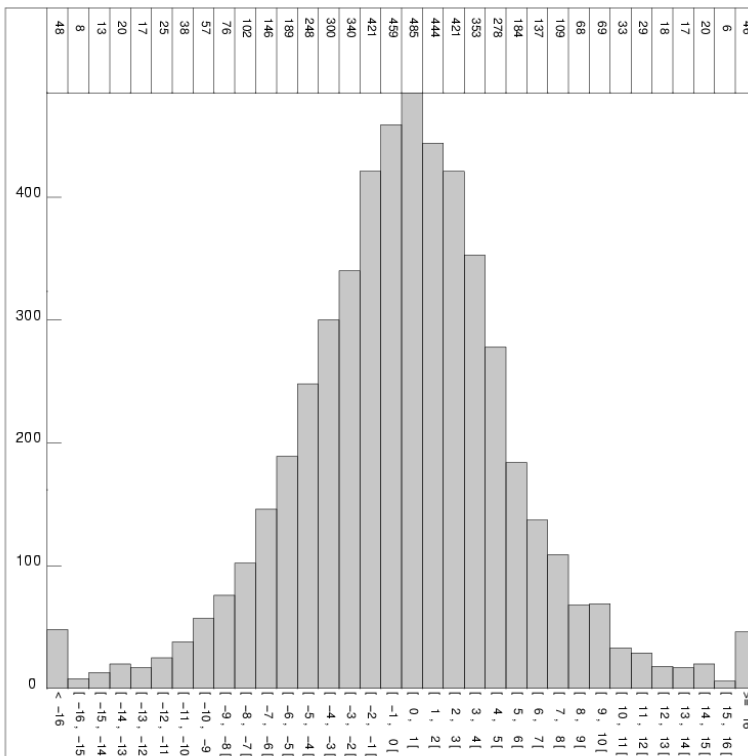
Type de points de croisement: TPTP  
 Zone géographique (deg): -90 / 90 , 0 / 360  
 Seuil sur les écarts d'analyse 0.00 (moy)  
 30.00 (seuil)  
 Selection(s) sur les champs :  
 CL Arc 1 :=INTERP\_SPLN  
 CL Arc 2 :=INTERP\_SPLN  
 Seuil Min +: 0.0000000  
 Seuil Max : 0.0000000

Selection(s) sur les écarts :  
 Aucune

#### RESULTATS STATISTIQUES

Valeur minimale : -29.2100  
 Valeur maximale : 29.5400  
 Différence Max – Min: 58.7500  
 Nombre de points lus: 5351  
 Nombre de points sélectionnés: 5225  
 Moyenne : 0.109397  
 Ecart-type : 5.59679  
 Moyenne Quadratique : 5.59786

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

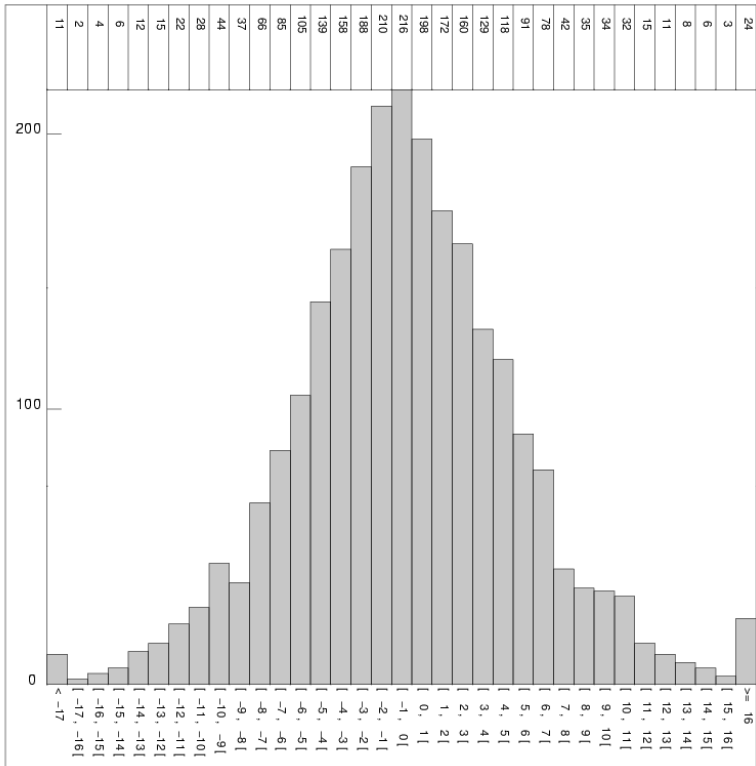
**RAPPEL DES SELECTIONS**

Type de points de croisement: TPTP  
 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 : -24.7600  
 Valeur maximale : 27.0400  
 Différence Max – Min: 51.8000  
 Nombre de points lus: 2736  
 Nombre de points sélectionnés: 2504  
 Moyenne : -0.290395  
 Écart-type : 5.66134  
 Moyenne Quadratique : 5.66878

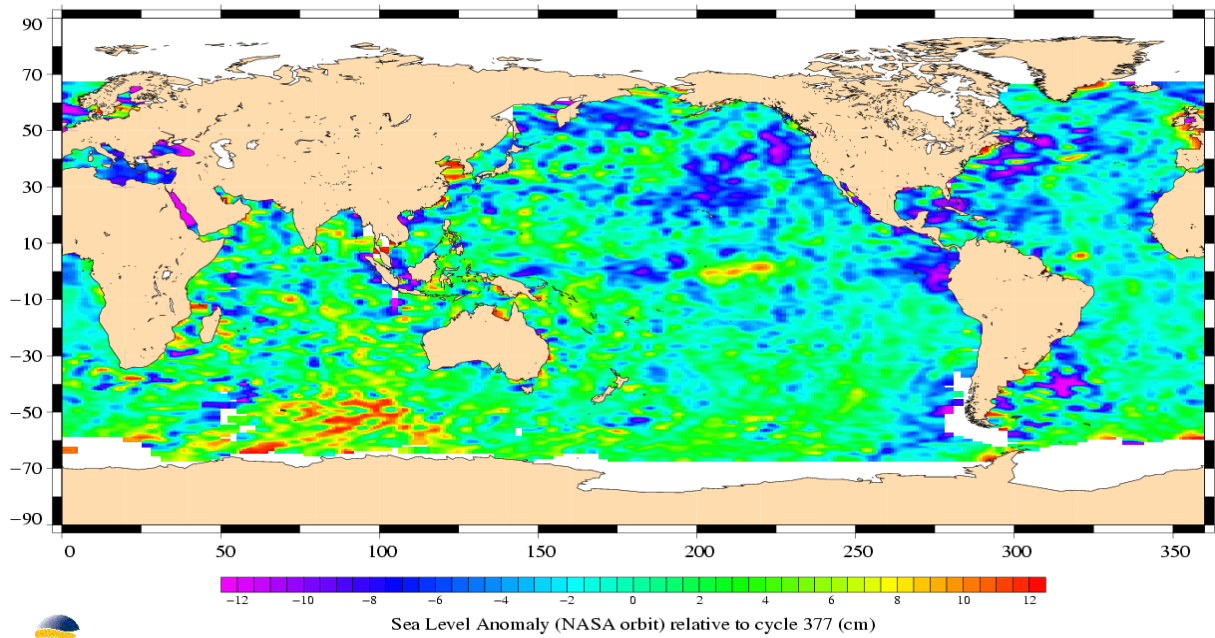
*CLS Space Oceanography Division*



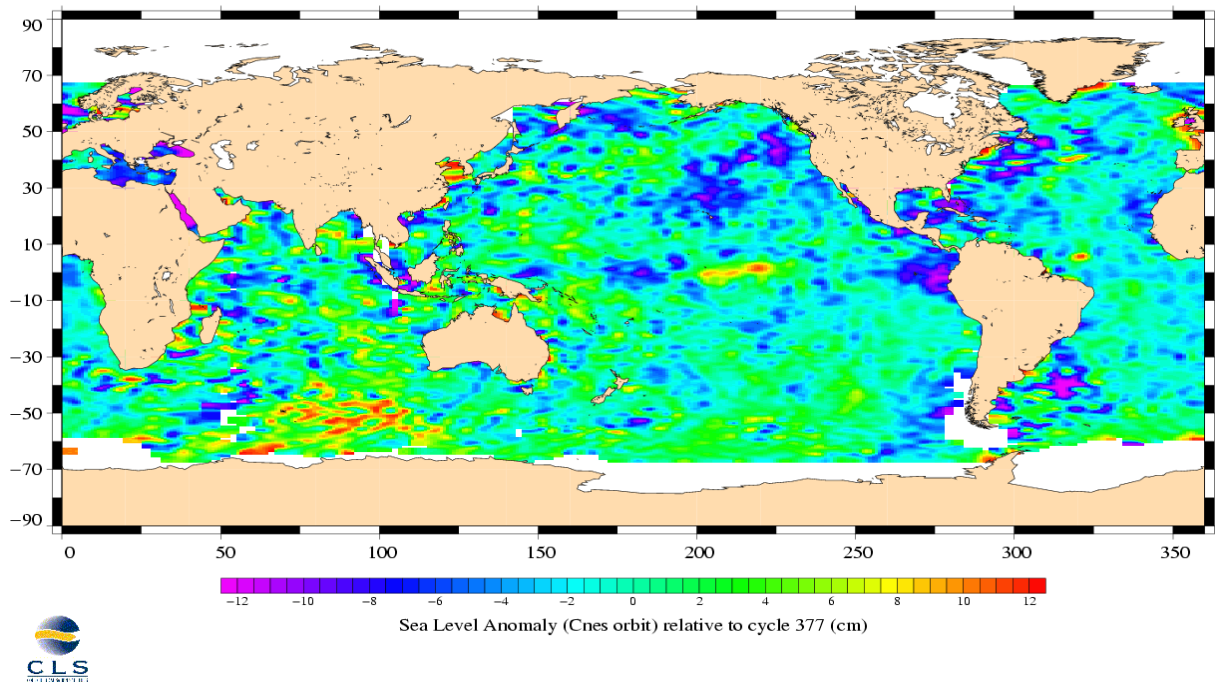
### 3.8 SSH variability

#### 3.8.1 Sea Level Anomaly

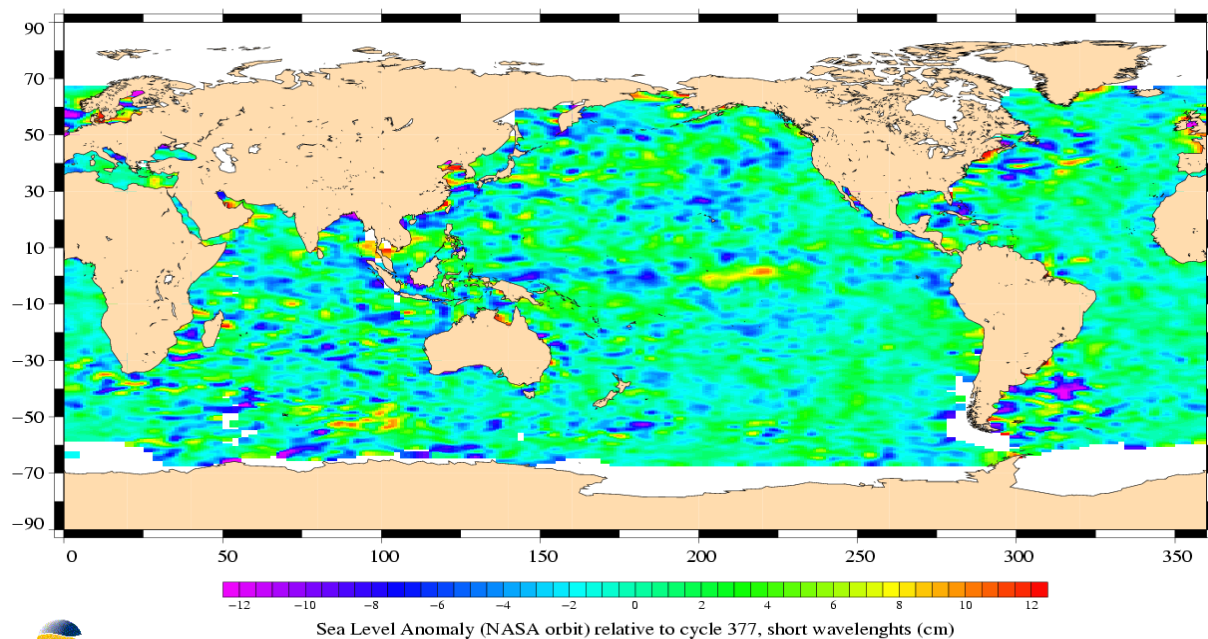
TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002



TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002



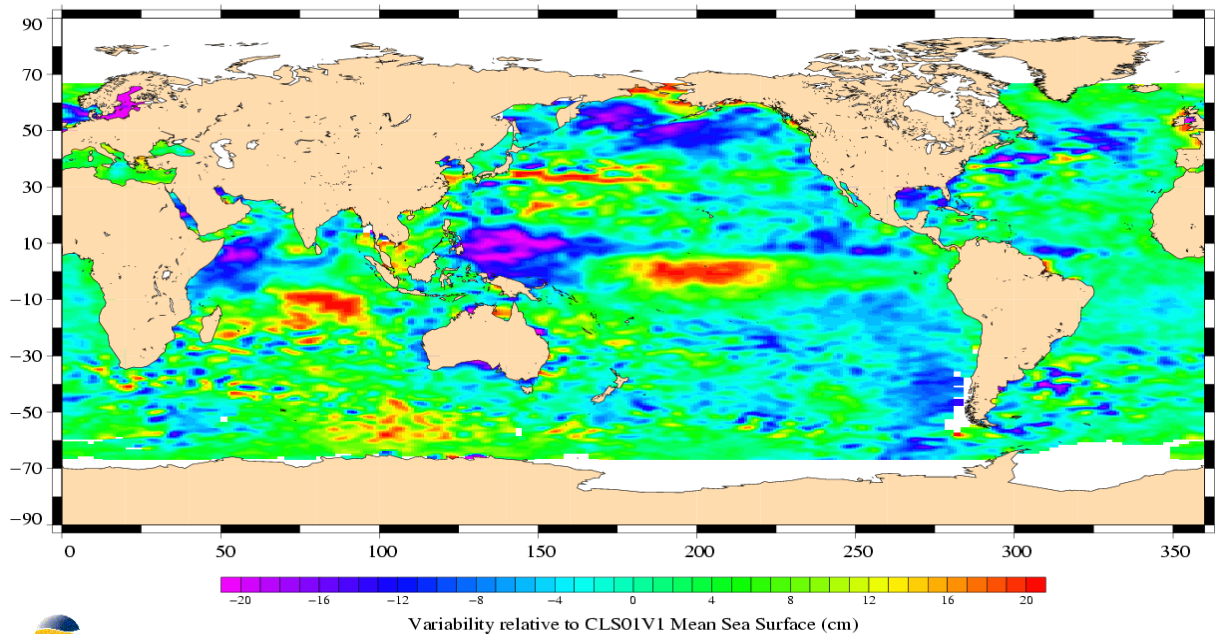
TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002



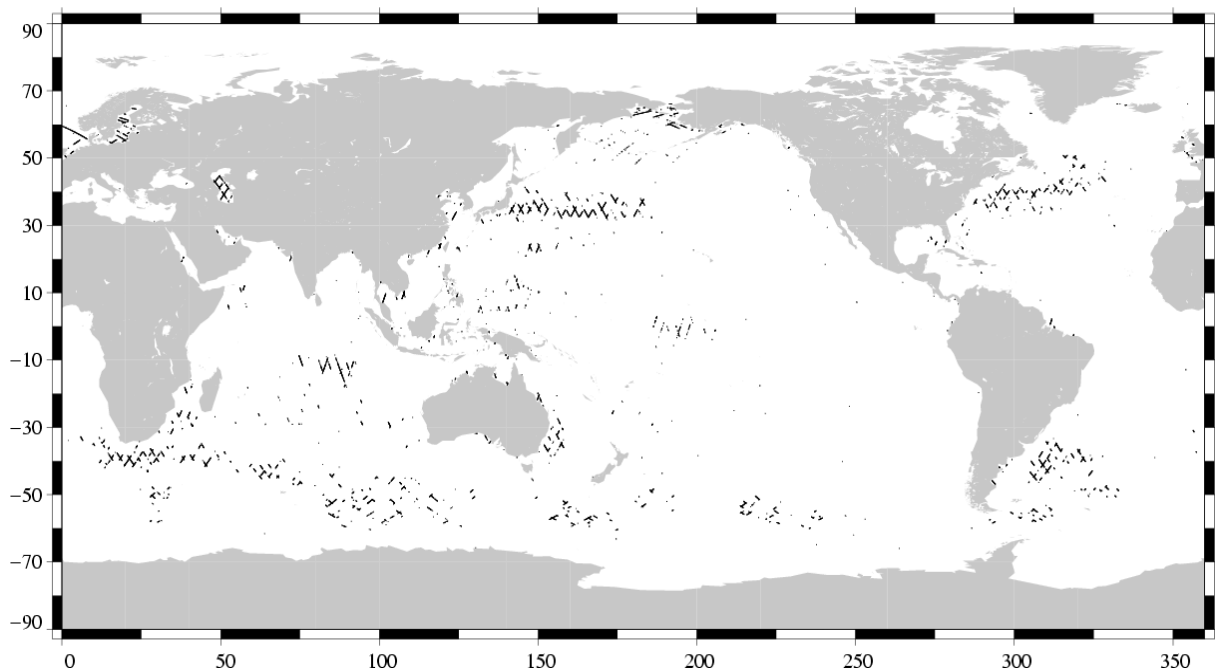
### 3.8.2 Comparison to a precise Mean Sea Surface

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 378  
Period : 18/12/2002 – 28/12/2002

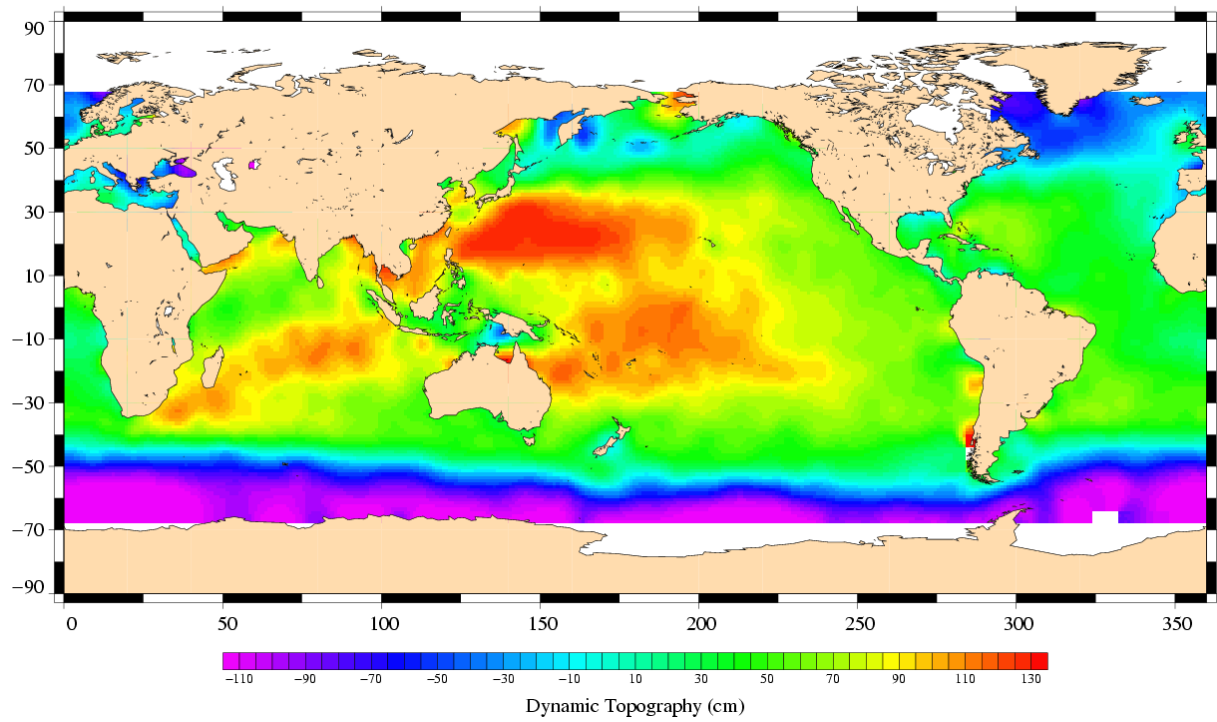


(SSH – MSS) differences greater than 0.3 m  
TOPEX/Poseidon Cycle 378 (18/12/2002 / 28/12/2002)



### 3.9 Dynamic topography

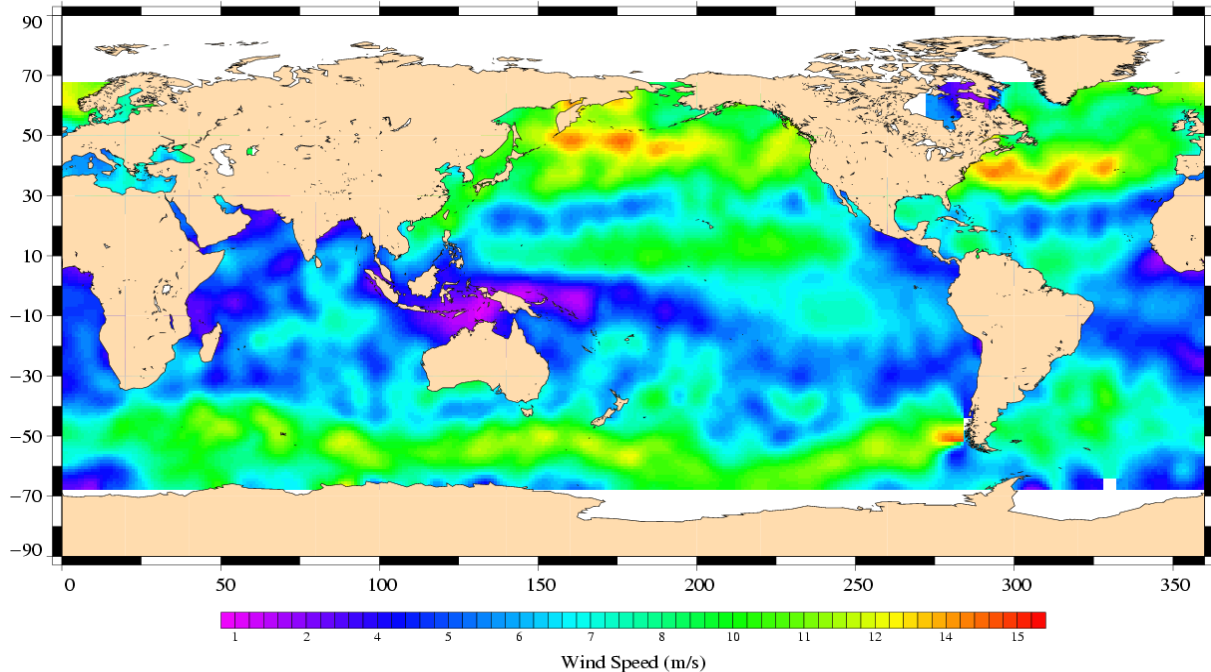
TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002



### 3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002



TOPEX/Poseidon, cycle 378  
Period : 18/12/2002 – 28/12/2002

