



TOPEX/Poseidon MGRD Quality Assessment Report

Cycle 443

22-09-2004 02-10-2004

Prepared by :	C. Schgounn, CLS G. Pontonnier, CLS M. Ablain, CLS	
Accepted by :	J. Dorandeu, CLS	
Quality visa :	M. Destouesse, CLS	
Approved by :	N. Picot, CNES	



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

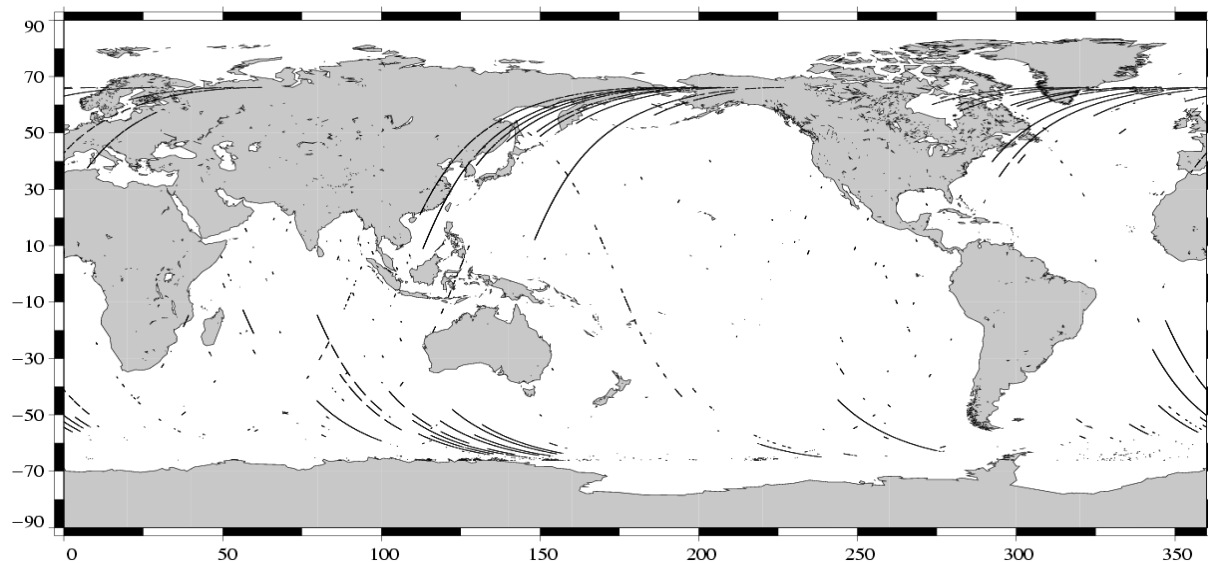
2.1 Cycle quality and performances

Data quality for this cycle appears to be nominal. For this cycle, the crossover standard deviation is 5.88 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.45 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.
The NASA Altimeter experienced an SEU on Tuesday, 28 September. Approximately 6 hours of data were lost (passes 155 to 159 are missing).
Passes 18, 23-26, 82, 246 are missing due to recorder anomalies.
- 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 :
 - 4.22% of the measurements are removed by the TMR correction criterion (see the following figure).
 - All measurements of passes 14 and 83 are removed by the radiometer land flag 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](#)) .

Edited parameter : Radiometer wet tropospheric correction
T/P Cycle 443 (22/09/2004 / 02/10/2004)



3 CALVAL main results

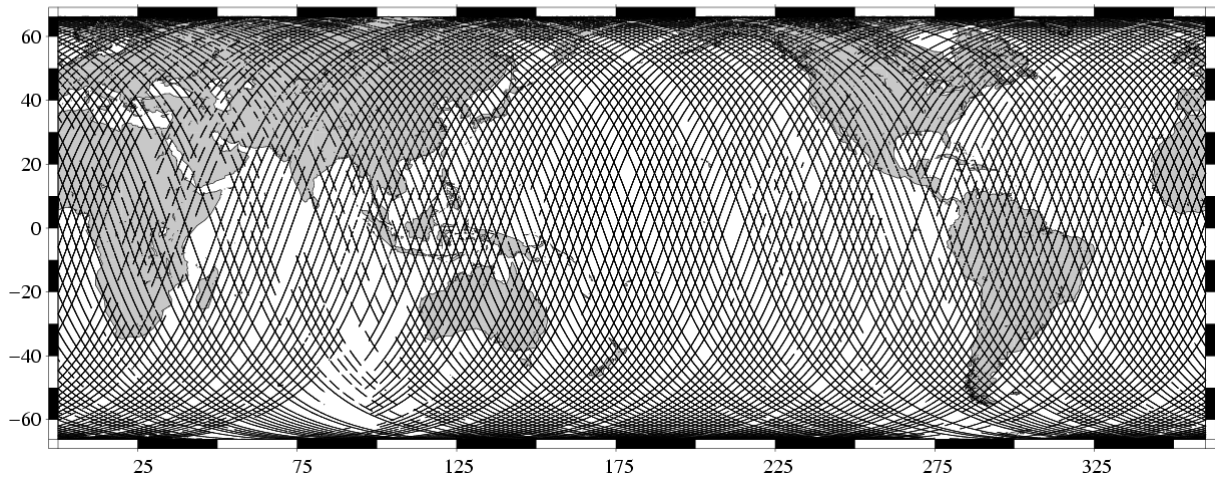
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

3.1 Missing measurements

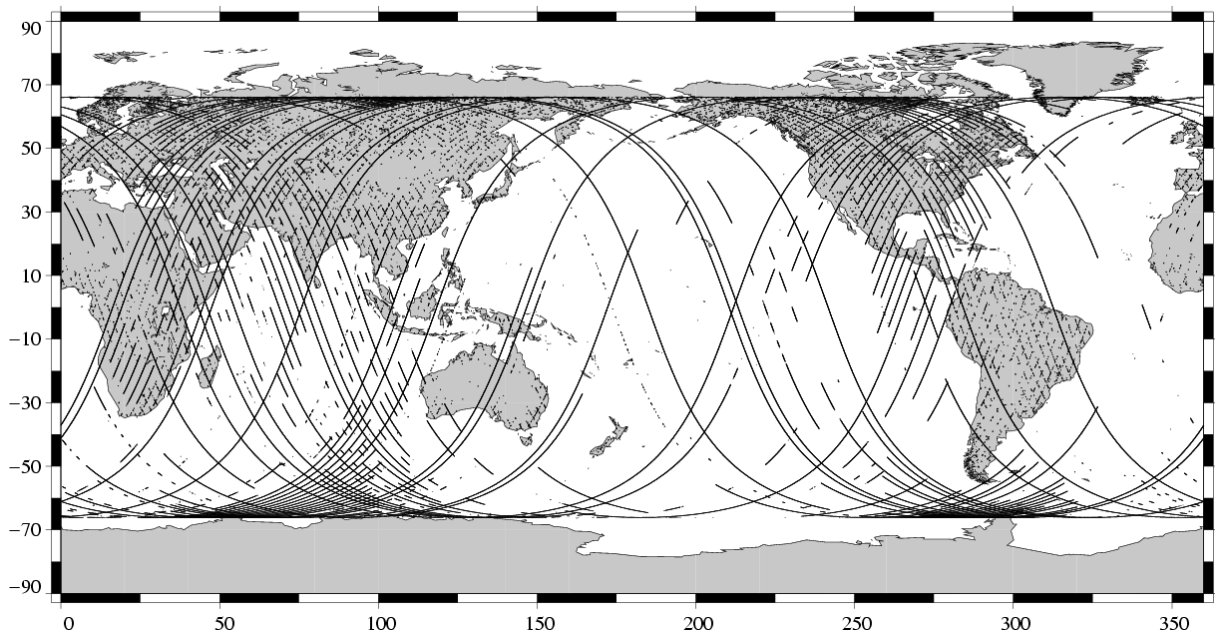
613499 altimeter measurements are present, and 181044 are missing.

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 443 (22/09/2004 / 02/10/2004)



Missing measurements
TOPEX/Poseidon Cycle 443 (22/09/2004 / 02/10/2004)



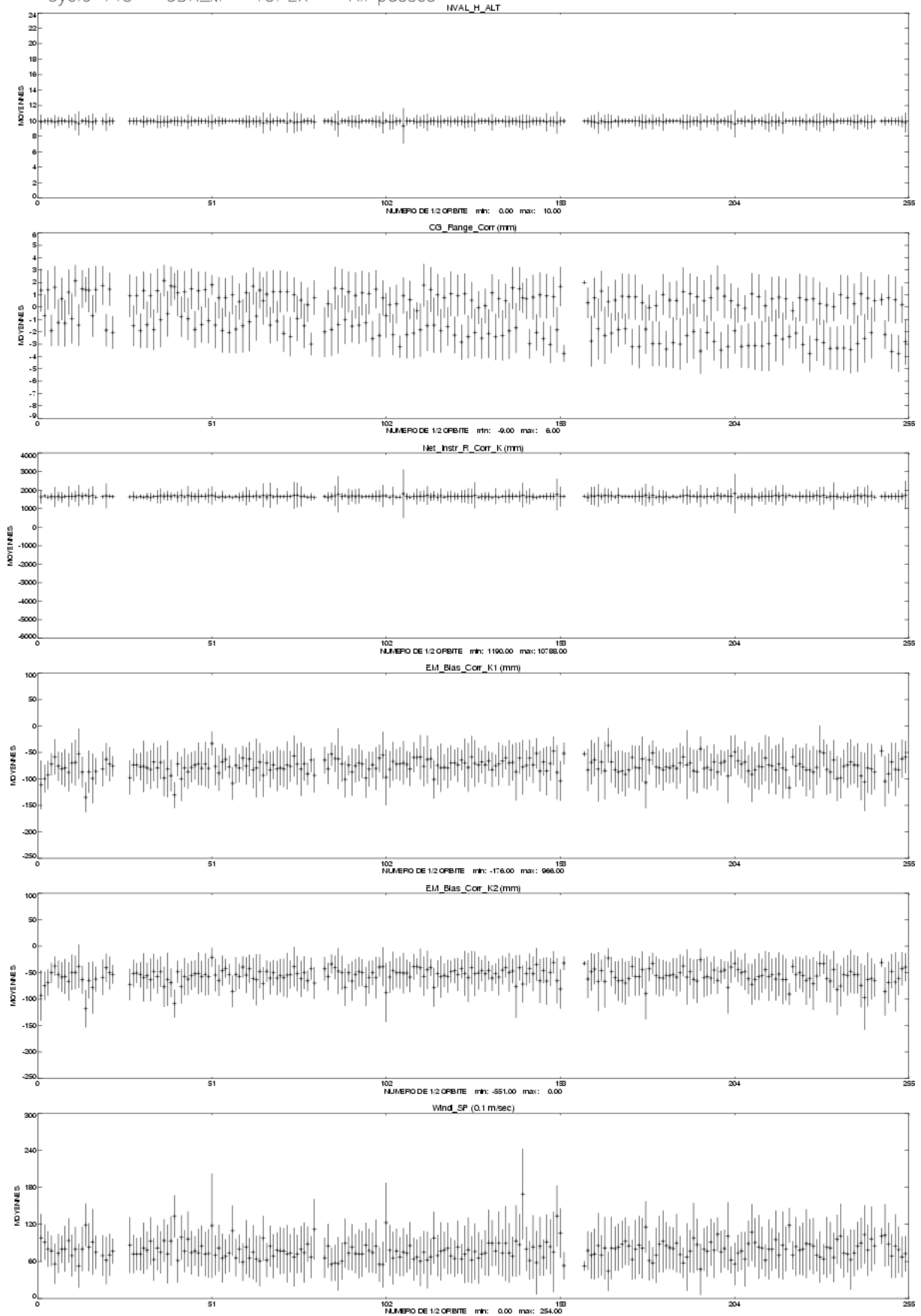
3.2 M-GDR quality flags

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

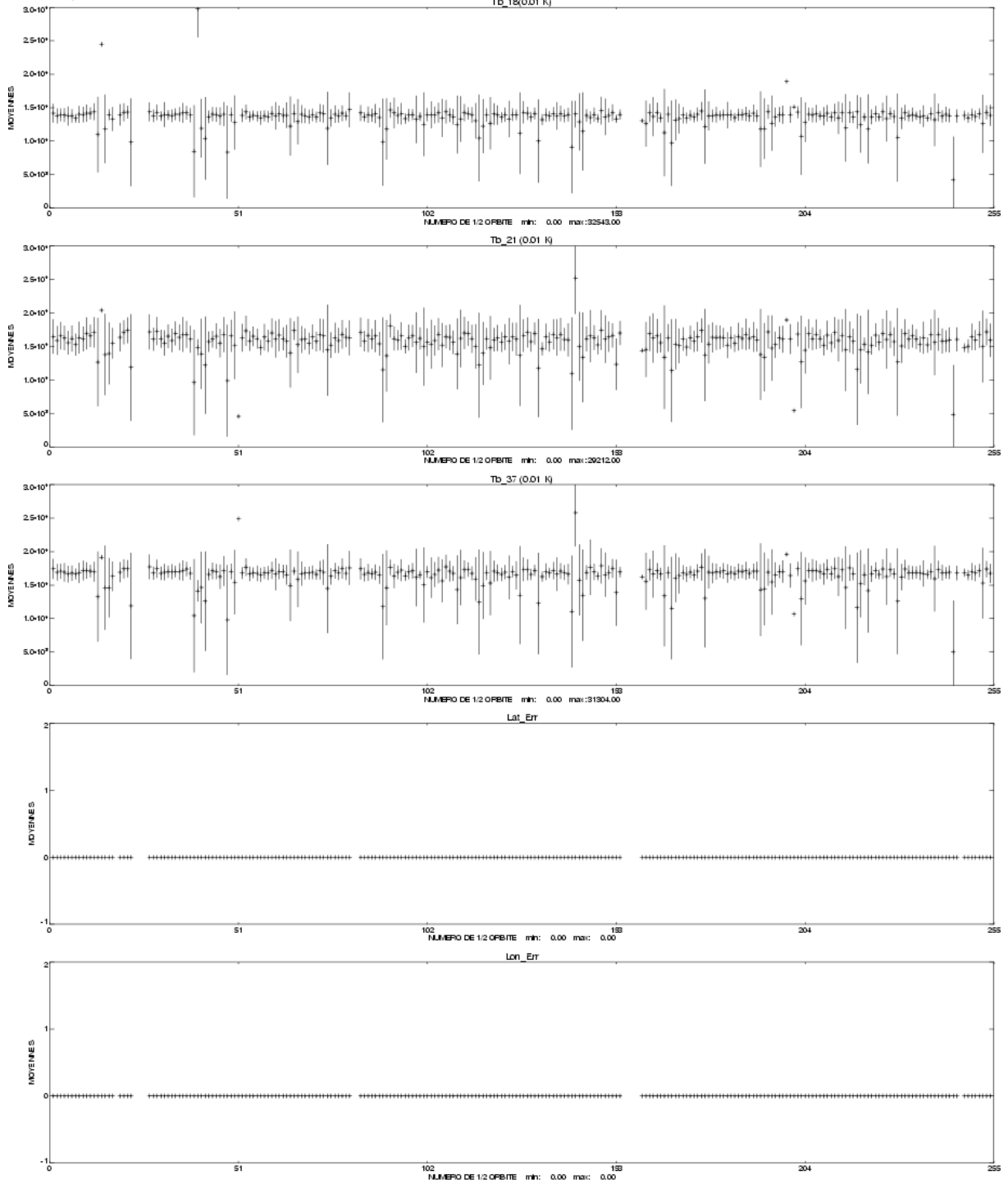
Name	Description	% bad
Geo_Bad_1	altimeter land flag	25.69
Geo_Bad_1	ice flag	8.12
Geo_Bad_1	radiometer land flag	27.61
Alt_Bad_1	conditions 1 altimeter	5.42
Alt_Bad_2	conditions 2 altimeter	5.29
Geo_Bad_2	rain (liquid water in excess)	7.52
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.43
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	2.94
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	7.92
DORIS	DORIS not valid	0.00

3.3 M-GDR parameter plots

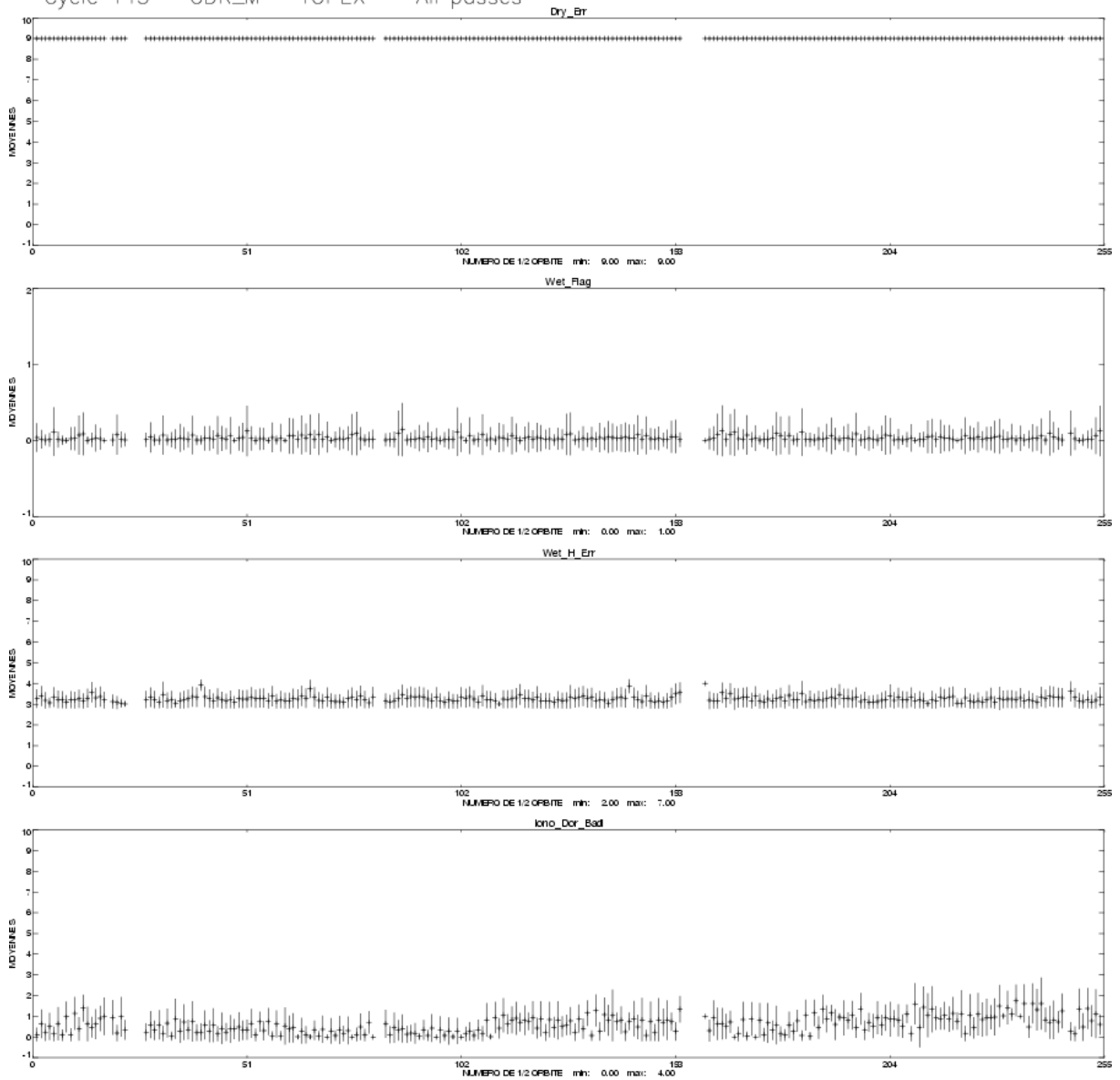
Cycle 443 – GDR_M – TOPEX – All passes –



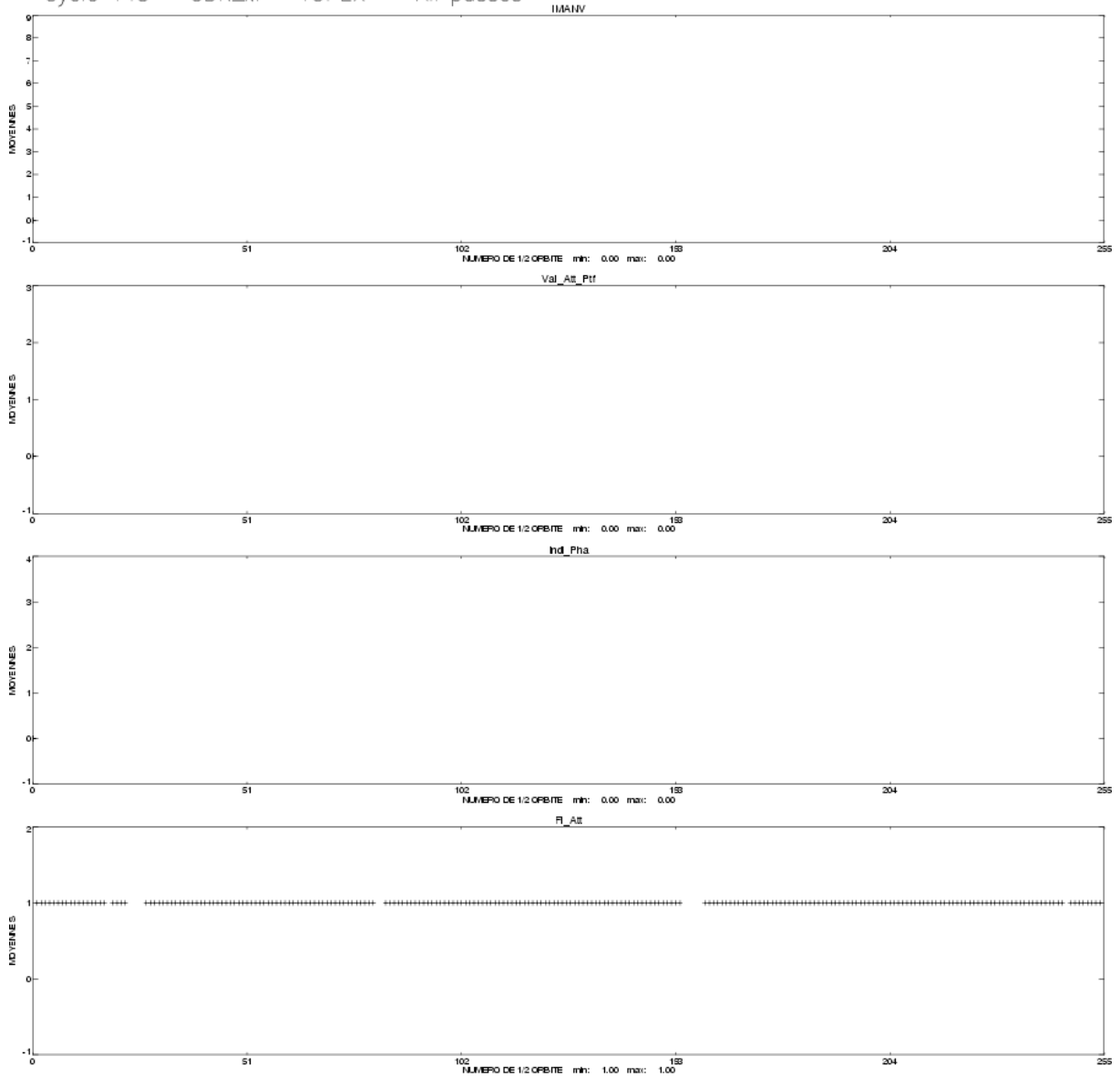
Cycle 443 – GDR_M – TOPEX – All passes –

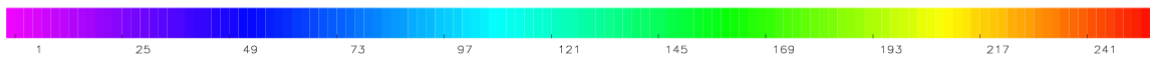
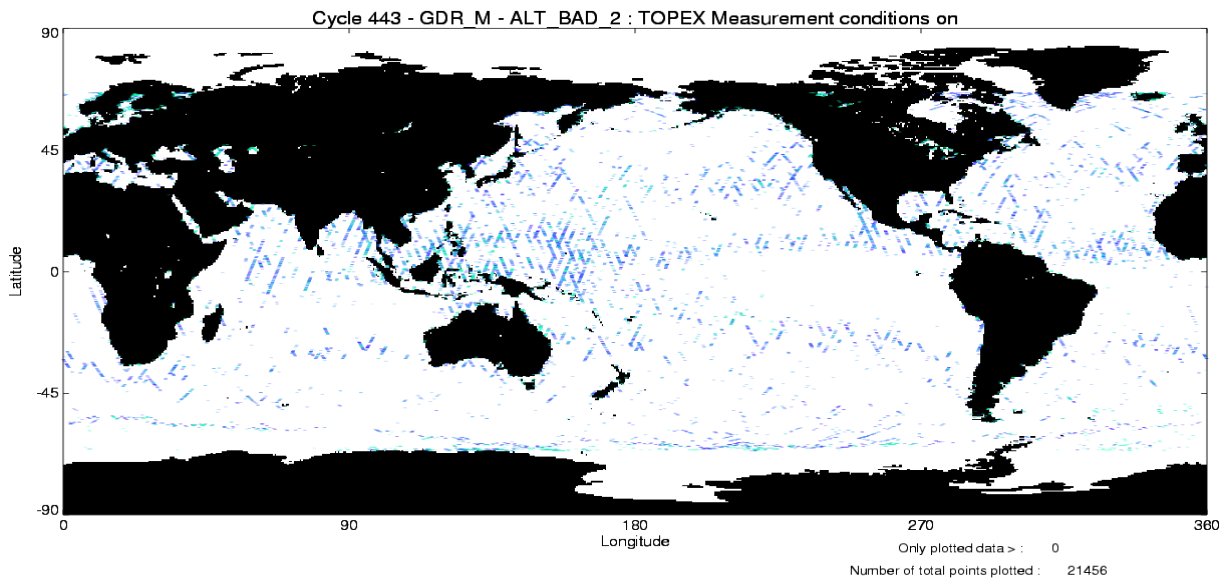
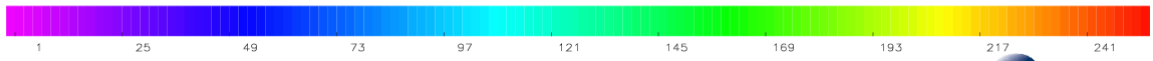
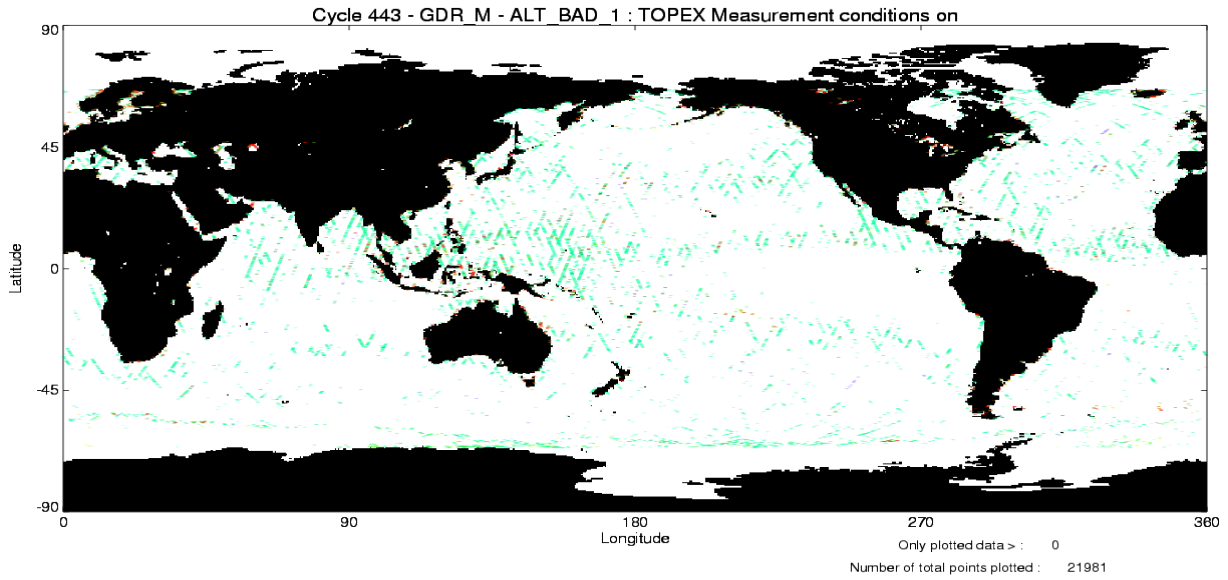


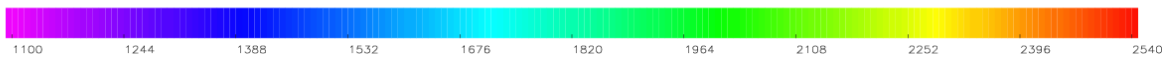
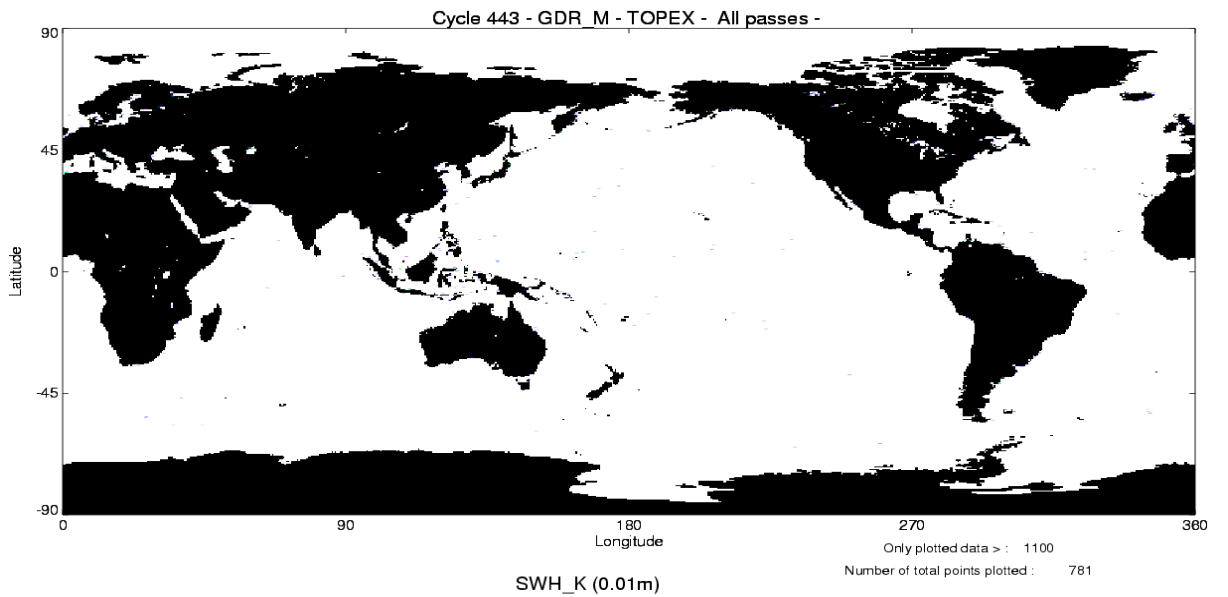
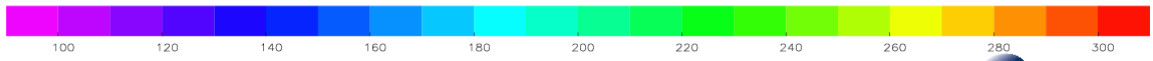
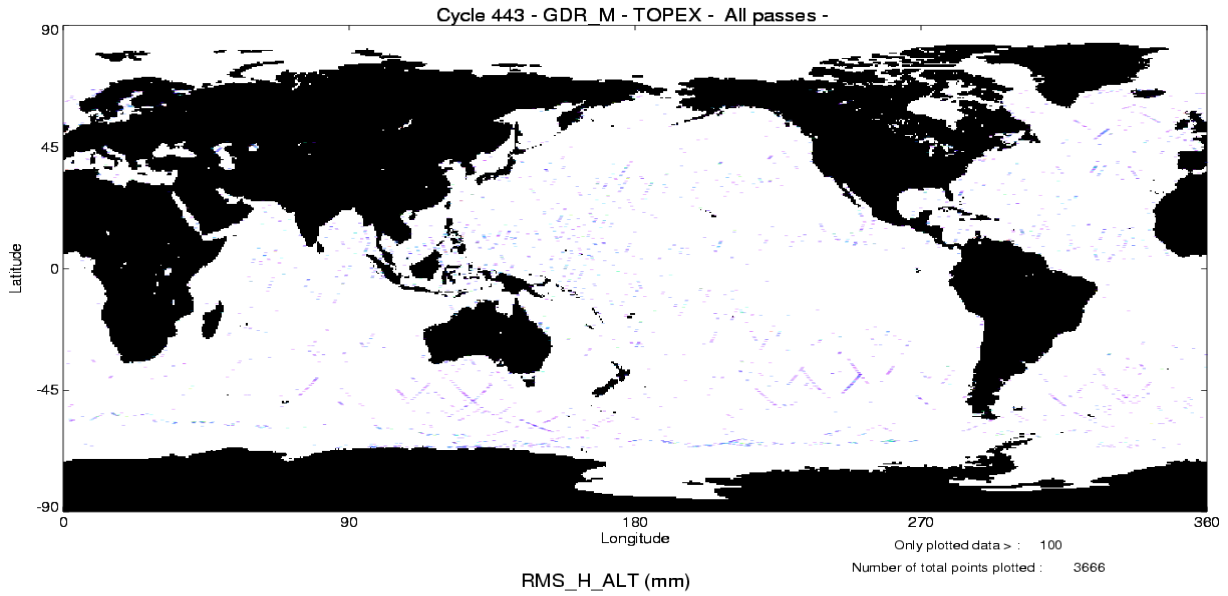
Cycle 443 – GDR_M – TOPEX – All passes –

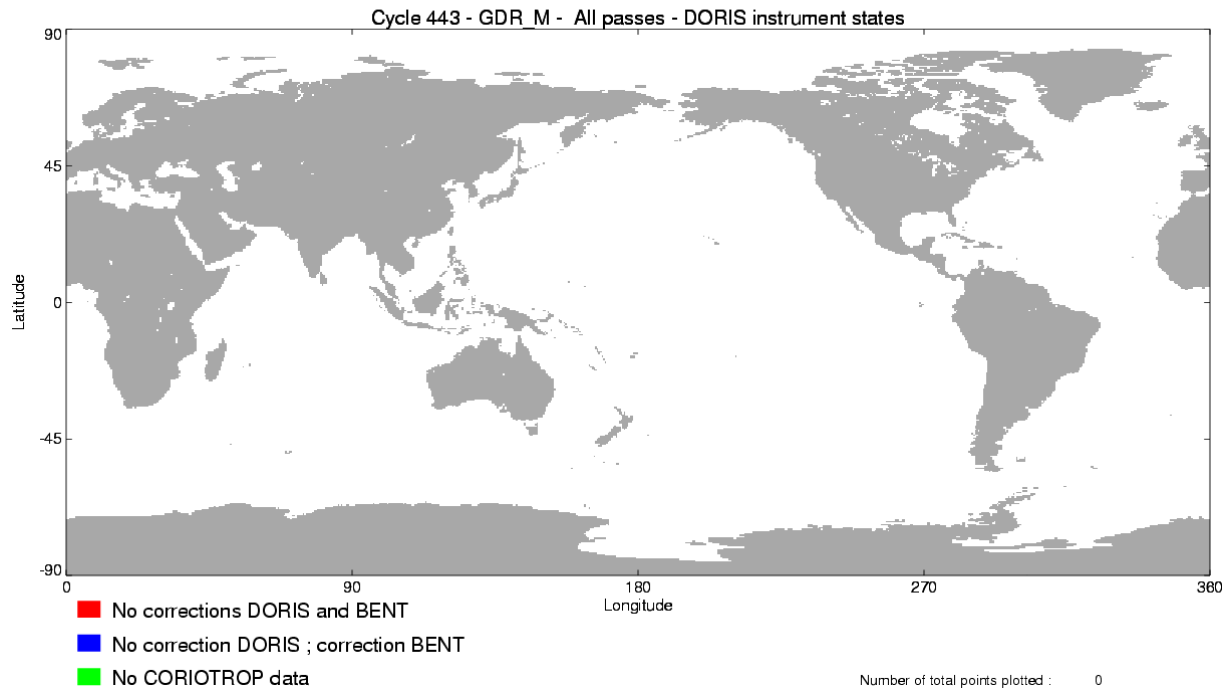


Cycle 443 – GDR_M – TOPEX – All passes –









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.

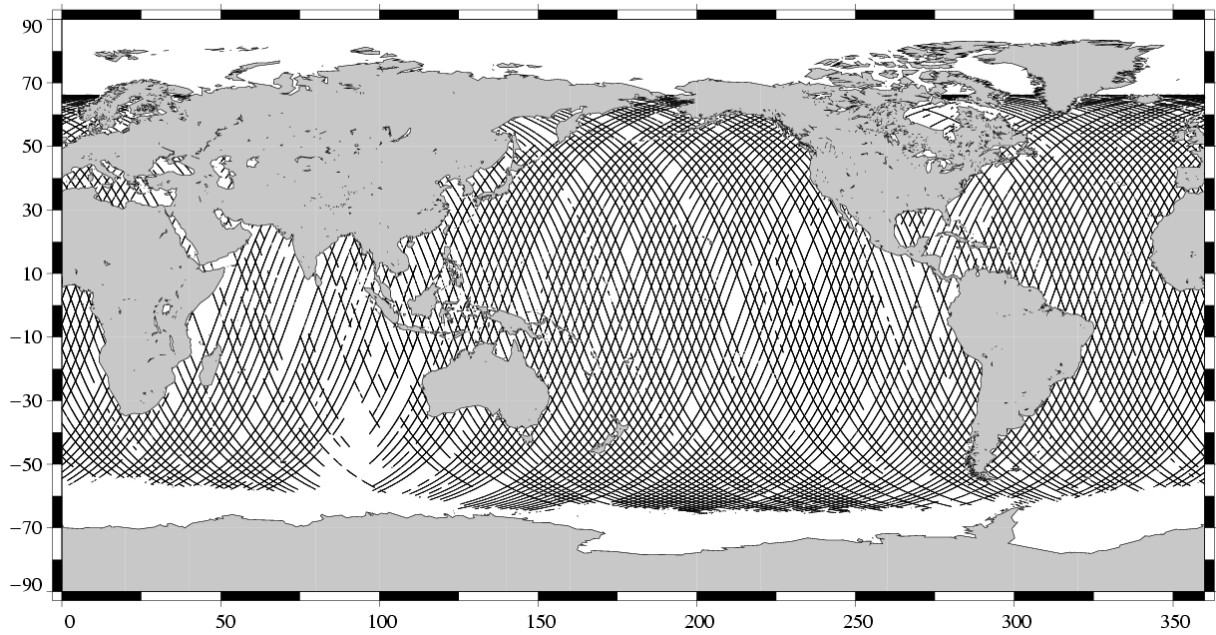
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (27.66 % of points removed) and ice flag (8.11 % of points removed).

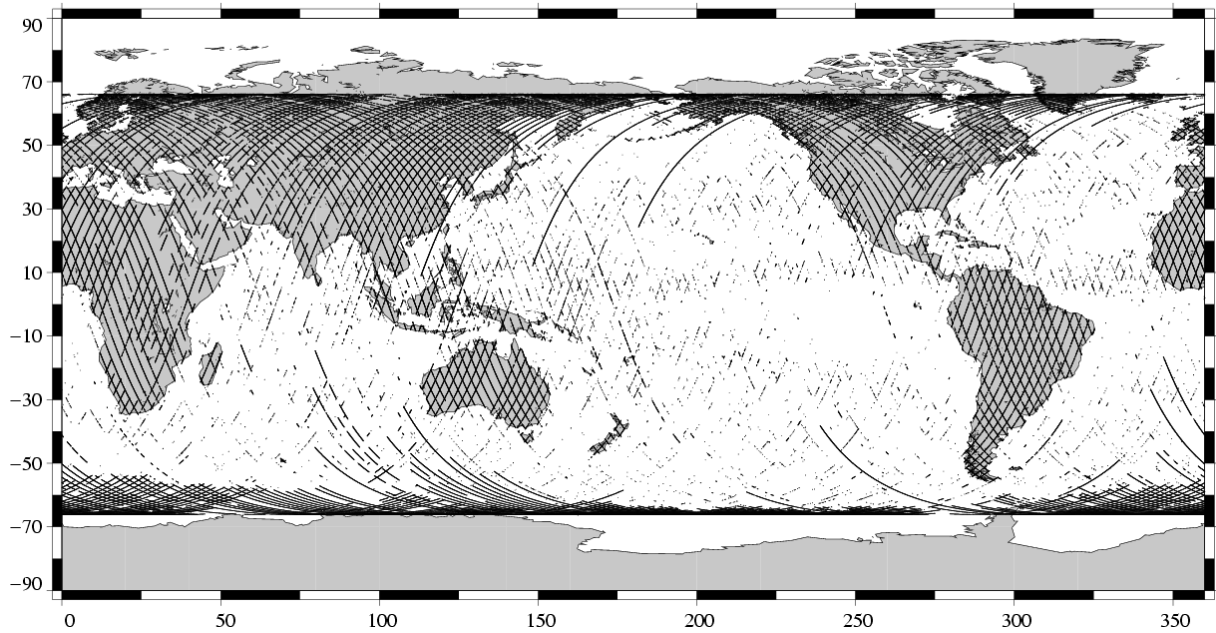
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	0.13
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	0.24
Std. deviation of range	0.000	0.100	m	1.85	0.92
Off nadir angle from waveform	0.000	0.400	deg	1.36	3.65
Dry tropospheric 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	4.22
Ionospheric correction (Poseidon:Doris, TOPEX:Dual)	-0.400	0.040	m	0.00	0.26
Significant wave height	0.000	11.000	m	1.46	0.07
Sea state Bias	-0.500	0.000	m	1.39	0.25
Backscatter coefficient	7.000	30.000	dB	1.44	0.52
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	0.57
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.

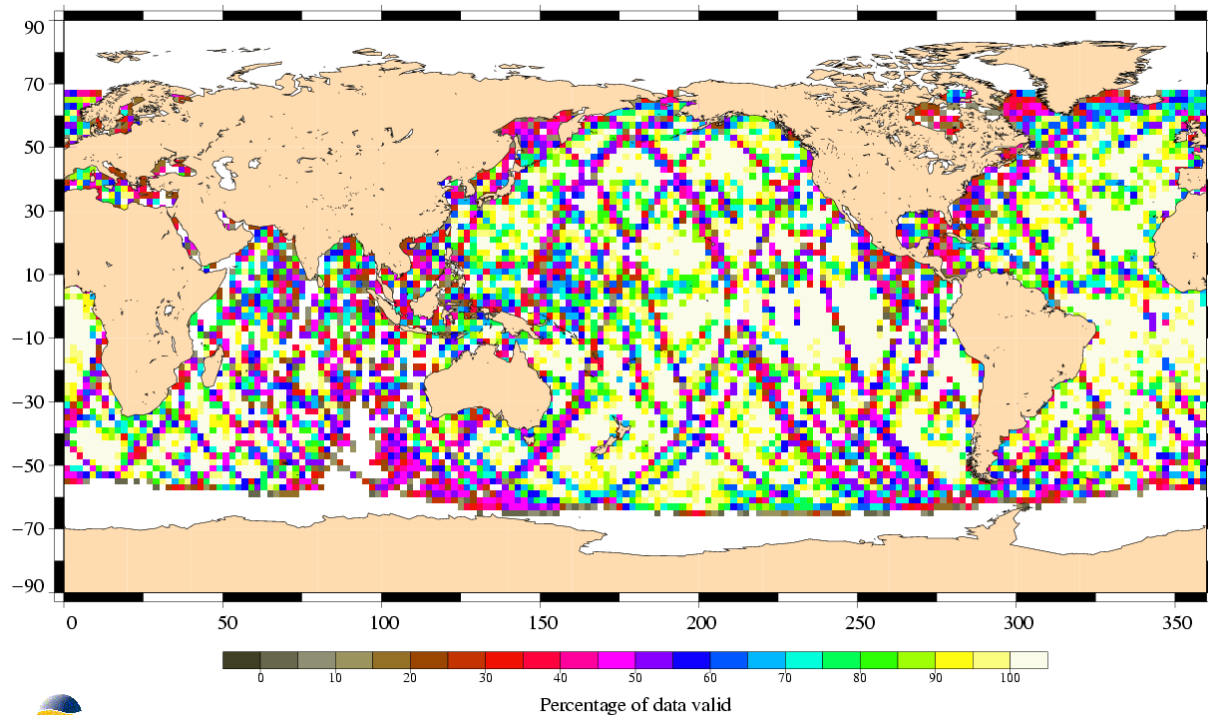
Valid data
TOPEX/Poseidon Cycle 443 (22/09/2004 / 02/10/2004)



Edited measurements
TOPEX Cycle 443 (22/09/2004 / 02/10/2004)

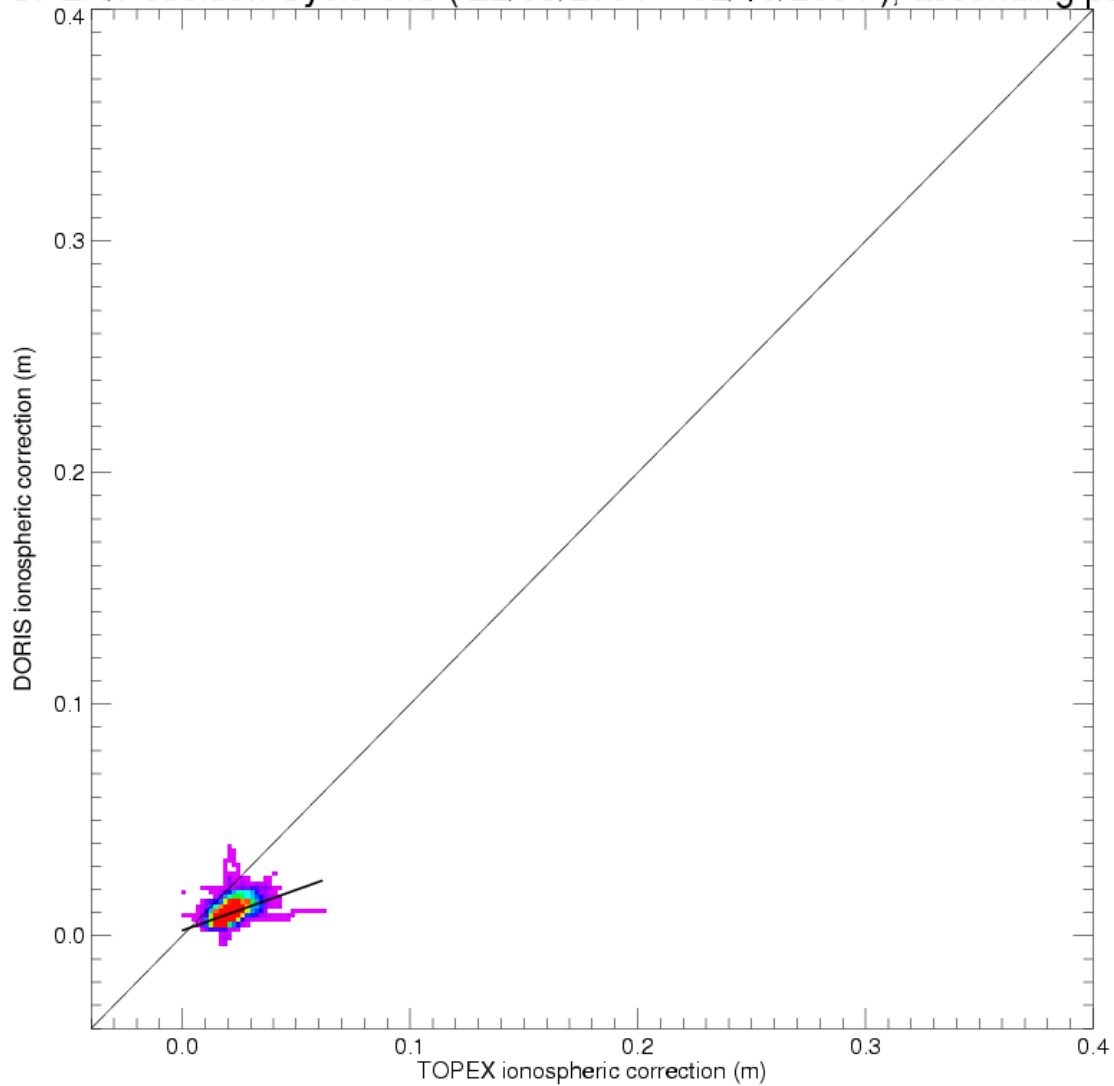


Percentage of valid data relative to the nominal pass
TOPEX/Poseidon Cycle 443 (22/09/2004 / 02/10/2004)

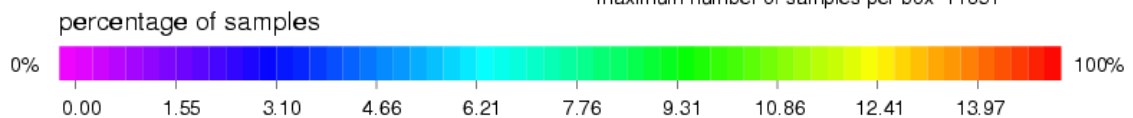


3.5 Ionospheric correction

TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), ascending passes



minimum number of samples per box 1
maximum number of samples per box 11851



Statistics Y-X

mean = -0.01092
rms = 0.01183
std = 0.00455

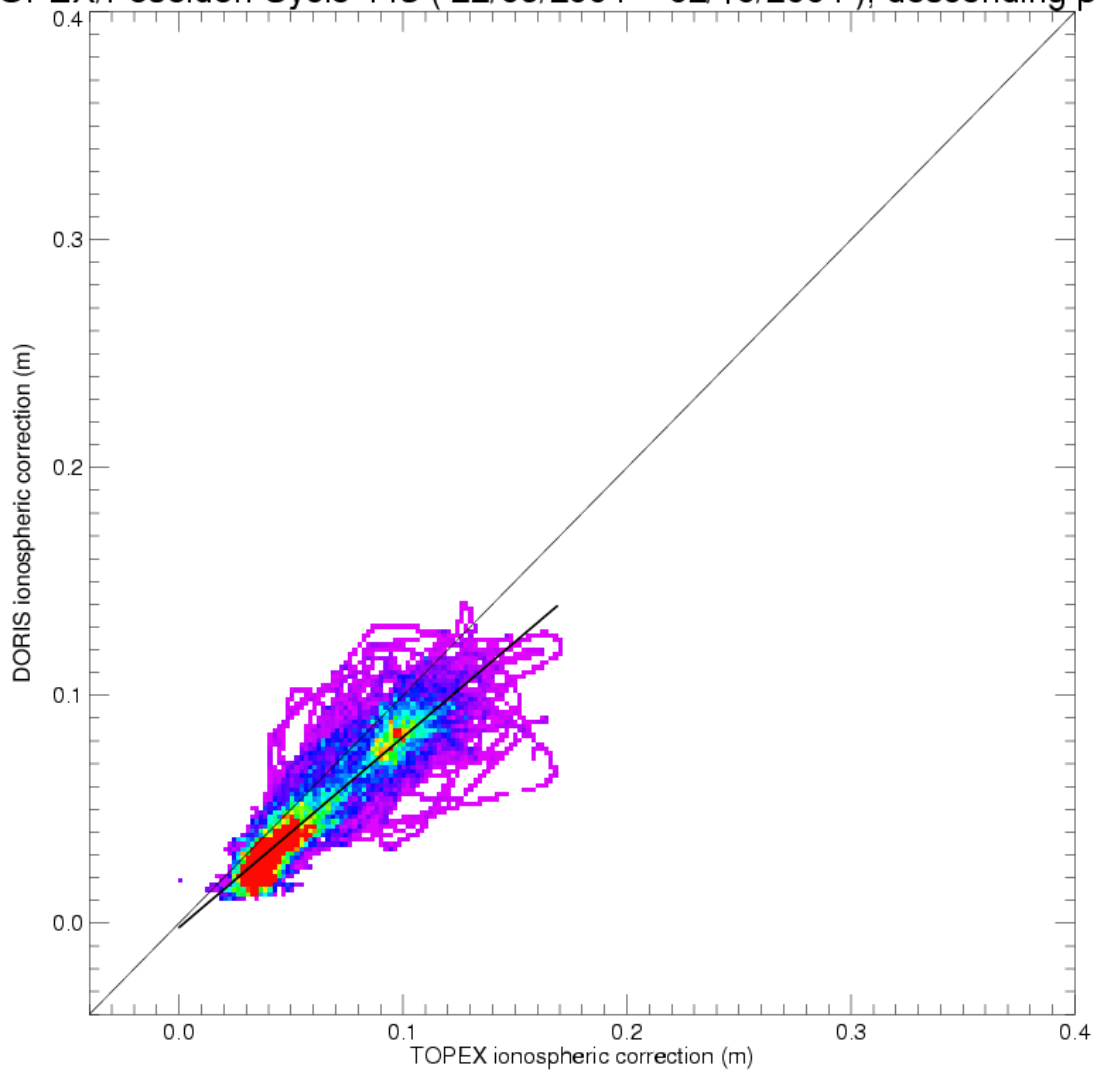
Order 1 fit polynom

$y = a x + b$
a = 0.35054690
b = 0.00230438

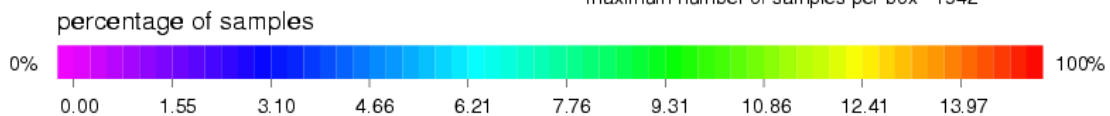
Legend

— Order 1 fit polynom
— Bisectrix

TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 1942



Statistics Y-X

mean = -0.01165
 rms = 0.01694
 std = 0.01229

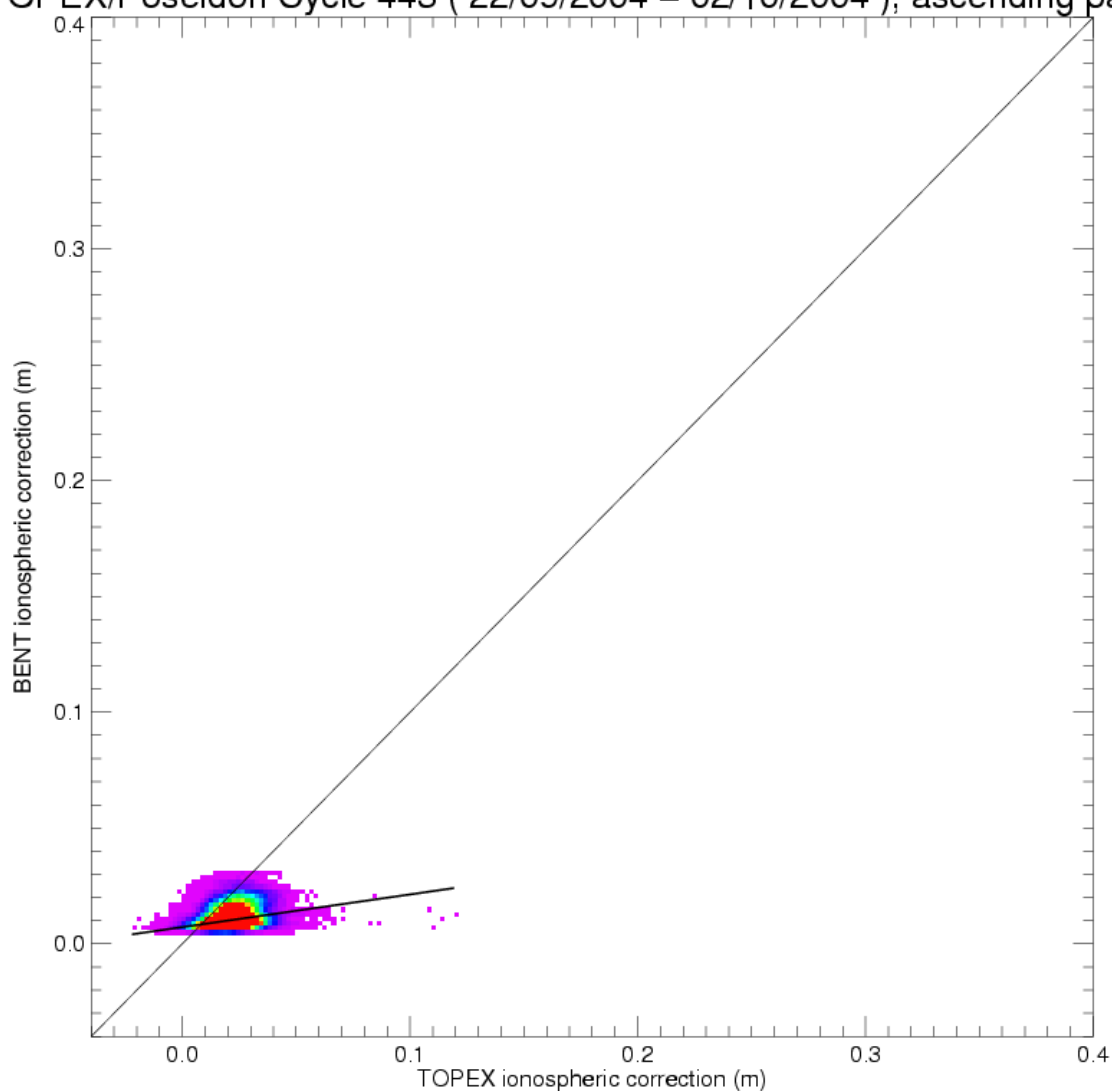
Order 1 fit polynom

$y = a x + b$
 $a = 0.83603811$
 $b = -0.00190513$

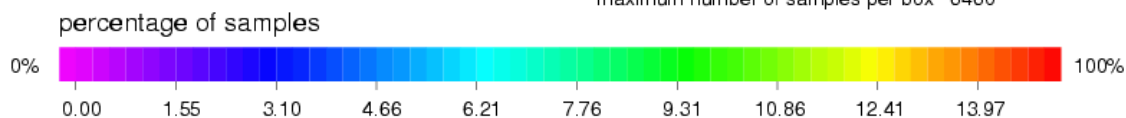
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 6460



Statistics Y-X

mean = -0.01068
 rms = 0.01319
 std = 0.00774

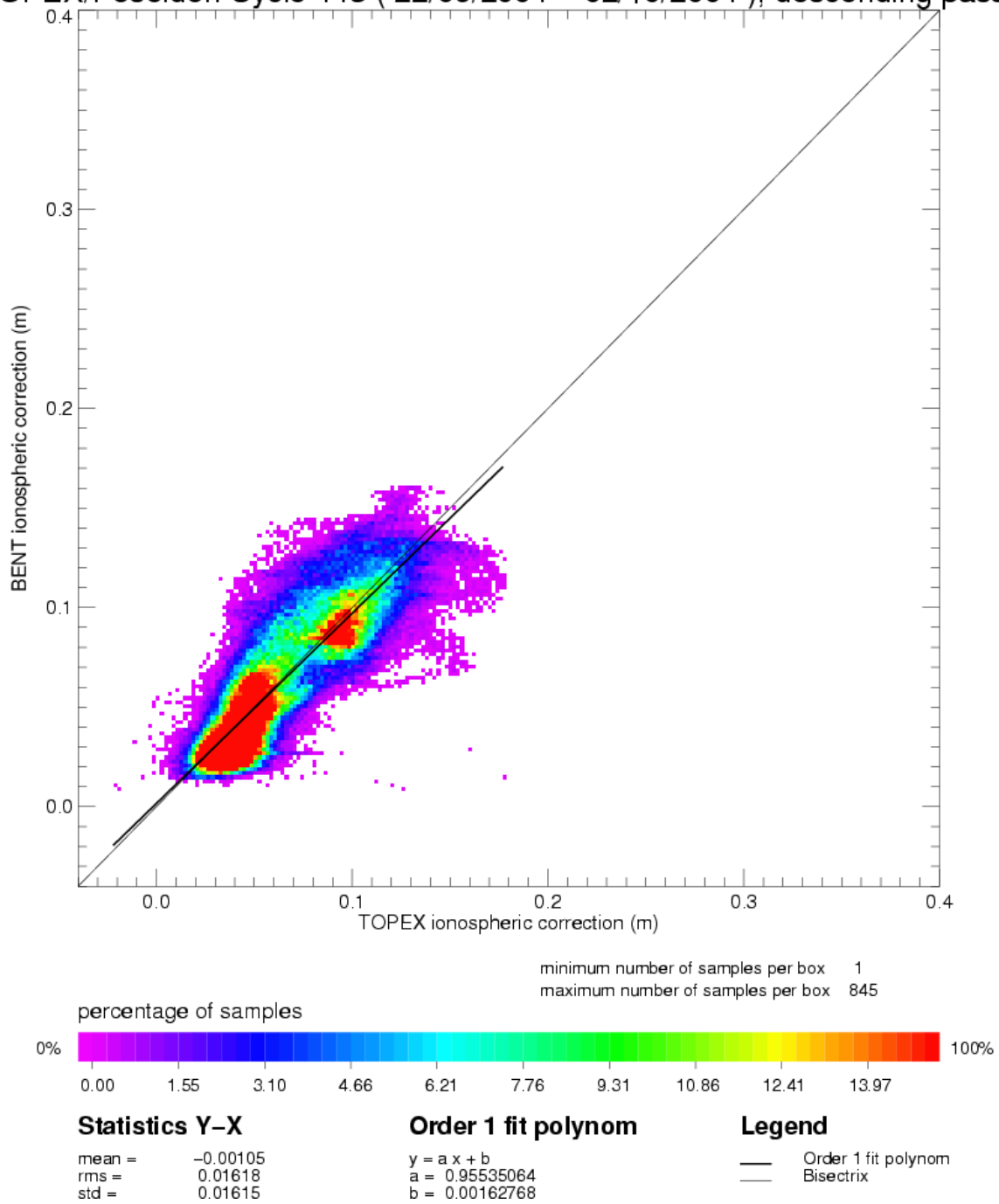
Order 1 fit polynom

$y = a x + b$
 $a = 0.14112066$
 $b = 0.00721783$

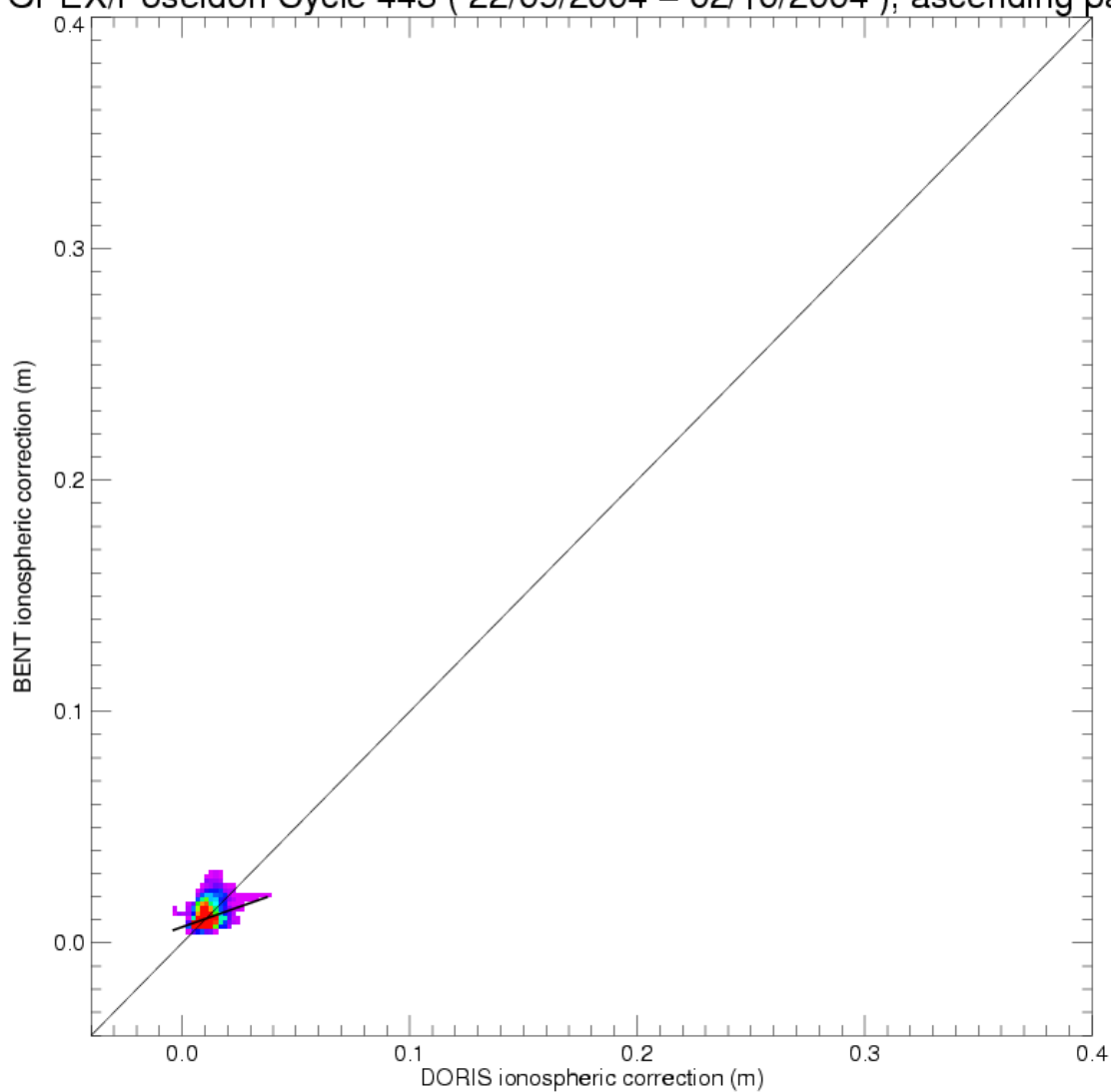
Legend

— Order 1 fit polynom
 — Bisectrix

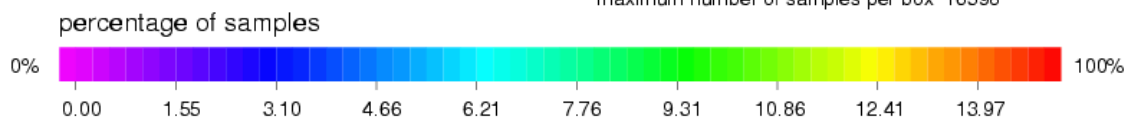
TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), descending passes



TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 16598



Statistics Y-X

mean = 0.00071
 rms = 0.00467
 std = 0.00462

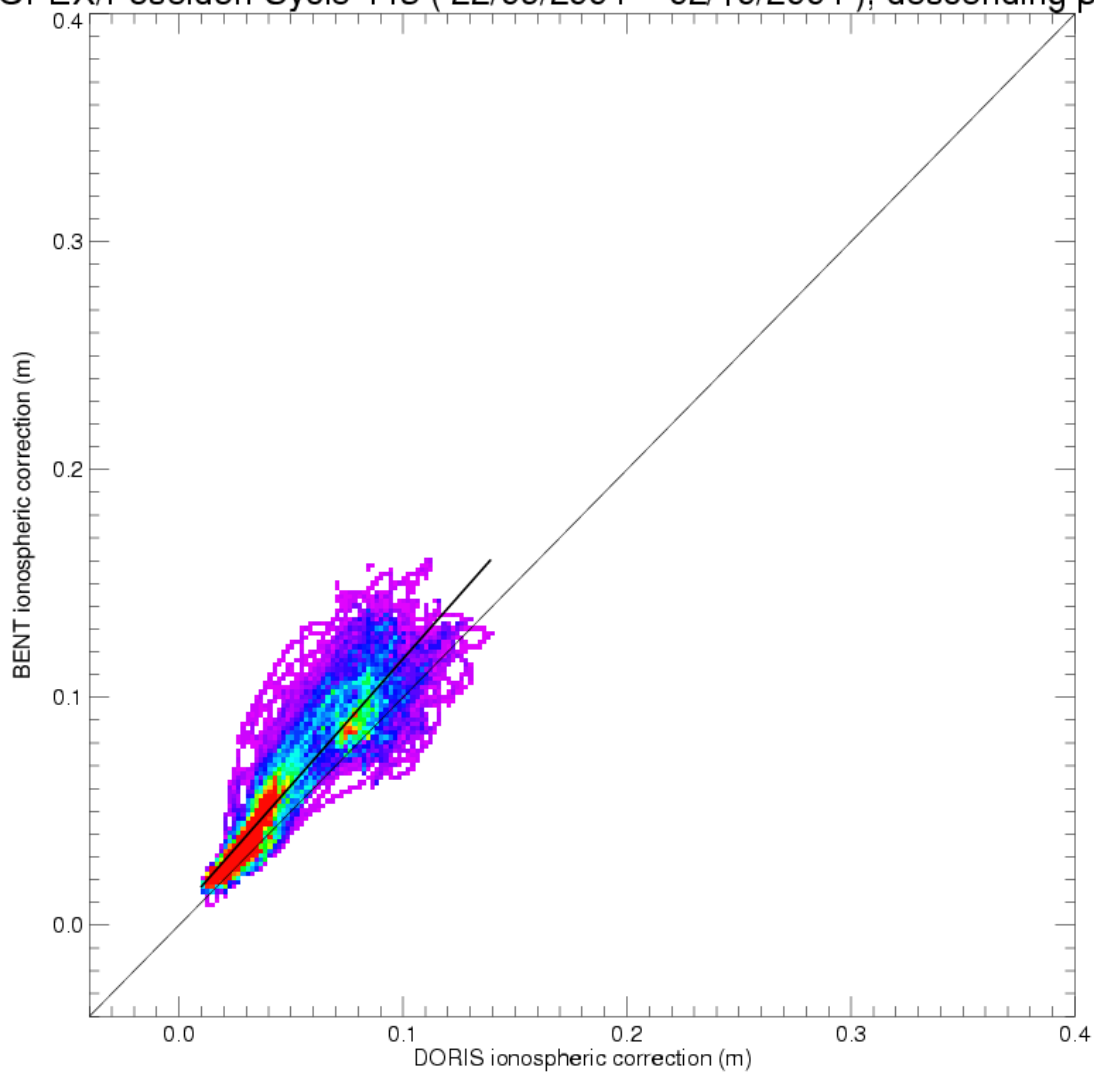
Order 1 fit polynom

$y = a x + b$
 $a = 0.34610569$
 $b = 0.00688994$

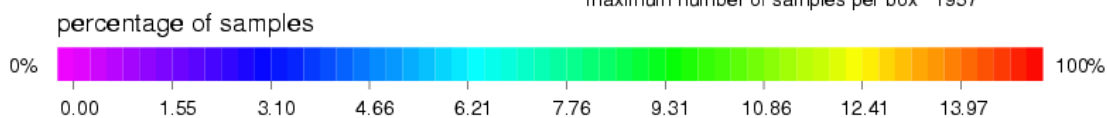
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 443 (22/09/2004 – 02/10/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 1957



Statistics Y-X

mean = 0.01110
 rms = 0.01747
 std = 0.01349

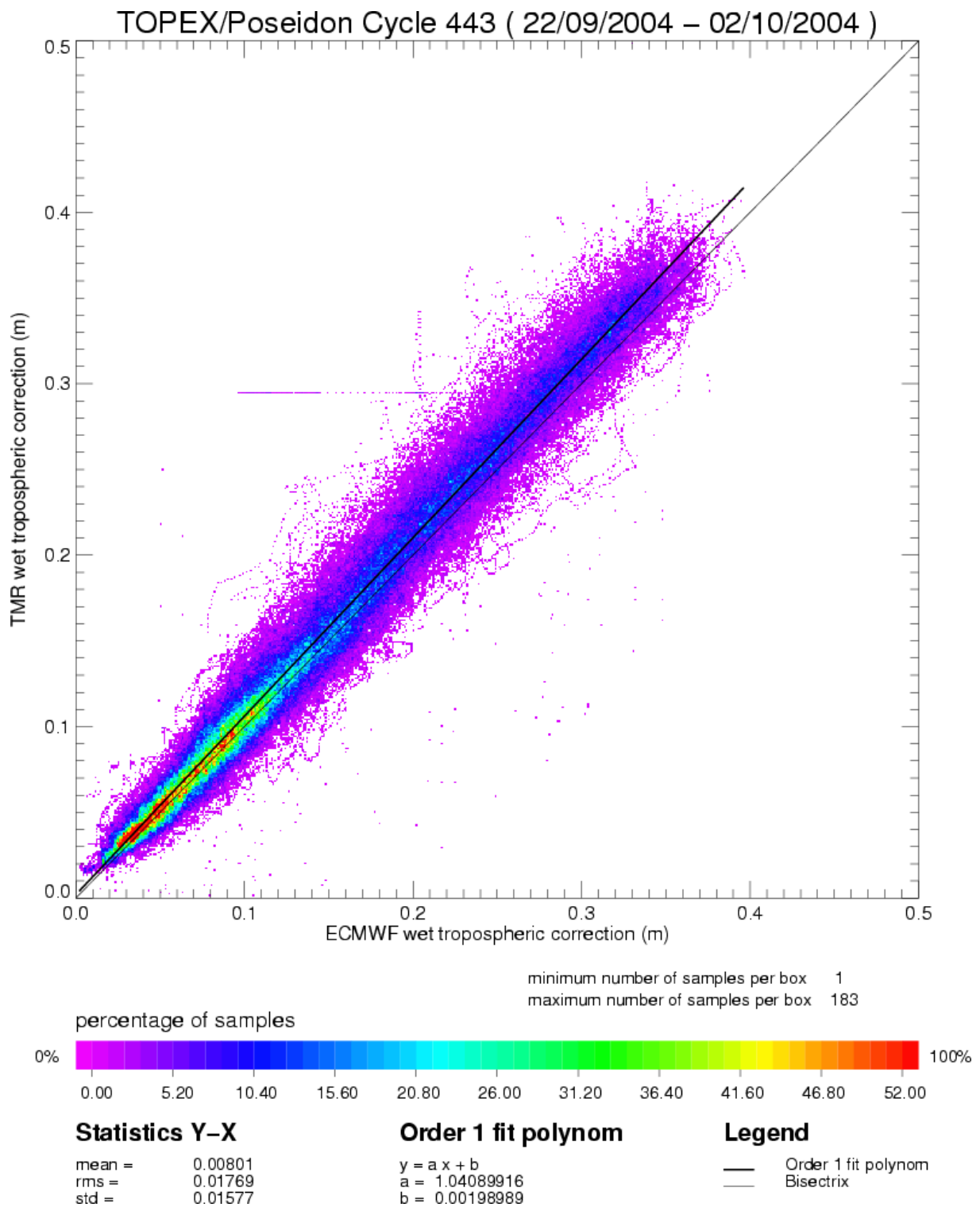
Order 1 fit polynom

$y = a x + b$
 $a = 1.11056733$
 $b = 0.00581672$

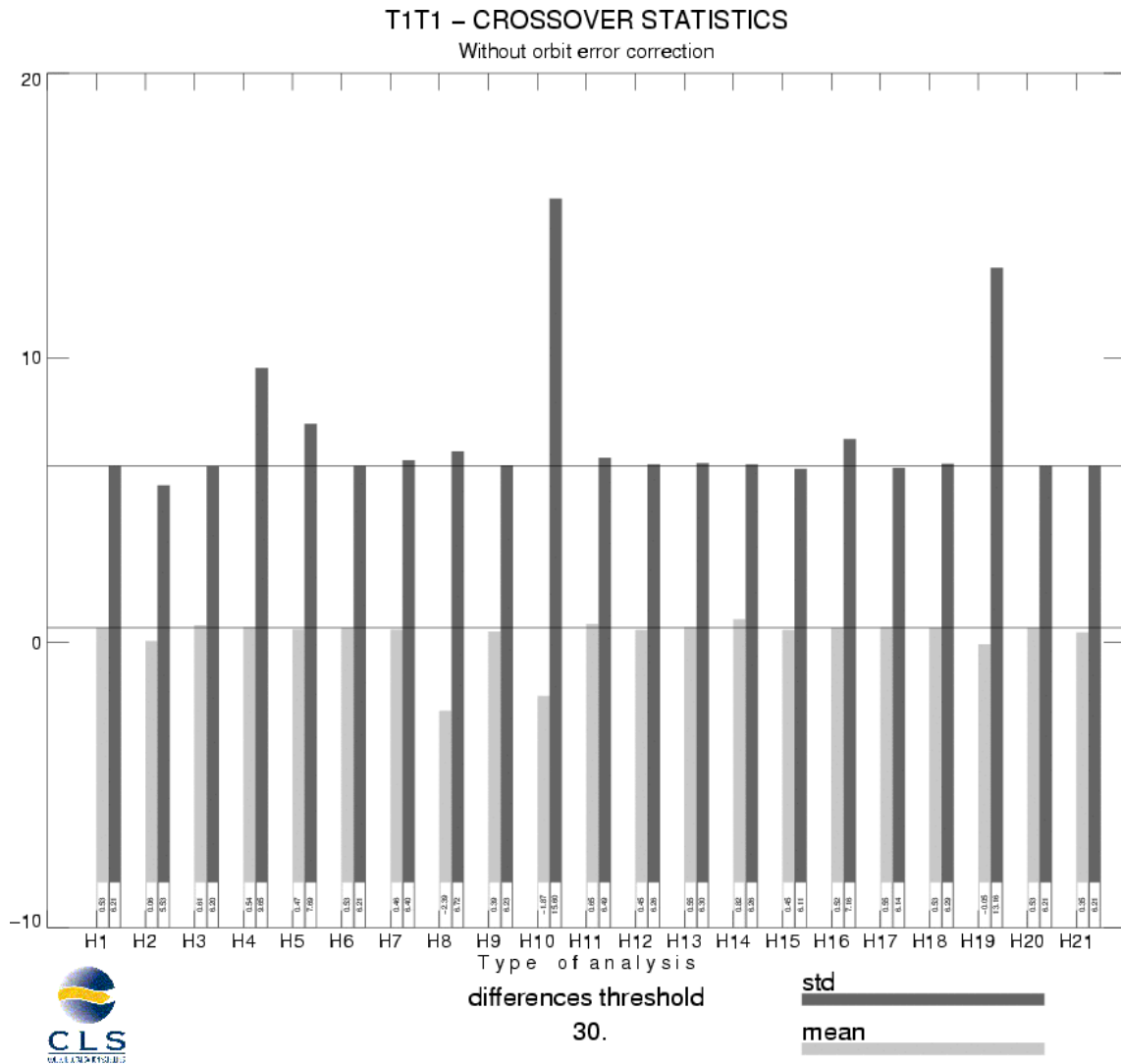
Legend

— Order 1 fit polynom
 — Bisectrix

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 : -29.4700
Valeur maximale : 28.7500
Difference Max – Min: 58.2200
Nombre de points lus: 3451
Nombre de points selectionnes: 3368
Moyenne : 0.527129
Ecart-type : 6.20776
Moyenne Quadratique : 0.527129

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 : -29.5000
Valeur maximale : 29.1900
Difference Max – Min: 58.6900
Nombre de points lus: 3451
Nombre de points selectionnes: 3350
Moyenne : 0.0588478
Ecart-type : 5.52612
Moyenne Quadratique : 0.0588478

CLS Space Oceanography Division

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

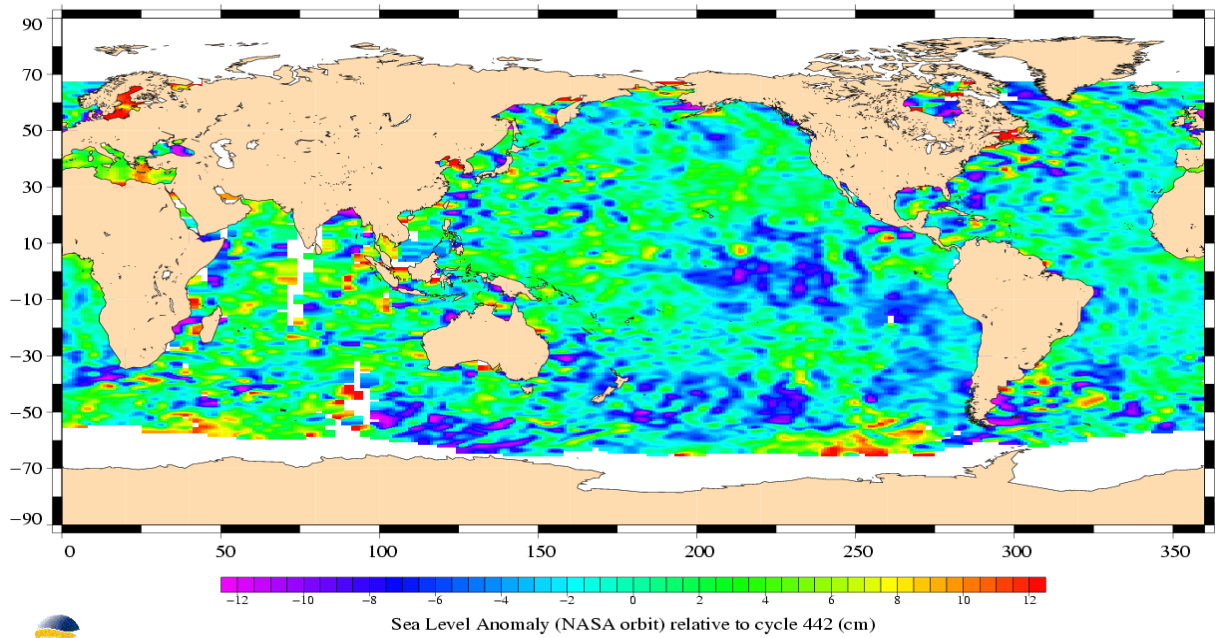
Valeur minimale : -30.5000
Valeur maximale : 34.1500
Difference Max – Min: 64.6500
Nombre de points lus: 2025
Nombre de points selectionnes: 1856
Moyenne : 0.173858
Ecart-type : 5.41251
Moyenne Quadratique : 0.173858

CLS Space Oceanography Division

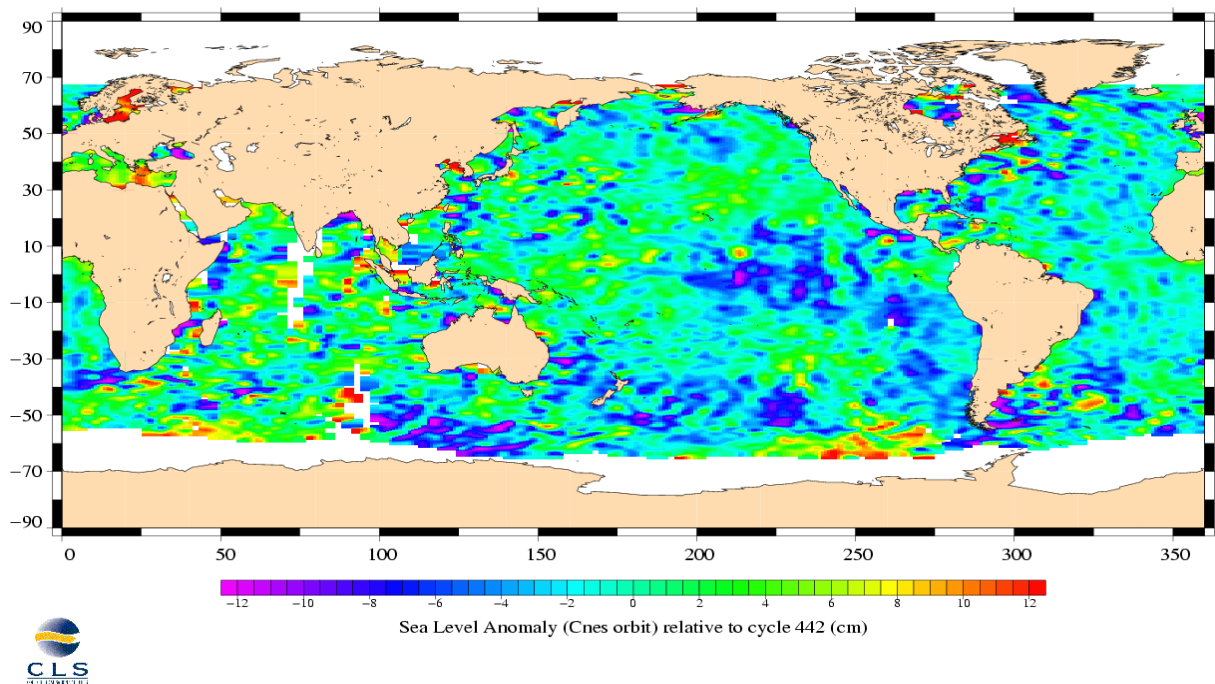
3.8 SSH variability

3.8.1 Sea Level Anomaly

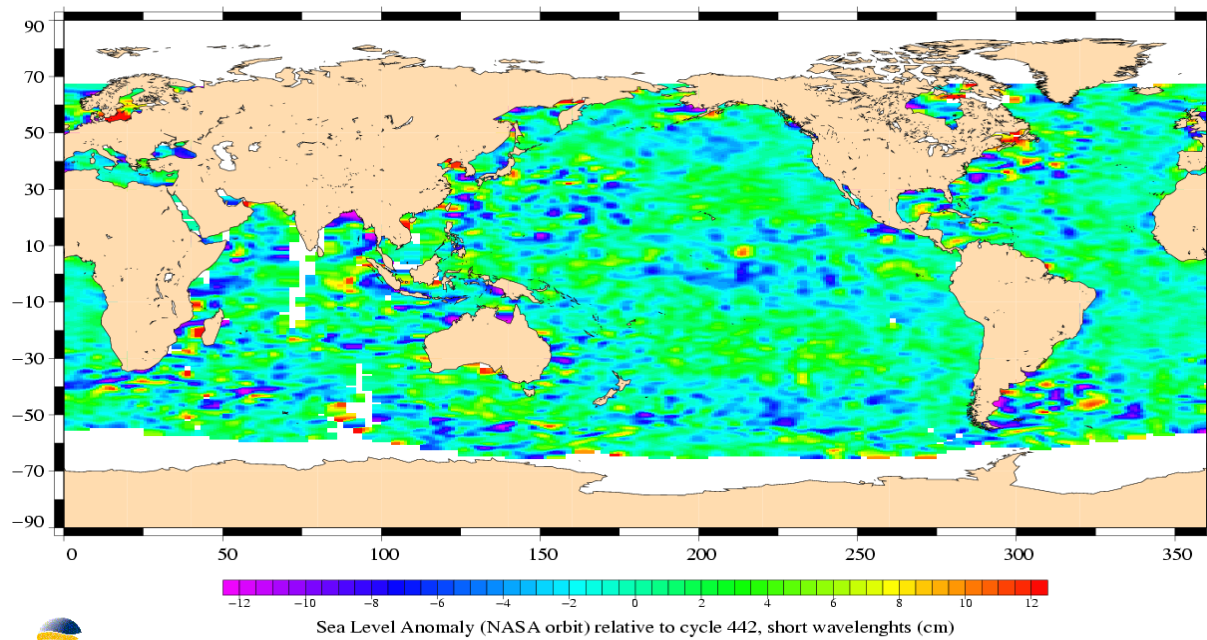
TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004



TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004



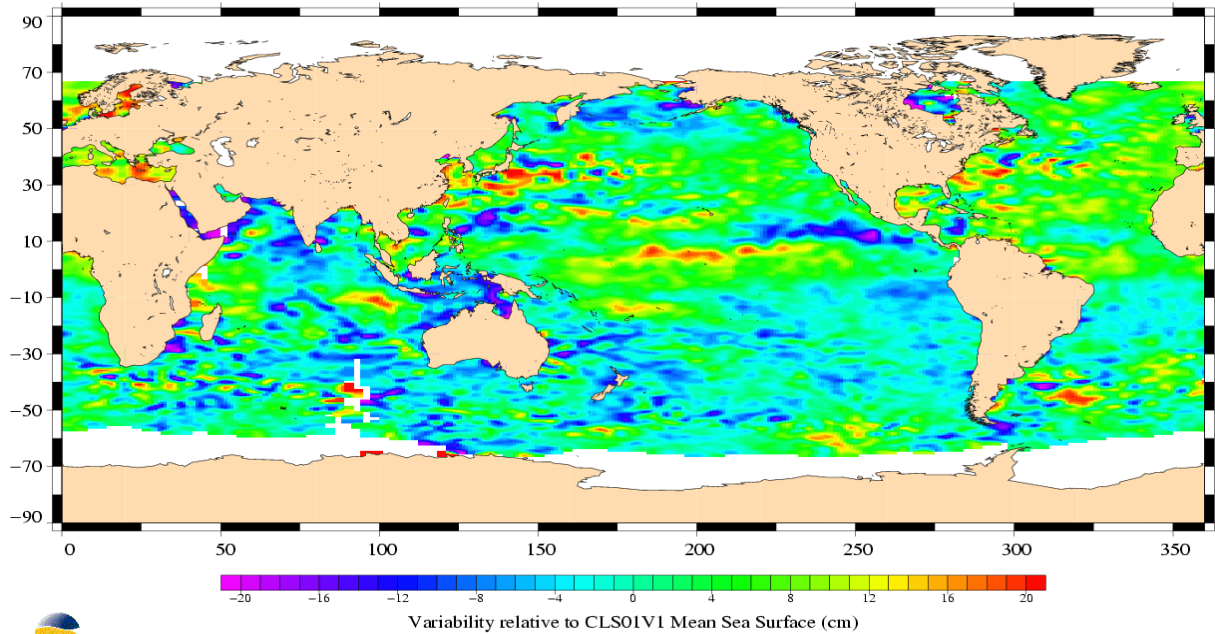
TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004



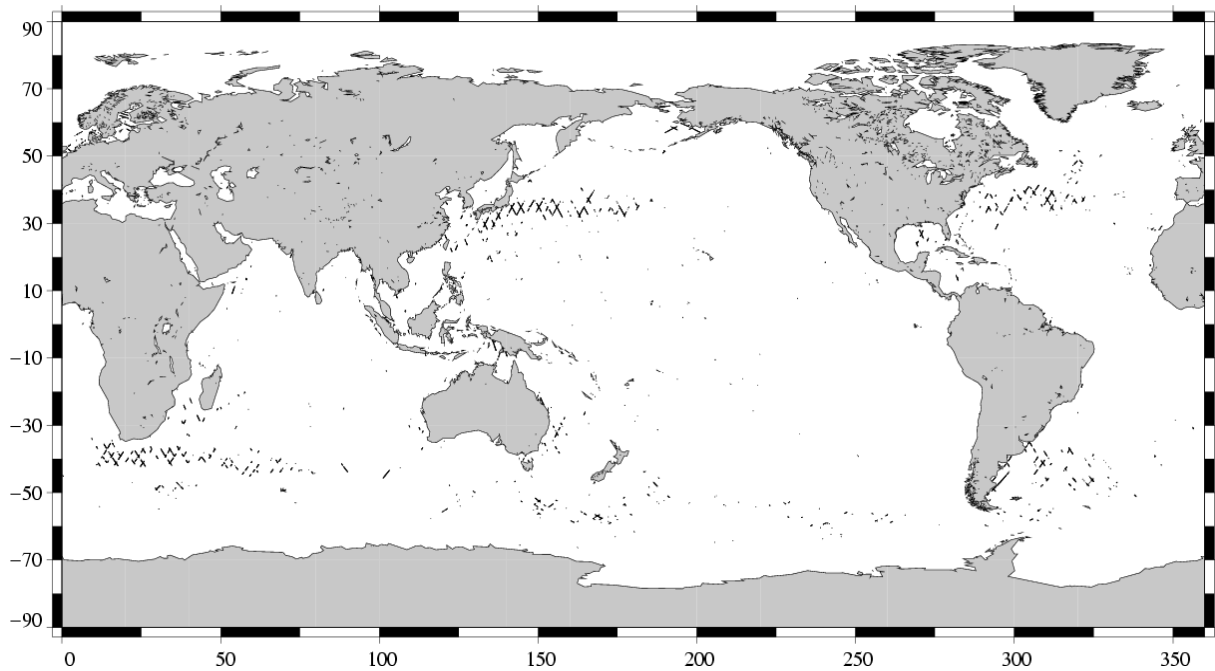
3.8.2 Comparison to a precise Mean Sea Surface

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 443
Period : 22/09/2004 – 02/10/2004

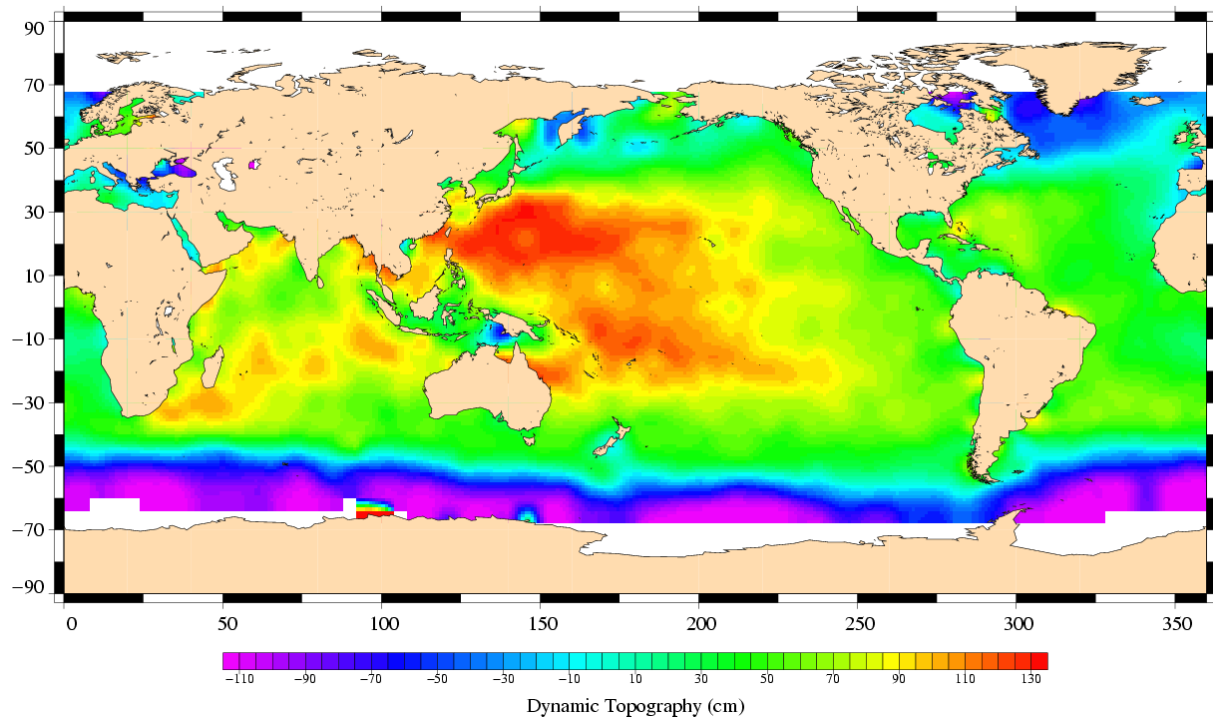


(SSH - MSS) differences greater than 0.3 m
TOPEX/Poseidon Cycle 443 (22/09/2004 / 02/10/2004)



3.9 Dynamic topography

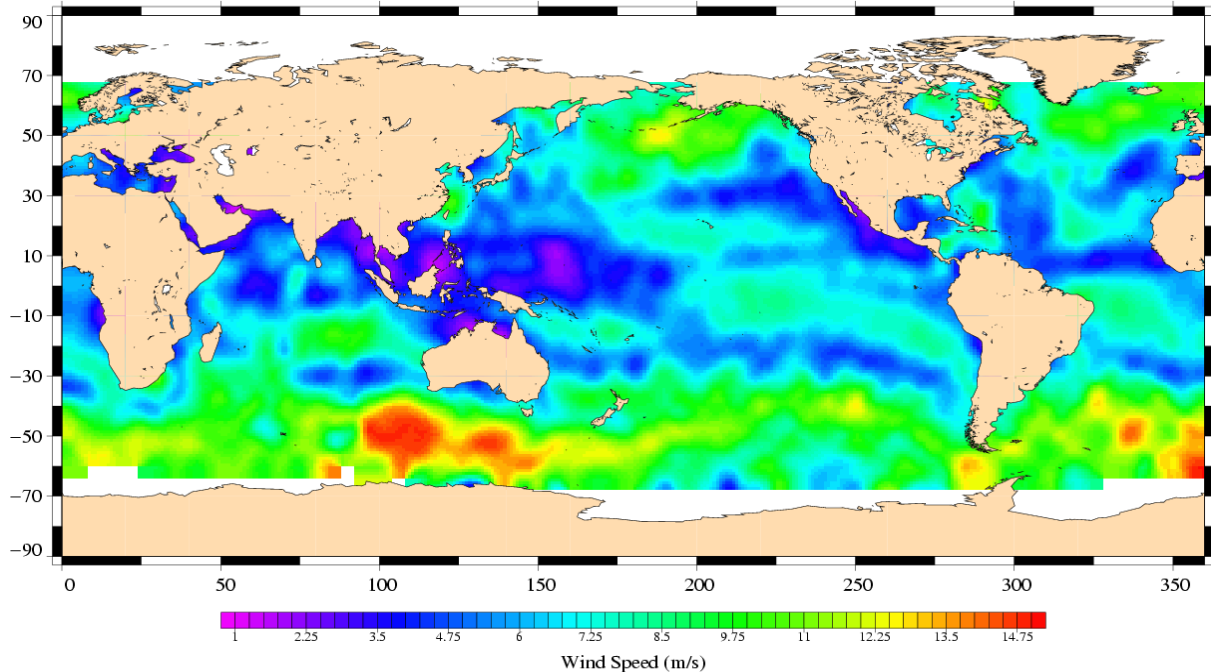
TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004



3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004



TOPEX/Poseidon, cycle 443
Period : 22/09/2004 – 02/10/2004

