



TOPEX/Poseidon MGRD Quality Assessment Report

Cycle 438

04-08-2004 14-08-2004

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SALP-RP-P2-EX-21120-CLS438

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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 7.04 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.12 cm.

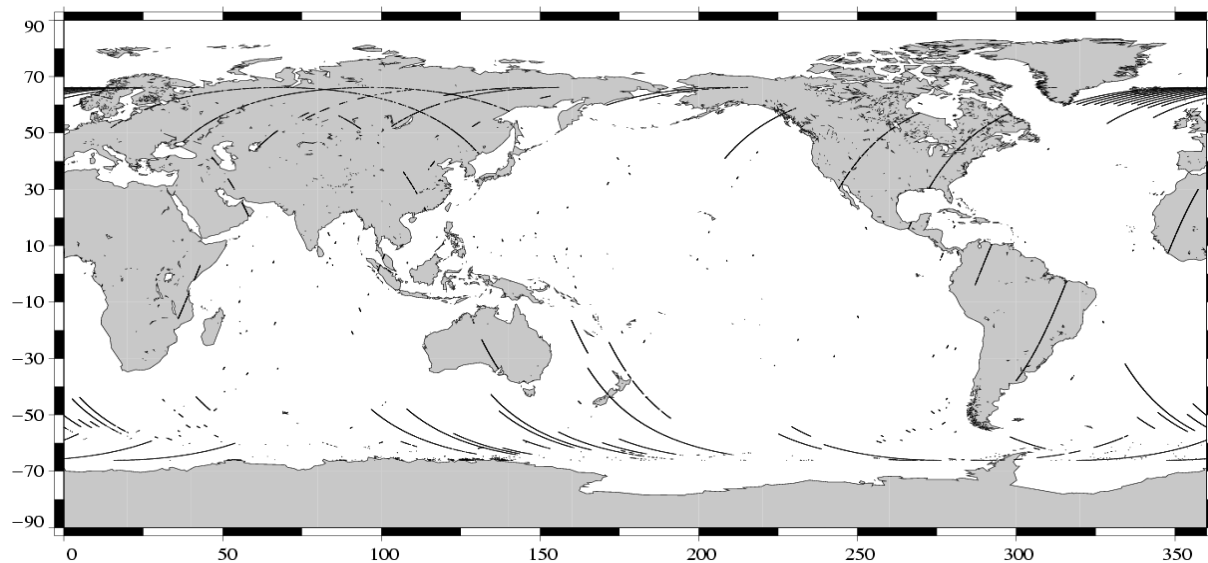
2.2 Warnings and recommendations

- 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.
Pass 61 is missing due to recorder anomalies.
- Measurements edited on waveform attitude parameter :
 - A large part of measurements are removed by the waveform attitude parameter on passes 1-9.
- CNES POE orbit :
 - Passes 1, 3, 6 et 8 are removed by the CNES POE quality flag, result of OMM maneuver performed during cycle 437 to test spacecraft thrusters.
- 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 :

 - 3.99% of the measurements are removed by the TMR correction criterion (see the following figure).
 - Passes 2, 4, 90, 138 and 166 are all removed by the radiometer earth flag.
 - 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 438 (04/08/2004 / 14/08/2004)



3 CALVAL main results

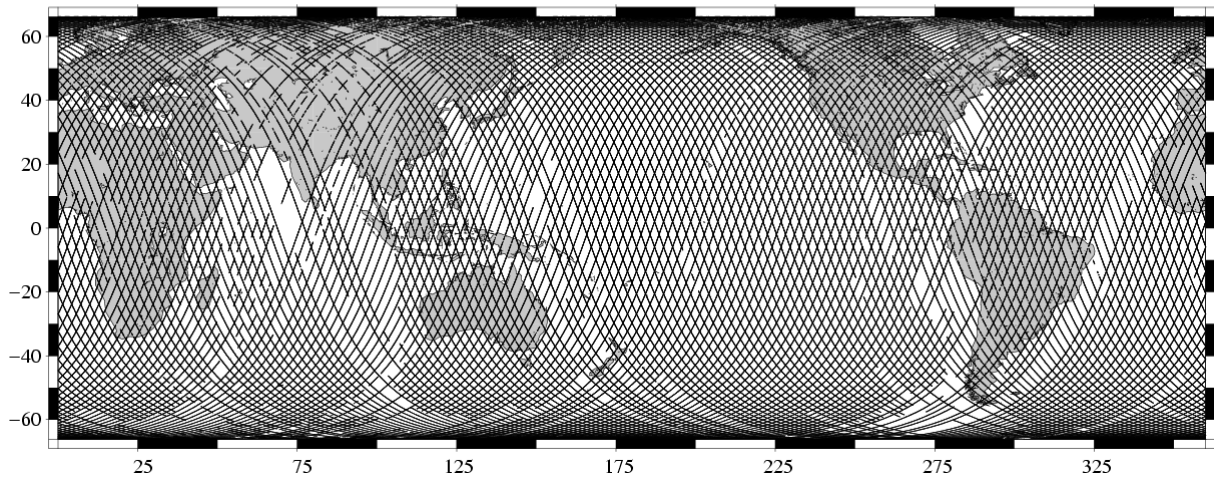
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

3.1 Missing measurements

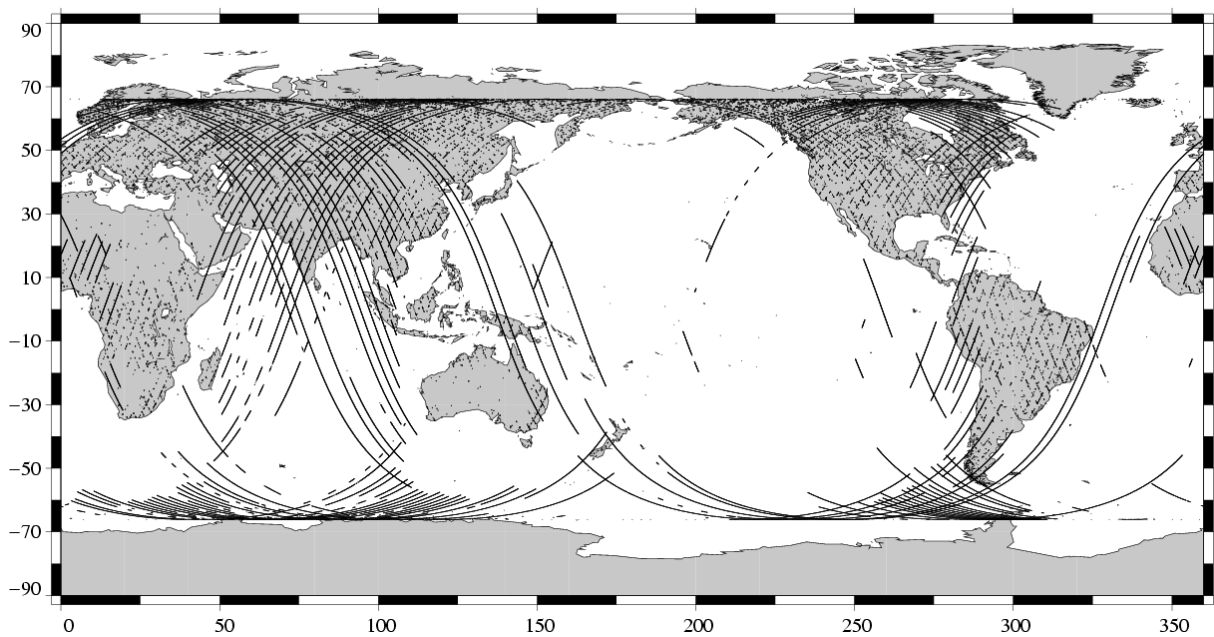
660636 altimeter measurements are present, and 133948 are missing.

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 438 (04/08/2004 / 14/08/2004)



Missing measurements
TOPEX/Poseidon Cycle 438 (04/08/2004 / 14/08/2004)



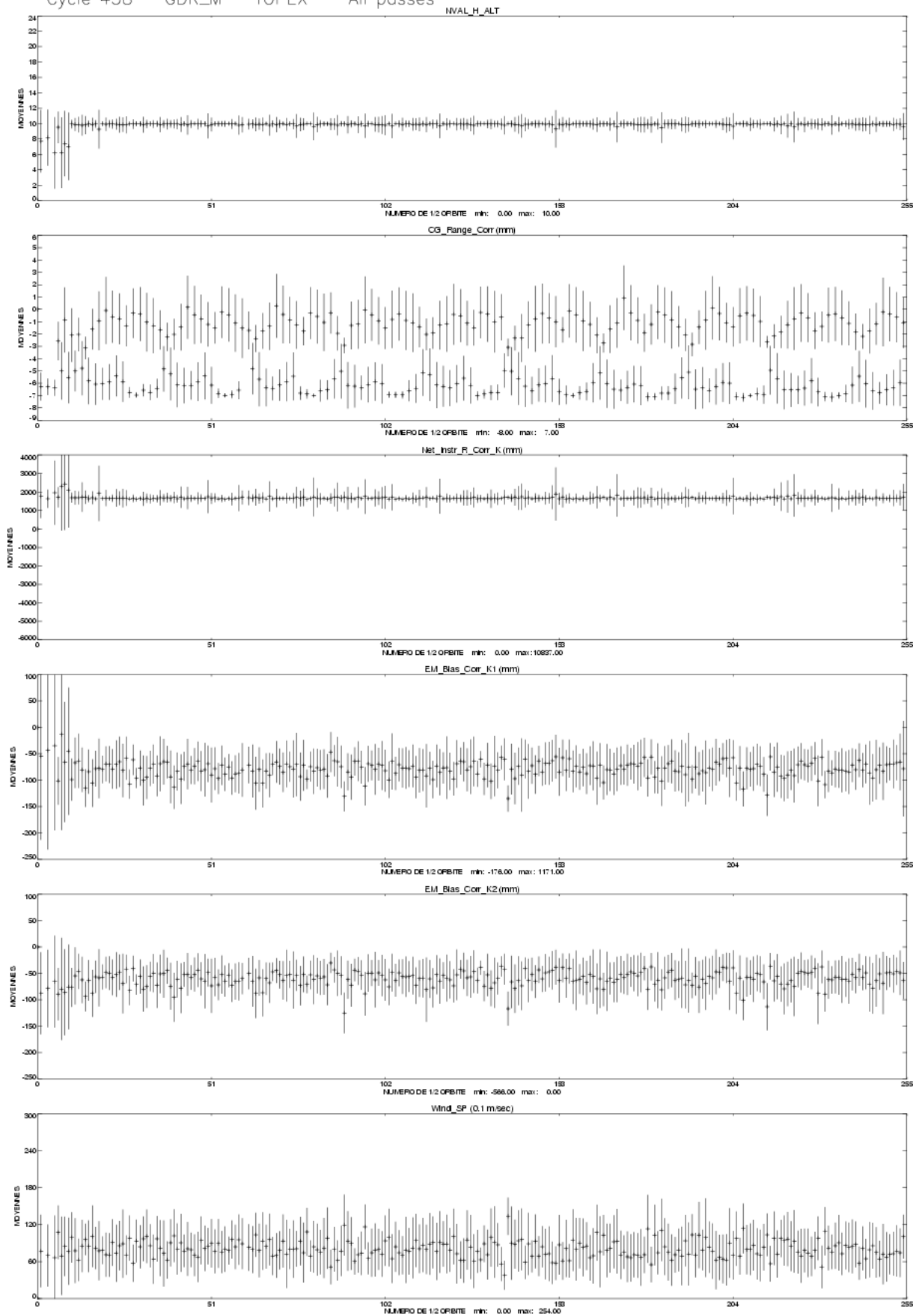
3.2 M-GDR quality flags

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

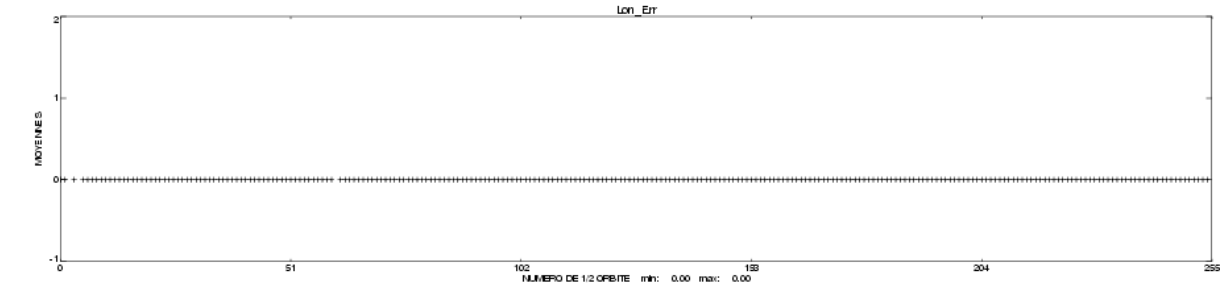
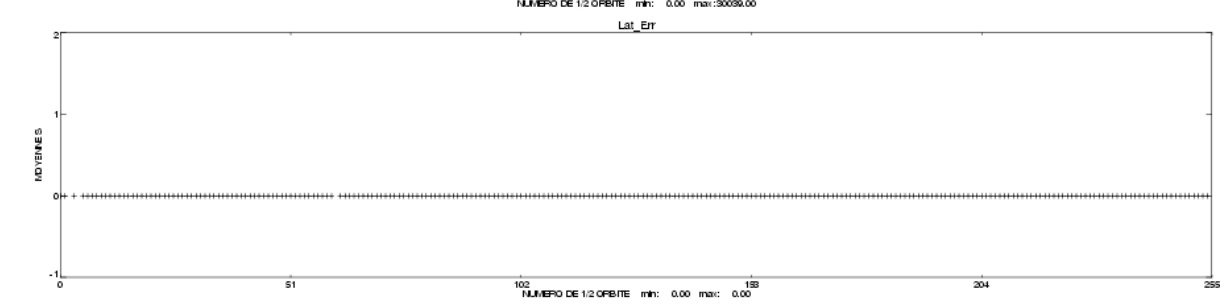
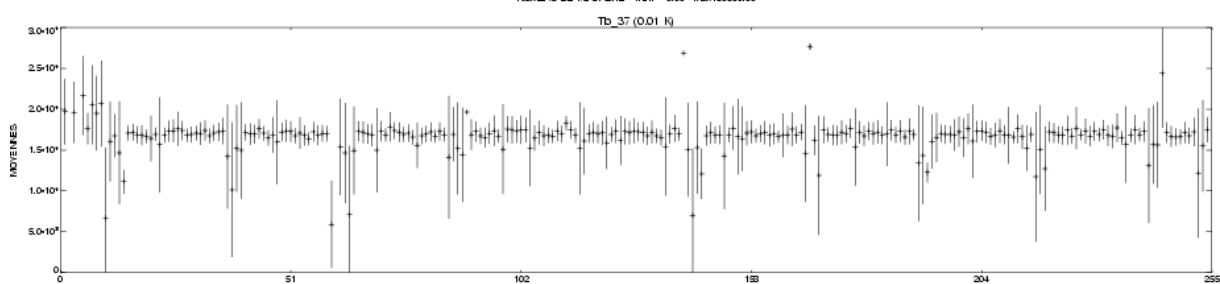
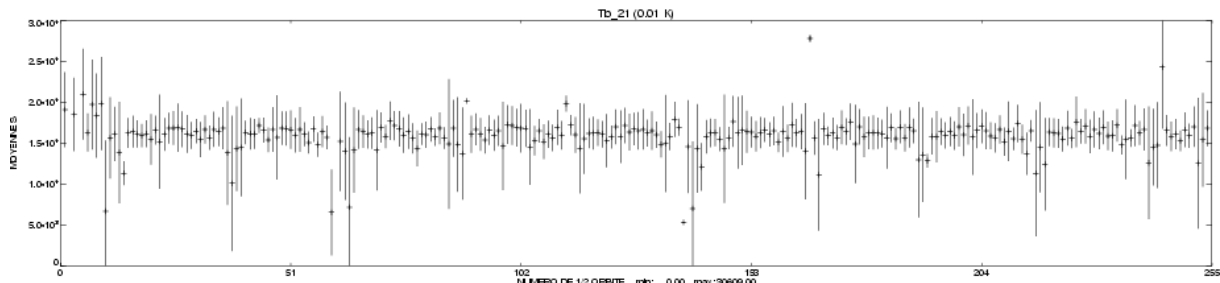
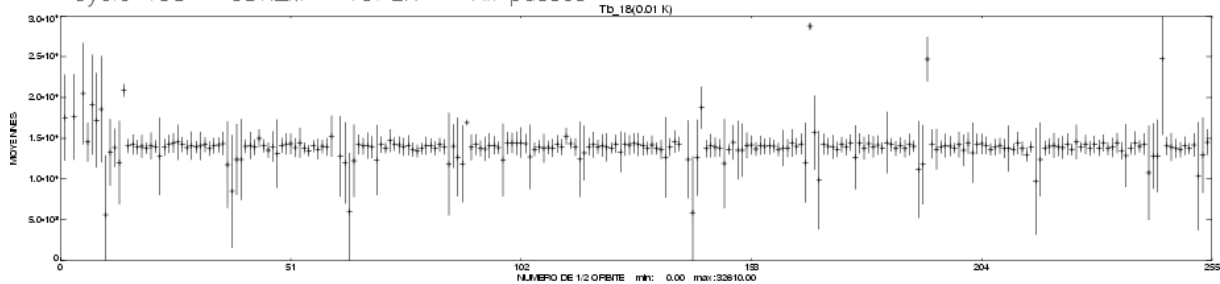
Name	Description	% bad
Geo_Bad_1	altimeter land flag	1
Geo_Bad_1	ice flag	32.47
Geo_Bad_1	radiometer land flag	0.00
Alt_Bad_1	conditions 1 altimeter	34.45
Alt_Bad_2	conditions 2 altimeter	92.85
Geo_Bad_2	rain (liquid water in excess)	32.92
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	31.59
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	11.15
TOPEX	TOPEX not valid	4.22
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	0.00
DORIS	DORIS not valid	0.00

3.3 M-GDR parameter plots

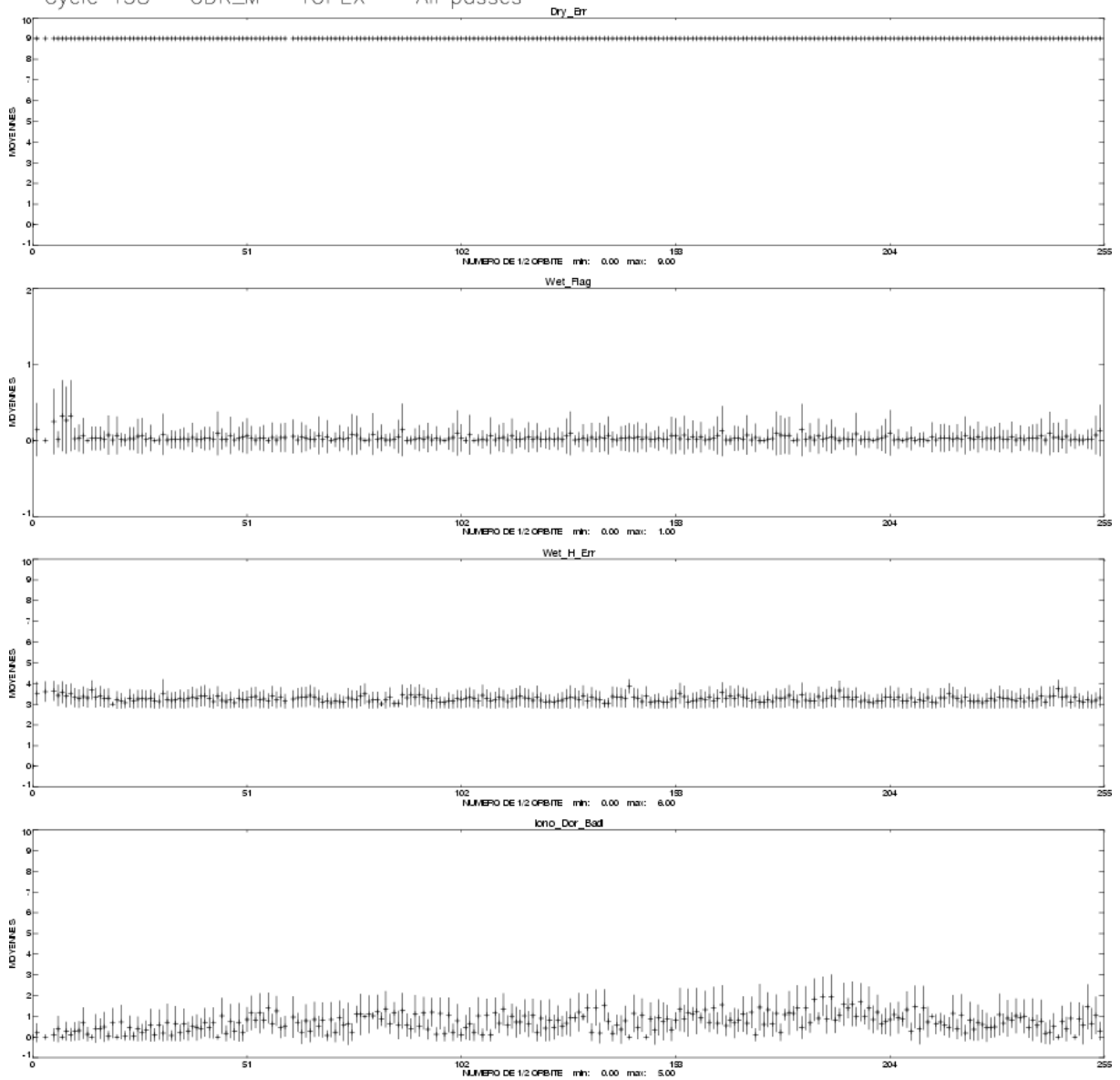
Cycle 438 – GDR_M – TOPEX – All passes –



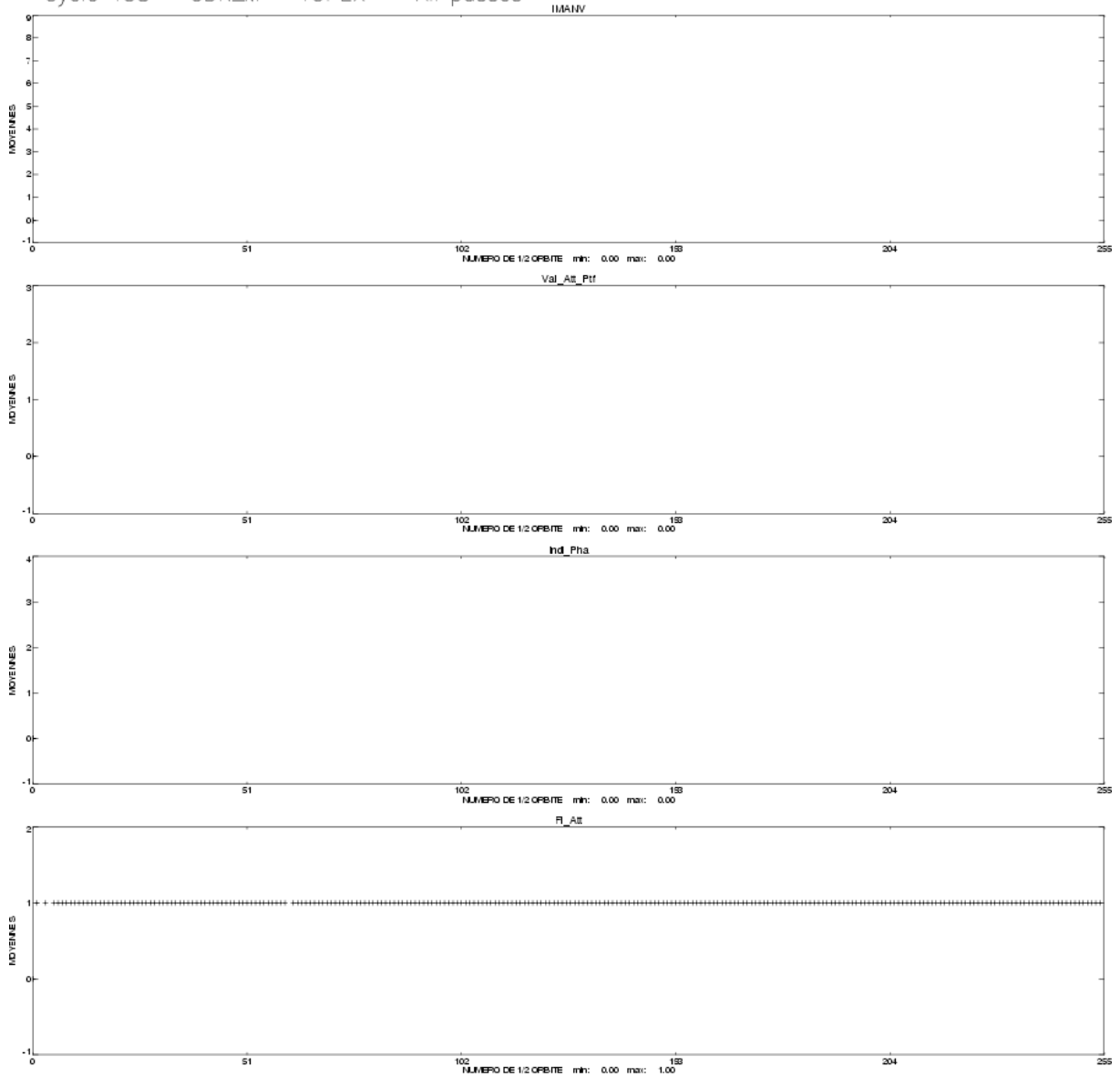
Cycle 438 – GDR_M – TOPEX – All passes –

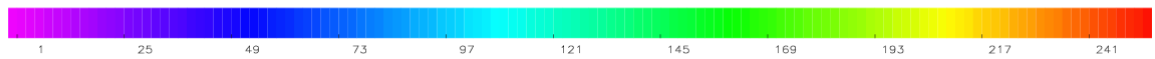
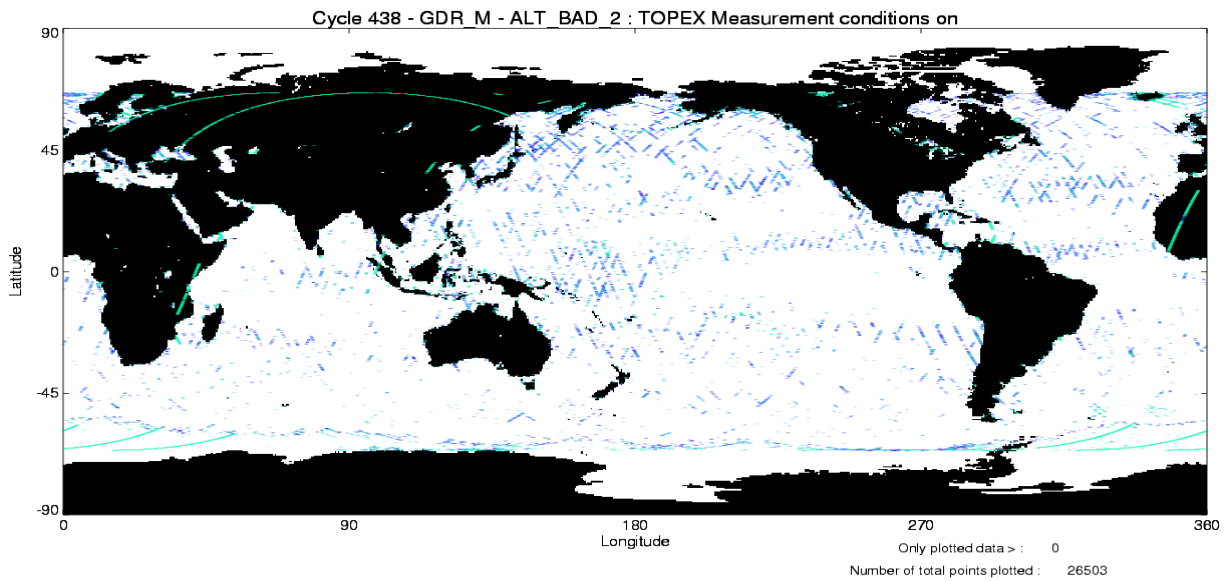
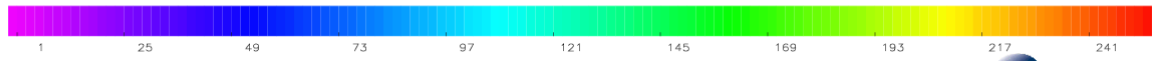
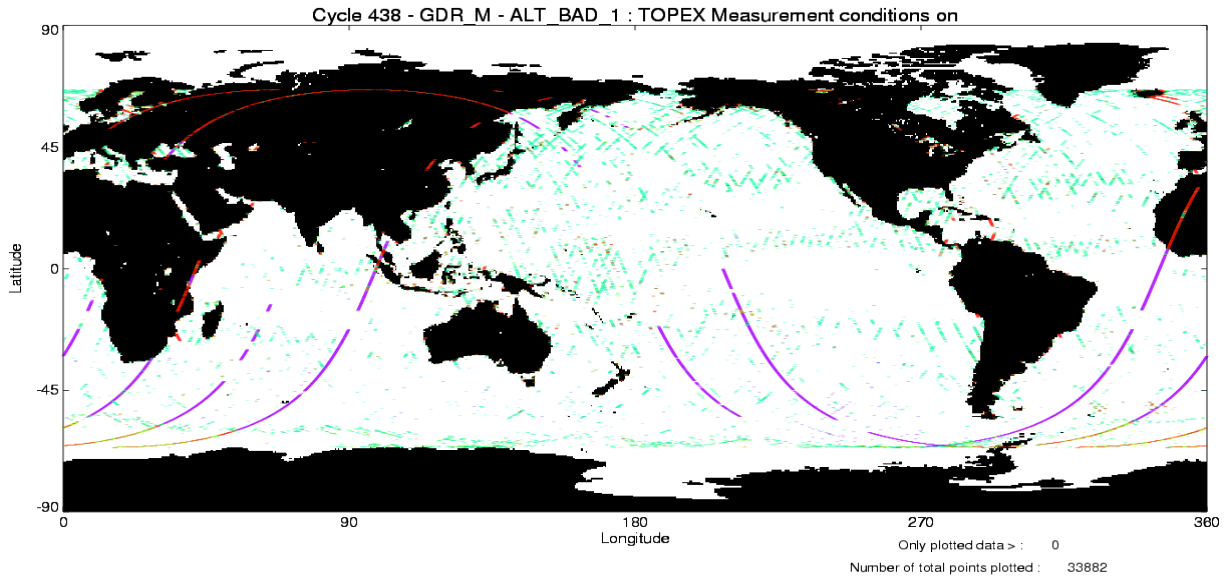


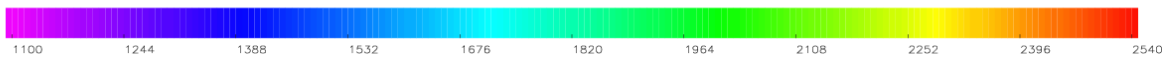
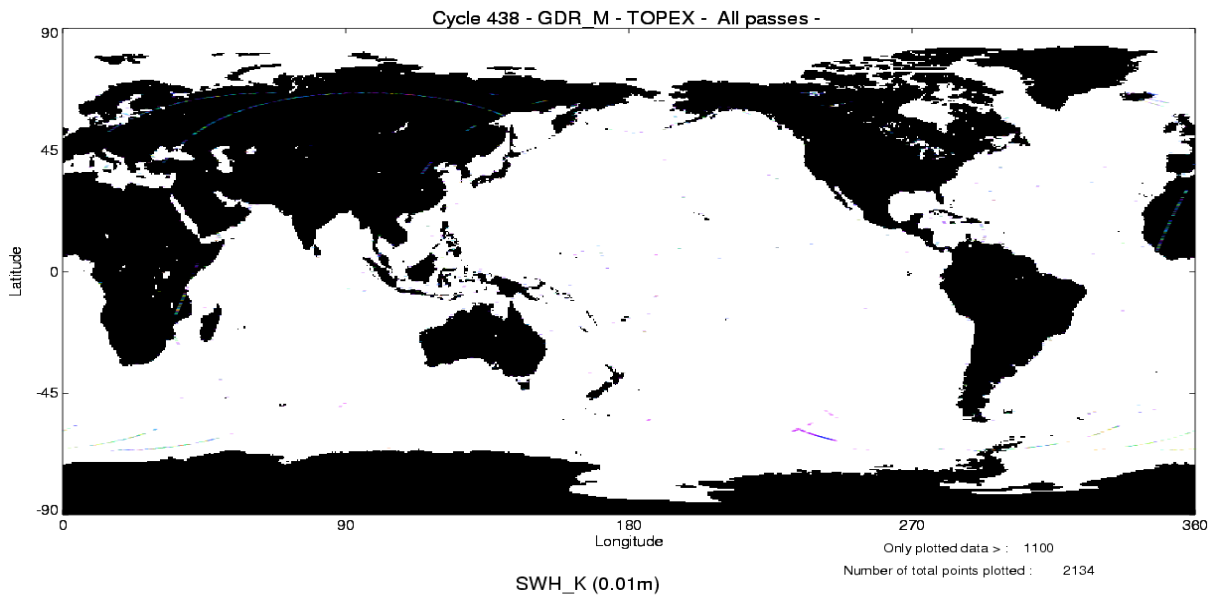
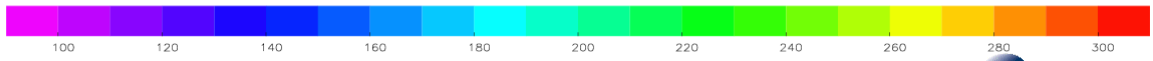
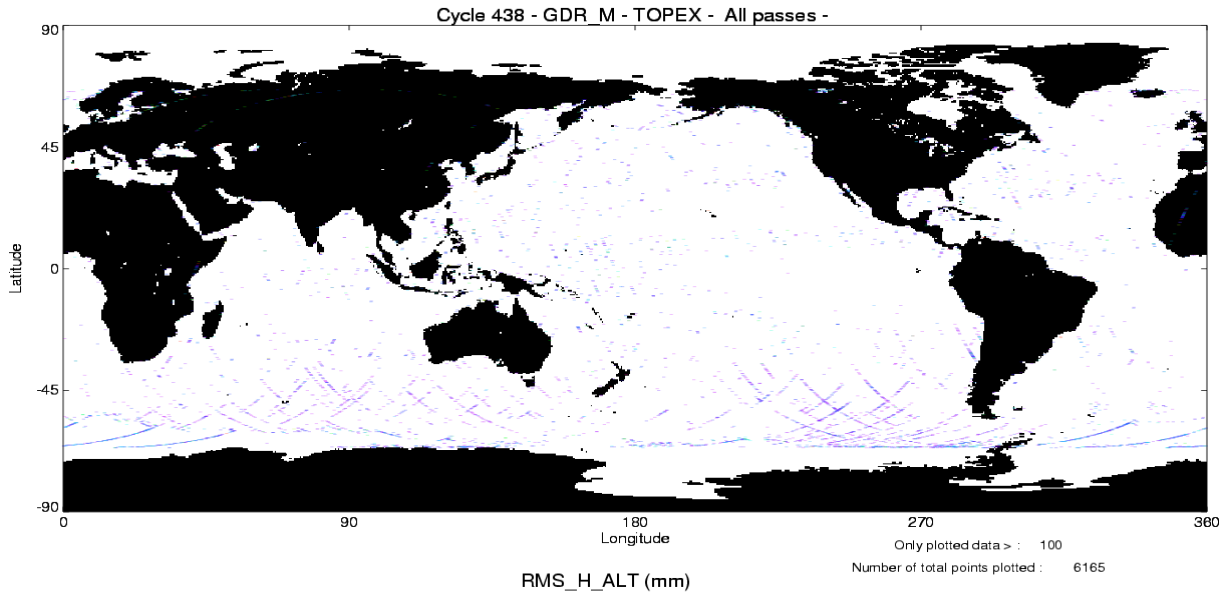
Cycle 438 – GDR_M – TOPEX – All passes –

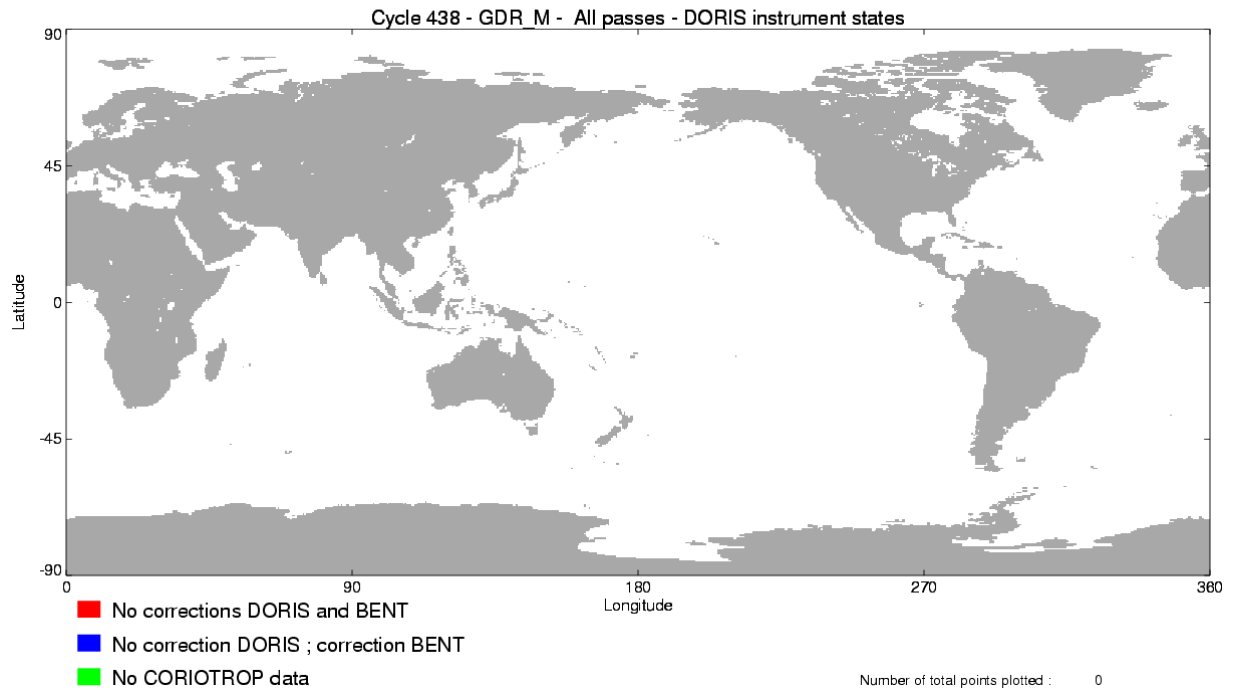


Cycle 438 – GDR_M – TOPEX – All passes –









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.

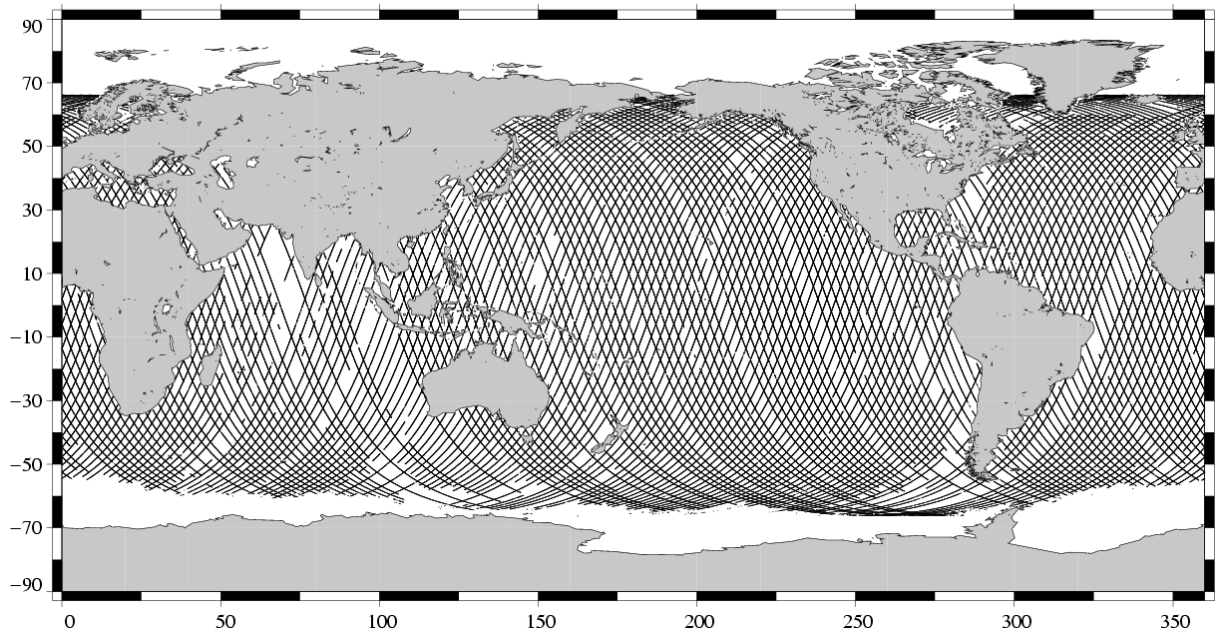
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (28.18 % of points removed) and ice flag (7.84 % of points removed).

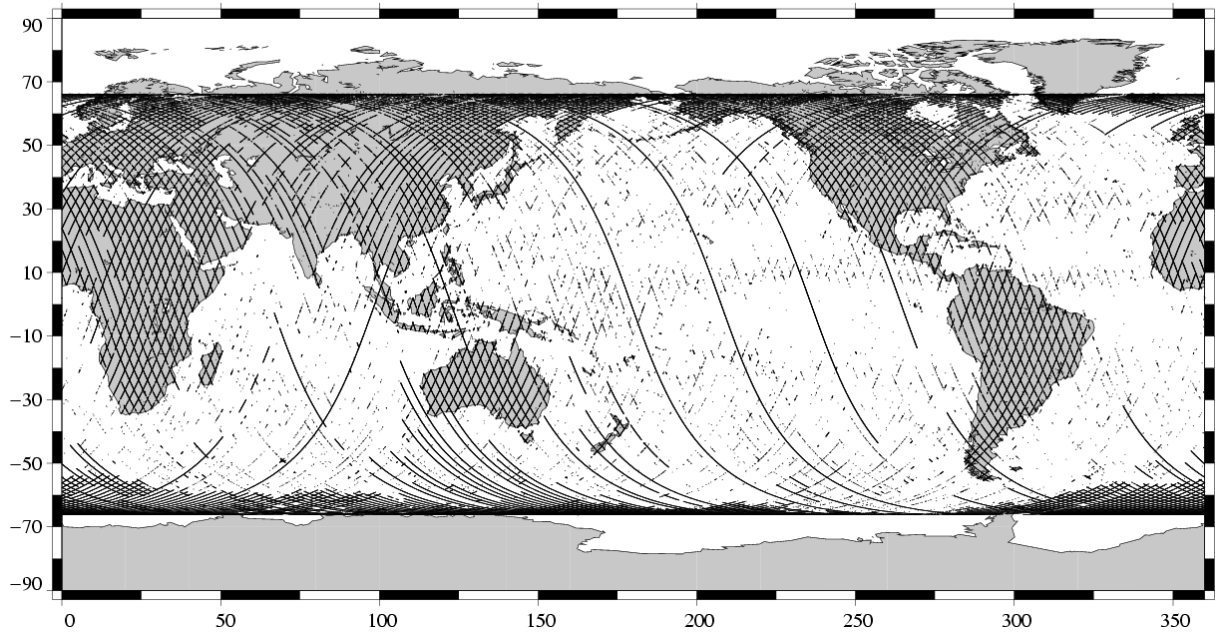
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	0.56
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	1.02
Std. deviation of range	0.000	0.100	m	1.85	2.17
Off nadir angle from waveform	0.000	0.400	deg	1.36	4.64
Dry tropospheric 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	3.99
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	0.87
Significant wave height	0.000	11.000	m	1.46	0.41
Sea state Bias	-0.500	0.000	m	1.39	0.64
Backscatter coefficient	7.000	30.000	dB	1.44	0.51
Ocean tide height	-5.000	5.000	m	0.01	0.65
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	0.66
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.

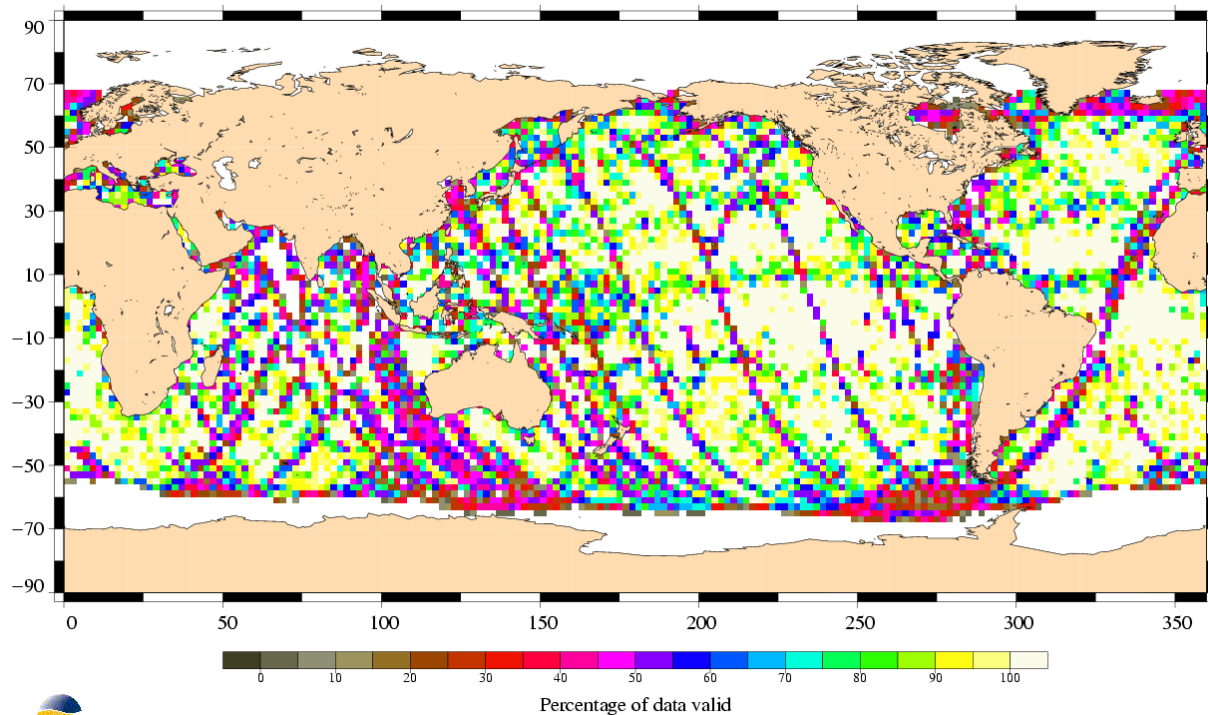
Valid data
TOPEX/Poseidon Cycle 438 (04/08/2004 / 14/08/2004)



Edited measurements
TOPEX Cycle 438 (04/08/2004 / 14/08/2004)

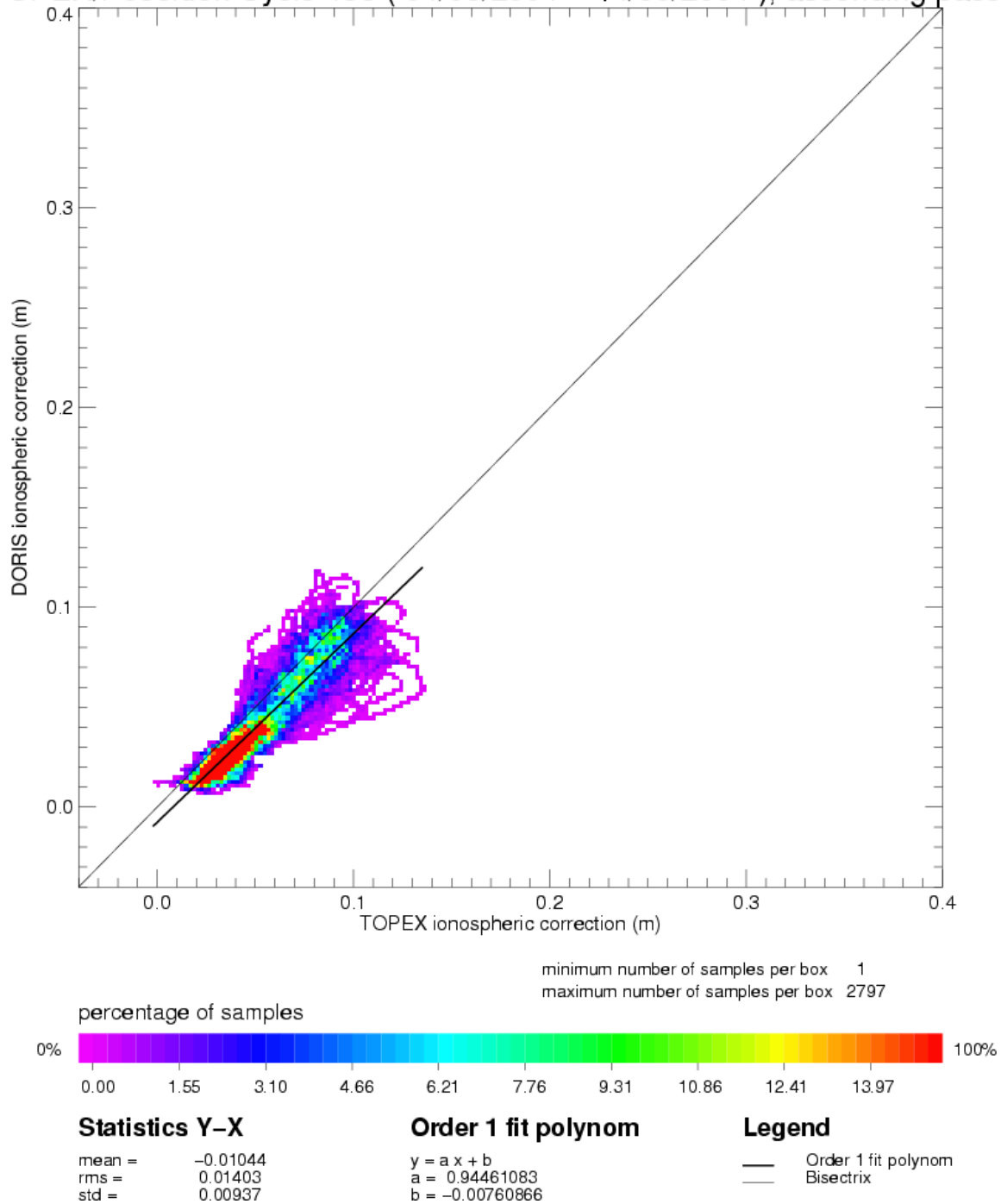


Percentage of valid data relative to the nominal pass
TOPEX/Poseidon Cycle 438 (04/08/2004 / 14/08/2004)

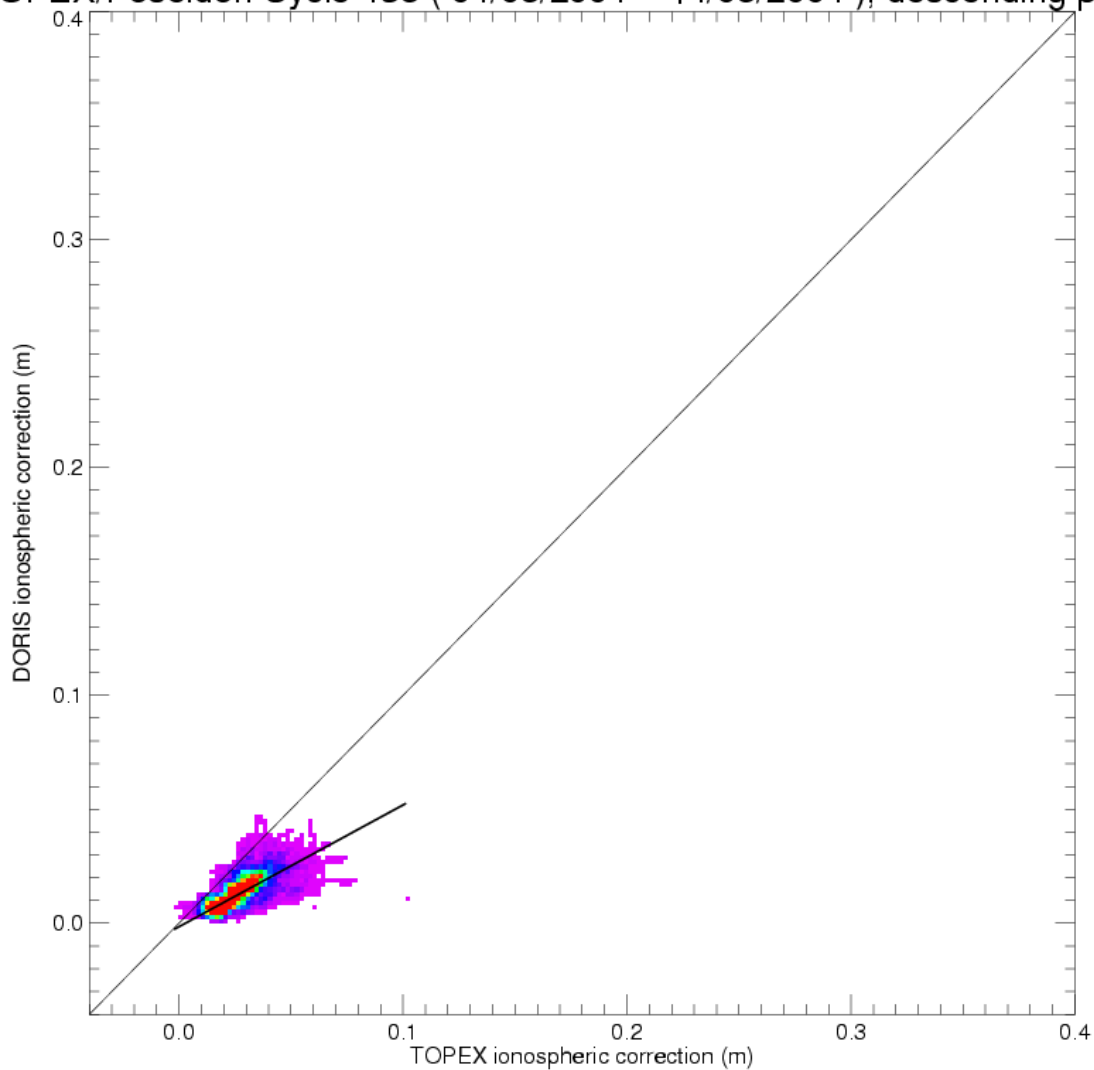


3.5 Ionospheric correction

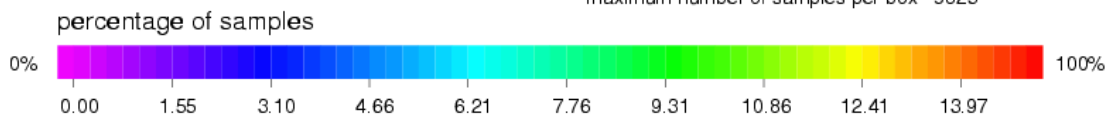
TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), ascending passes



TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 9825



Statistics Y-X

mean = -0.01276
 rms = 0.01412
 std = 0.00605

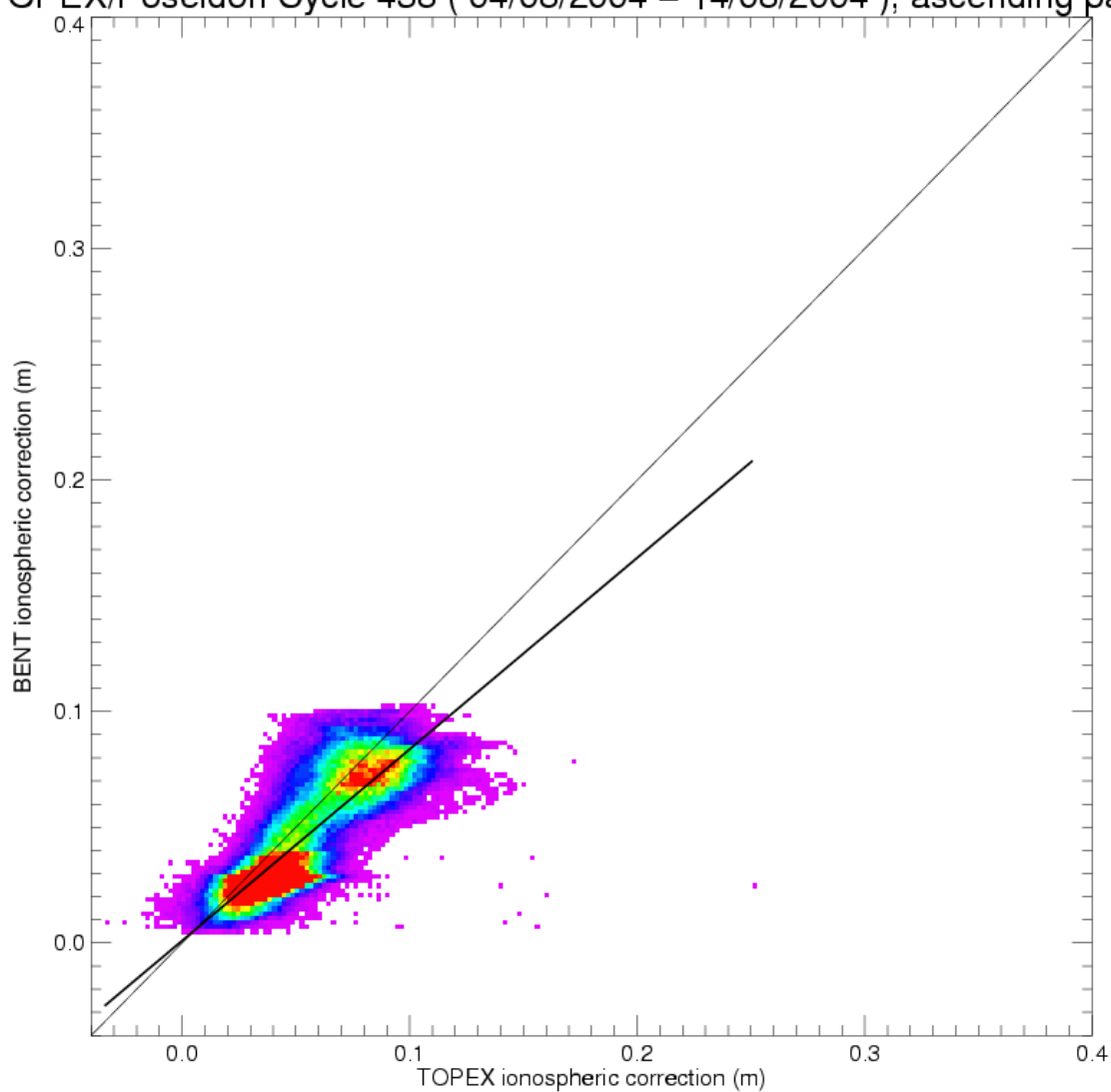
Order 1 fit polynom

$y = a x + b$
 $a = 0.53412825$
 $b = -0.00154175$

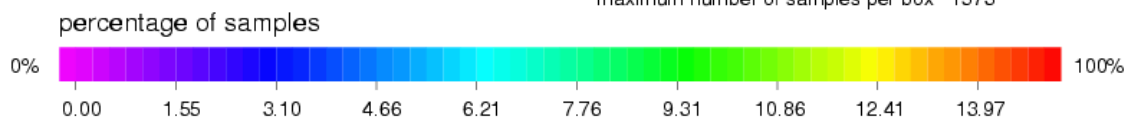
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 1573



Statistics Y-X

mean = -0.00792
 rms = 0.01543
 std = 0.01324

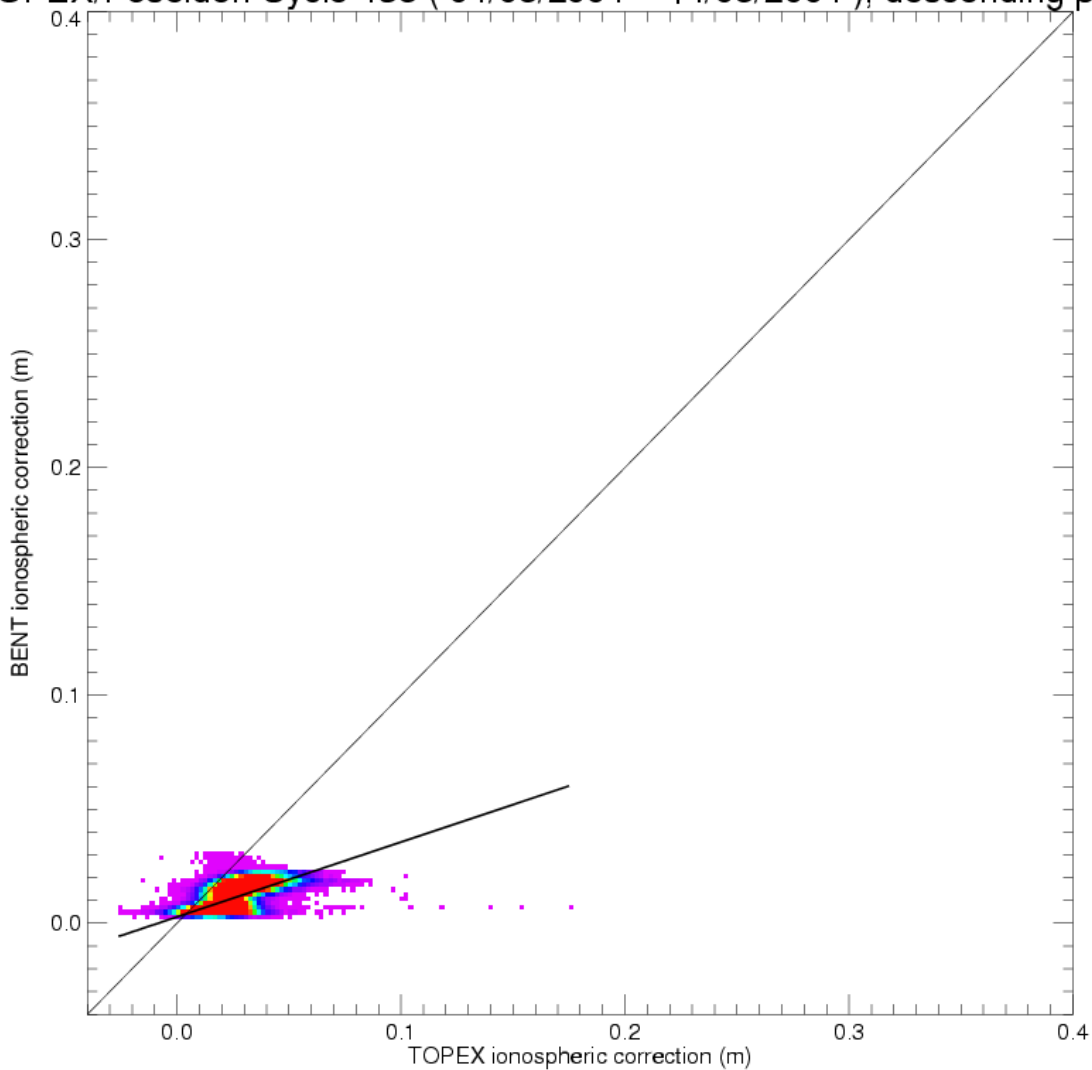
Order 1 fit polynom

$y = a x + b$
 $a = 0.82730192$
 $b = 0.00097884$

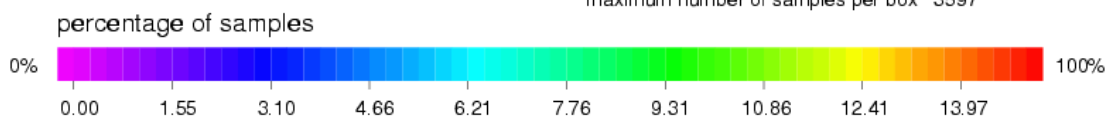
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 3597



Statistics Y-X

mean = -0.01373
 rms = 0.01616
 std = 0.00852

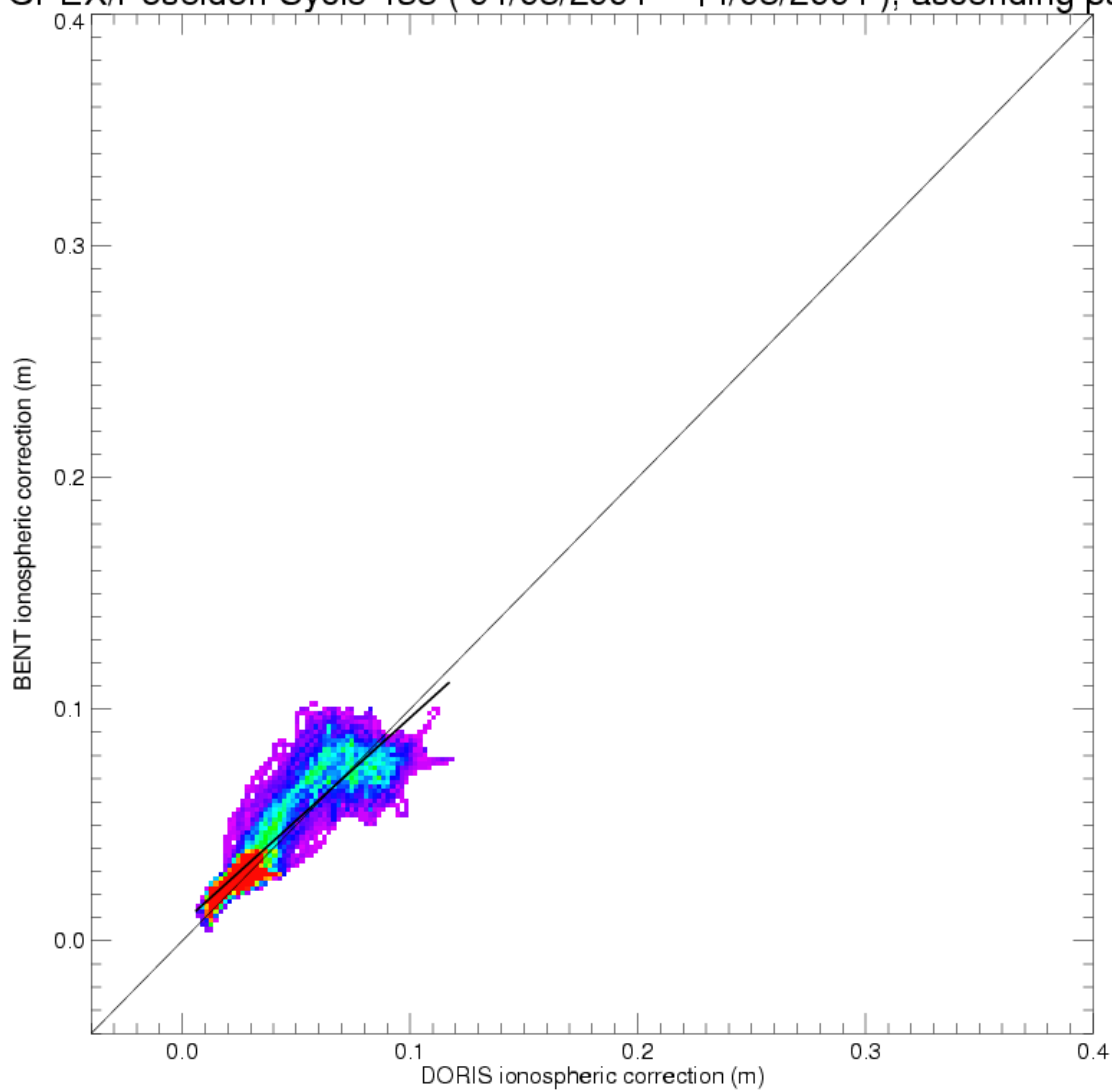
Order 1 fit polynom

$y = a x + b$
 $a = 0.32860792$
 $b = 0.00275945$

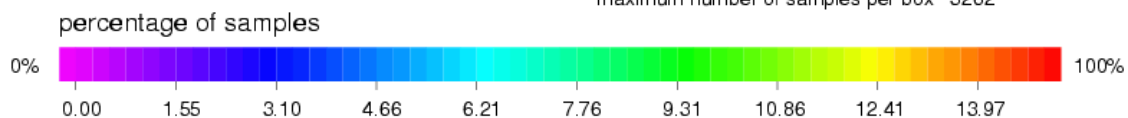
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), ascending passes



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



Statistics Y-X

mean = 0.00300
 rms = 0.01111
 std = 0.01070

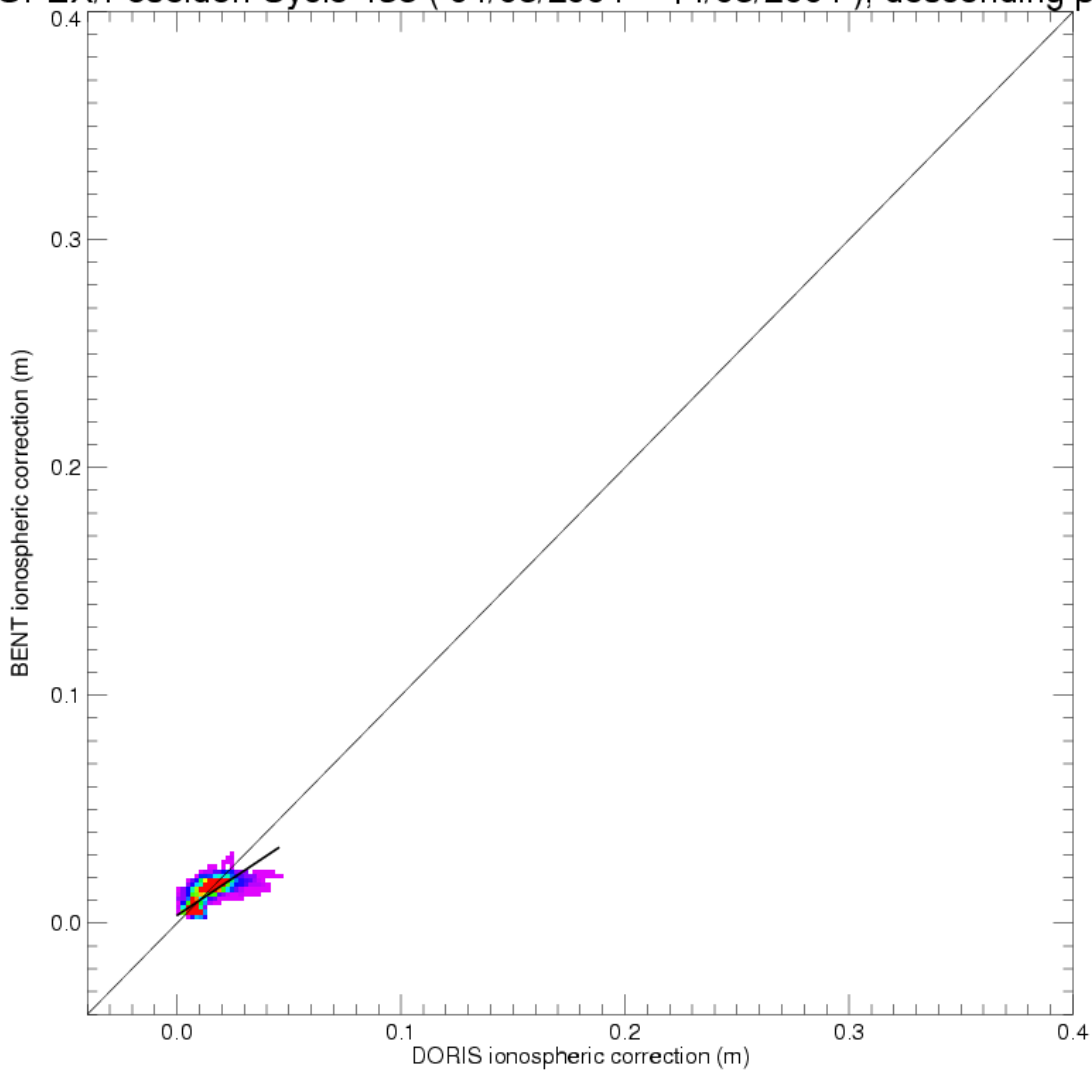
Order 1 fit polynom

$y = a x + b$
 $a = 0.88714159$
 $b = 0.00758308$

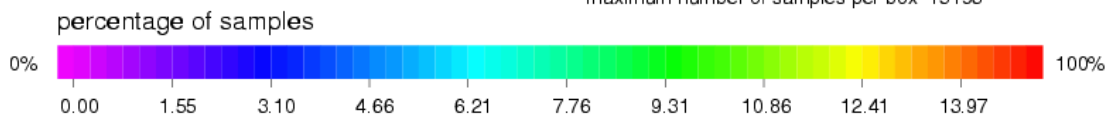
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 438 (04/08/2004 – 14/08/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 15193



Statistics Y-X

mean = -0.00049
 rms = 0.00433
 std = 0.00430

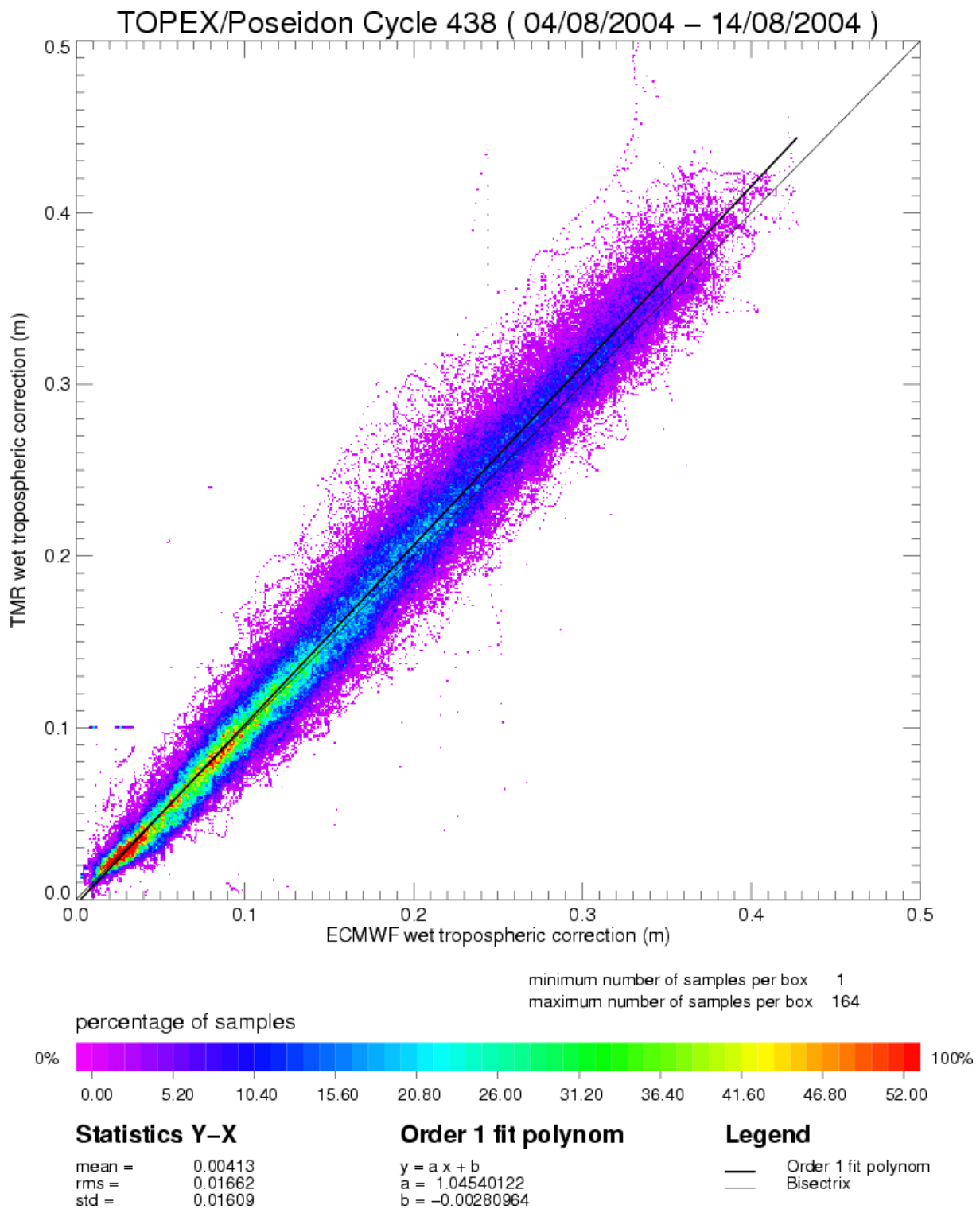
Order 1 fit polynom

$y = a x + b$
 $a = 0.65524554$
 $b = 0.00341003$

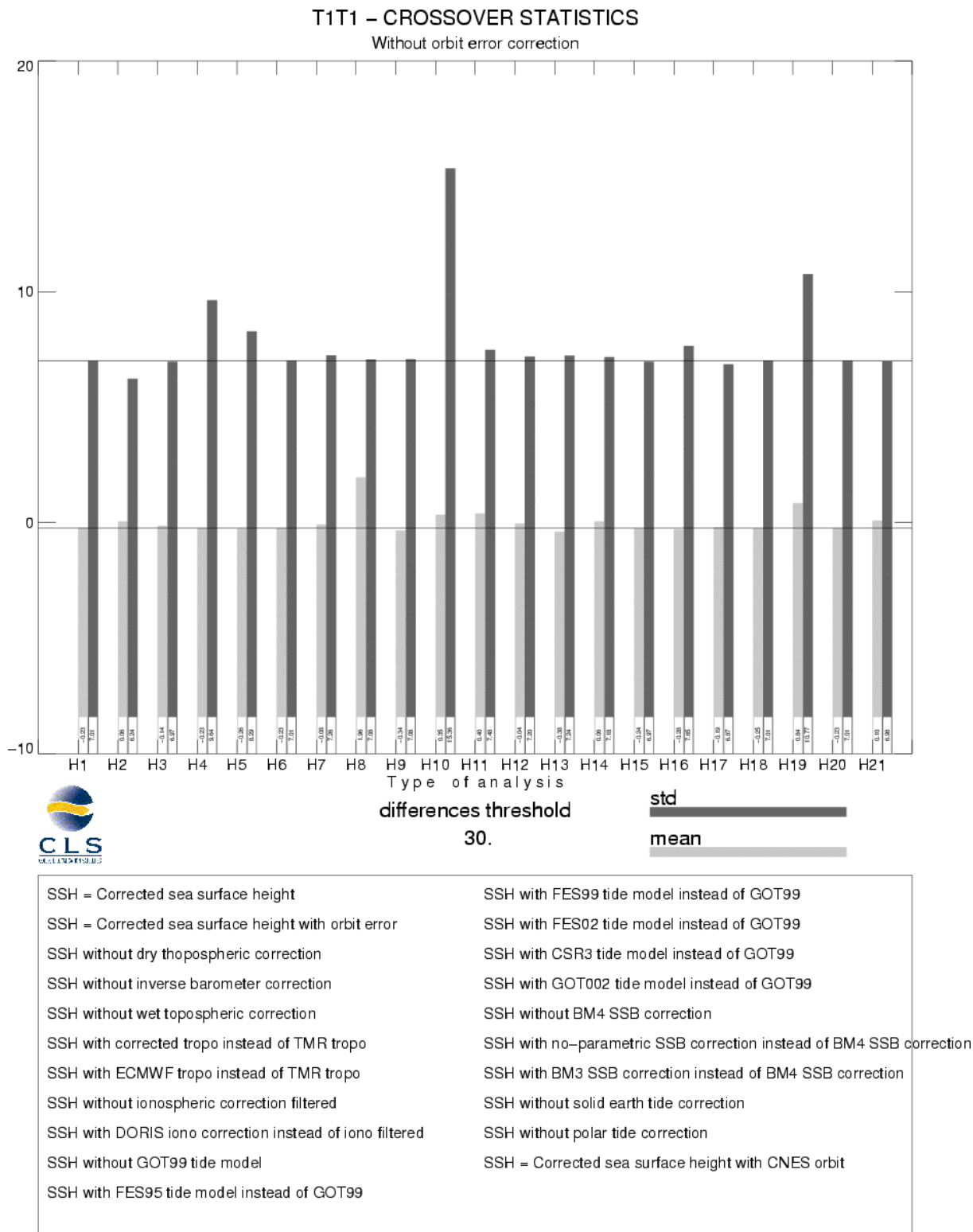
Legend

— 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

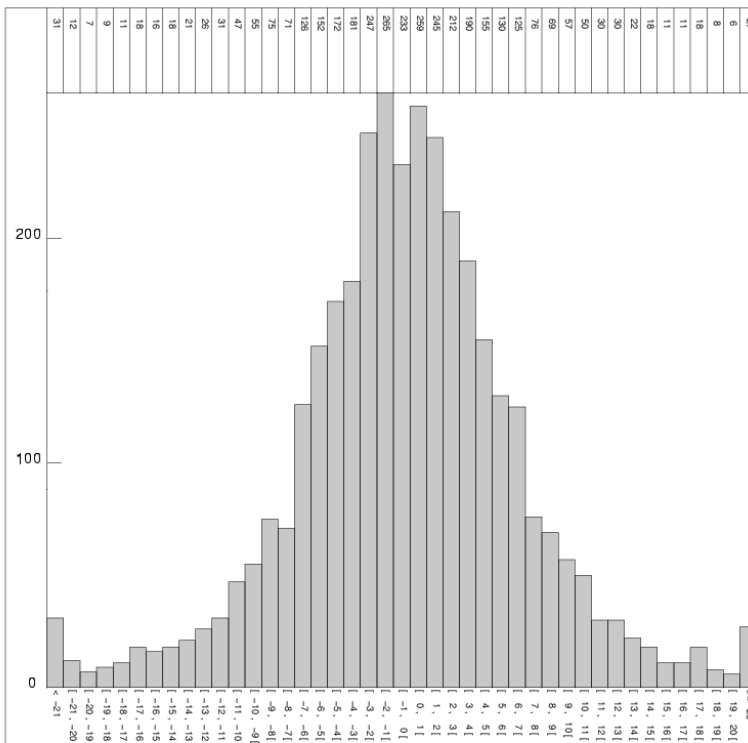
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -29.8200
 Valeur maximale : 26.5300
 Différence Max – Min: 56.3500
 Nombre de points lus: 3648
 Nombre de points sélectionnés: 3569
 Moyenne : -0.228112
 Écart-type : 7.01293
 Moyenne Quadratique : 7.01664

CLS Space Oceanography Division



T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

RAPPEL DES SELECTIONS

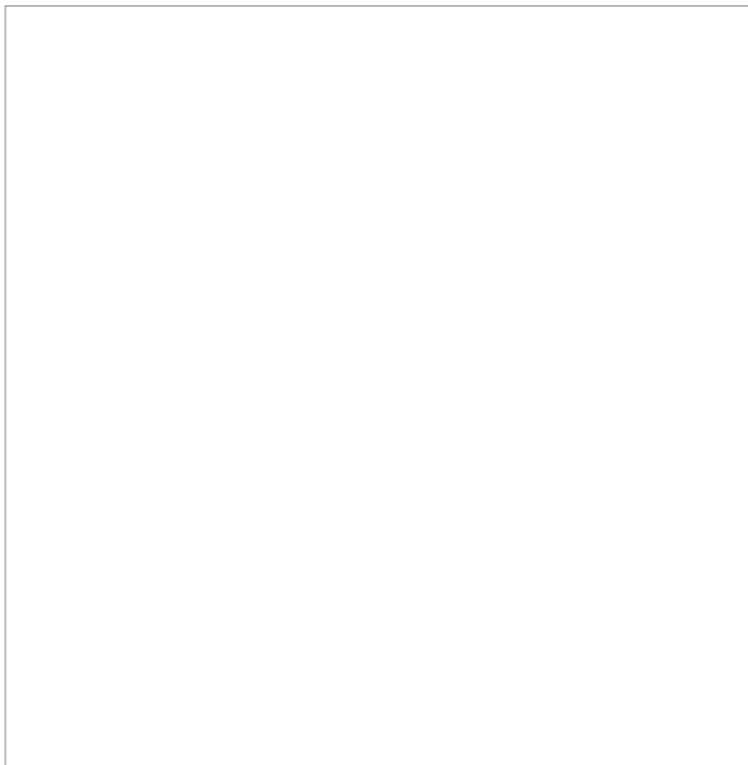
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -28.5400
 Valeur maximale : 28.0900
 Différence Max – Min: 56.6300
 Nombre de points lus: 3648
 Nombre de points sélectionnés: 3558
 Moyenne : 0.0589039
 Écart-type : 6.23903
 Moyenne Quadratique : 0.0589039

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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 : -31.2500

Valeur maximale : 36.7300

Difference Max – Min: 67.9800

Nombre de points lus: 2317

Nombre de points selectionnes: 2124

Moyenne : -0.519920

Ecart-type : 6.14667

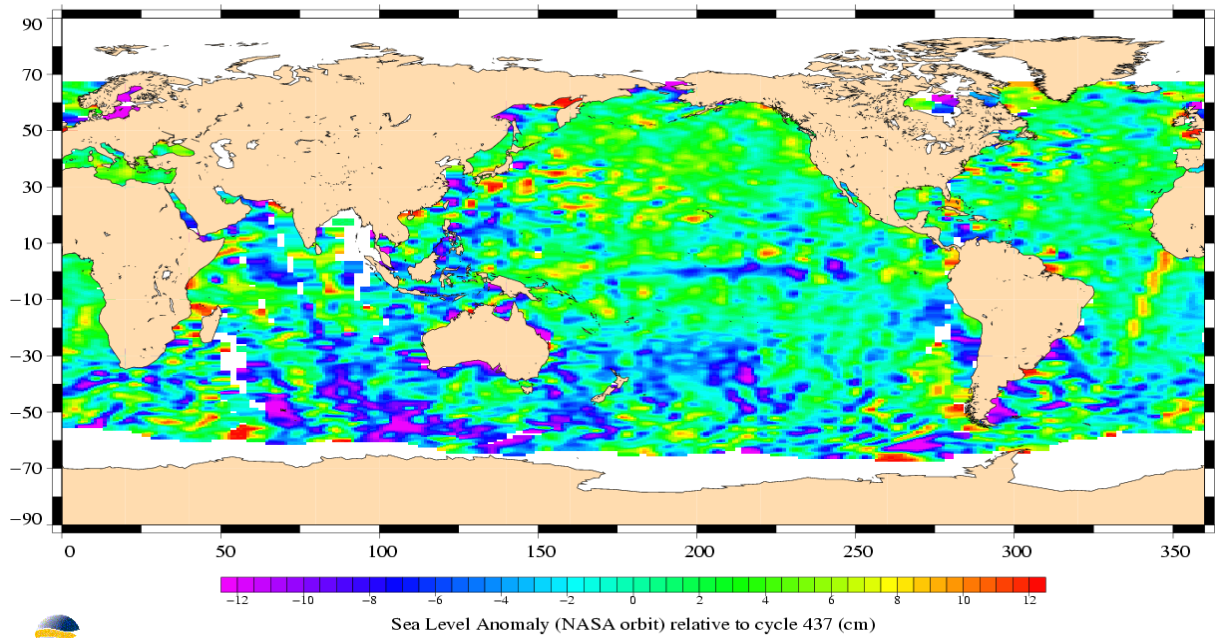
Moyenne Quadratique : -0.519920

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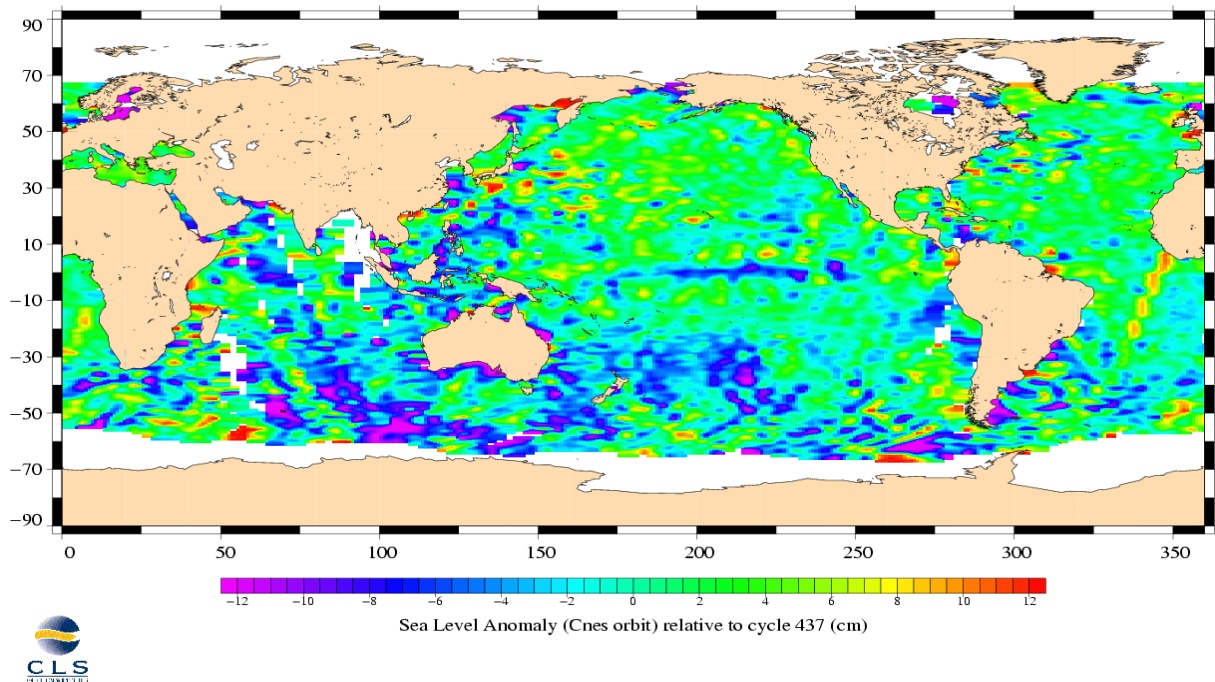
3.8 SSH variability

3.8.1 Sea Level Anomaly

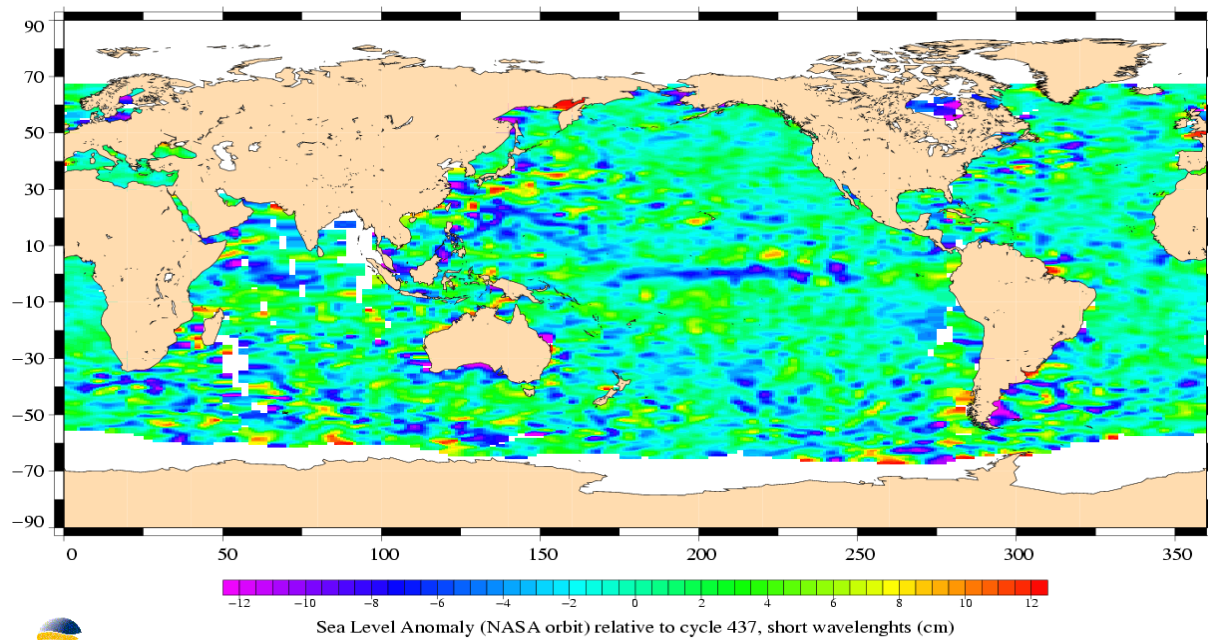
TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004



TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004



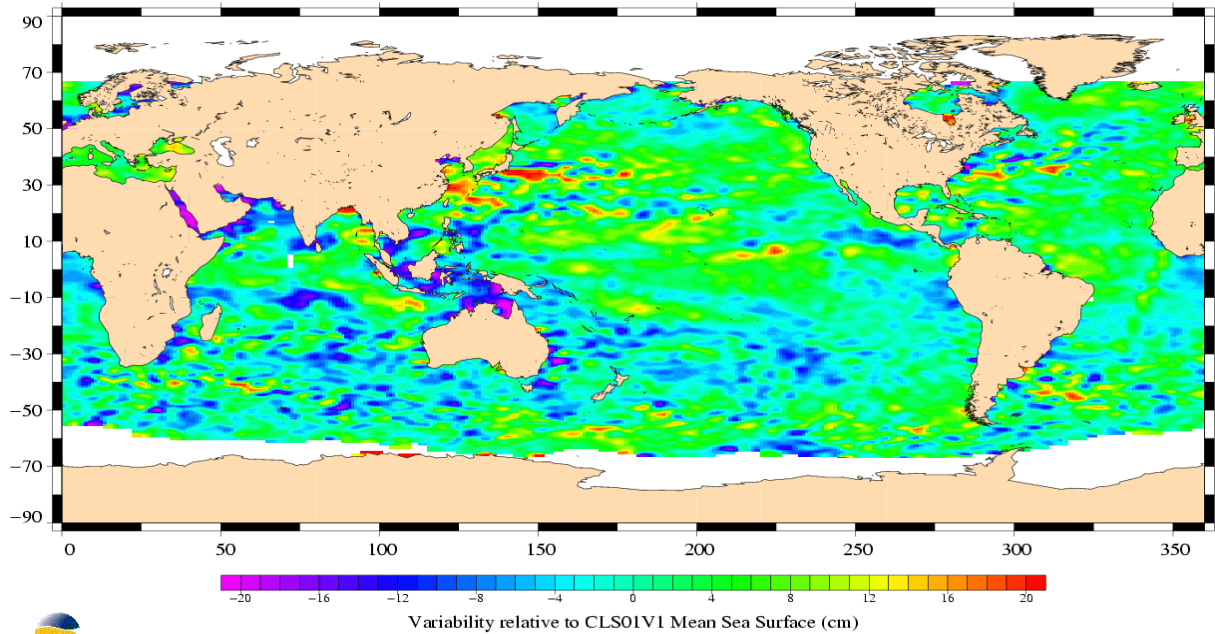
TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004



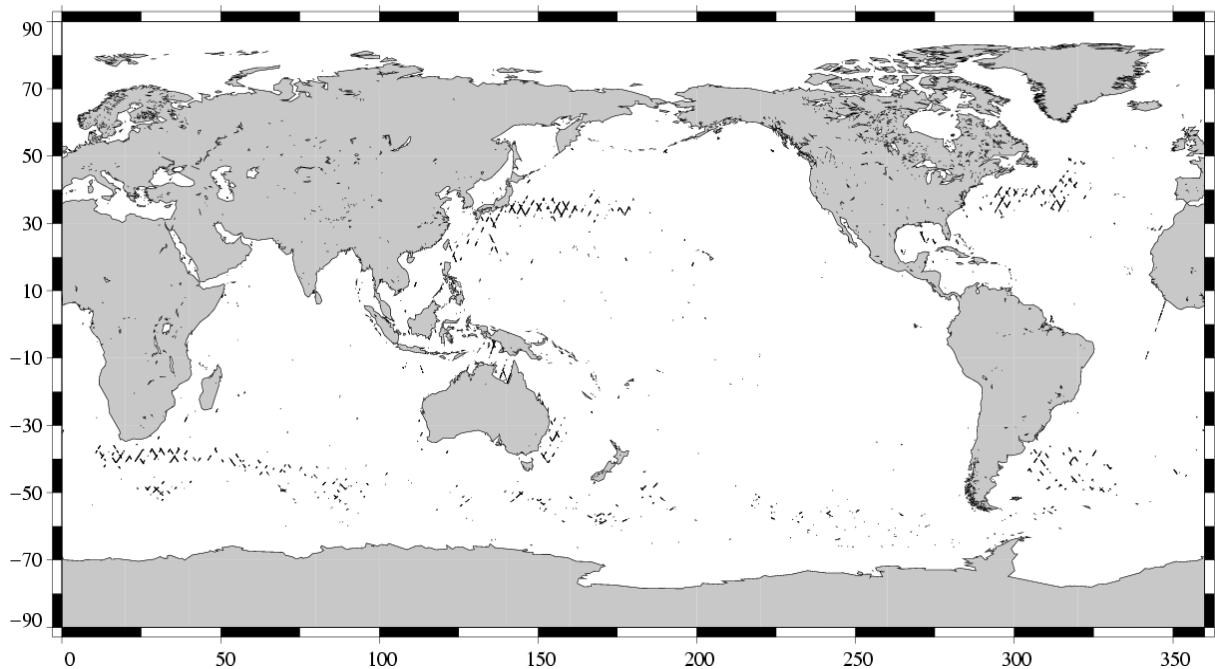
3.8.2 Comparison to a precise Mean Sea Surface

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 438
Period : 04/08/2004 – 14/08/2004

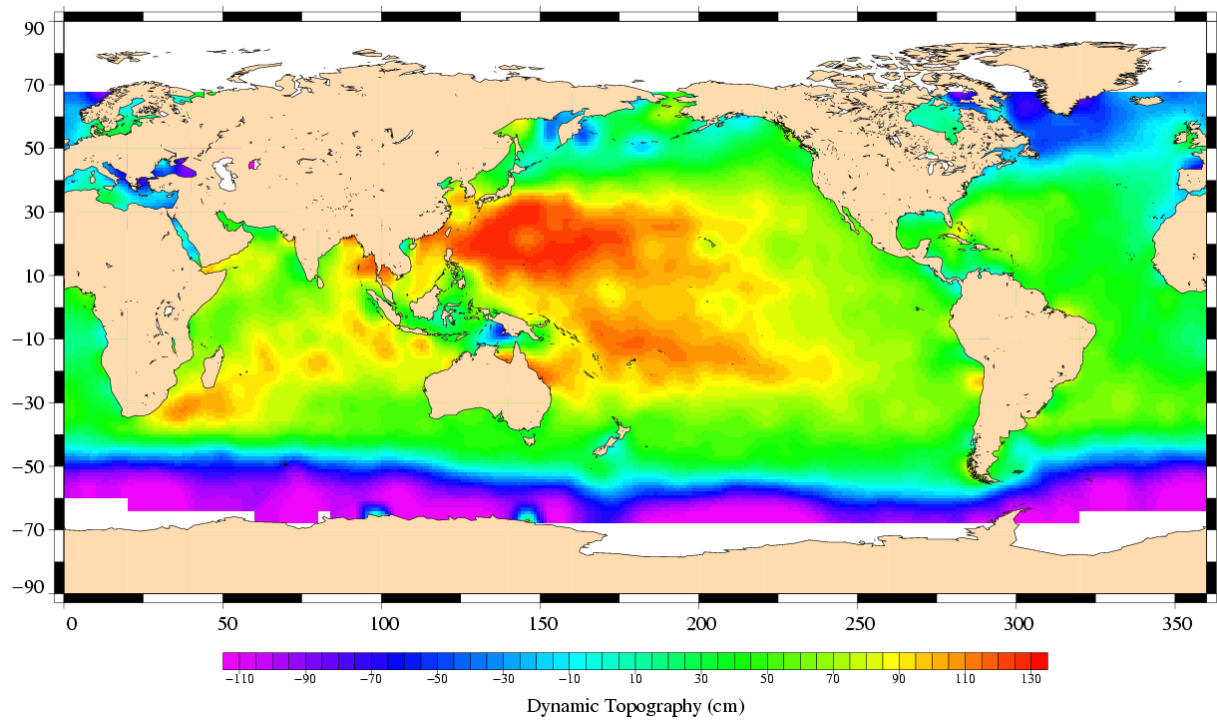


(SSH - MSS) differences greater than 0.3 m
TOPEX/Poseidon Cycle 438 (04/08/2004 / 14/08/2004)



3.9 Dynamic topography

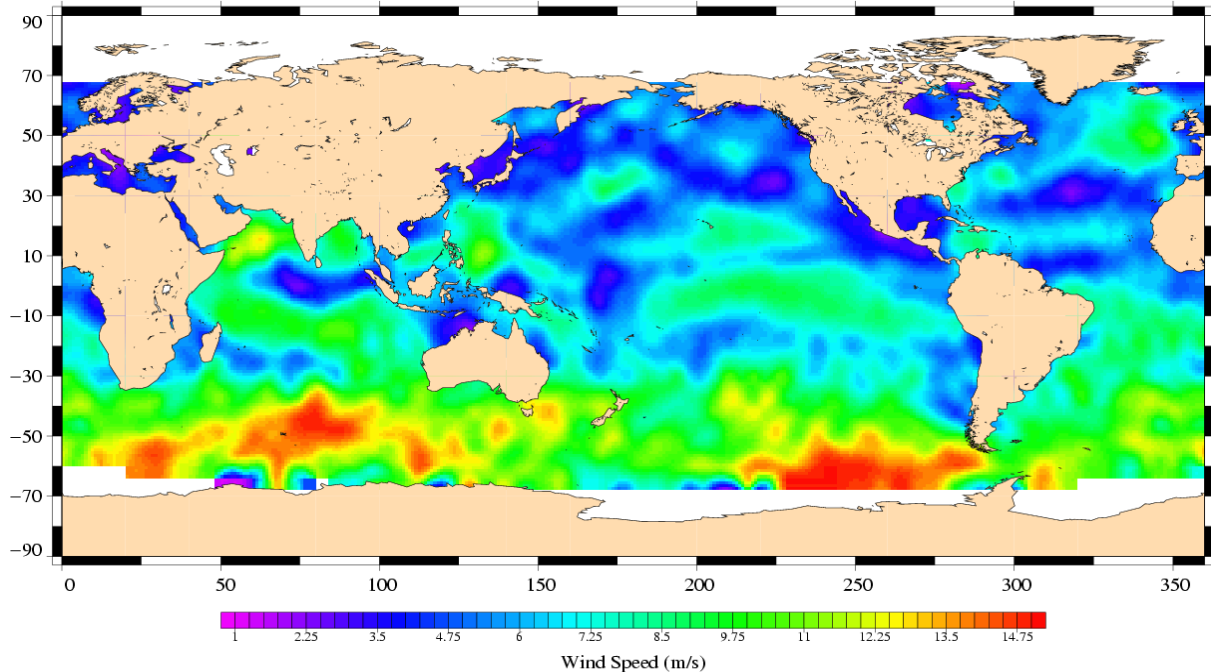
TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004



3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004



TOPEX/Poseidon, cycle 438
Period : 04/08/2004 – 14/08/2004

