



TOPEX/Poseidon MGRD Quality Assessment Report

Cycle 440

24-08-2004 03-09-2004

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SALP-RP-P2-EX-21120-CLS440

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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 6.03 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.35 cm.

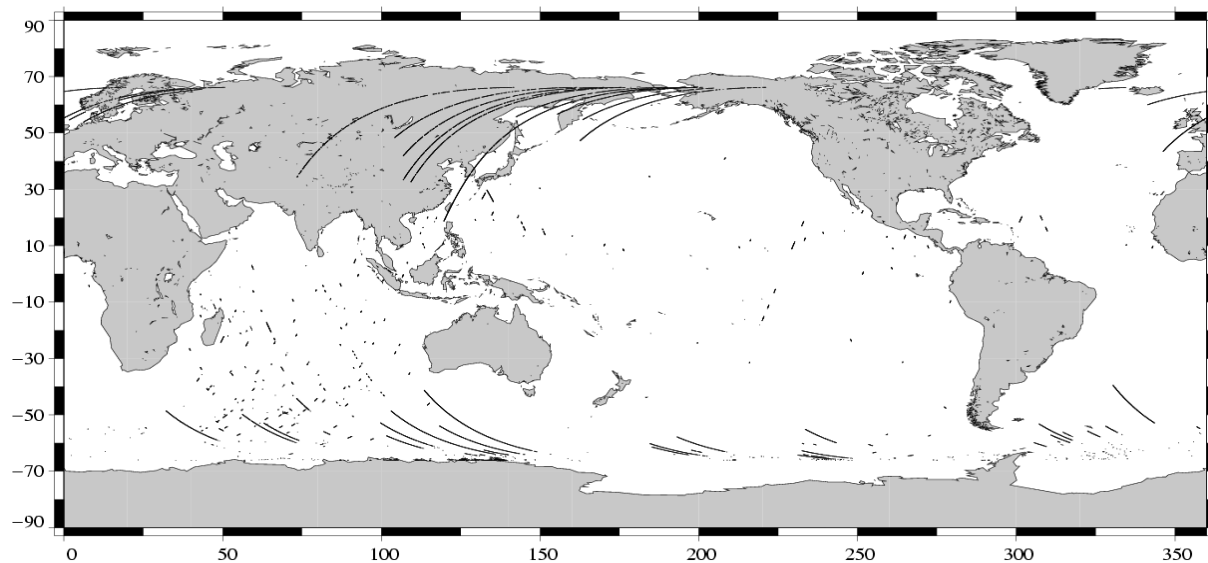
2.2 Warnings and recommendations

- 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.
- Doris ionospheric correction
 - The DORIS instrument experienced an incident on August 30th, therefore there is no DORIS data available for this day (passes 152-177). Only bent ionospheric correction is available for this passes.
- 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 :

 - 2.31% 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 440 (24/08/2004 / 03/09/2004)



3 CALVAL main results

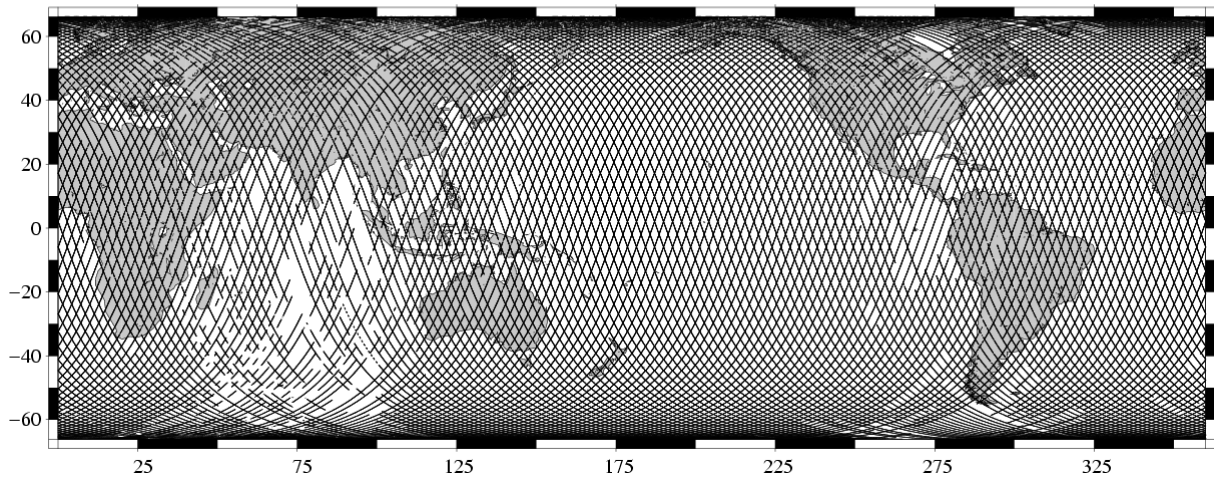
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

3.1 Missing measurements

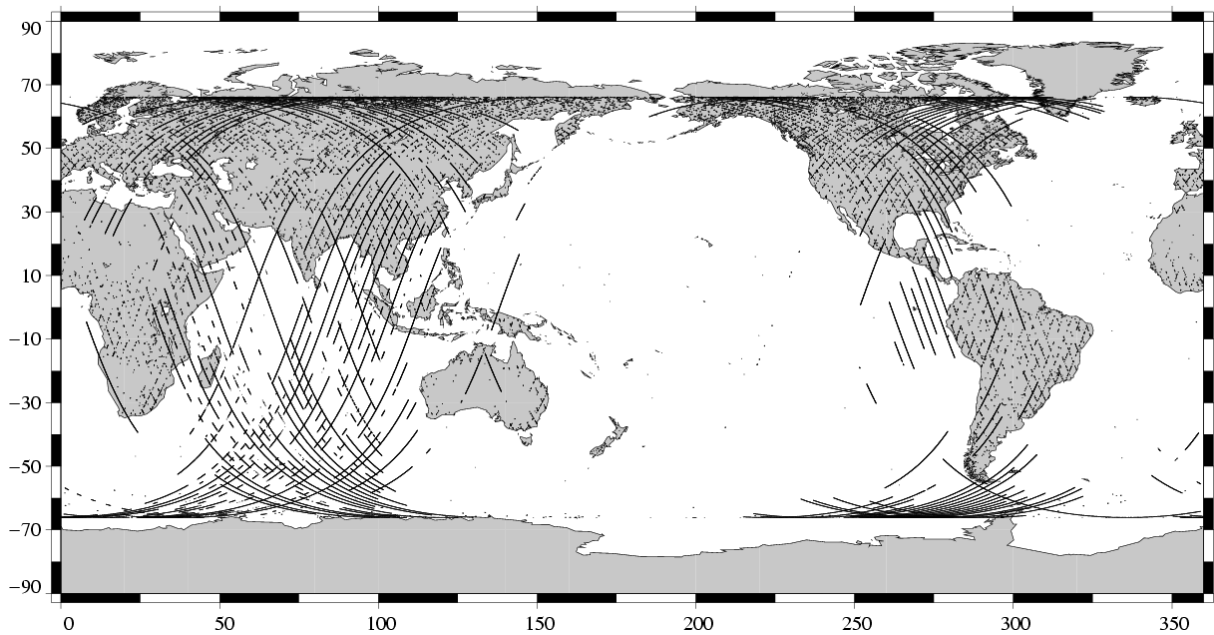
677393 altimeter measurements are present, and 117166 are missing.

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 440 (24/08/2004 / 03/09/2004)



Missing measurements
TOPEX/Poseidon Cycle 440 (24/08/2004 / 03/09/2004)



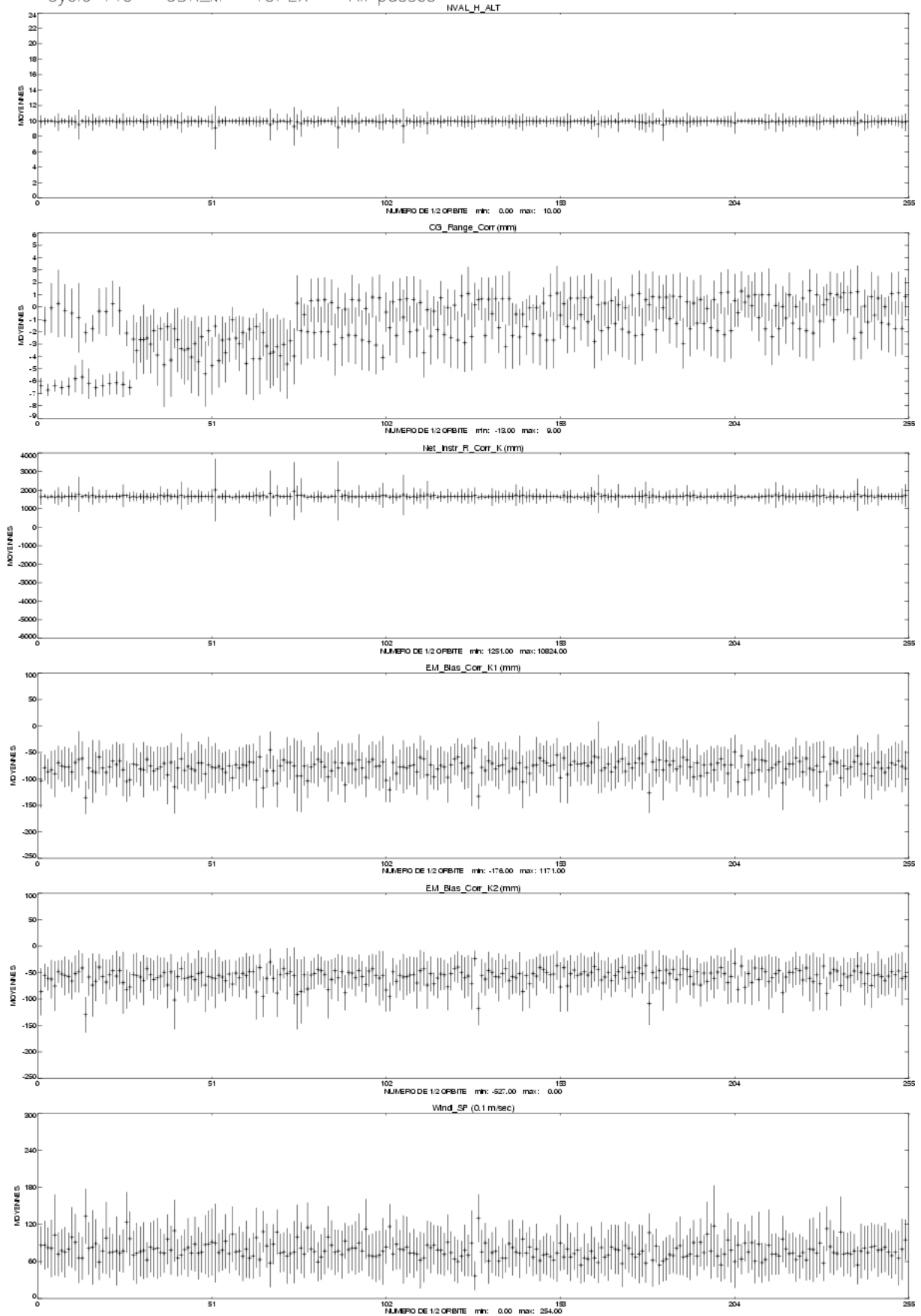
3.2 M-GDR quality flags

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

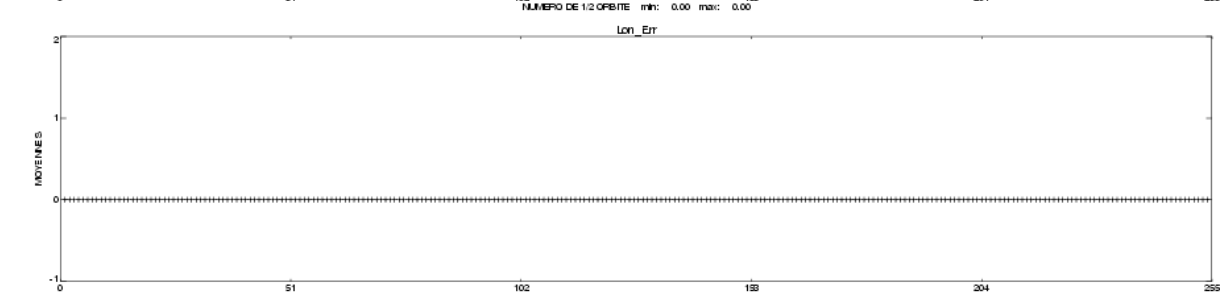
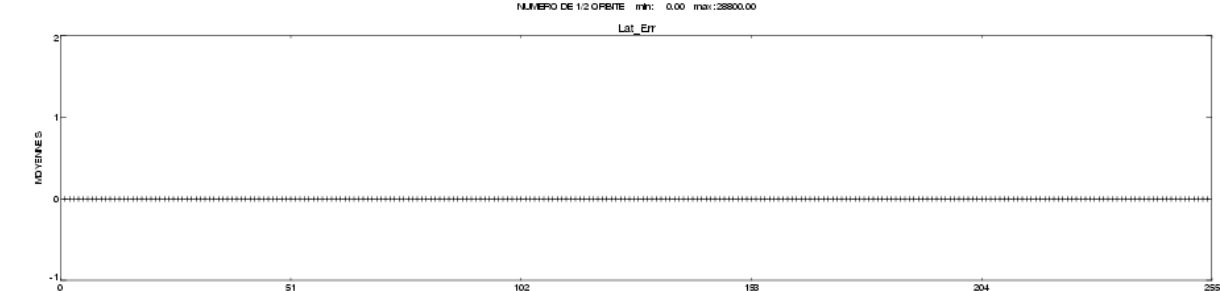
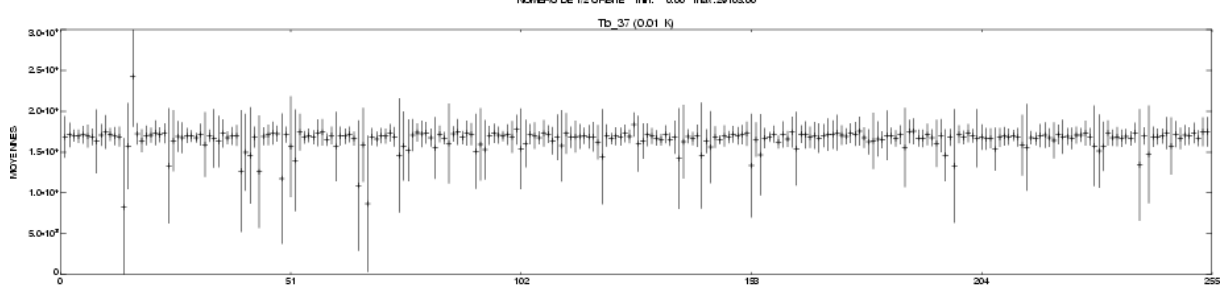
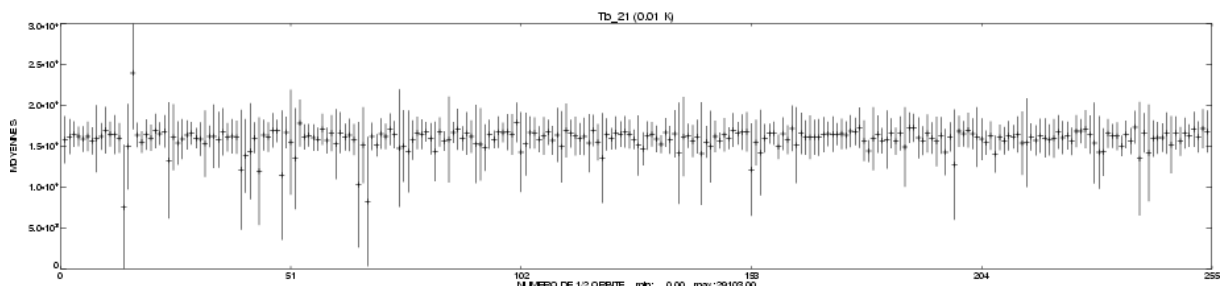
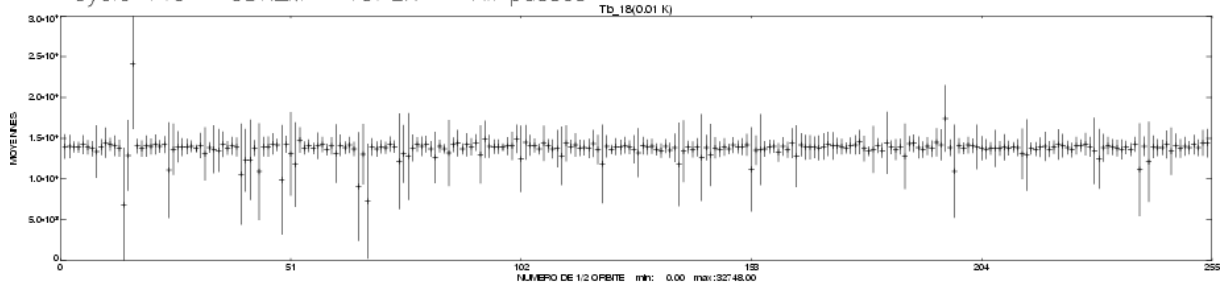
Name	Description	% bad
Geo_Bad_1	altimeter land flag	25.53
Geo_Bad_1	ice flag	8.74
Geo_Bad_1	radiometer land flag	27.09
Alt_Bad_1	conditions 1 altimeter	5.42
Alt_Bad_2	conditions 2 altimeter	5.25
Geo_Bad_2	rain (liquid water in excess)	5.61
Geo_Bad_2	less than 4 points for CSR3.0 tide calculation	0.45
Geo_Bad_2	less than 4 points for FES95.2.1 tide calculation	3.17
TOPEX	TOPEX not valid	0.00
TMR	TMR not valid	0.00
TMR_Bad	Brightness temperatures not valid	6.10
DORIS	DORIS not valid	0.00

3.3 M-GDR parameter plots

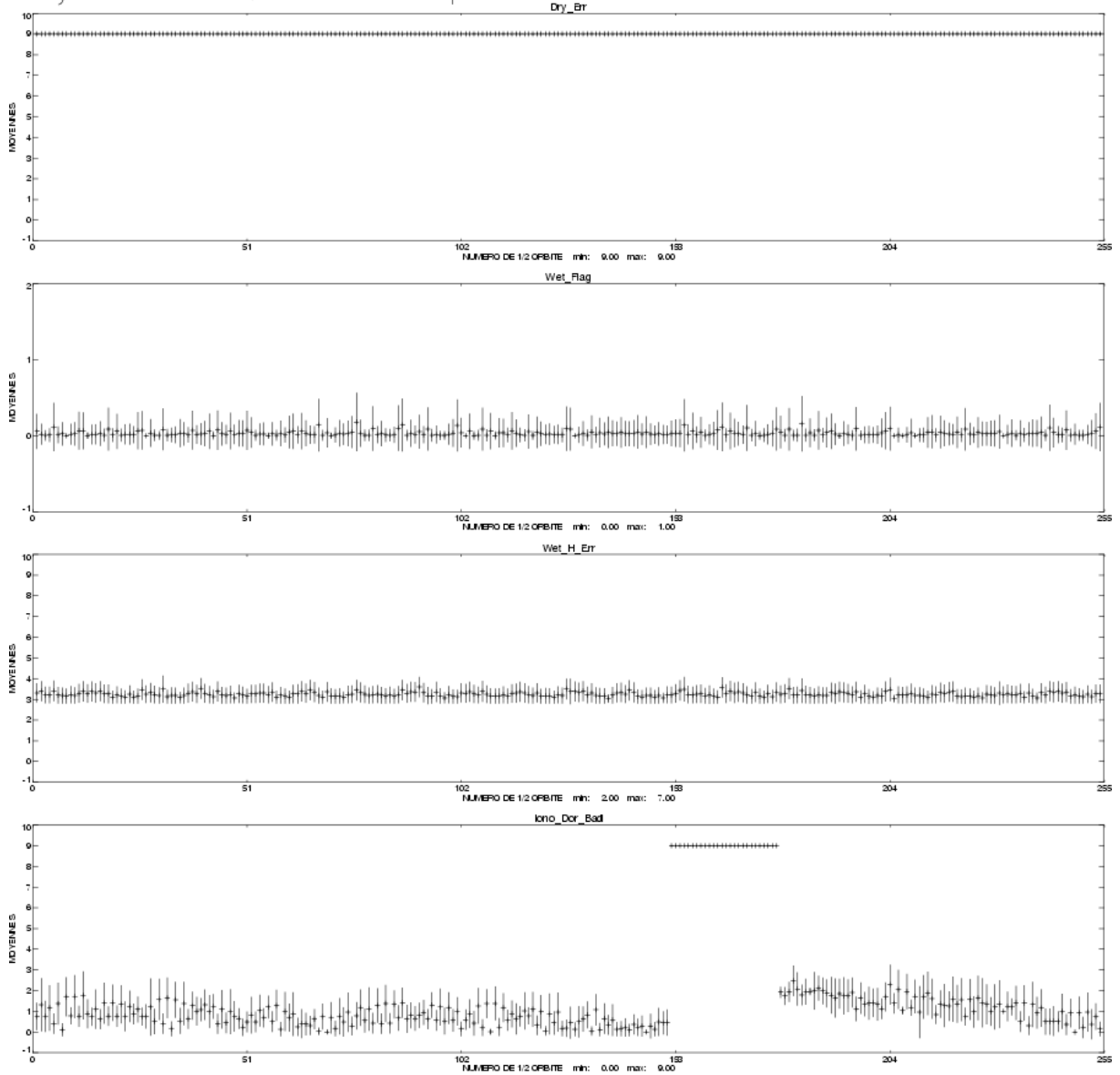
Cycle 440 – GDR_M – TOPEX – All passes –



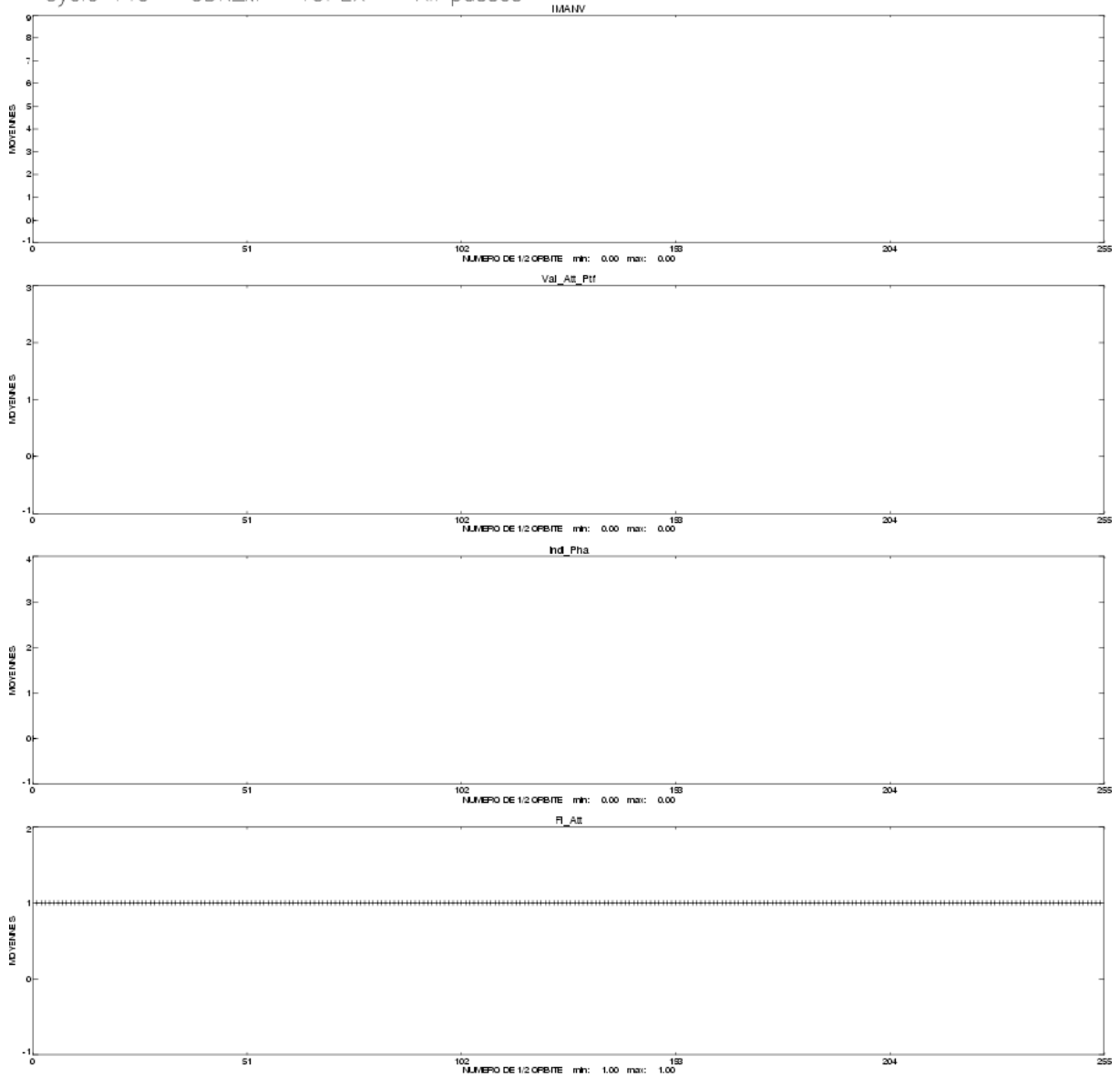
Cycle 440 – GDR_M – TOPEX – All passes –

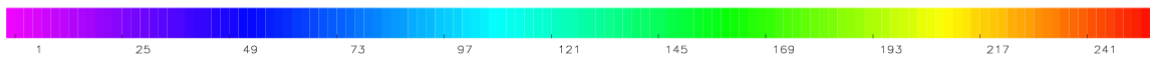
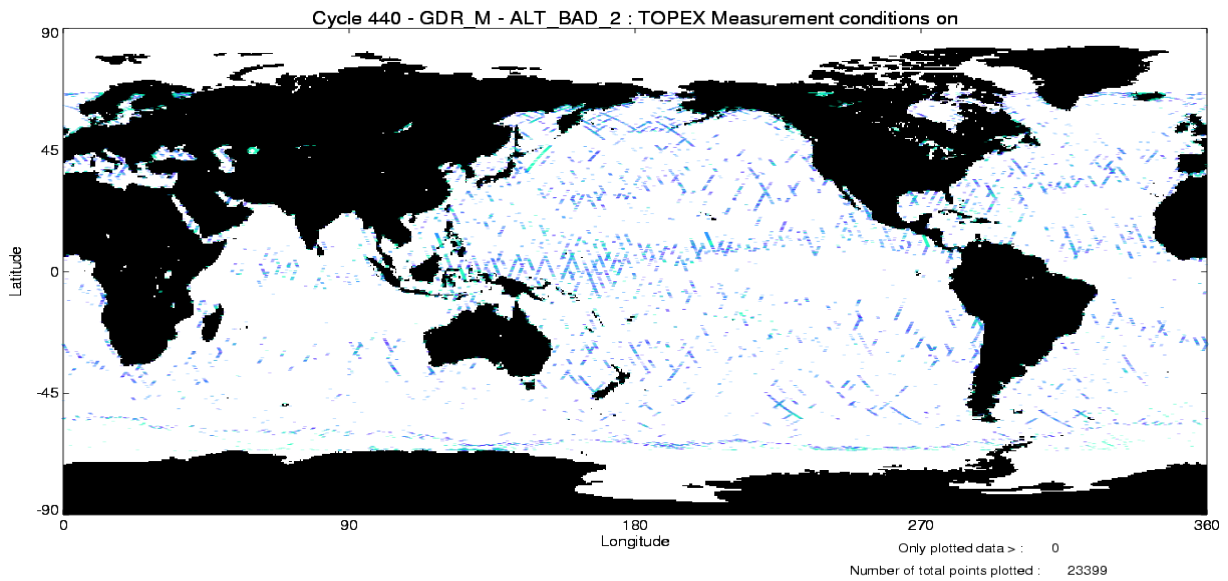
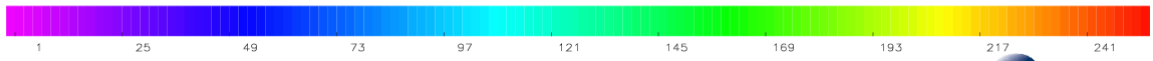
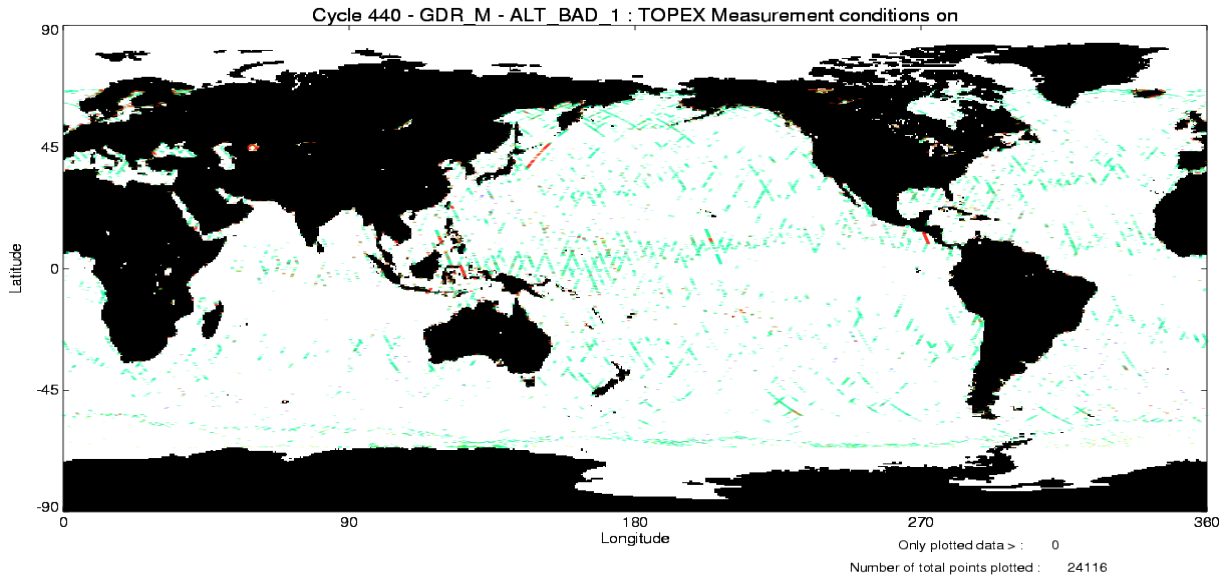


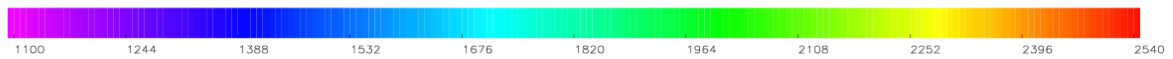
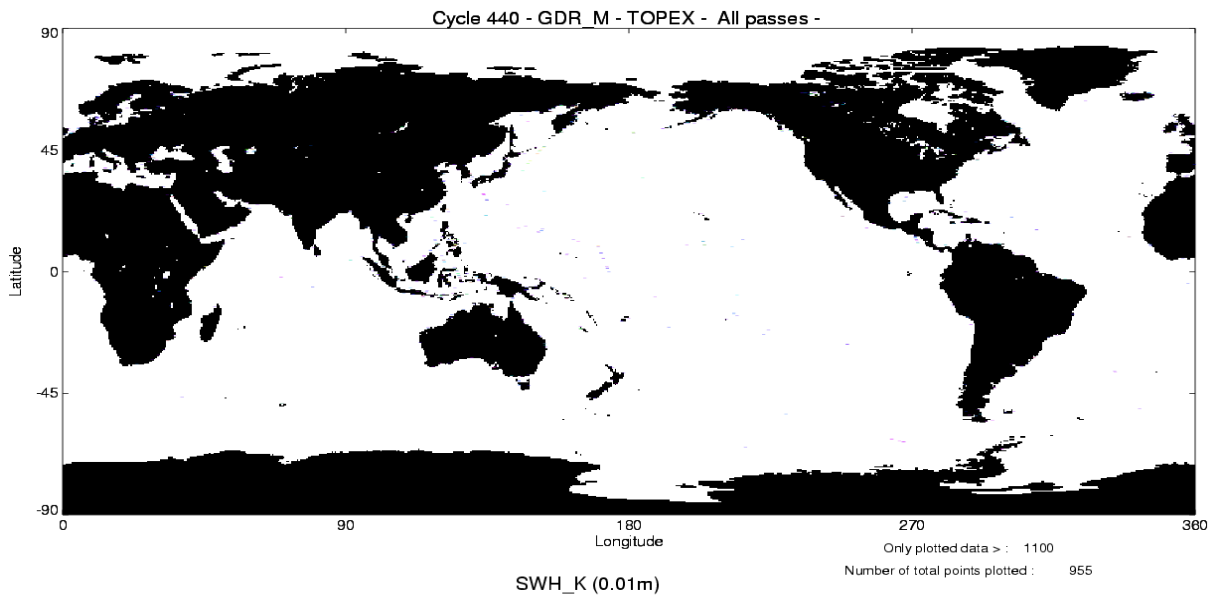
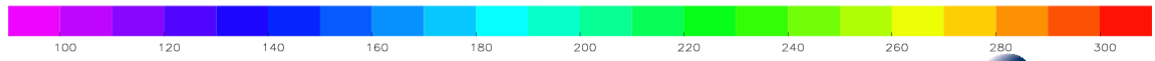
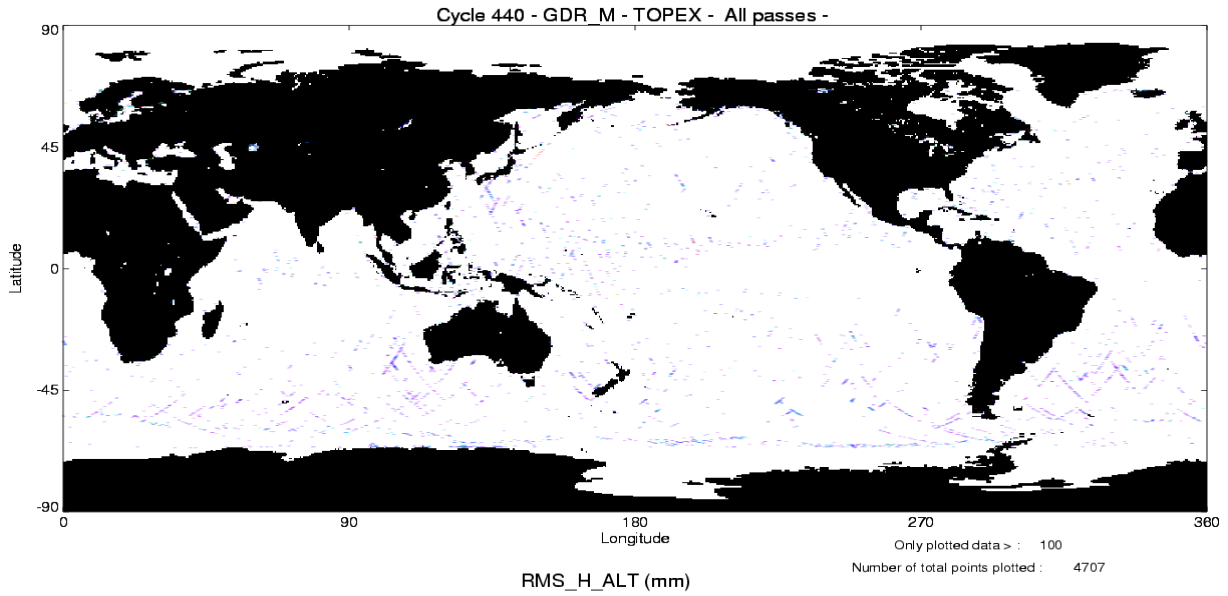
Cycle 440 – GDR_M – TOPEX – All passes –

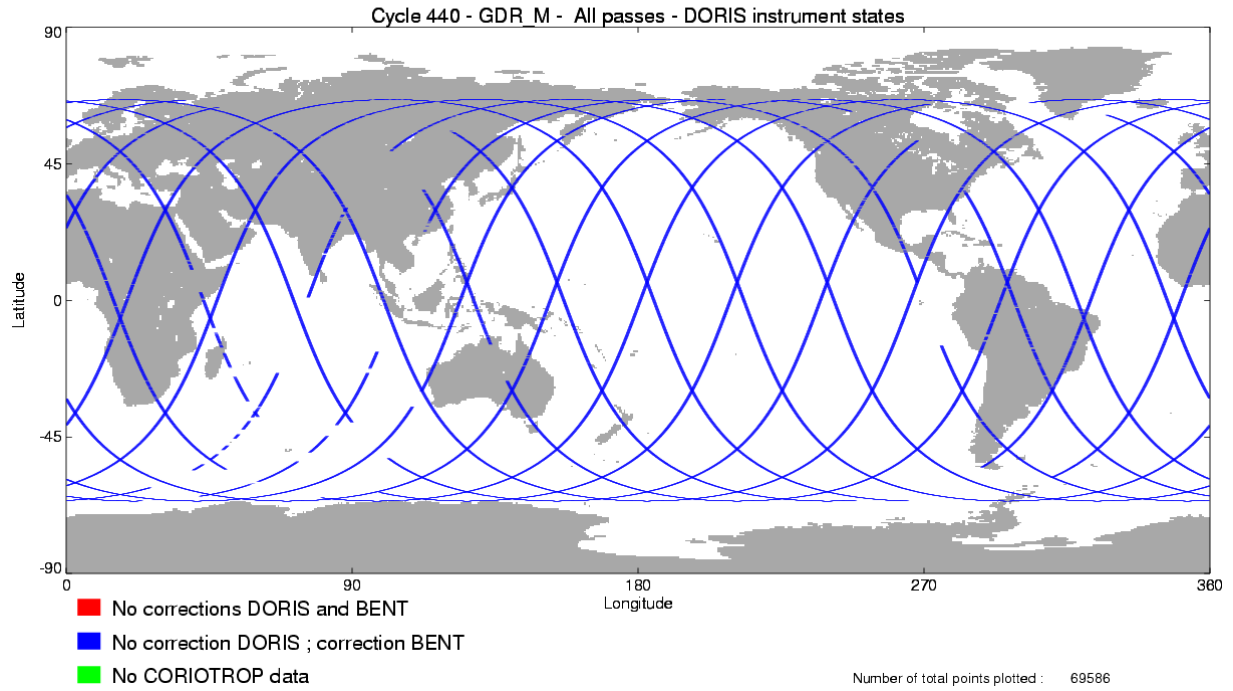


Cycle 440 – GDR_M – TOPEX – All passes –









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.

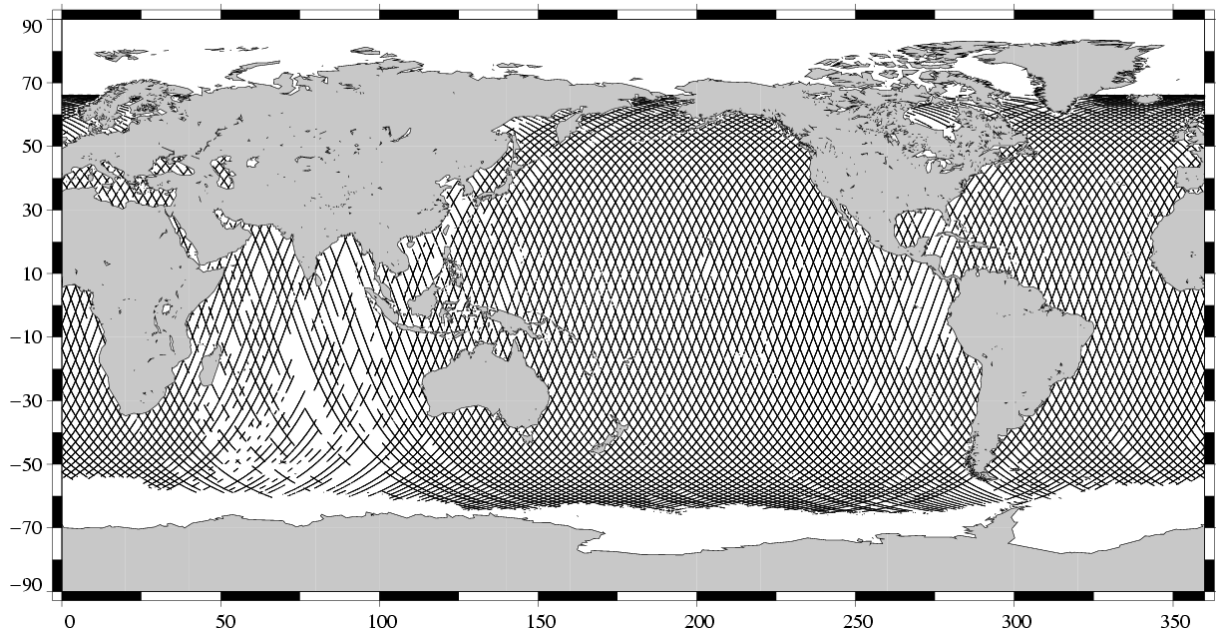
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (27.08 % of points removed) and ice flag (8.74 % of points removed).

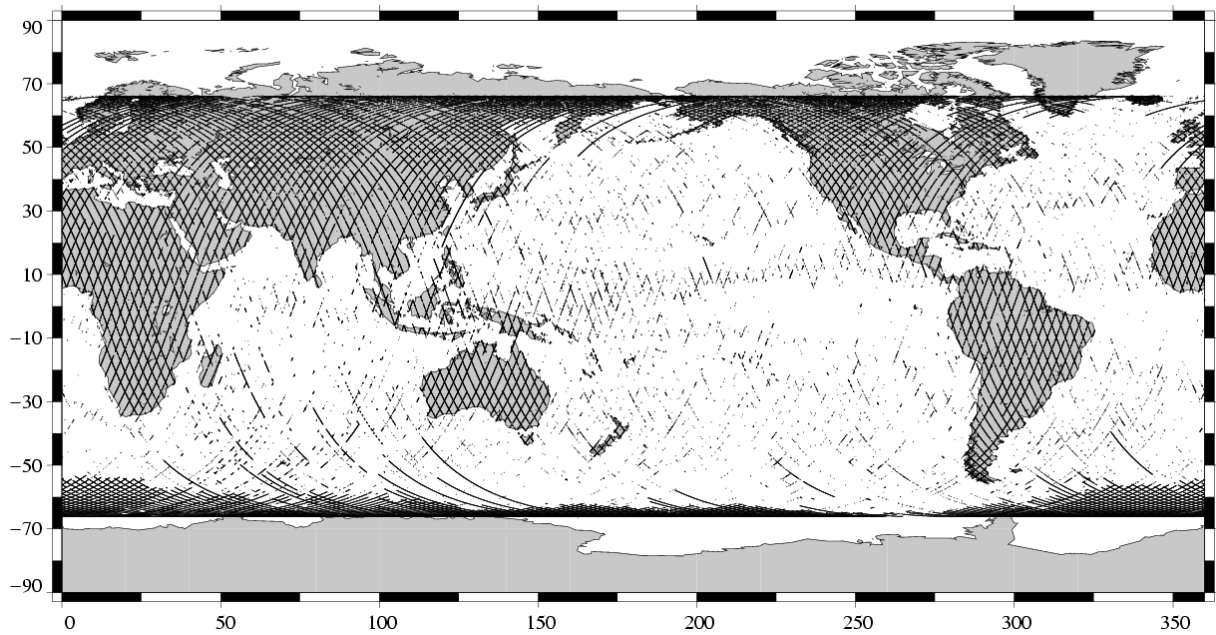
Parameters	Min Thres.	Max Thres.	Unit	Mean % removed in 1997	% removed
Sea surface height	-130.000	100.000	m	1.37	0.17
Number of 20/10Hz valid points Poseidon/TOPEX	5.000	-		1.37	0.27
Std. deviation of range	0.000	0.100	m	1.85	1.10
Off nadir angle from waveform	0.000	0.400	deg	1.36	3.57
Dry tropospheric 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	2.31
Ionospheric correction (Poseidon:Doris, TOPEX: Dual)	-0.400	0.040	m	0.00	0.30
Significant wave height	0.000	11.000	m	1.46	0.09
Sea state Bias	-0.500	0.000	m	1.39	0.27
Backscatter coefficient	7.000	30.000	dB	1.44	0.34
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	0.34
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.

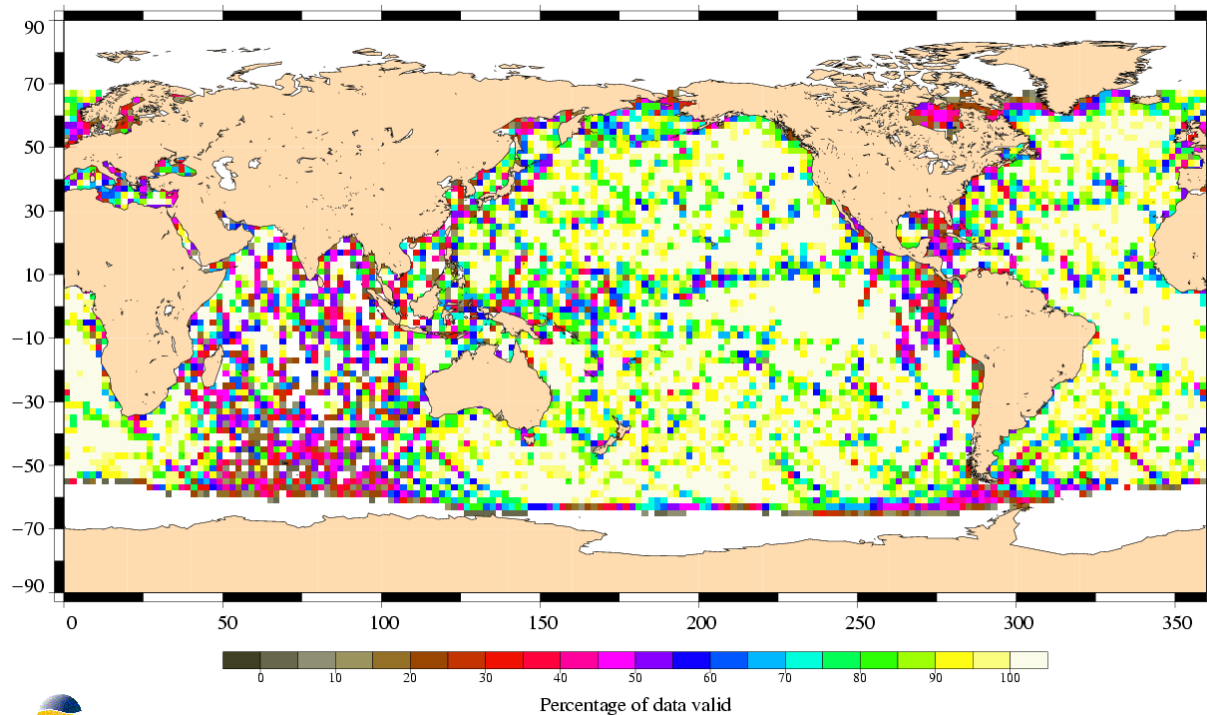
Valid data
TOPEX/Poseidon Cycle 440 (24/08/2004 / 03/09/2004)



Edited measurements
TOPEX Cycle 440 (24/08/2004 / 03/09/2004)

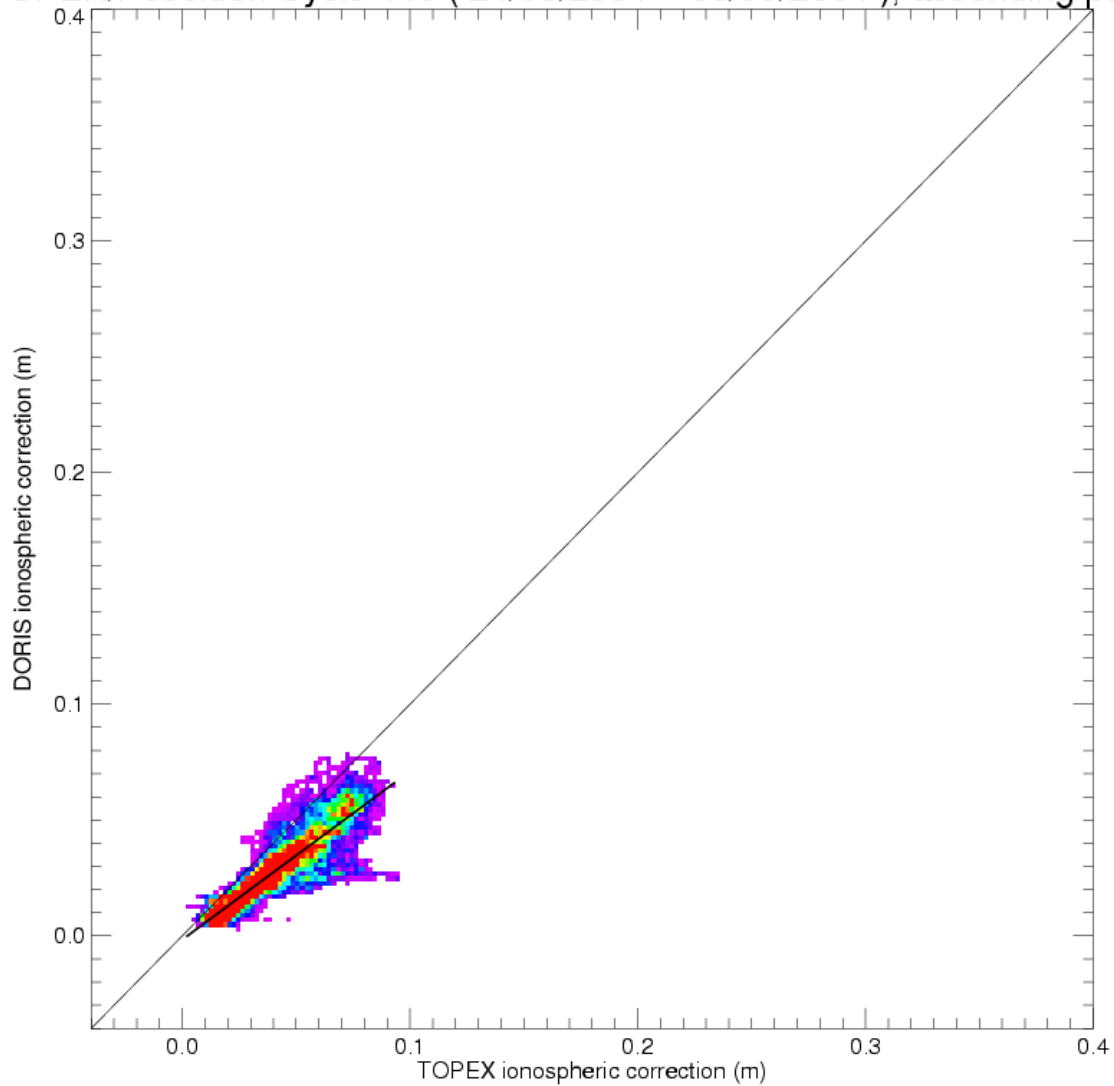


Percentage of valid data relative to the nominal pass
TOPEX/Poseidon Cycle 440 (24/08/2004 / 03/09/2004)

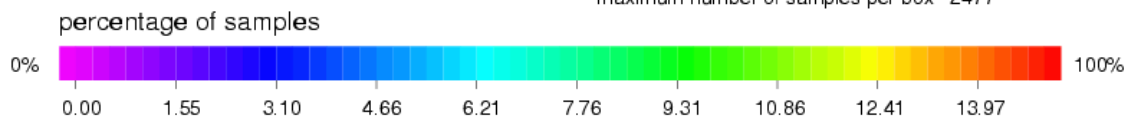


3.5 Ionospheric correction

TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), ascending passes



minimum number of samples per box 1
maximum number of samples per box 2477



Statistics Y-X

mean = -0.01252
rms = 0.01503
std = 0.00831

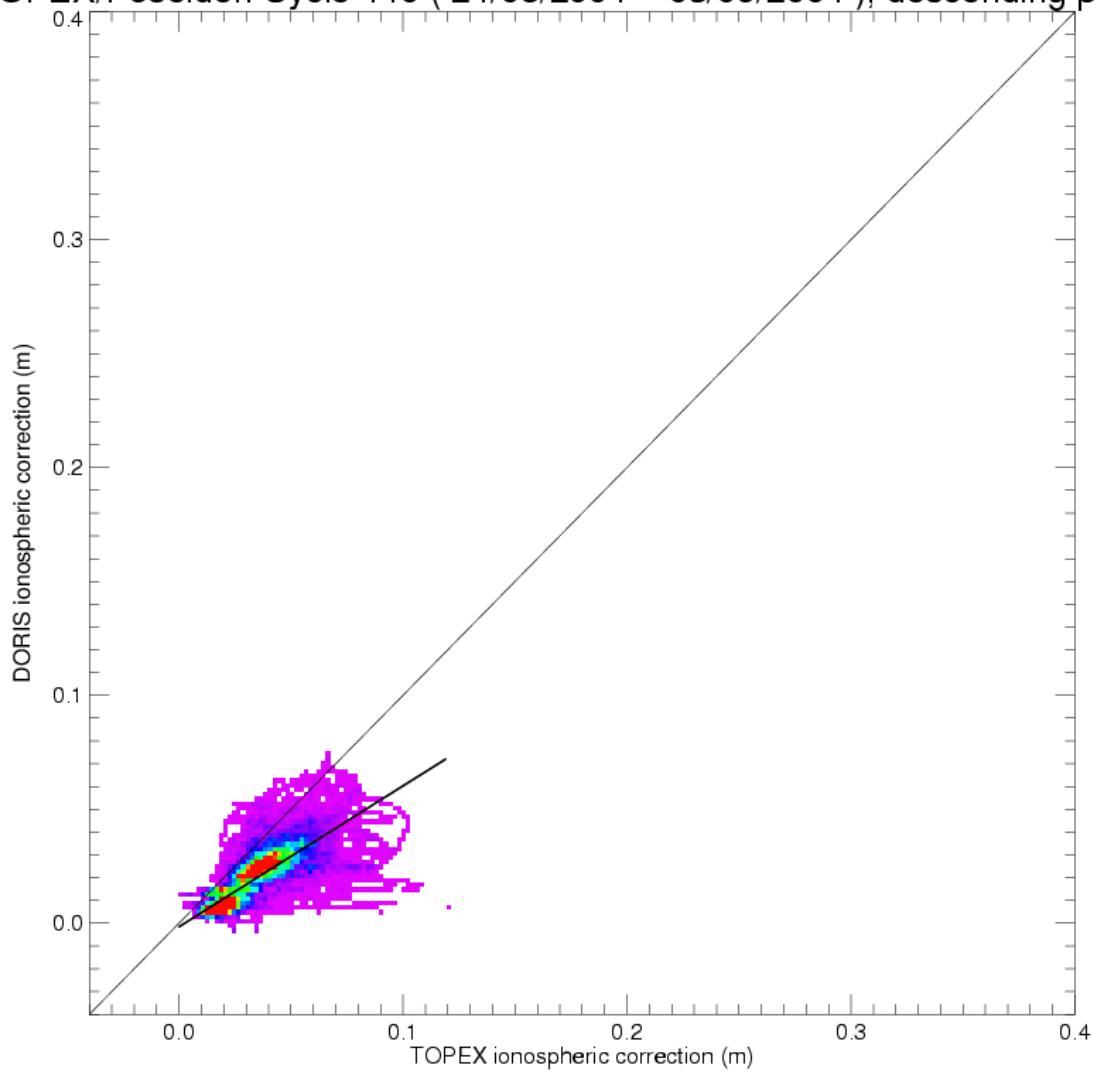
Order 1 fit polynomial

$y = a x + b$
a = 0.72733694
b = -0.00165547

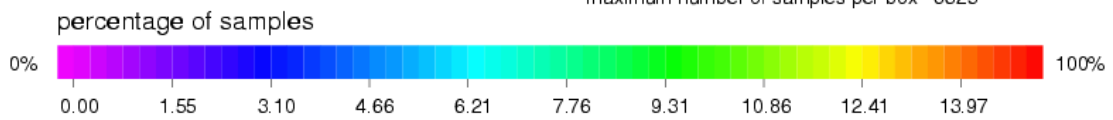
Legend

— Order 1 fit polynomial
— Bisectrix

TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), descending passes



minimum number of samples per box 1
 maximum number of samples per box 6325



Statistics Y-X

mean = -0.01346
 rms = 0.01623
 std = 0.00907

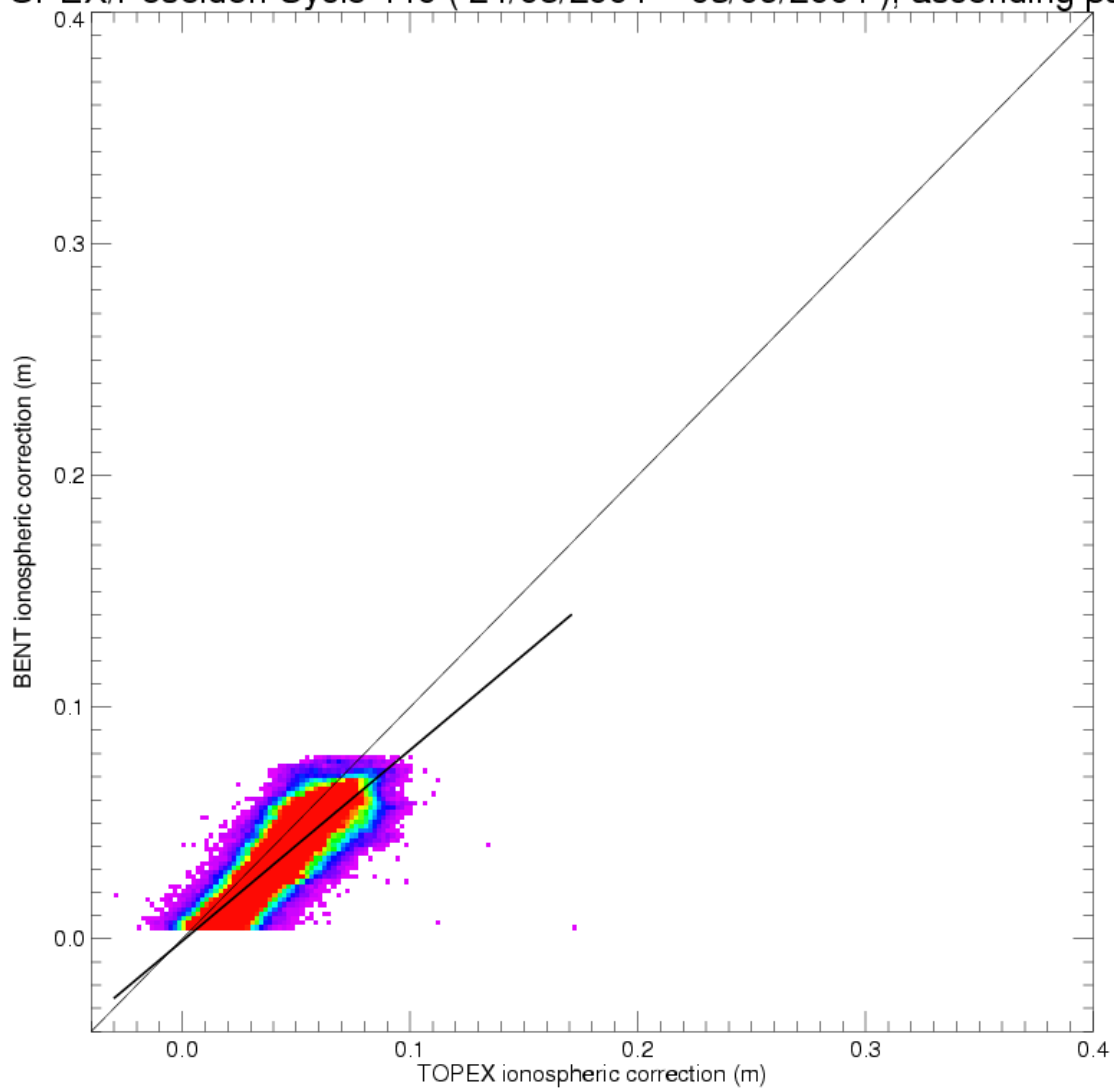
Order 1 fit polynom

$y = a x + b$
 $a = 0.61827070$
 $b = -0.00156679$

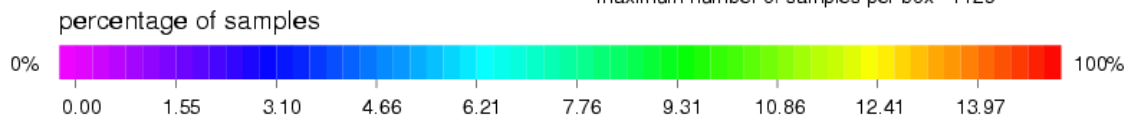
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 1129



Statistics Y-X

mean = -0.00795
 rms = 0.01278
 std = 0.01000

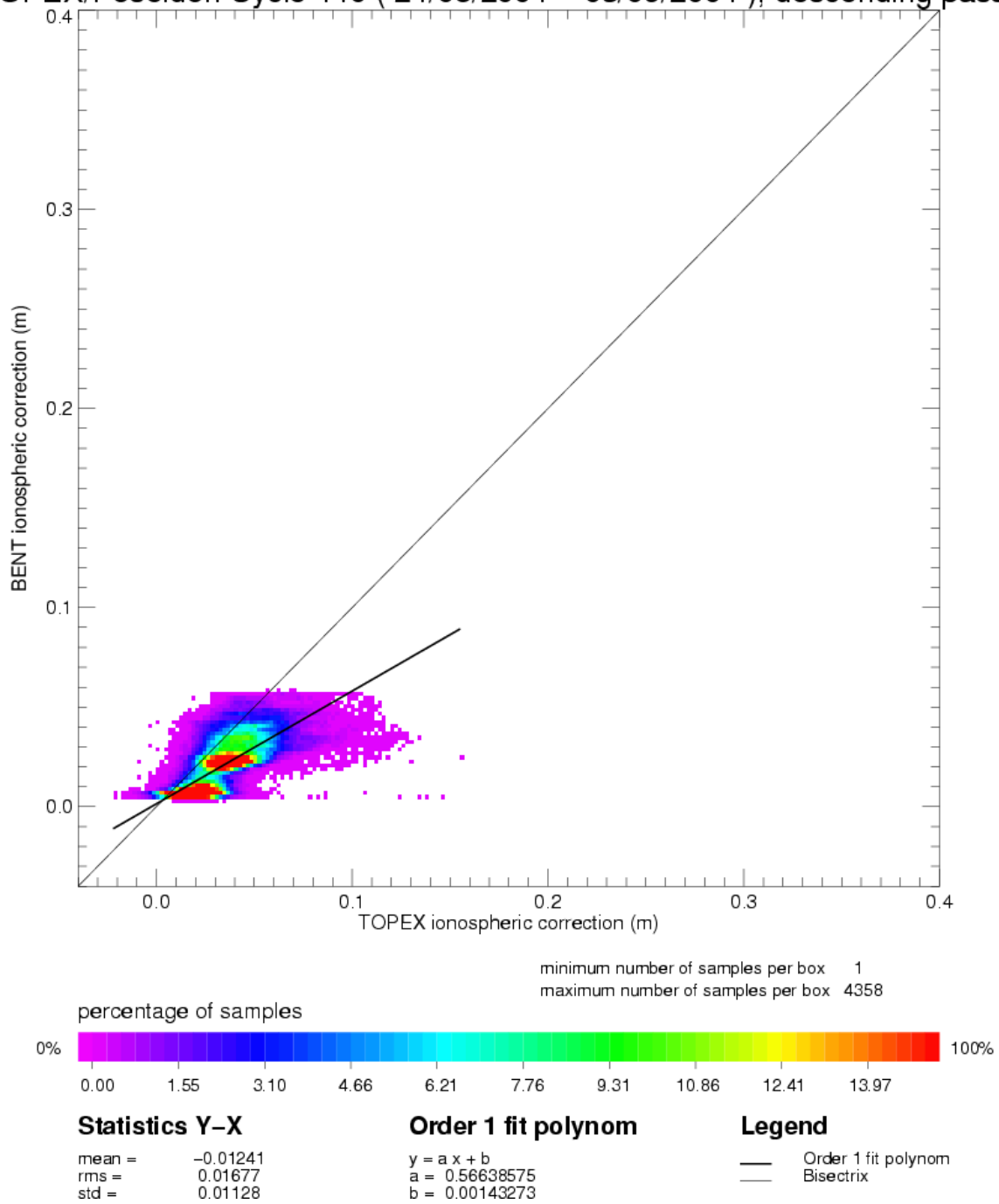
Order 1 fit polynom

$y = a x + b$
 $a = 0.82445002$
 $b = -0.00092648$

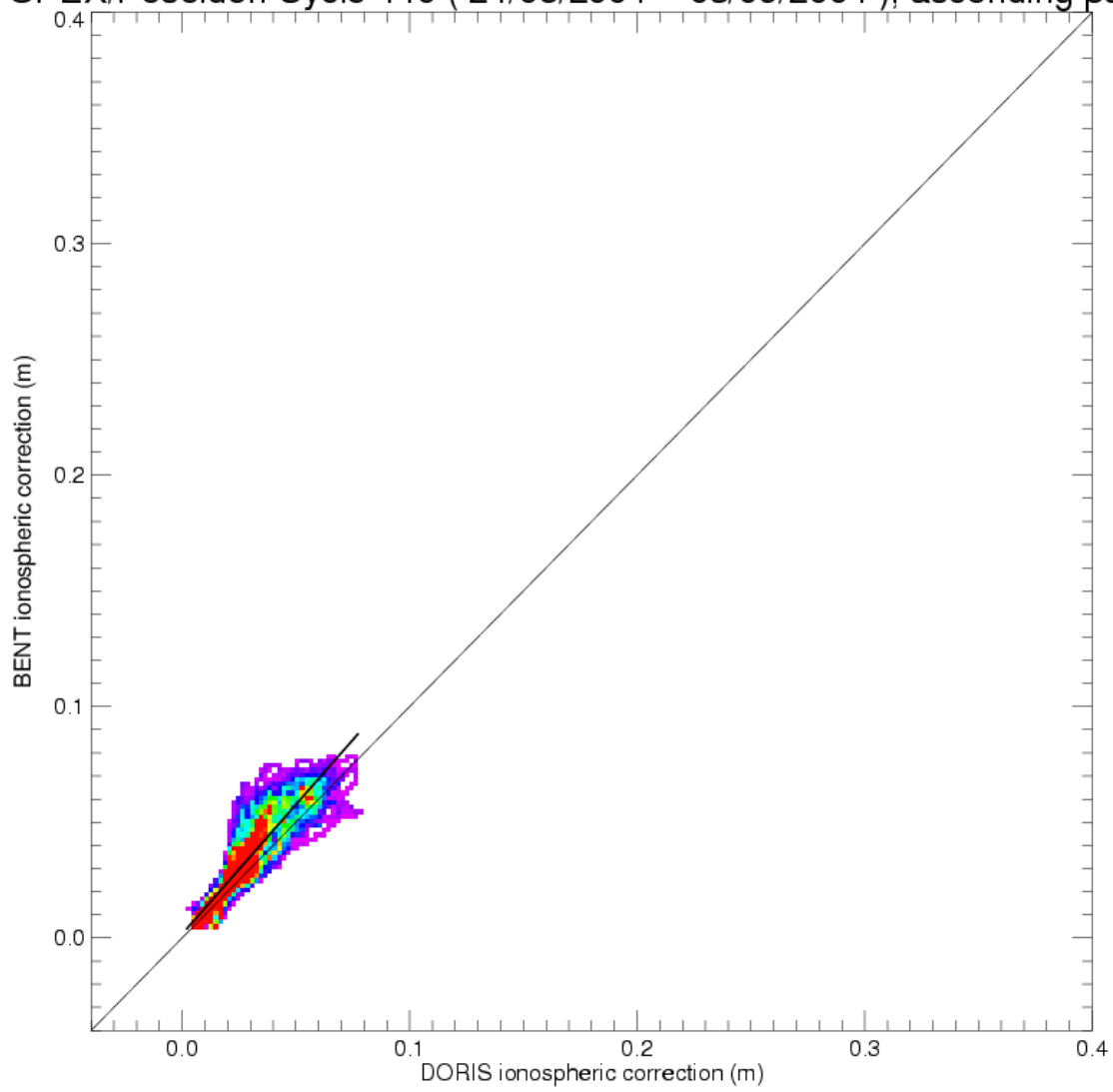
Legend

— Order 1 fit polynom
 — Bisectrix

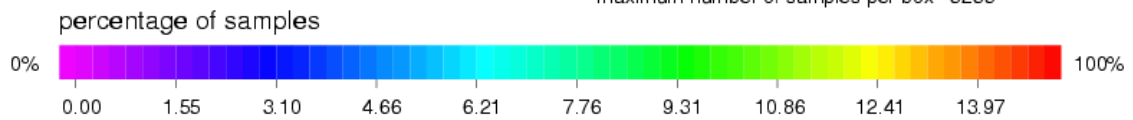
TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), descending passes



TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 3235



Statistics Y-X

mean = 0.00495
 rms = 0.00946
 std = 0.00806

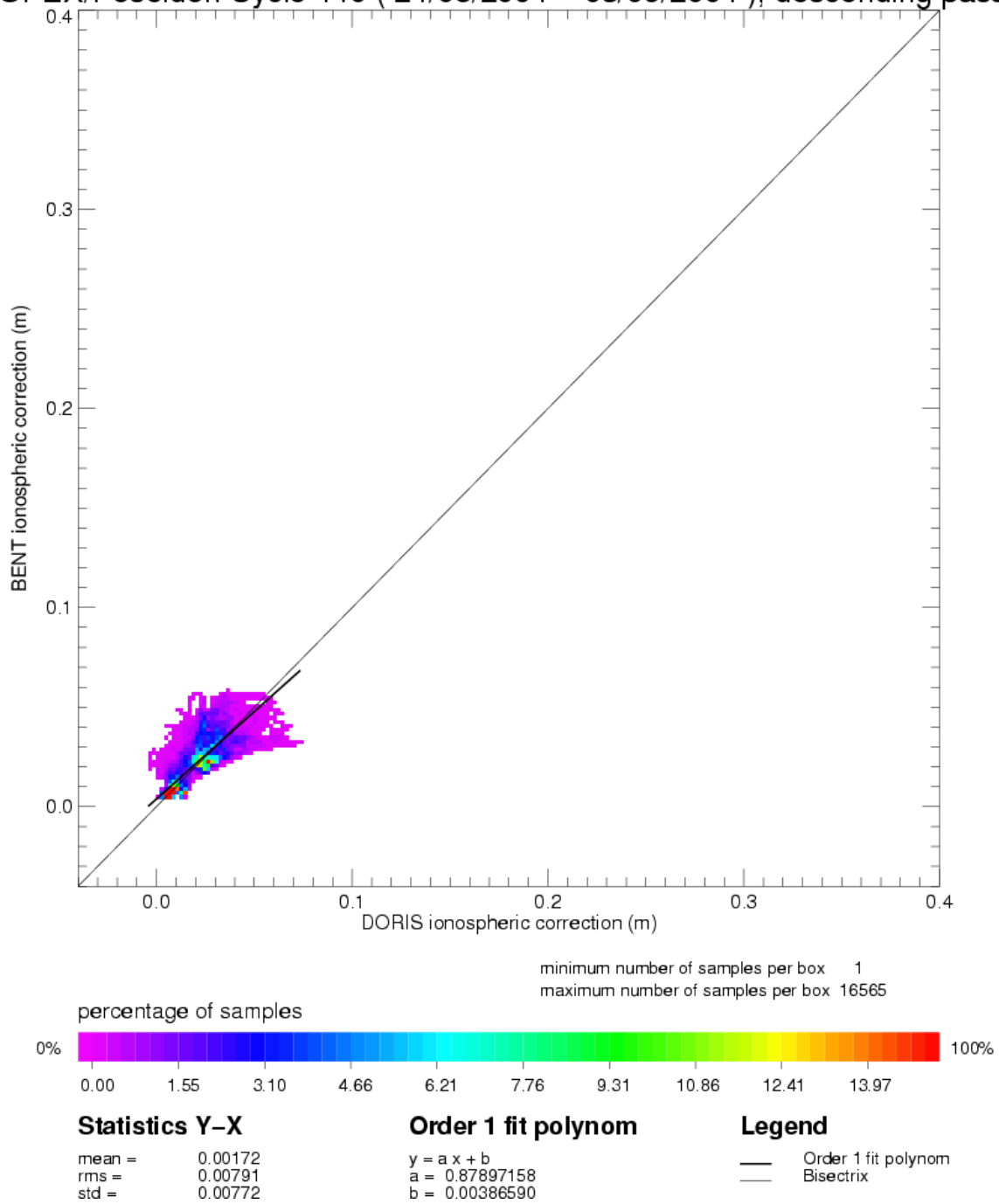
Order 1 fit polynom

$y = a x + b$
 $a = 1.11880279$
 $b = 0.00170220$

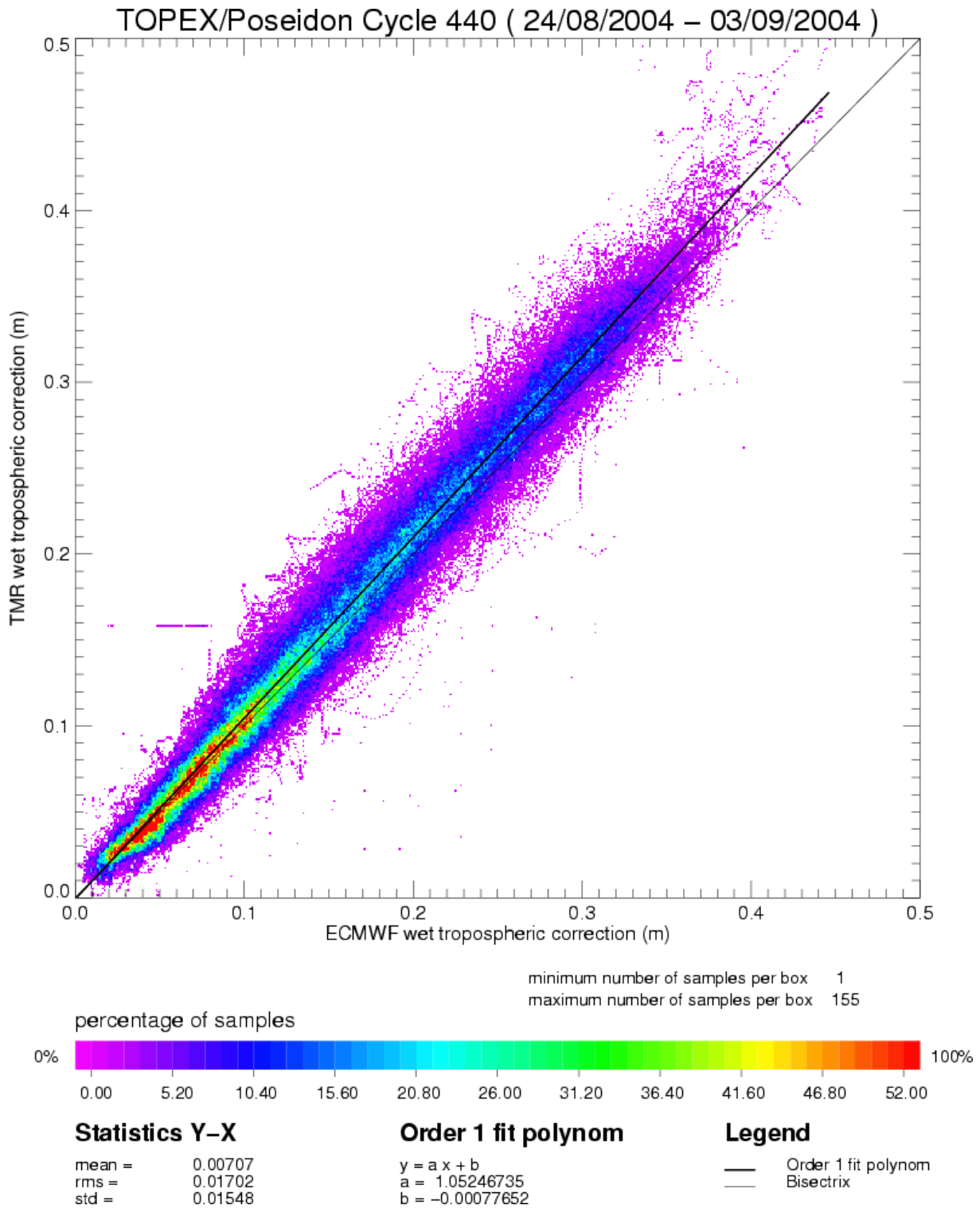
Legend

— Order 1 fit polynom
 — Bisectrix

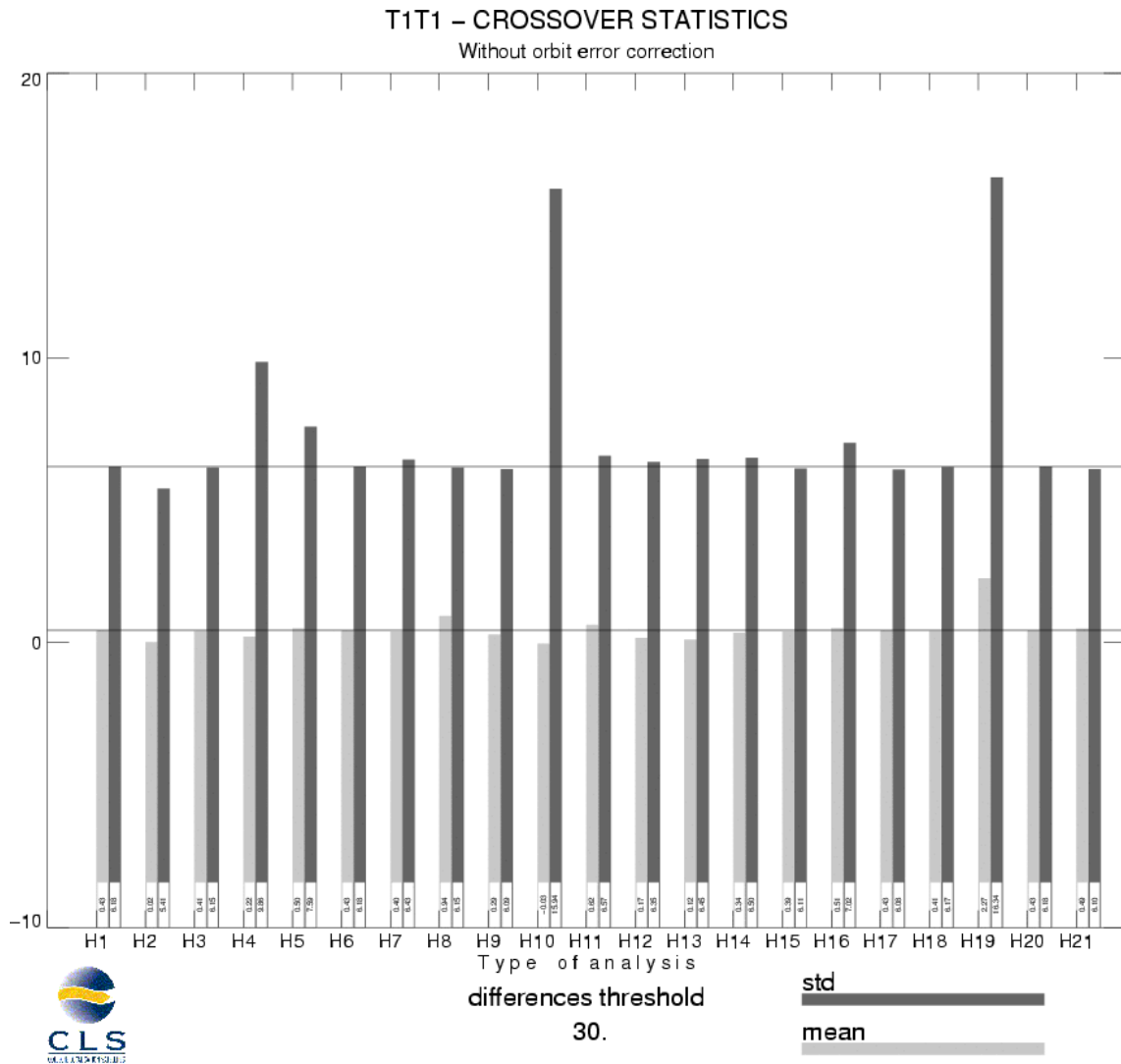
TOPEX/Poseidon Cycle 440 (24/08/2004 – 03/09/2004), descending passes



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

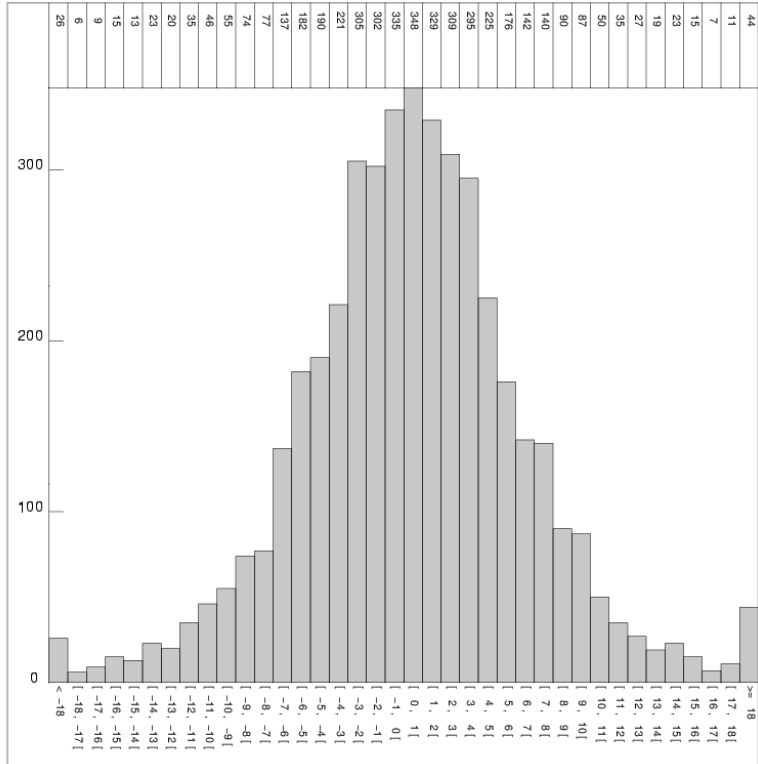
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -29.7600
 Valeur maximale : 29.2200
 Différence Max – Min: 58.9800
 Nombre de points lus: 4525
 Nombre de points sélectionnés: 4437
 Moyenne : 0.432743
 Écart-type : 6.18306
 Moyenne Quadratique : 6.19818

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T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

RAPPEL DES SELECTIONS

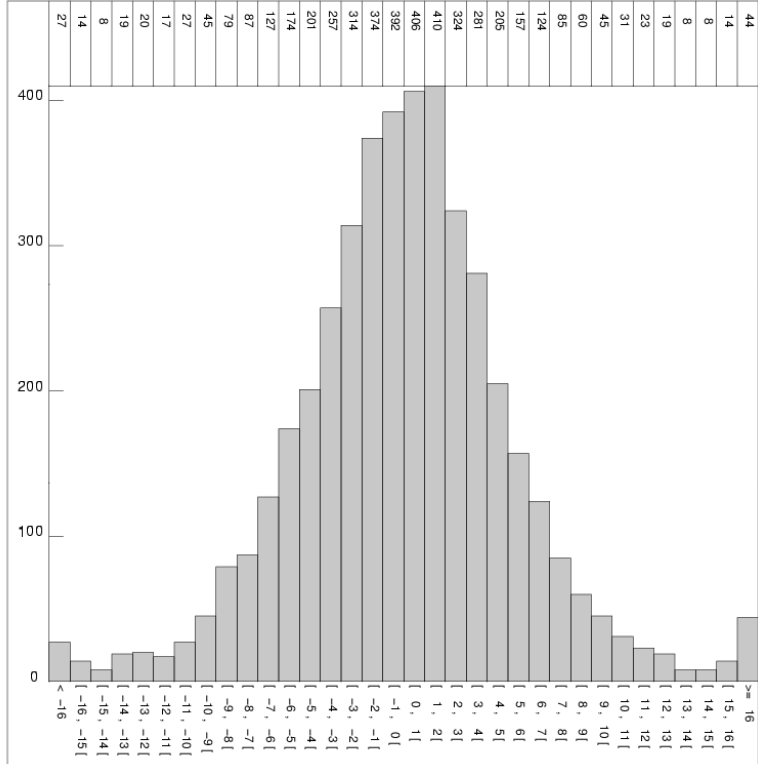
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse DV (moy) 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -29.7900
 Valeur maximale : 29.3500
 Différence Max – Min: 59.1400
 Nombre de points lus: 4525
 Nombre de points sélectionnés: 4421
 Moyenne : 0.0228907
 Écart-type : 5.41283
 Moyenne Quadratique : 5.41288

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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

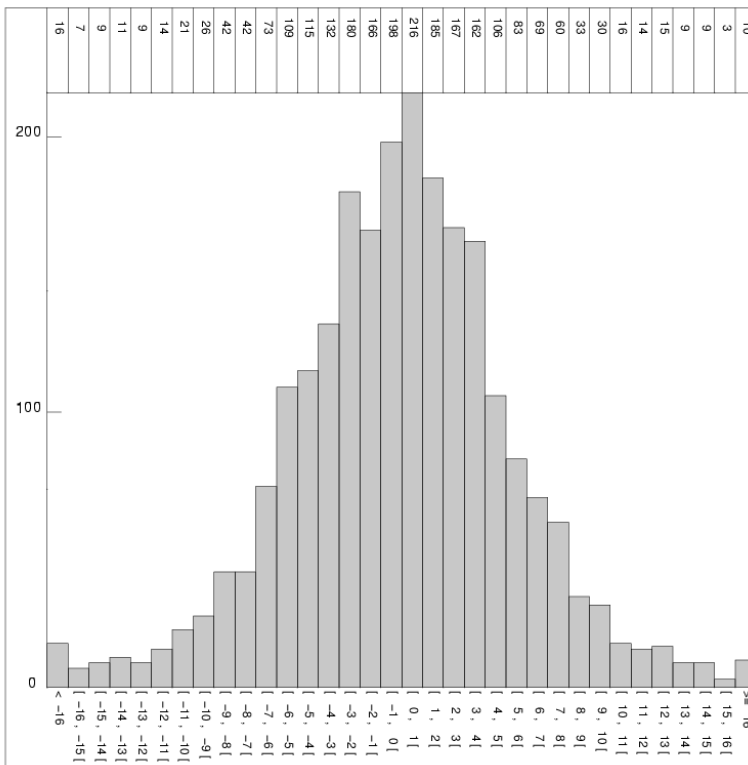
RAPPEL DES SELECTIONS

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 : -26.5900
 Valeur maximale : 24.9400
 Différence Max – Min: 51.5300
 Nombre de points lus: 2579
 Nombre de points sélectionnés: 2357
 Moyenne : -0.0931778
 Écart-type : 5.50882
 Moyenne Quadratique : 5.50961

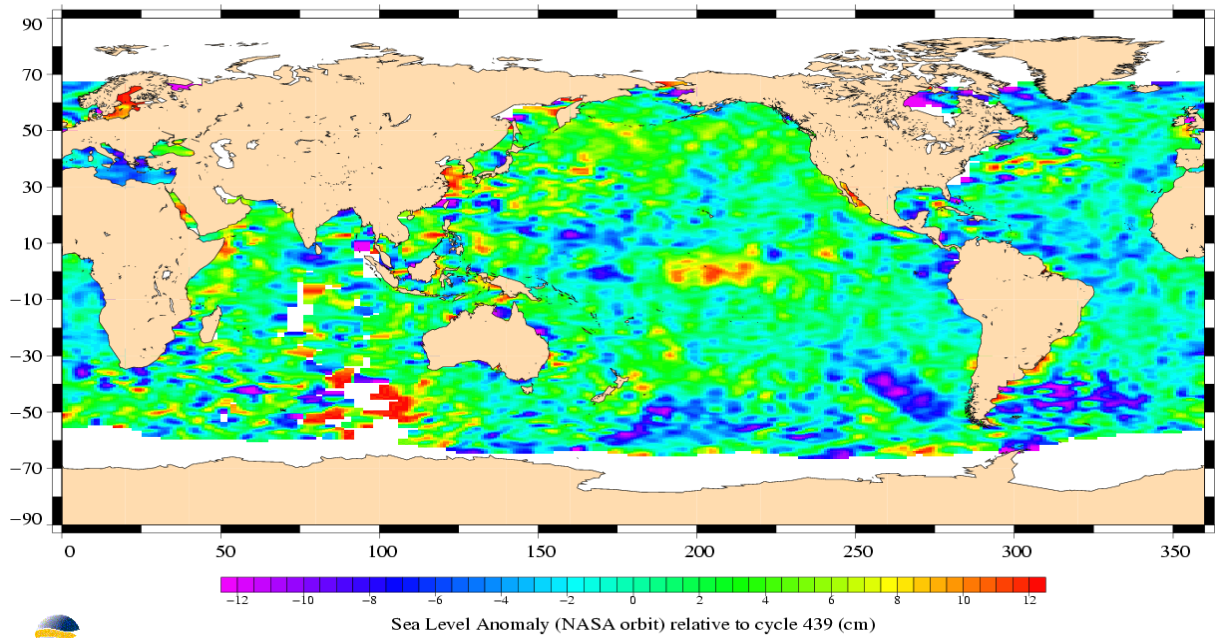
CLS Space Oceanography Division



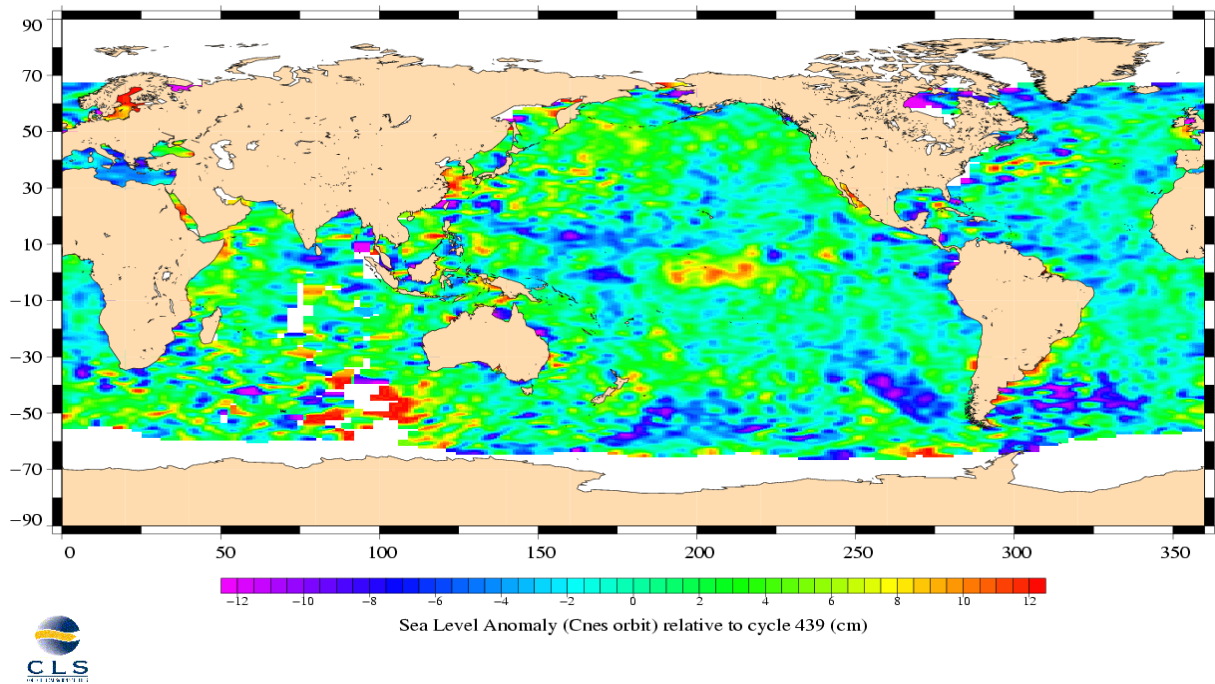
3.8 SSH variability

3.8.1 Sea Level Anomaly

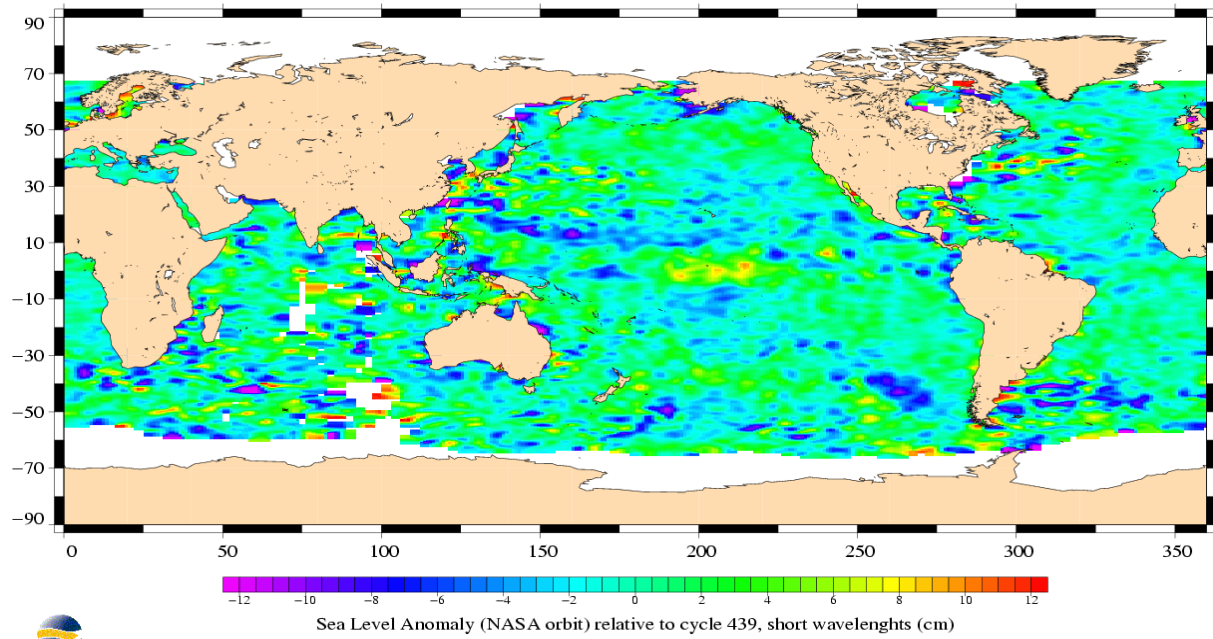
TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004



TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004



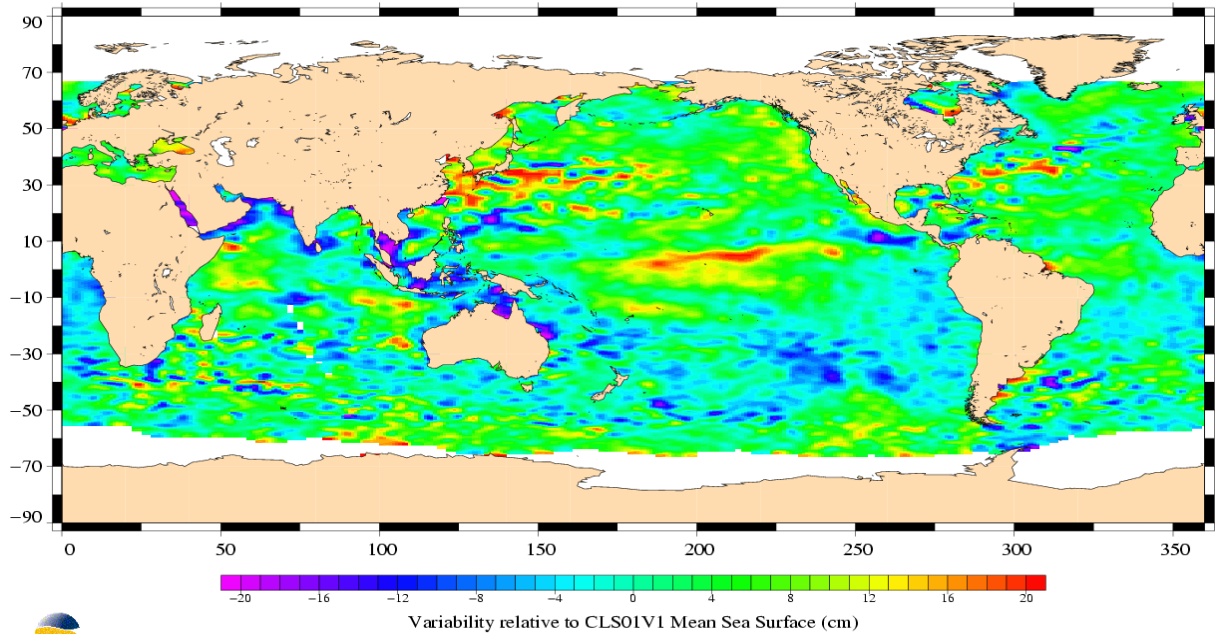
TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004



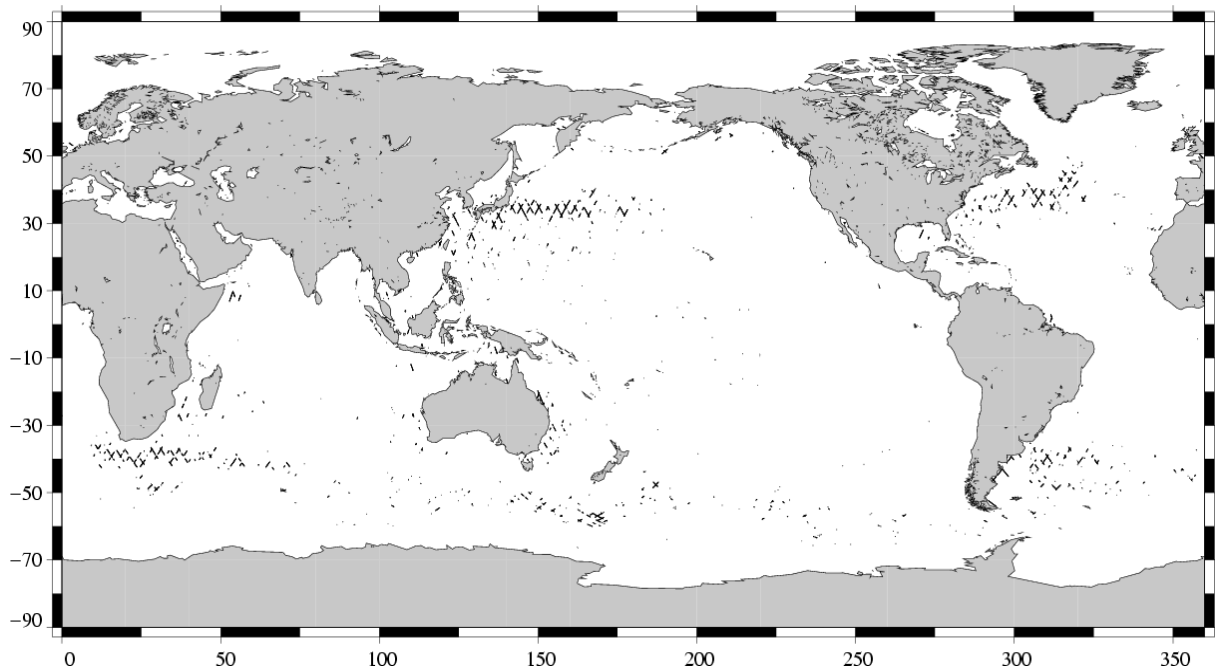
3.8.2 Comparison to a precise Mean Sea Surface

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 440
Period : 24/08/2004 – 03/09/2004

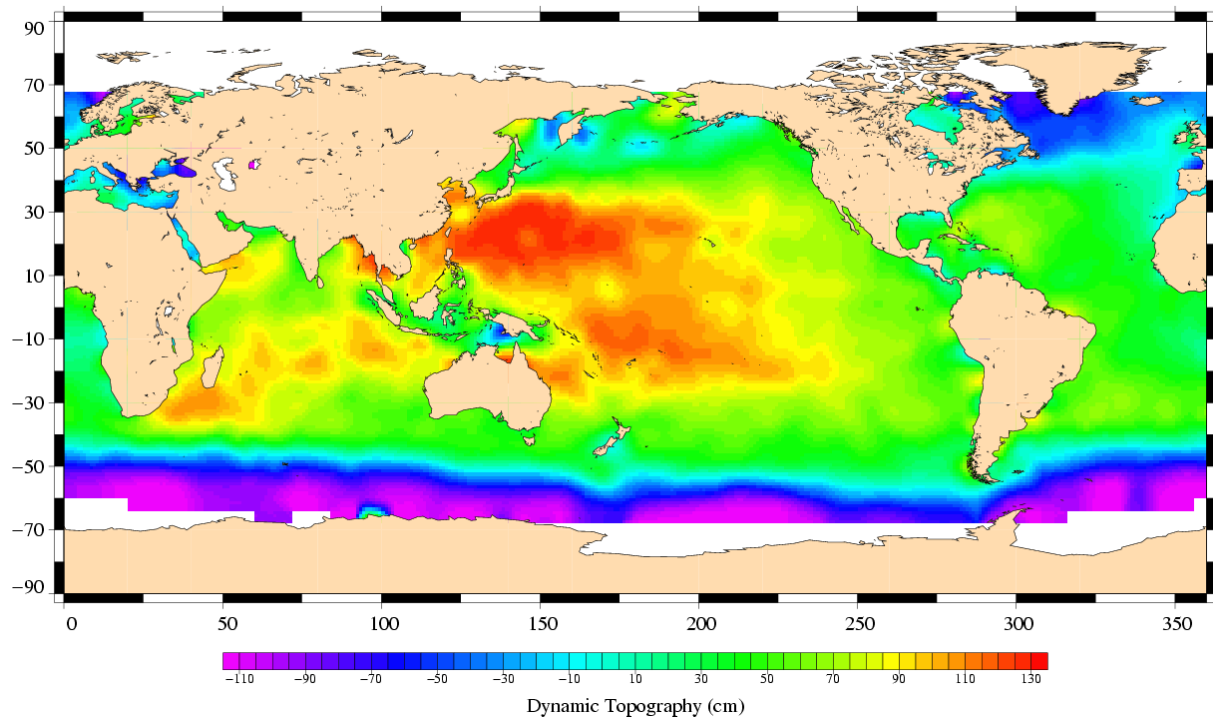


(SSH - MSS) differences greater than 0.3 m
TOPEX/Poseidon Cycle 440 (24/08/2004 / 03/09/2004)



3.9 Dynamic topography

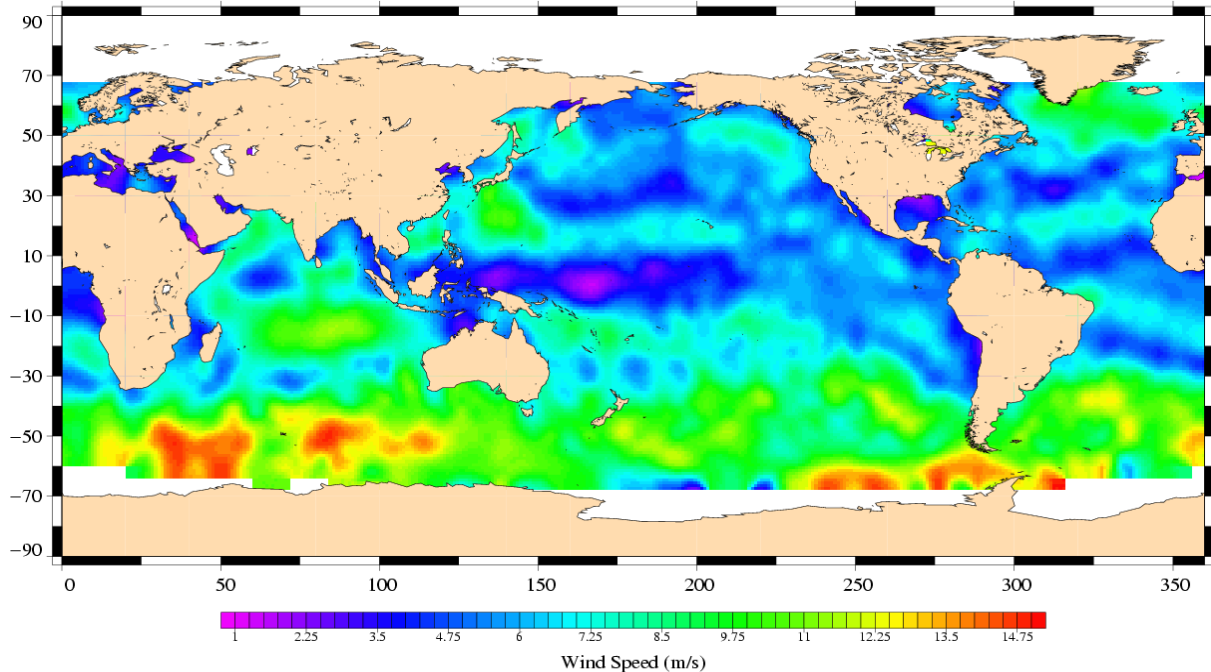
TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004



3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004



TOPEX/Poseidon, cycle 440
Period : 24/08/2004 – 03/09/2004

