



TOPEX/Poseidon MGRD Quality Assessment Report

Cycle 403

23-08-2003 02-09-2003

| | | |
|----------------|--|--|
| 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 | |



SALP-RP-P2-EX-21120-CLS403

Edition 01.0, October 2003

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

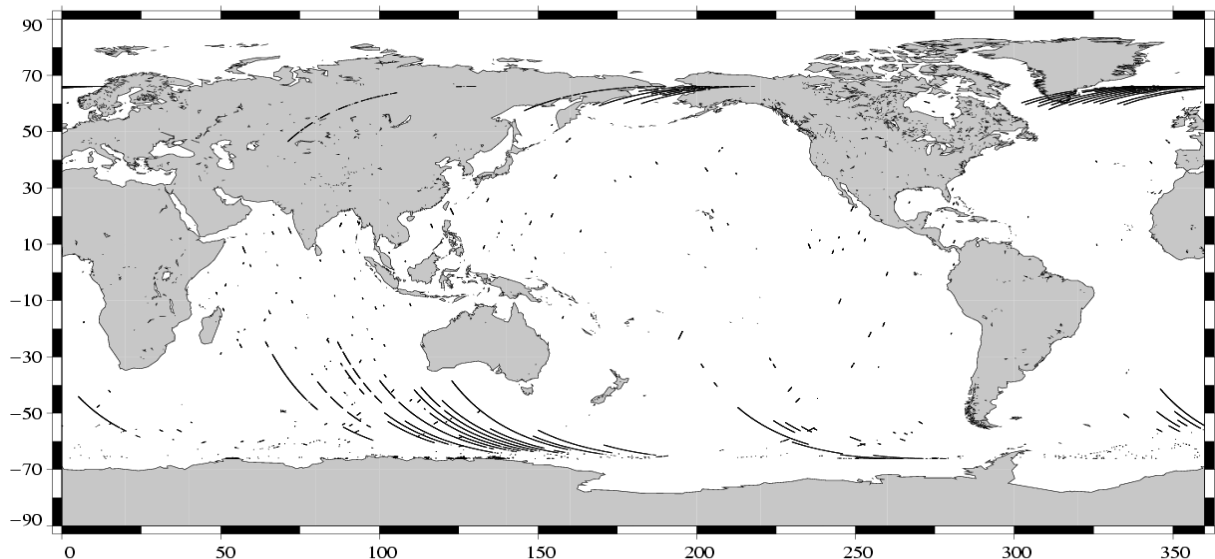
2.1 Cycle quality and performances

Data quality for this cycle appears to be nominal. For this cycle, the crossover standard deviation is 6.30 cm rms, and the standard deviation of Sea Level Anomalies (SLA) relative to a Mean Sea Surface is 9.31 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 America coasts, below the Australia and in North Atlantic Ocean close to the Groenland.
- 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 :
 - 3.34% 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 403 (23/08/2003 / 02/09/2003)



3 CALVAL main results

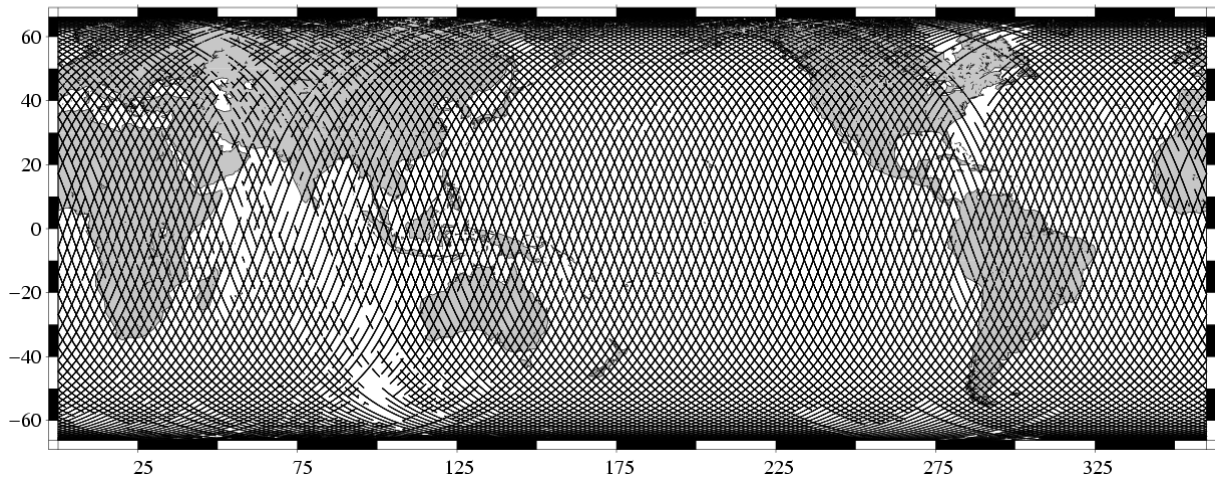
This section presents results that illustrate data quality during this cycle. These verification products are produced operationally so that they allow systematic monitoring of the main relevant parameters.

3.1 Missing measurements

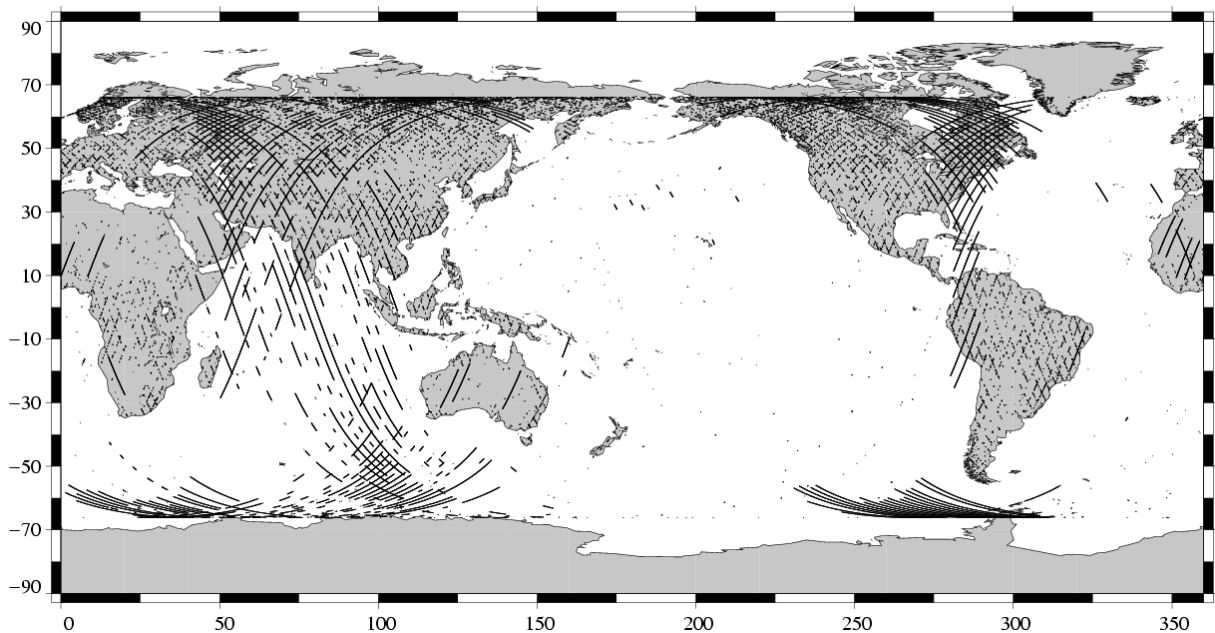
696345 altimeter measurements are present, and 98233 are missing.

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 403 (23/08/2003 / 02/09/2003)



Missing measurements
TOPEX/Poseidon Cycle 403 (23/08/2003 / 02/09/2003)



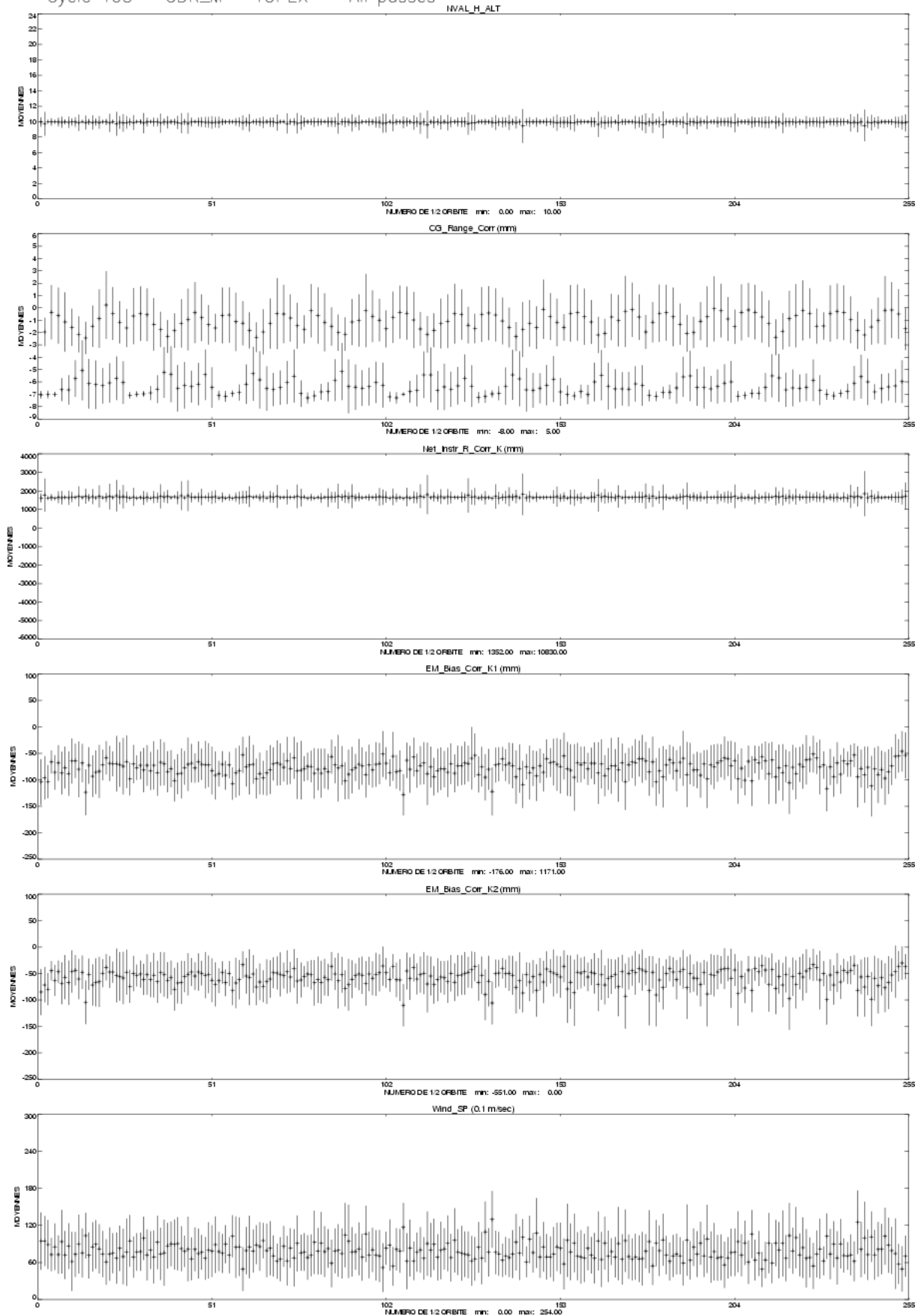
3.2 M-GDR quality flags

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

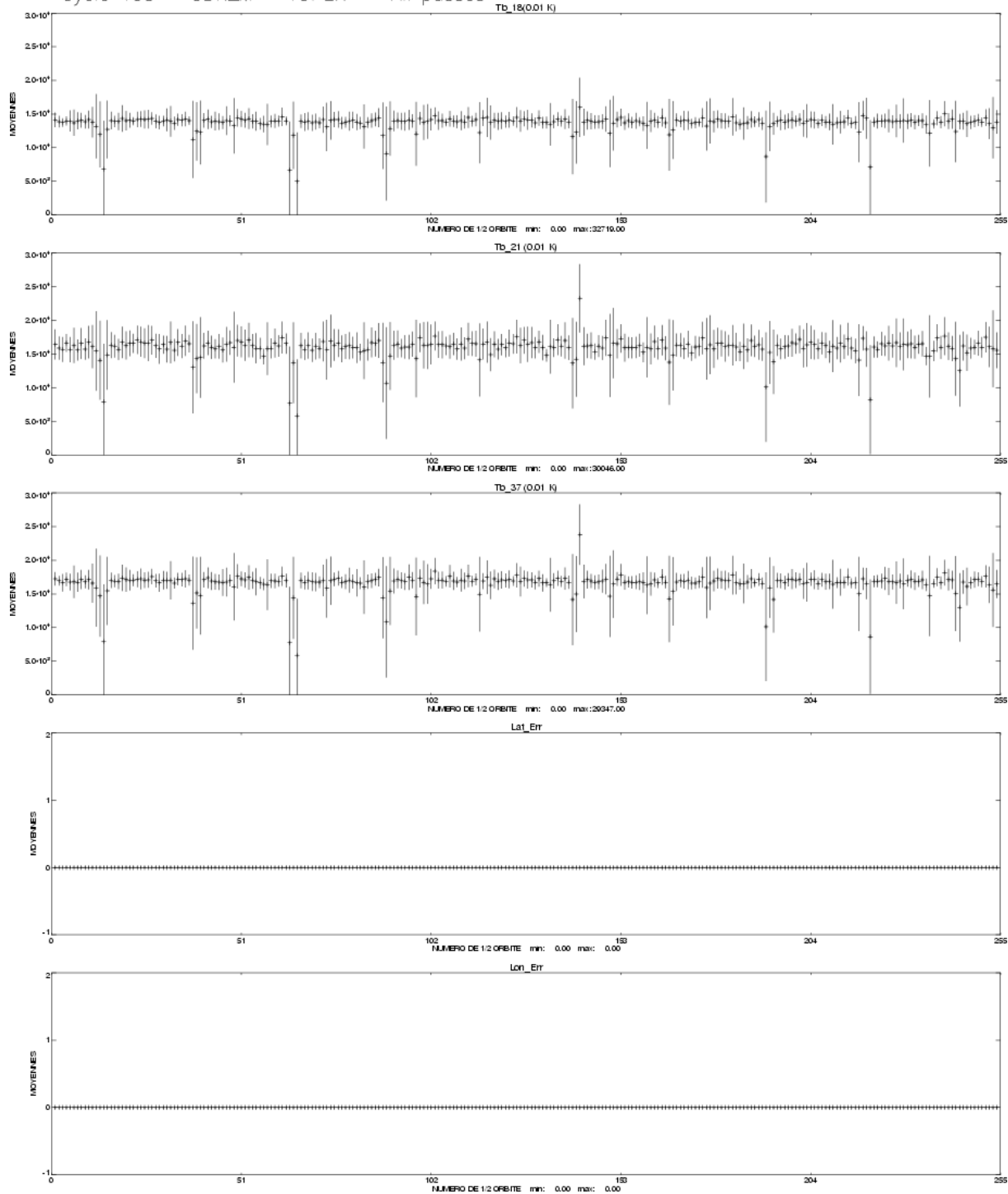
| Name | Description | % bad |
|-----------|---|-------|
| Geo_Bad_1 | altimeter land flag | 25.01 |
| Geo_Bad_1 | ice flag | 8.31 |
| Geo_Bad_1 | radiometer land flag | 26.66 |
| Alt_Bad_1 | conditions 1 altimeter | 5.33 |
| Alt_Bad_2 | conditions 2 altimeter | 5.21 |
| Geo_Bad_2 | rain (liquid water in excess) | 6.00 |
| Geo_Bad_2 | less than 4 points for CSR3.0 tide calculation | 0.44 |
| Geo_Bad_2 | less than 4 points for FES95.2.1 tide calculation | 3.01 |
| TOPEX | TOPEX not valid | 0.00 |
| TMR | TMR not valid | 0.00 |
| TMR_Bad | Brightness temperatures not valid | 5.20 |
| DORIS | DORIS not valid | 0.00 |

3.3 M-GDR parameter plots

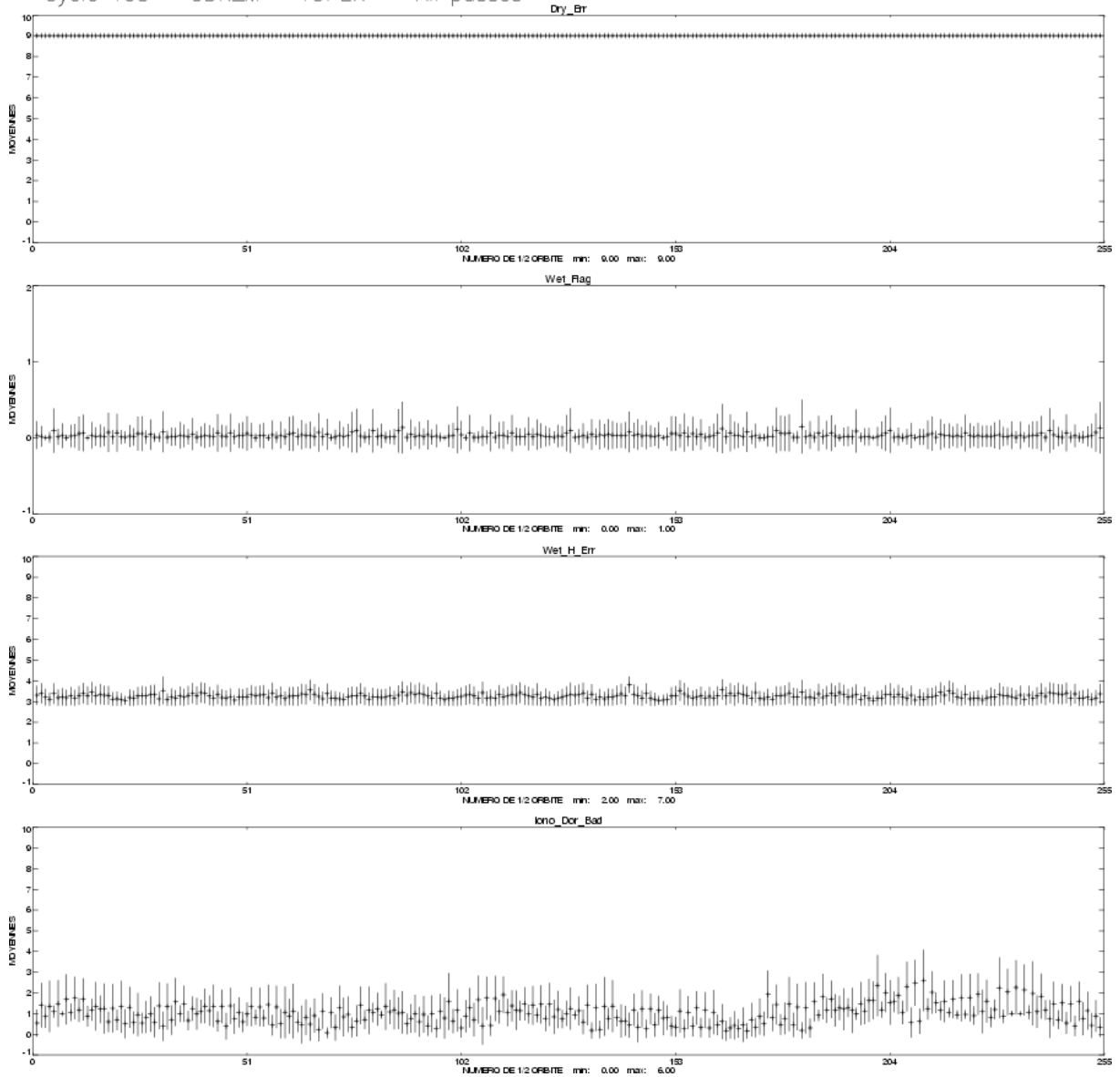
Cycle 403 – GDR_M – TOPEX – All passes –



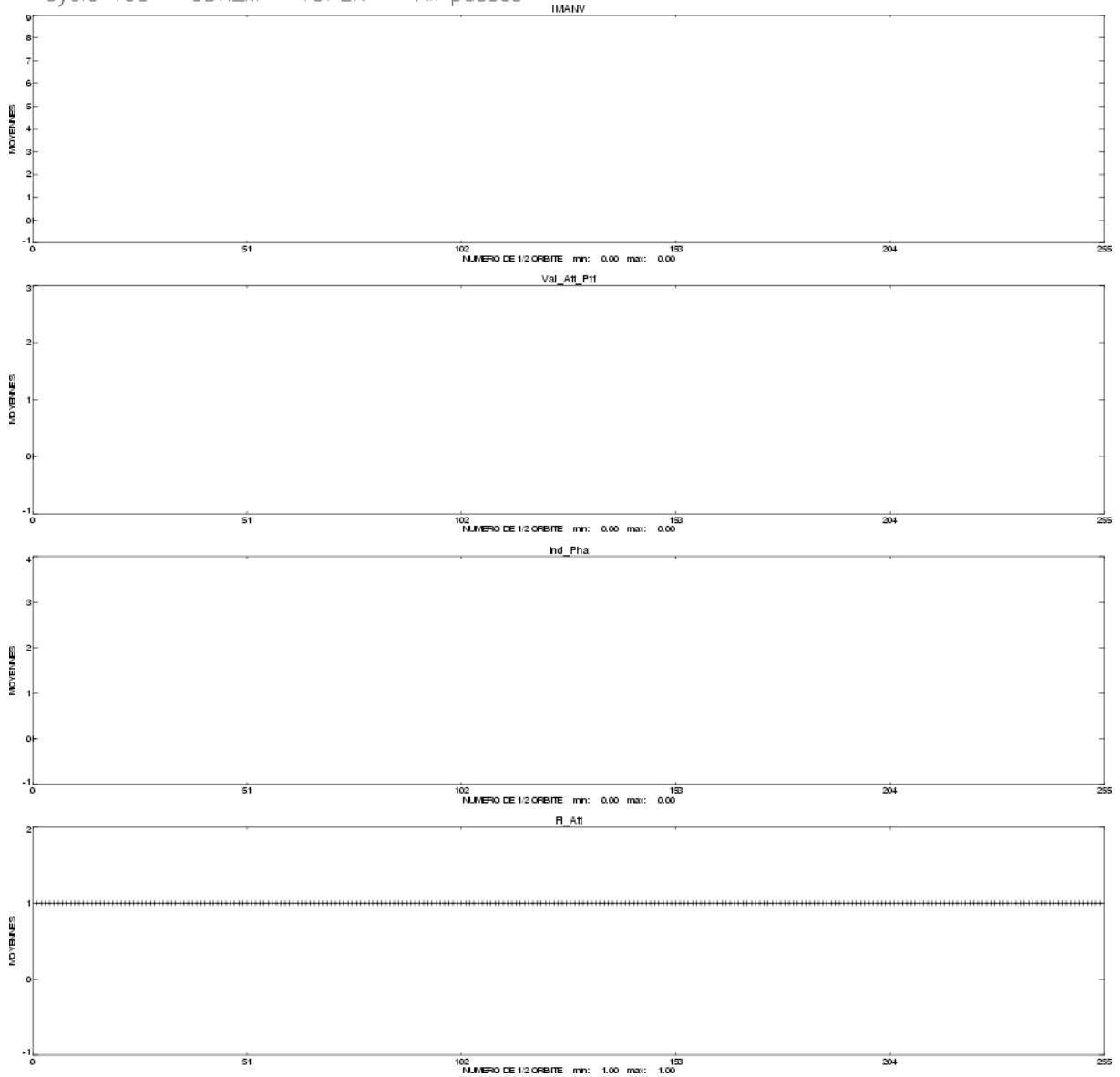
Cycle 403 – GDR_M – TOPEX – All passes –

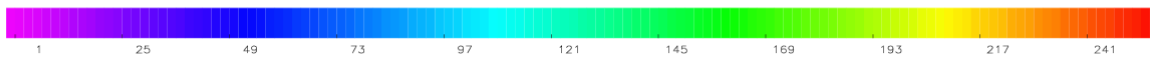
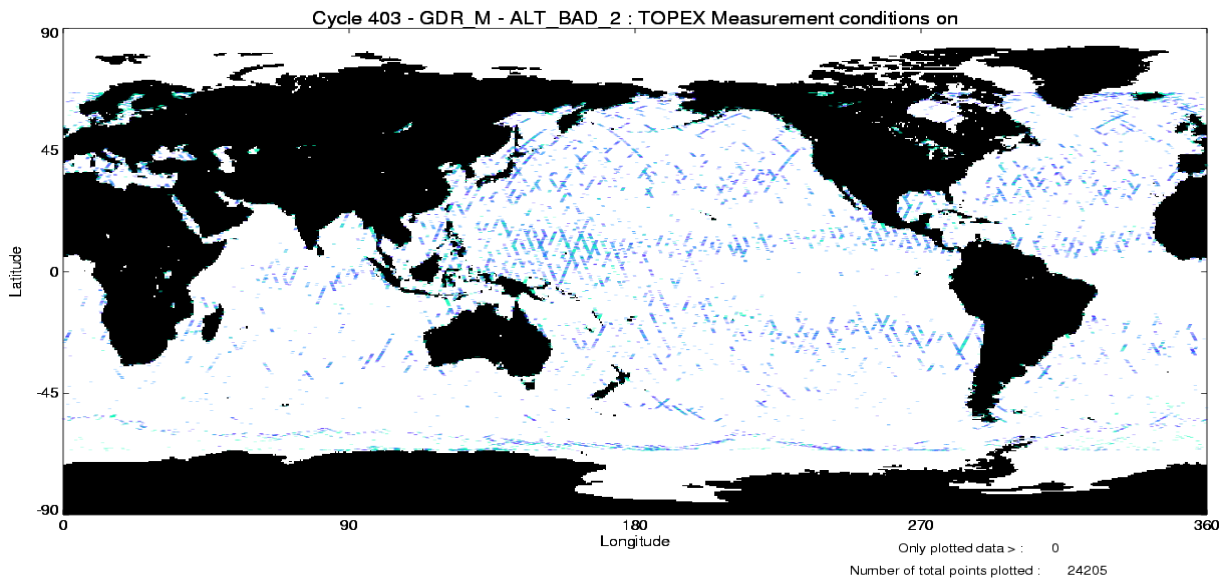
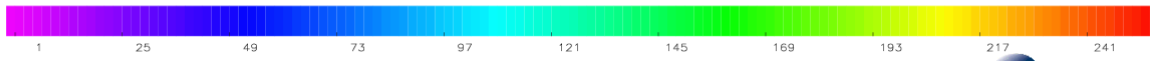
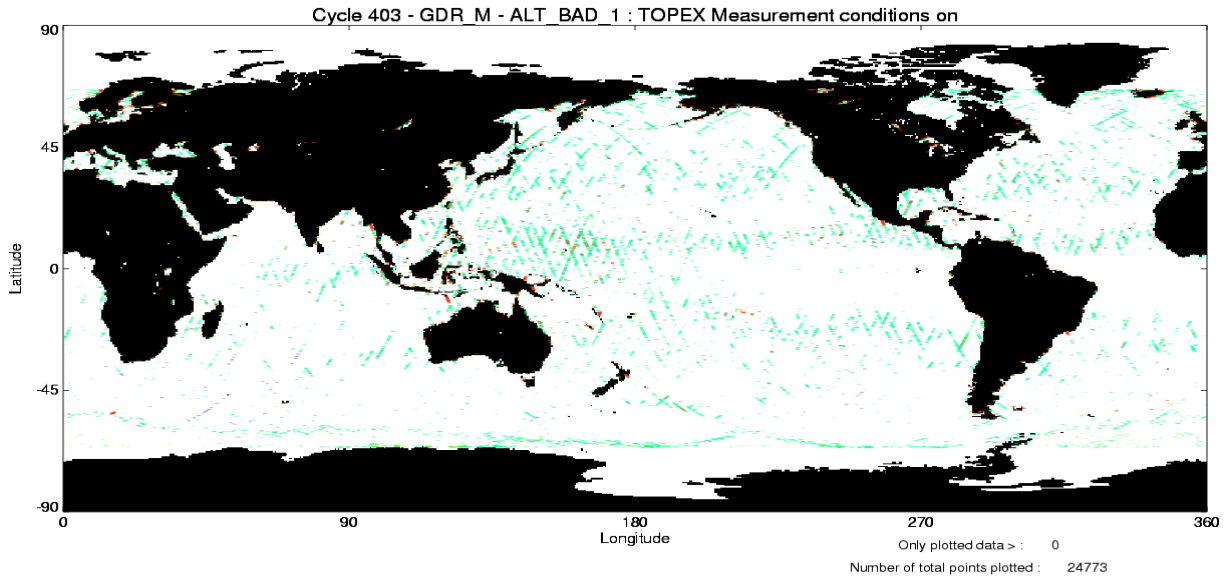


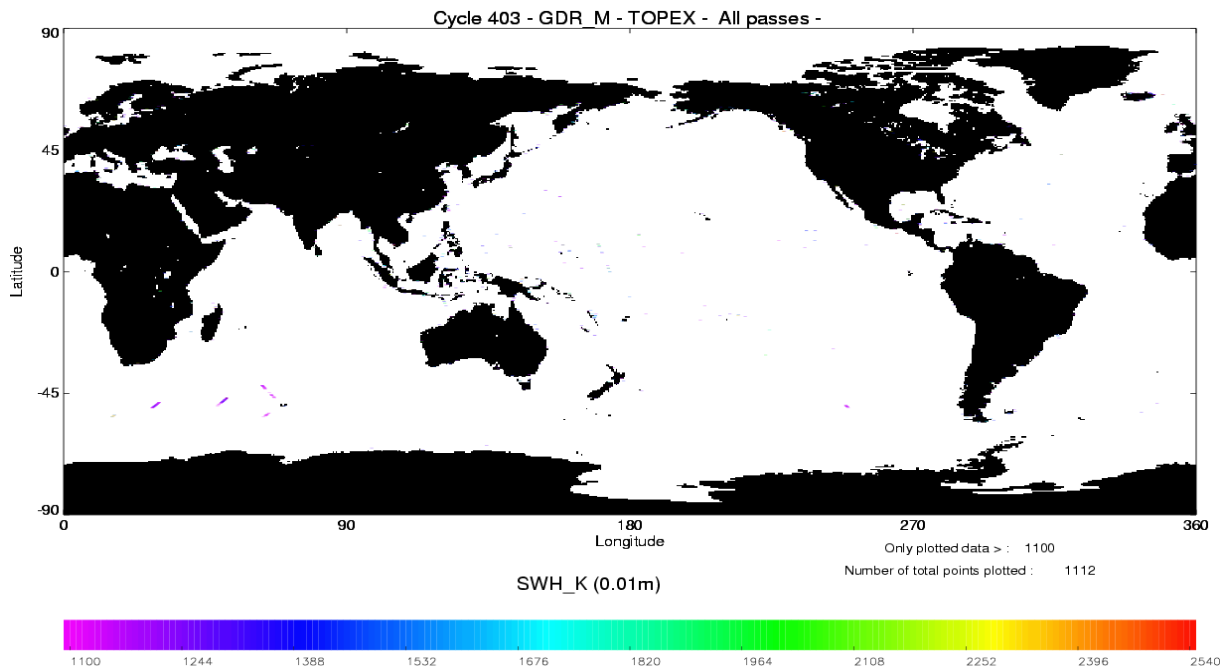
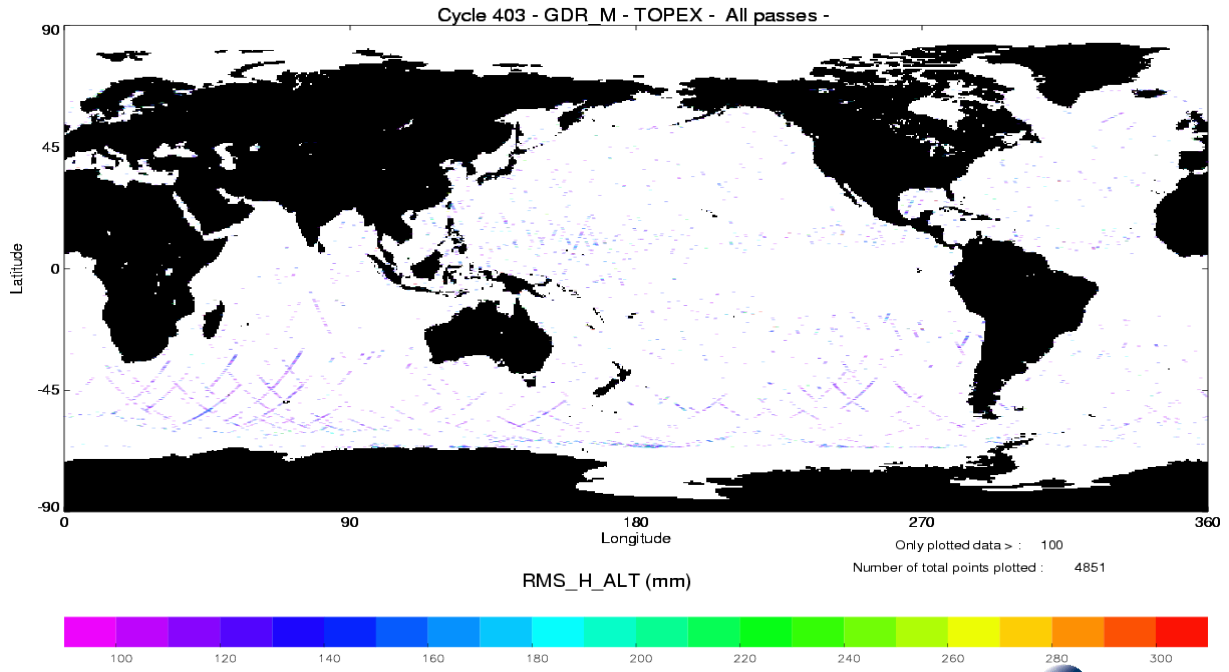
Cycle 403 – GDR_M – TOPEX – All passes –

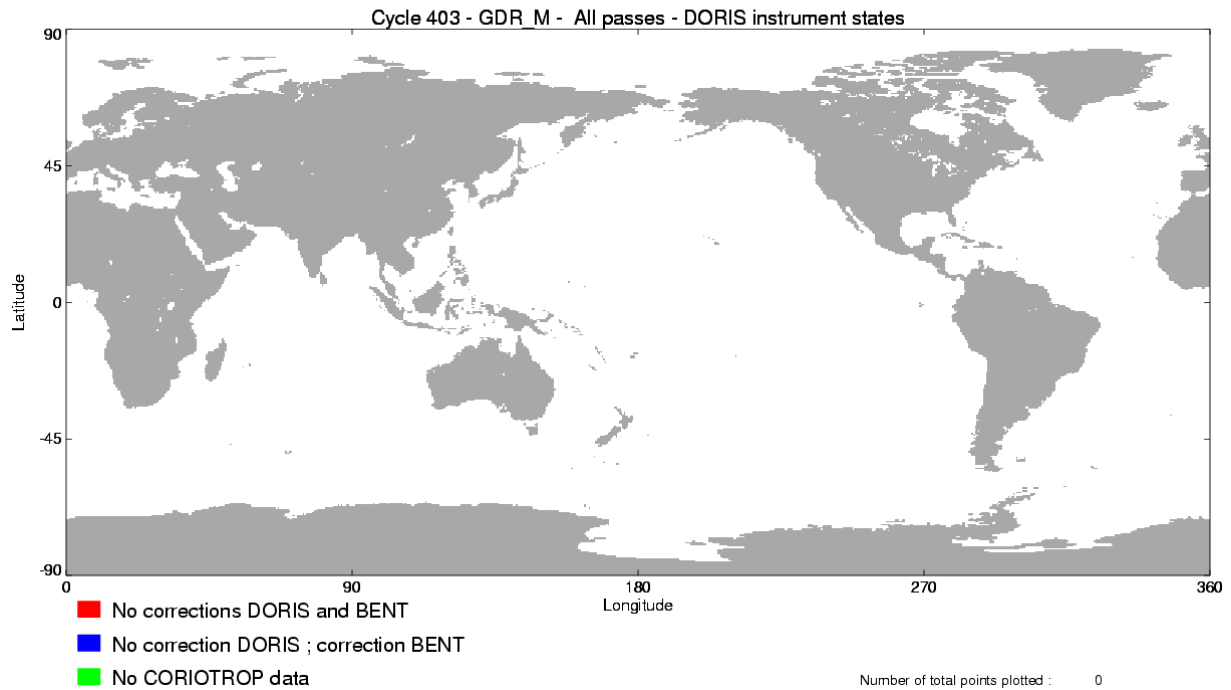


Cycle 403 – GDR_M – TOPEX – All passes –









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.

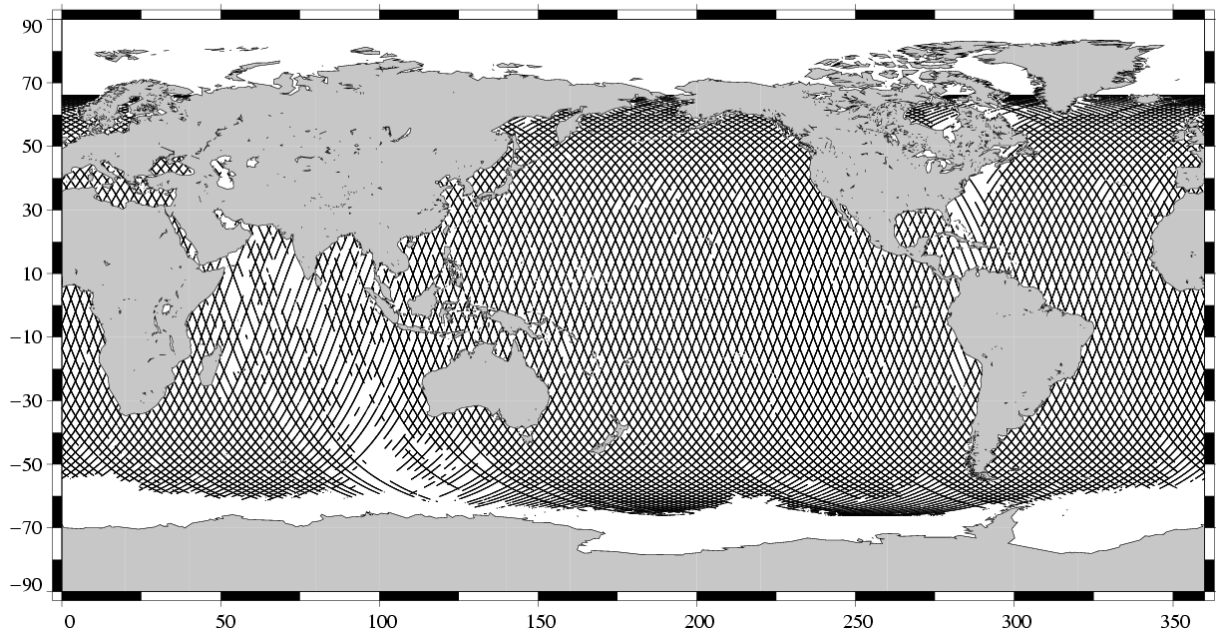
Probably due to the interpolation problem with the TMR, some measurements have radiometer land flag unset over land. This has no impact on the valid data because these measurements have been edited by the altimetric parameter criteria. Nevertheless, this anomaly leads to wrong statistics of the edited 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 (26.66 % of points removed) and ice flag (8.31 % of points removed).

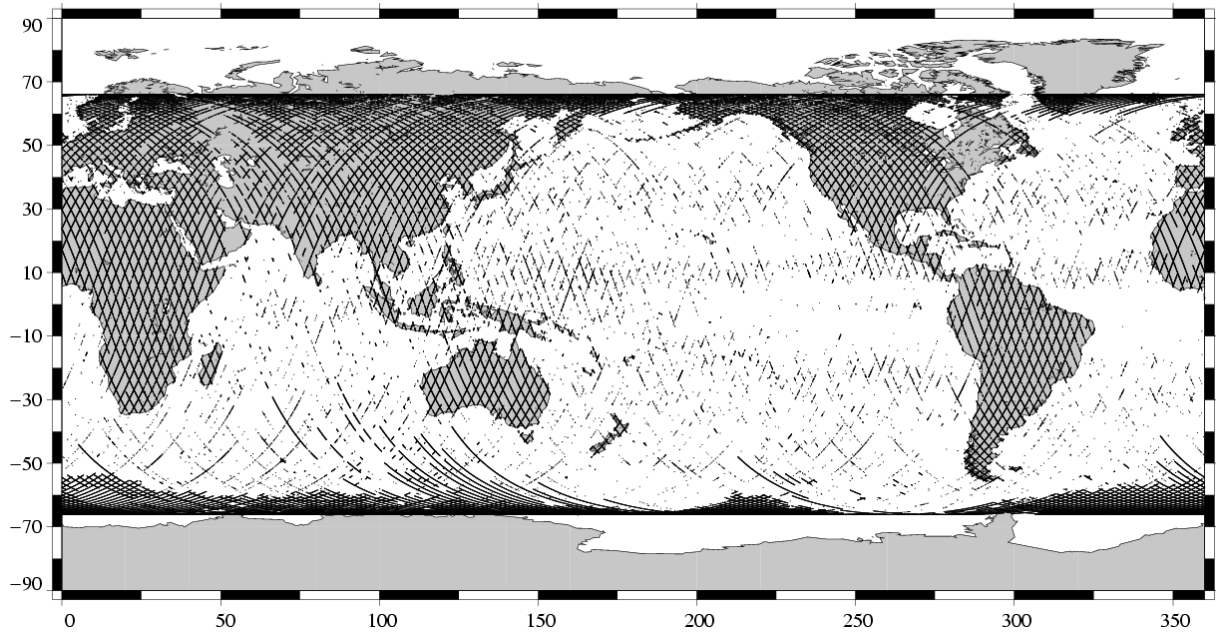
| Parameters | Min Thres. | Max Thres. | Unit | Mean % removed in 1997 | % removed |
|---|------------|------------|------|------------------------|-----------|
| Sea surface height | -130.000 | 100.000 | m | 1.37 | 0.16 |
| Number of 20/10Hz valid points Poseidon/TOPEX | 5.000 | - | | 1.37 | 0.23 |
| 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 | 3.60 |
| 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 | 3.34 |
| 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 | 0.11 |
| Sea state Bias | -0.500 | 0.000 | m | 1.39 | 0.20 |
| Backscatter coefficient | 7.000 | 30.000 | dB | 1.44 | 0.22 |
| Ocean tide height | -5.000 | 5.000 | m | 0.01 | 0.13 |
| 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 | 0.26 |
| Spline fitting | | | | | 0.02 |

The following three maps are complementary: they show respectively the removed, the selected measurements and the percentage of selected measurements in the editing procedure.

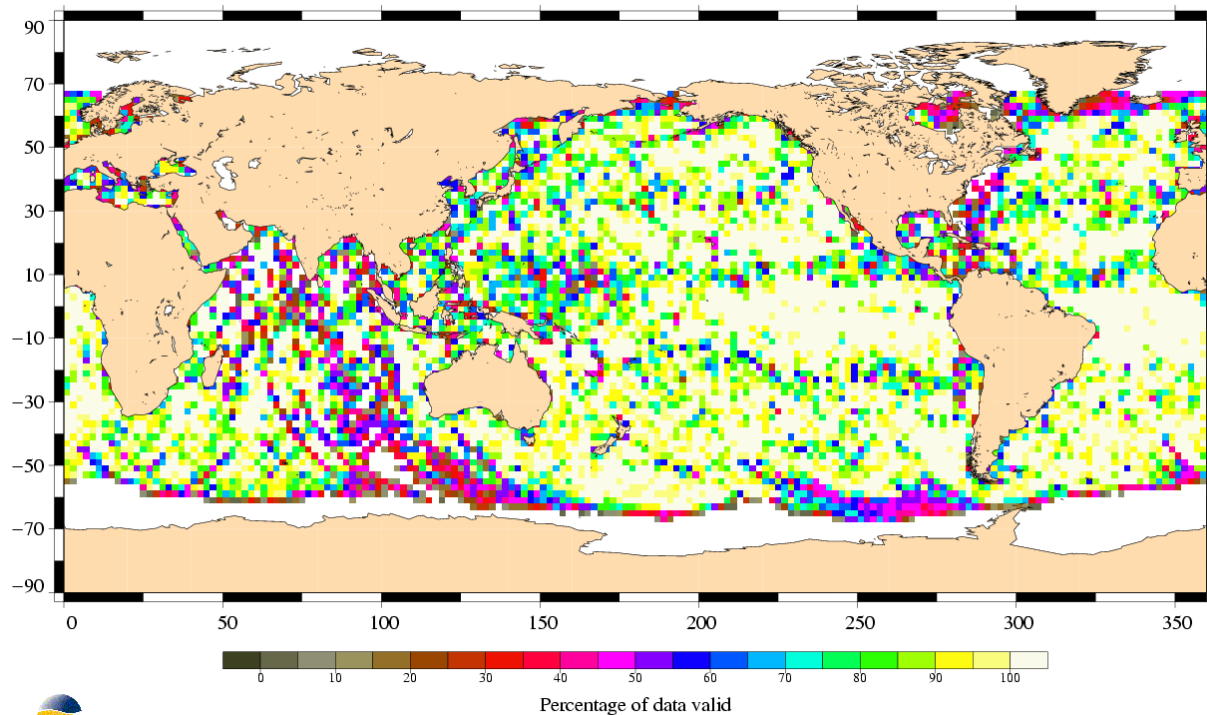
Valid data
TOPEX/Poseidon Cycle 403 (23/08/2003 / 02/09/2003)



Edited measurements
TOPEX Cycle 403 (23/08/2003 / 02/09/2003)

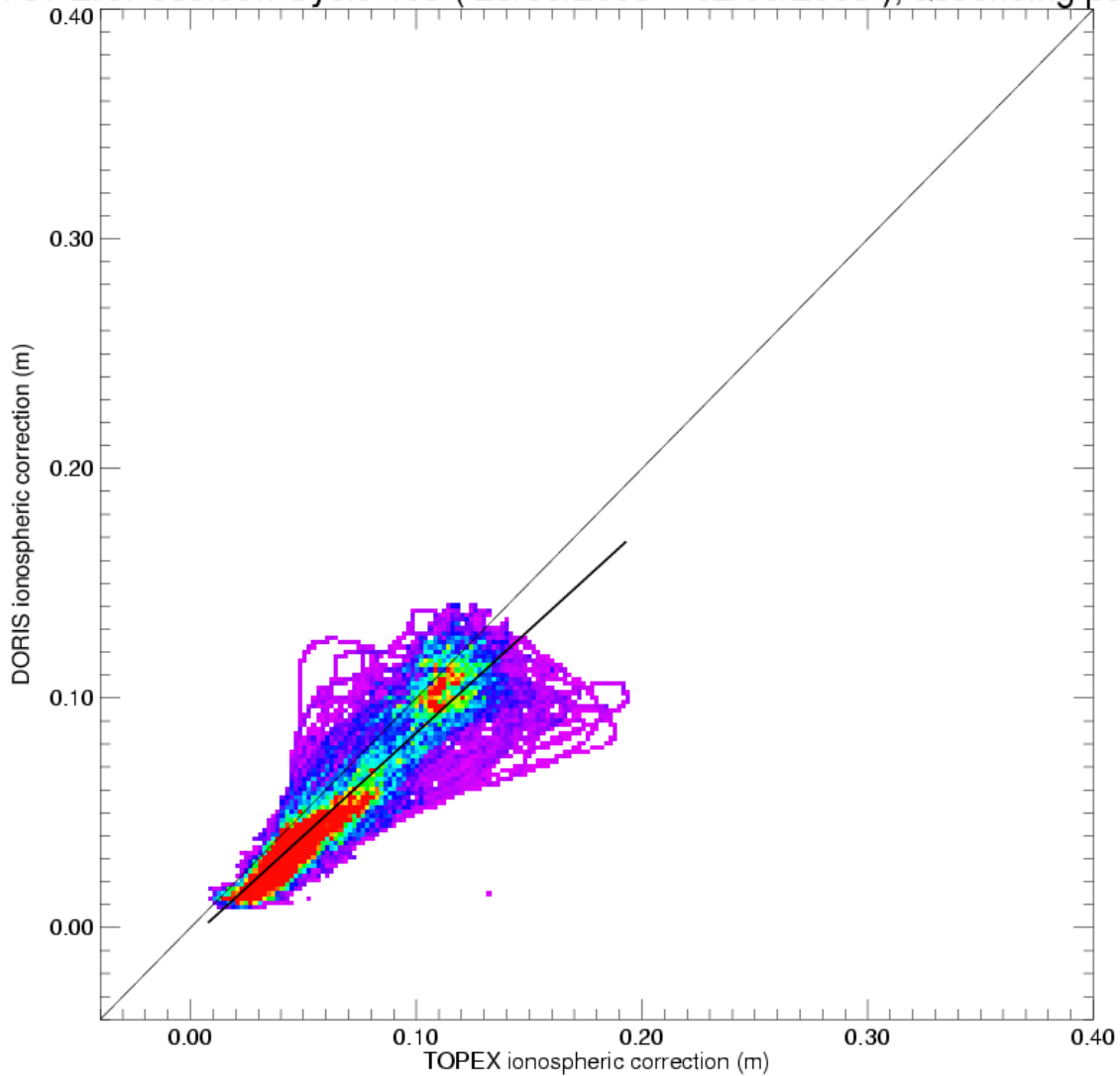


Percentage of valid data relative to the nominal pass
TOPEX/Poseidon Cycle 403 (23/08/2003 / 02/09/2003)

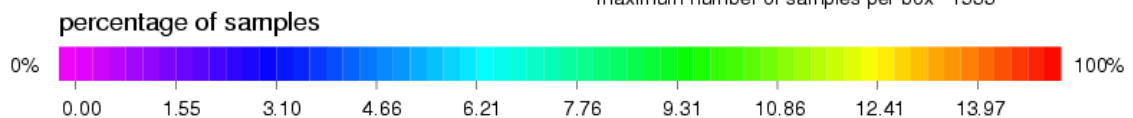


3.5 Ionospheric correction

TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), ascending passes



minimum number of samples per box 1
maximum number of samples per box 1533



Statistics Y-X

mean = -0.01182
rms = 0.01817
std = 0.01380

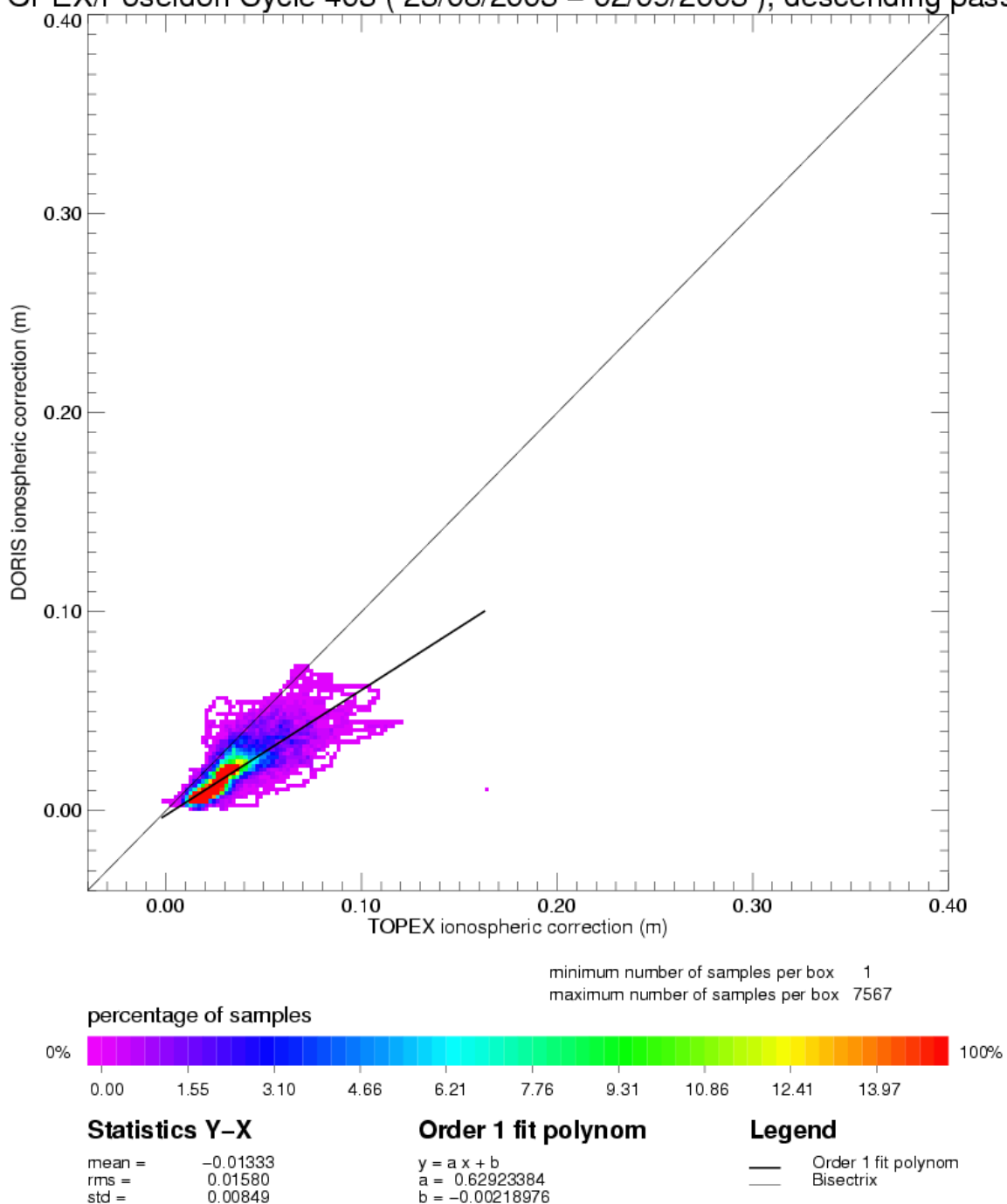
Order 1 fit polynomial

$y = a x + b$
a = 0.89650691
b = -0.00484818

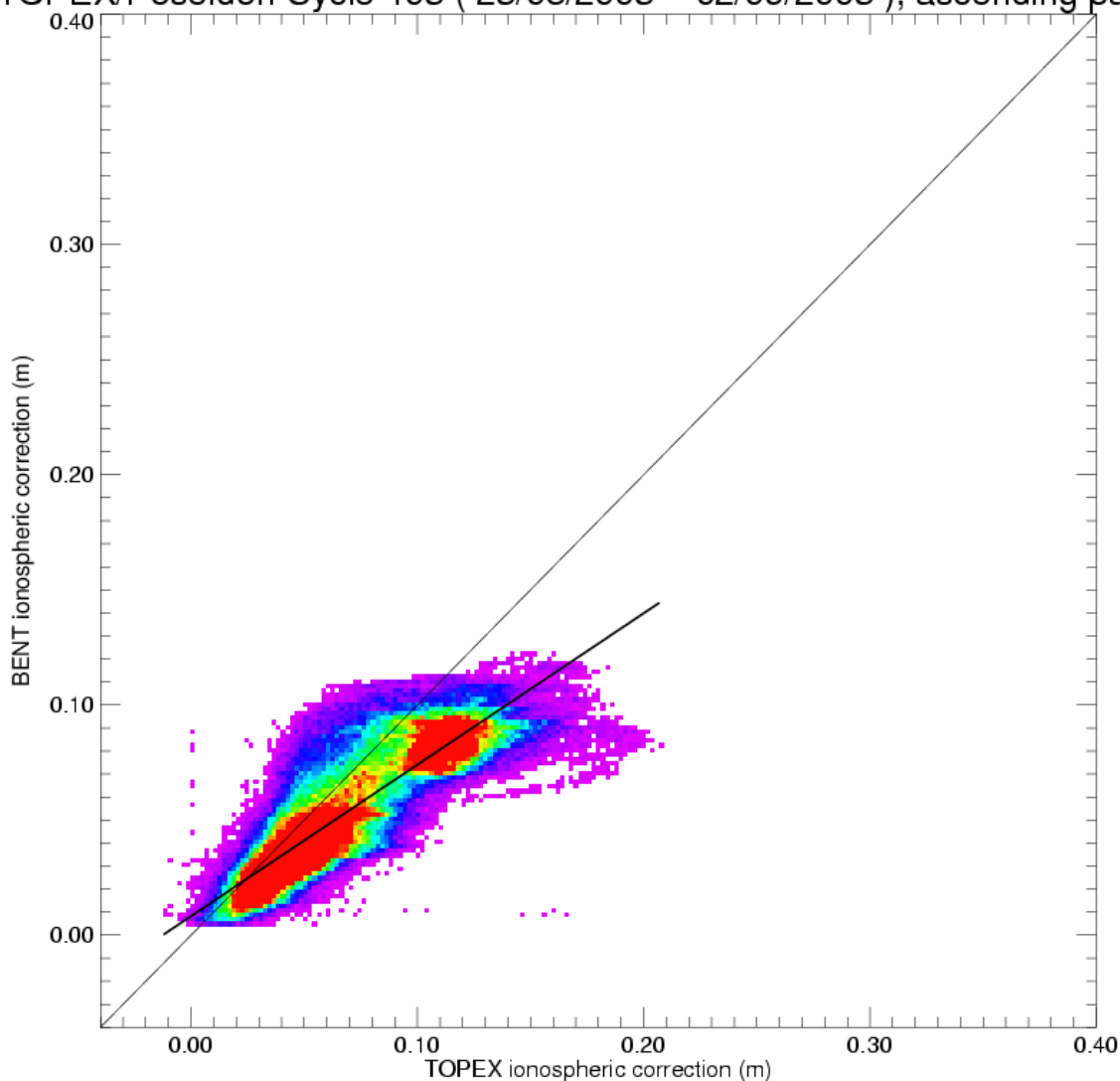
Legend

— Order 1 fit polynomial
— Bisectrix

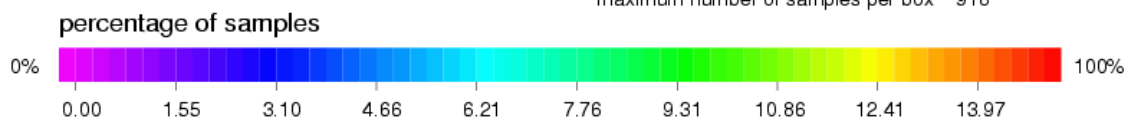
TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), descending passes



TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 918



Statistics Y-X

mean = -0.01493
 rms = 0.02286
 std = 0.01731

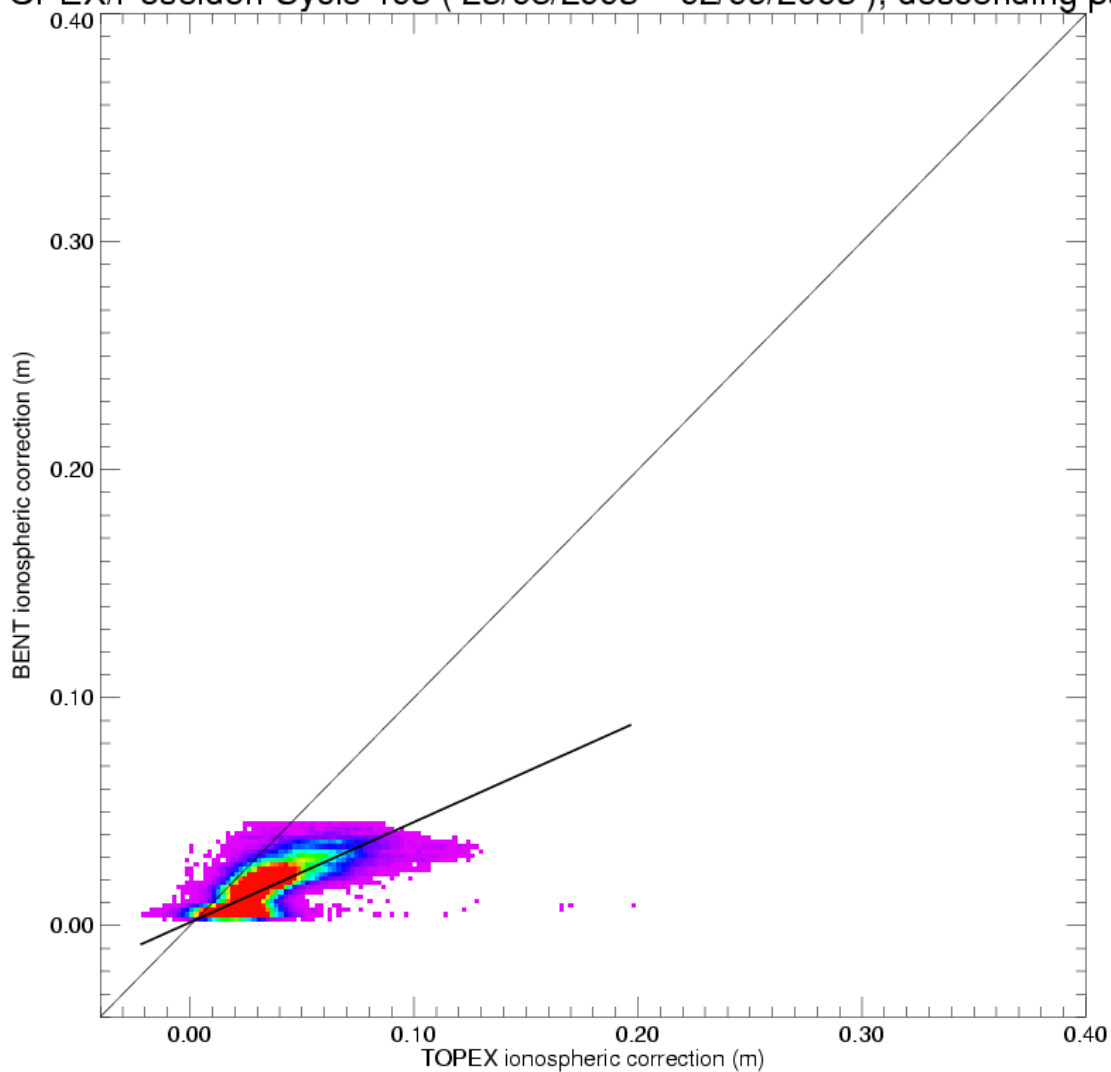
Order 1 fit polynom

$y = a x + b$
 $a = 0.65788203$
 $b = 0.00827507$

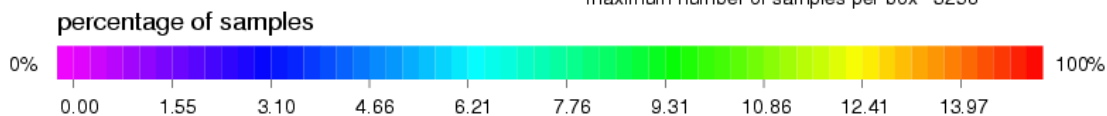
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), descending passes



minimum number of samples per box 1
 maximum number of samples per box 3258



Statistics Y-X

mean = -0.01566
 rms = 0.01905
 std = 0.01084

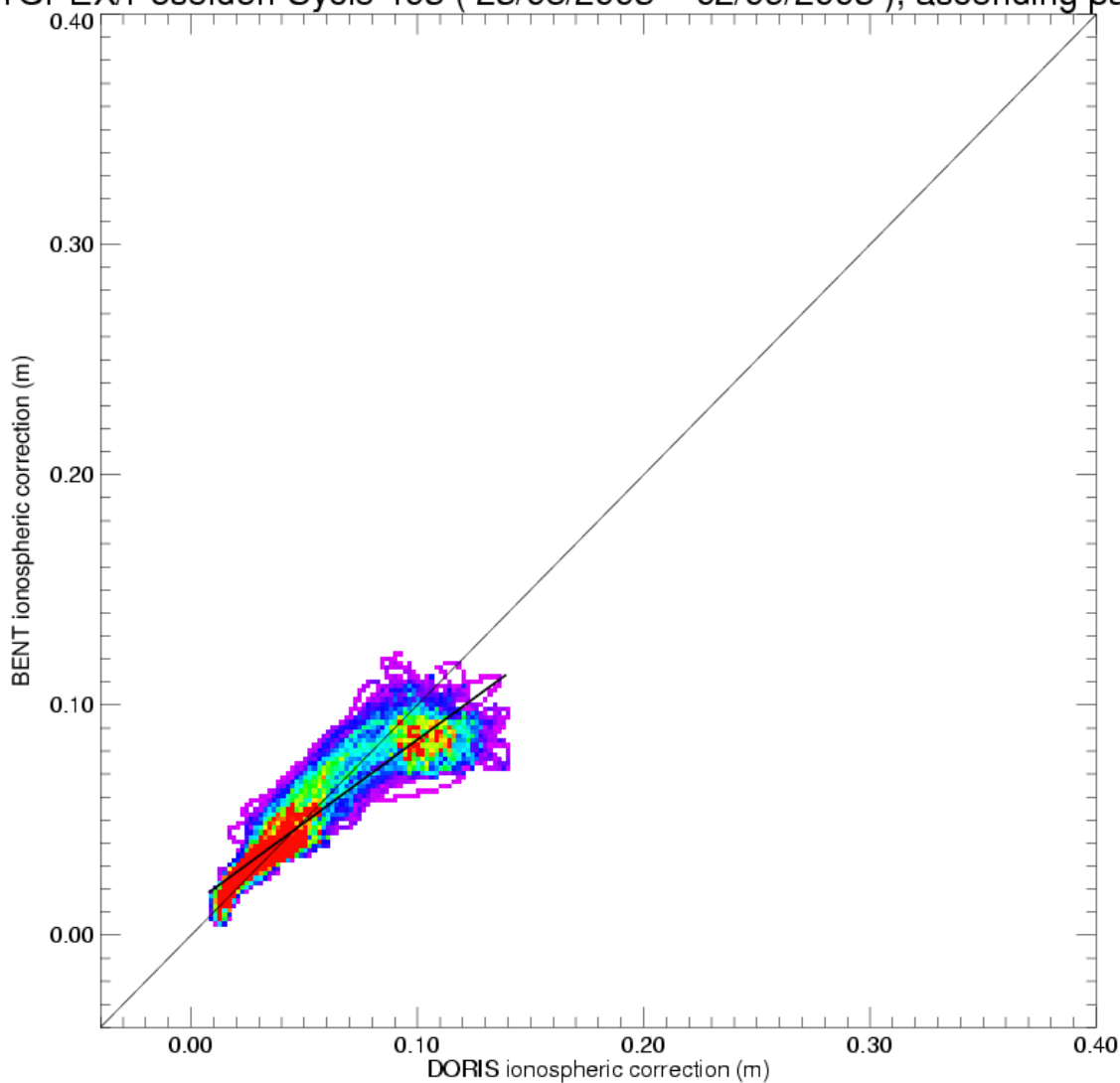
Order 1 fit polynom

$y = a x + b$
 $a = 0.44015843$
 $b = 0.00142801$

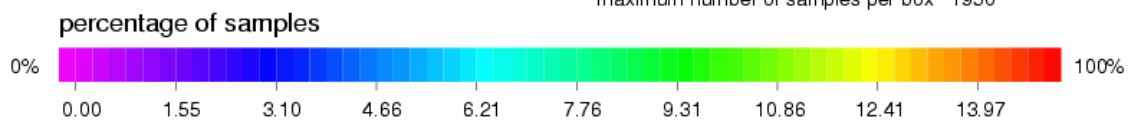
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), ascending passes



minimum number of samples per box 1
 maximum number of samples per box 1950



Statistics Y-X

mean = -0.00263
 rms = 0.01402
 std = 0.01377

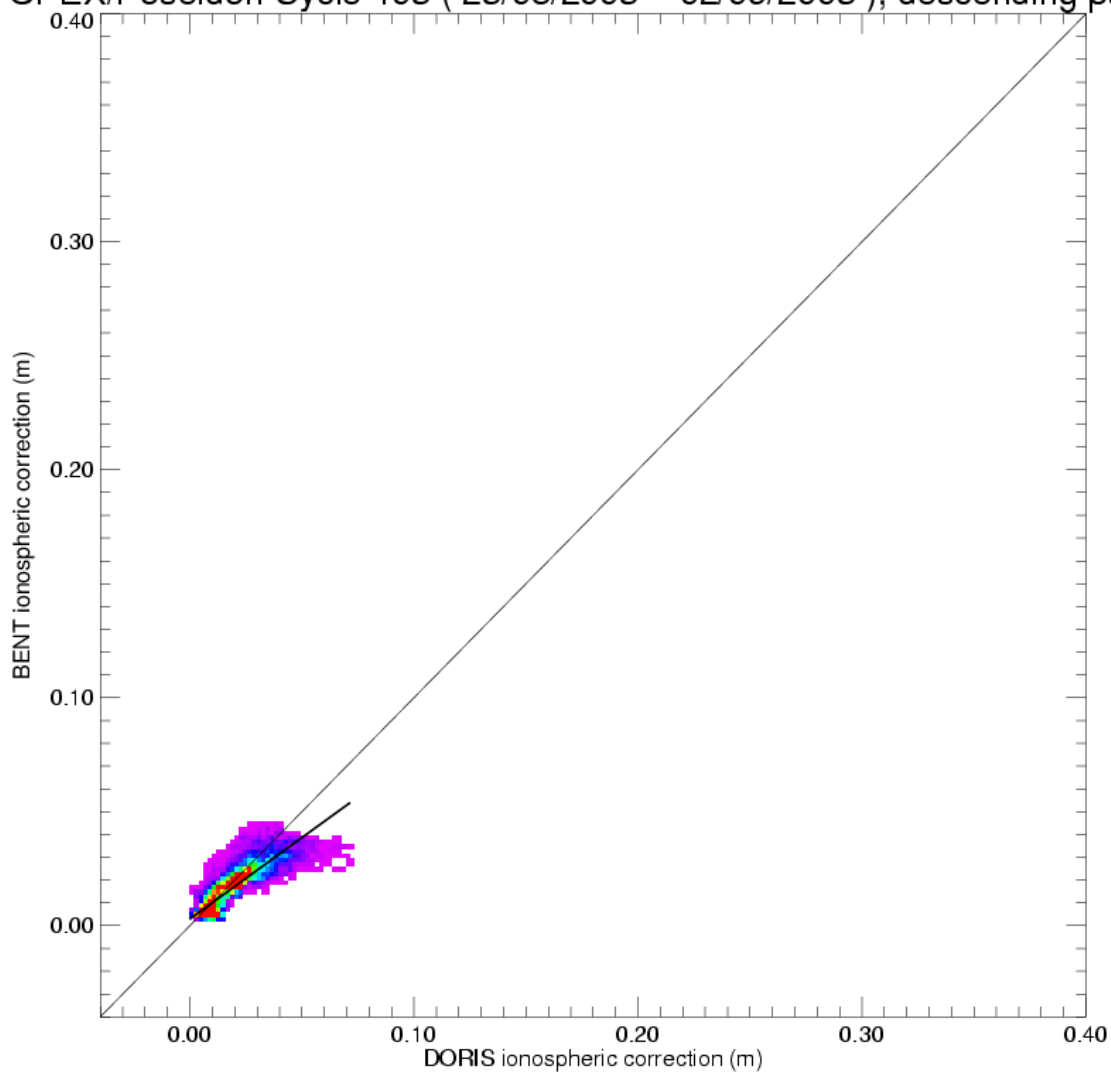
Order 1 fit polynom

$y = a x + b$
 $a = 0.72008711$
 $b = 0.01291077$

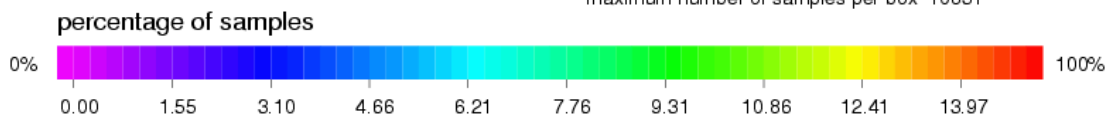
Legend

— Order 1 fit polynom
 — Bisectrix

TOPEX/Poseidon Cycle 403 (23/08/2003 – 02/09/2003), descending passes



minimum number of samples per box 1
 maximum number of samples per box 10831



Statistics Y-X

mean = -0.00185
 rms = 0.00591
 std = 0.00561

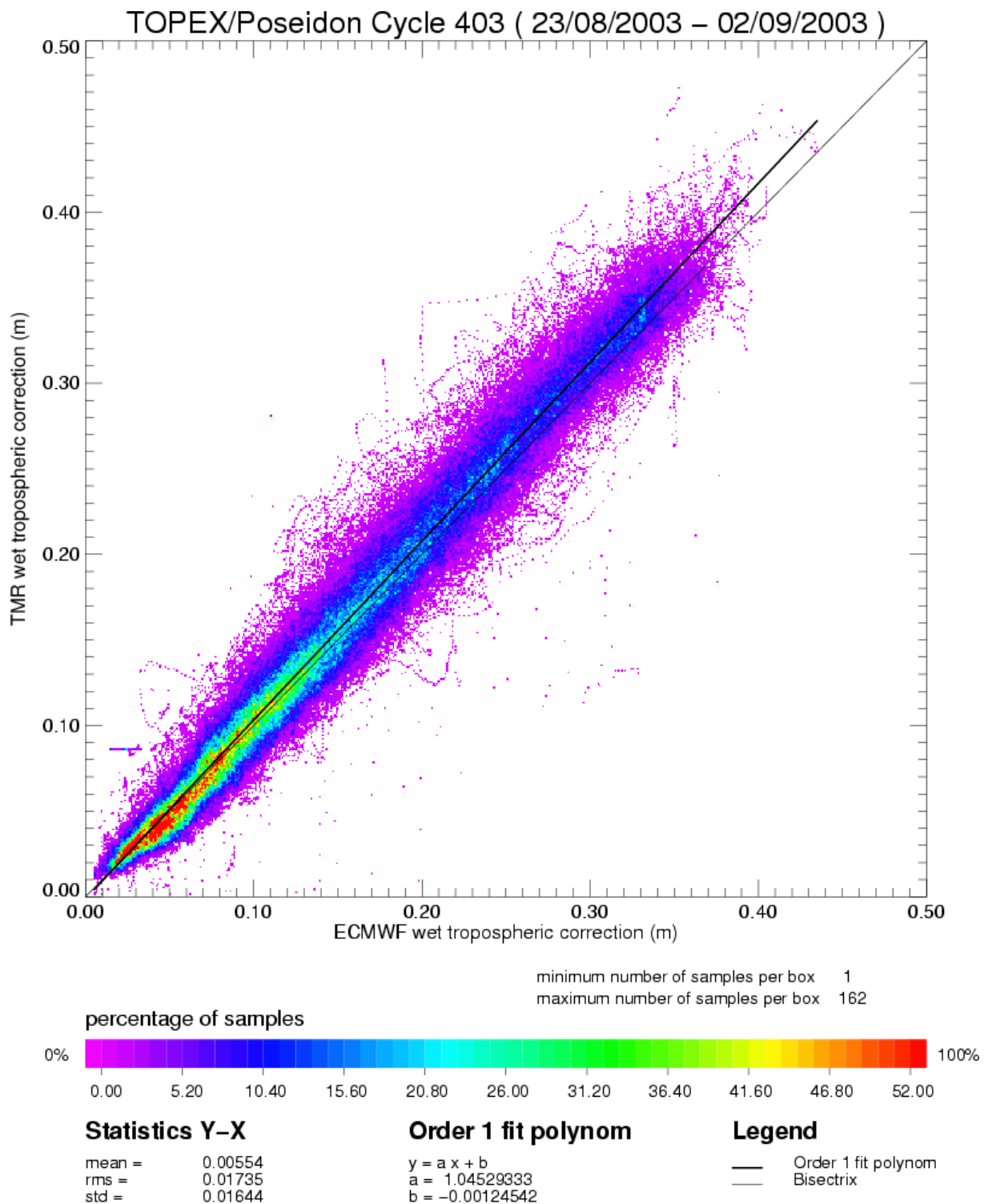
Order 1 fit polynom

$y = a x + b$
 $a = 0.71344131$
 $b = 0.00294007$

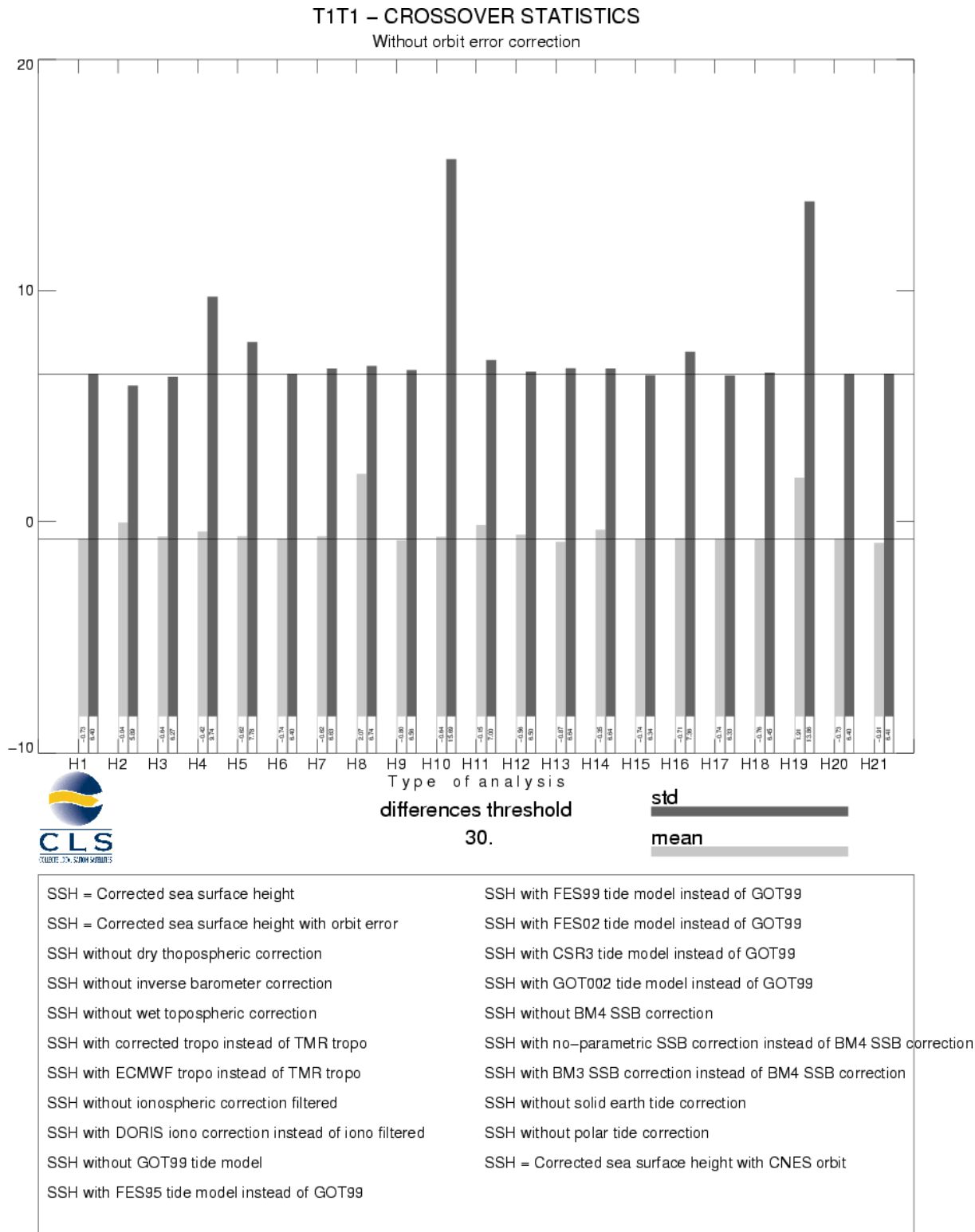
Legend

— 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

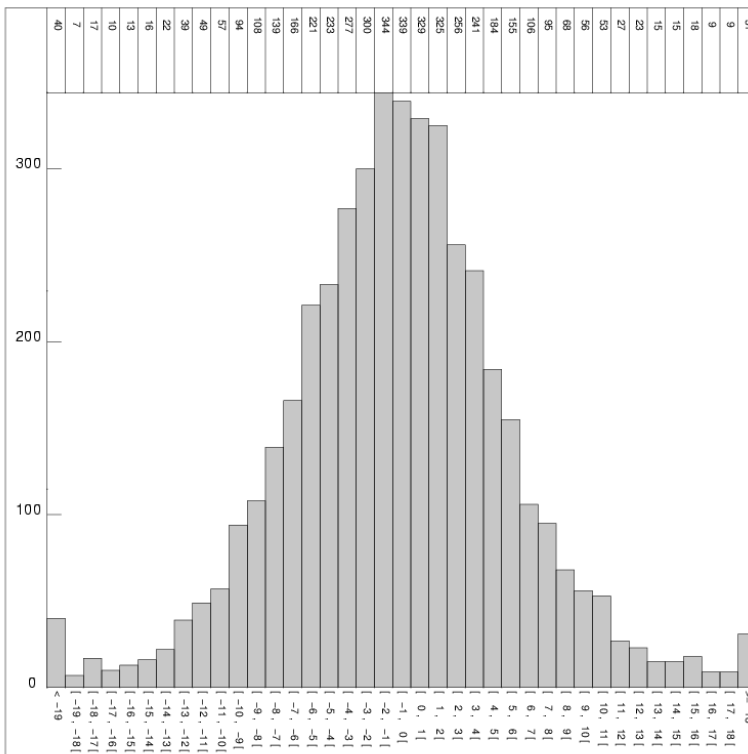
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse 0.00 (moy)
 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -29.7000
 Valeur maximale : 29.0800
 Différence Max – Min: 58.7800
 Nombre de points lus: 4624
 Nombre de points sélectionnés: 4506
 Moyenne : -0.734115
 Écart-type : 6.40065
 Moyenne Quadratique : 6.44261

CLS Space Oceanography Division



T1T1 – CROSSOVER STATISTICS

With orbit error correction

SSH = Corrected sea surface height

RAPPEL DES SELECTIONS

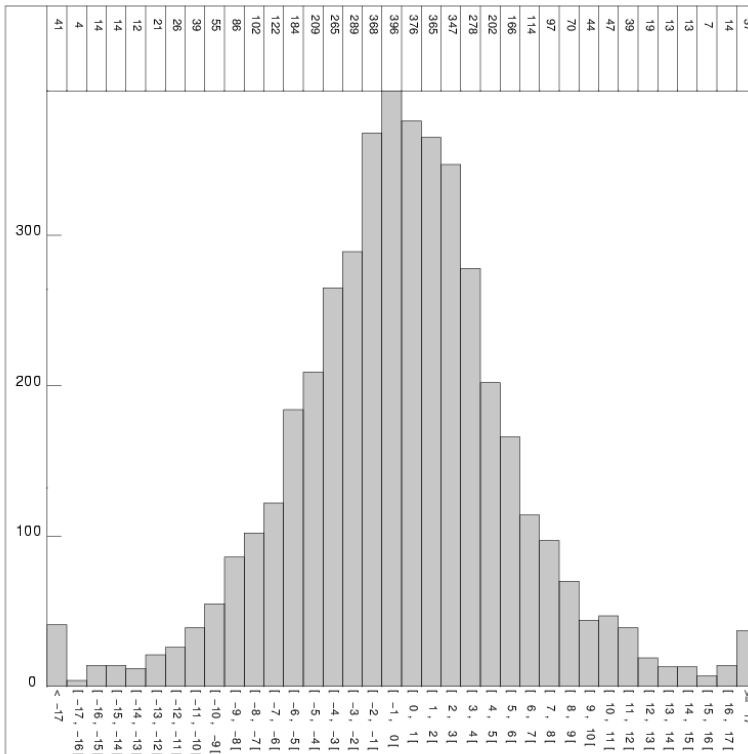
Type de points de croisement: T1T1
 Zone géographique (deg): -90 / 90 , 0 / 360
 Seuil sur les écarts d'analyse 0.00 (moy)
 30.00 (seuil)
 Selection(s) sur les champs :
 CL Arc 1 :=INTERP_SPLN
 CL Arc 2 :=INTERP_SPLN
 Seuil Min +: 0.0000000
 Seuil Max : 0.0000000

Selection(s) sur les écarts :
 Aucune

RESULTATS STATISTIQUES

Valeur minimale : -29.8600
 Valeur maximale : 29.3100
 Différence Max – Min: 59.1700
 Nombre de points lus: 4624
 Nombre de points sélectionnés: 4495
 Moyenne : -0.0370010
 Écart-type : 5.89219
 Moyenne Quadratique : 5.89230

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

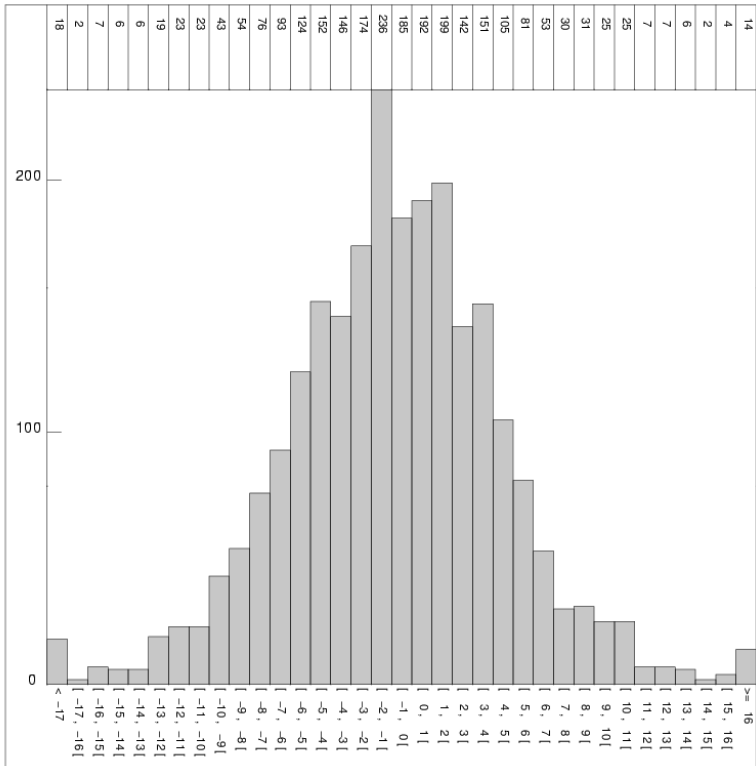
RAPPEL DES SELECTIONS

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 : -39.3300
 Valeur maximale : 36.1800
 Différence Max – Min: 75.5100
 Nombre de points lus: 2709
 Nombre de points selectionnes: 2461
 Moyenne : -0.839025
 Ecart-type : 5.64085
 Moyenne Quadratique : 5.70290

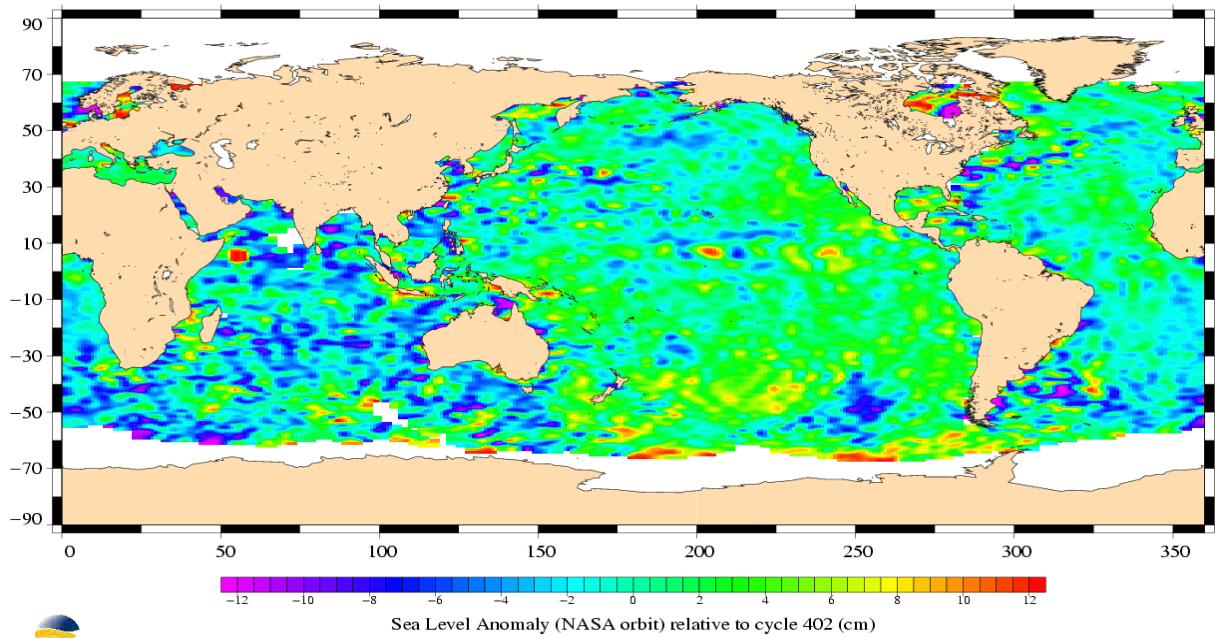
CLS Space Oceanography Division



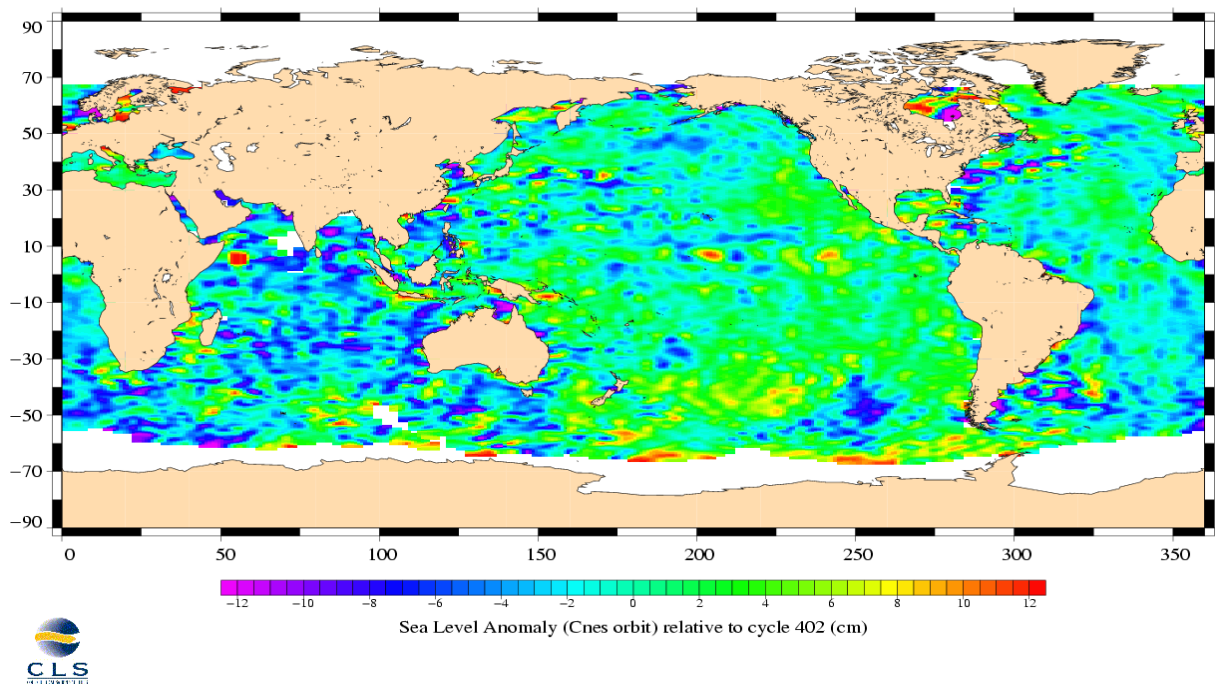
3.8 SSH variability

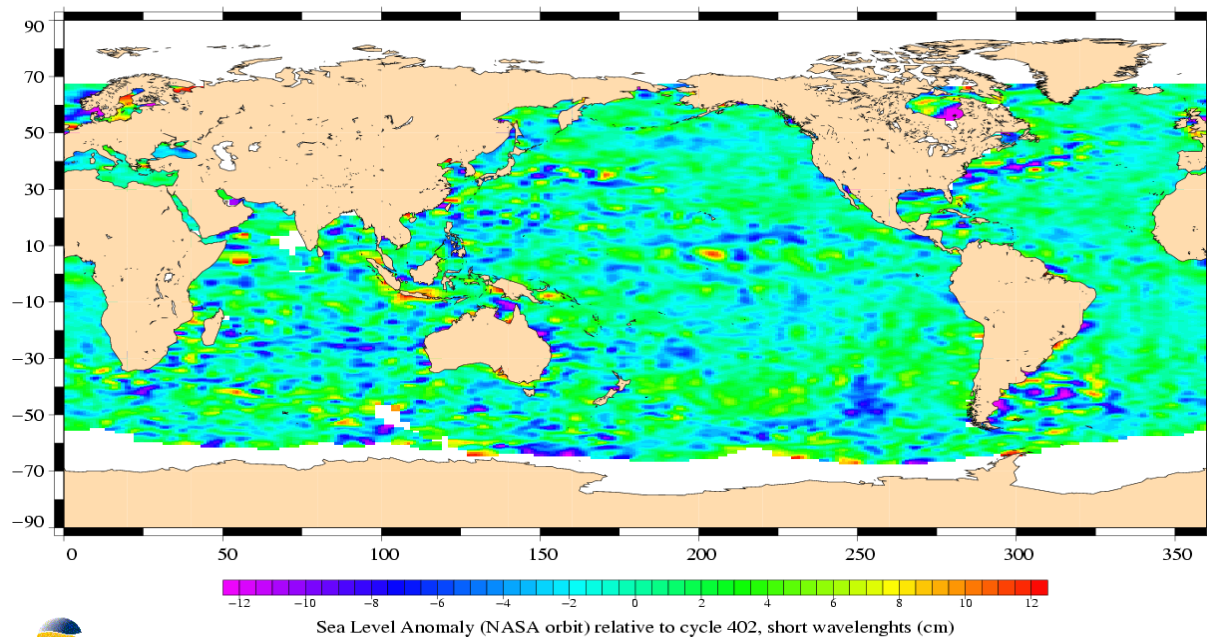
3.8.1 Sea Level Anomaly

TOPEX/Poseidon, cycle 403
Period : 23/08/2003 – 02/09/2003



TOPEX/Poseidon, cycle 403
Period : 23/08/2003 – 02/09/2003

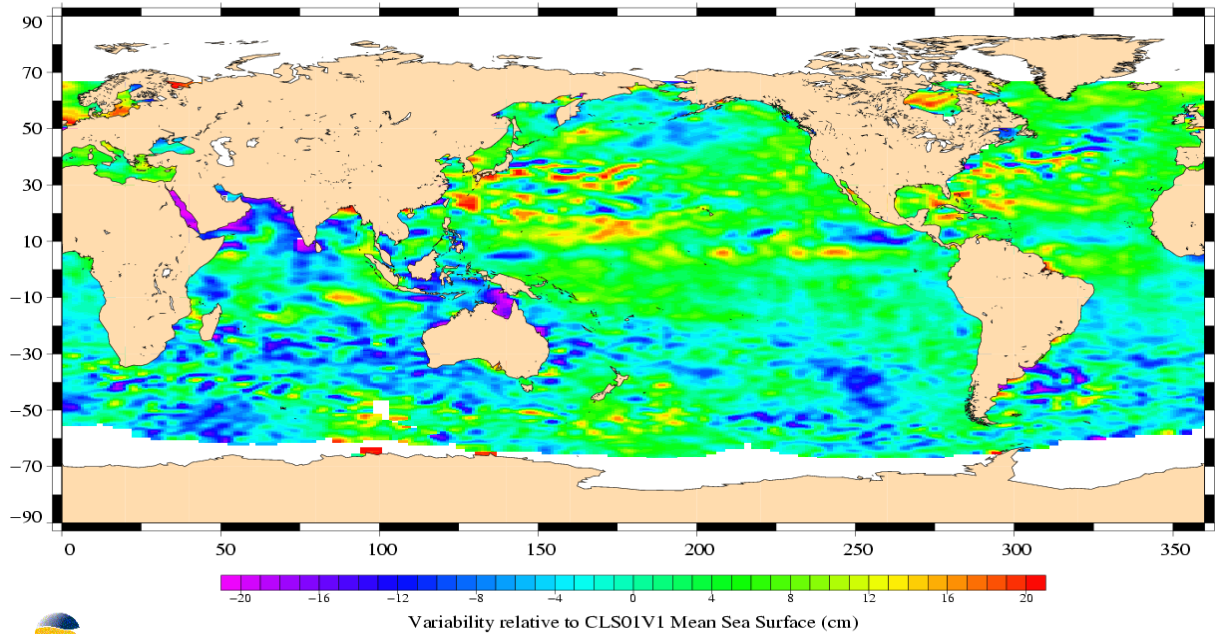




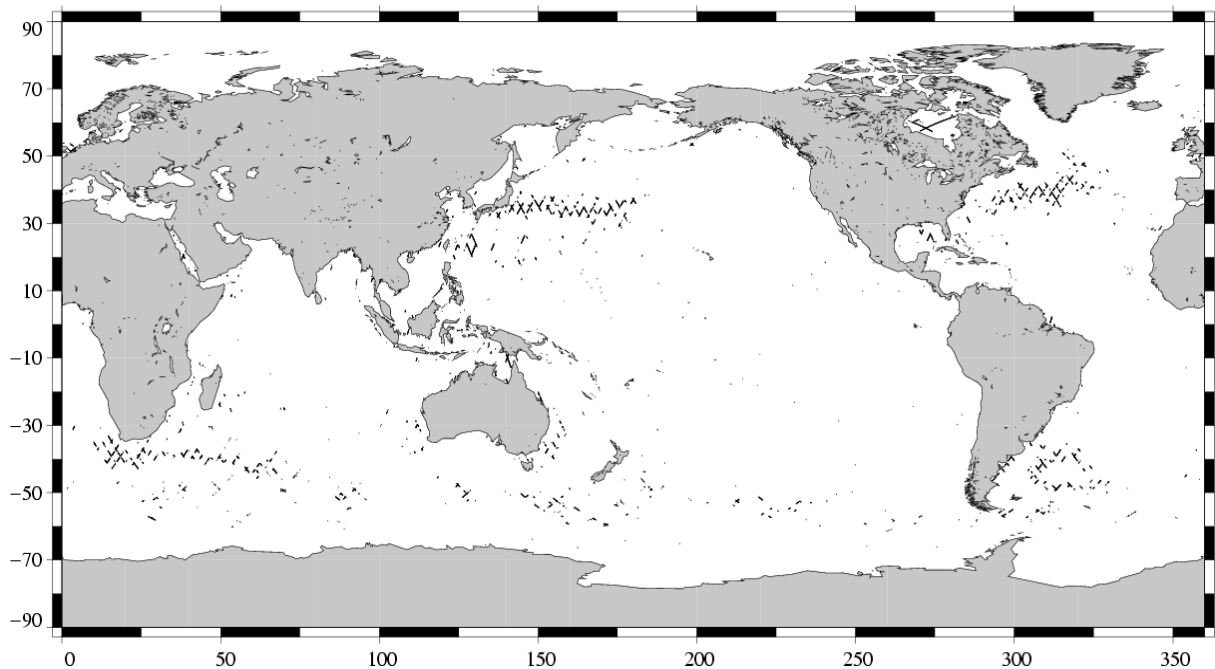
3.8.2 Comparison to a precise Mean Sea Surface

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 403
Period : 23/08/2003 – 02/09/2003

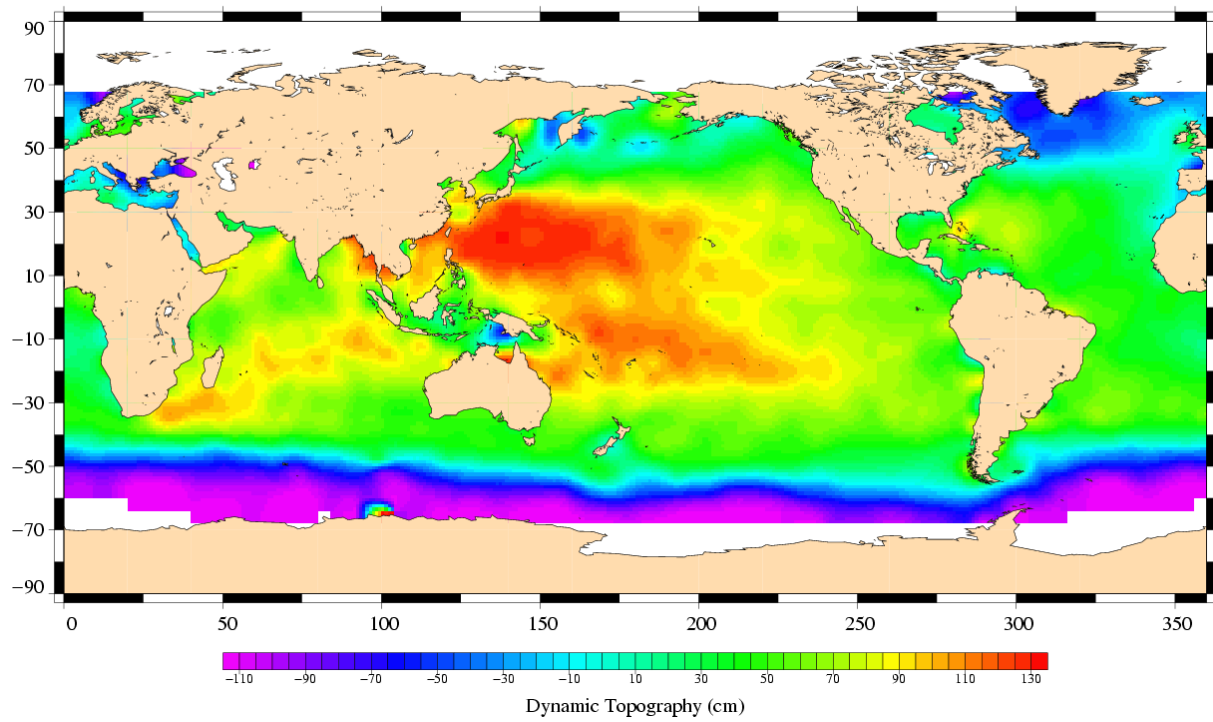


(SSH - MSS) differences greater than 0.3 m
TOPEX/Poseidon Cycle 403 (23/08/2003 / 02/09/2003)



3.9 Dynamic topography

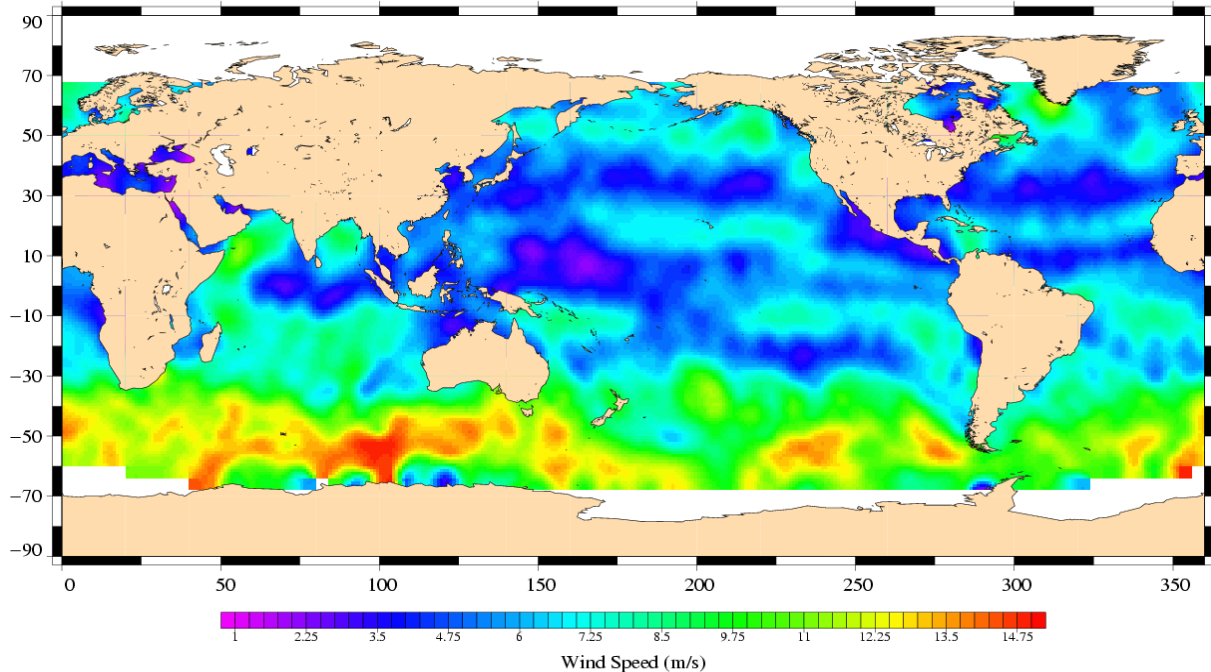
TOPEX/Poseidon, cycle 403
Period : 23/08/2003 – 02/09/2003



3.10 Wind and wave maps

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

TOPEX/Poseidon, cycle 403
Period : 23/08/2003 – 02/09/2003



TOPEX/Poseidon, cycle 403
Period : 23/08/2003 – 02/09/2003

