esa DOCUMENT

document title/ titre du document

ENVISAT CYCLIC ALTIMETRIC REPORT

CYCLE 24 from 02-02-2004 to 08-03-2004

Quality Assessment Report

prepared by/*préparé par*	EOP-GOQ and PCF team
reference/*réference*	ENVI-GSOP-EOPG-03-0011
issue/*édition*	1
revision/*révision*	0
date of issue/*date d'édition*	2 April 2004
status/*état*	
Document type/*type de document*	Technical Note
Distribution/*distribution*	

European Space Agency
Agence spatiale européenne

Table Of Contents

1 INTRODUCTION 1

2 DISTRIBUTION LIST 1

3 ACRONYMS 1

4 REFERENCE DOCUMENTS 2

5 GENERAL QUALITY ASSESSMENT 3
5.1 Instruments status 3
5.2 Cycle quality 3
5.3 Orbit quality 3
5.4 Ground Segment Processing Chain Status 4
5.4.1 IPF Processing Chain 4
5.4.2 F-PAC Processing Chain 4
5.4.3 Auxiliary Data File 4
5.4.4 Planned upgrades 5

6 ENVISAT PAYLOAD STATUS 5
6.1 Altimeter Events 5
6.1.1 RA-2 instrument planning 6
6.2 MWR Events 6
6.3 DORIS Events 7

7 INSTRUMENT PERFORMANCES 7
7.1 RA-2 Performances 7
7.1.1 IF Filter MASK 7
7.1.2 USO 8
7.1.3 Tracking capability 9
7.1.4 Sigma0 Transponder 11
7.1.5 Datation 12
7.1.6 Mispointing 12
7.1.7 S-Band anomaly 14
7.2 MWR Performances 14
7.3 DORIS Performances 15

8 PRODUCT PERFORMANCES 15
8.1 Availability of data 15

8.2 RA-2 Altimeter Parameters 20
8.2.1 Altimeter range 20
8.2.2 Significant Wave Height 21
8.2.3 Backscatter coefficient – Wind Speed 22
8.3 Edited measurements 23
8.4 Product disclaimer 24
8.5 Data handling recommendations 24
8.5.1 Sea-Ice flag 24
8.5.2 Ocean S-Band anomalies detection 24
8.5.3 Warning on IPF 4.56 Version Identification field 24
8.5.4 S-Band Backscattering Coefficient 25
8.5.5 USO Range Correction 25
8.6 Wind & Wave quality assessment 25

9 LONG TERM MONITORING 25
9.1 RA-2 Instrument monitoring 25
9.1.1 IF Filter Mask 25
9.1.2 Uso 26
9.1.3 Tracking Capability 27
9.1.4 Datation 29
9.1.5 mispointing 30
9.1.6 S-Band Anomaly 31
9.2 Products Monitoring 32
9.2.1 Availability of Data 32
9.2.2 RA-2 Altimeter Parameters 33
9.2.2.1 Altimeter range 33
9.2.2.2 Significant Wave Height 34
9.2.2.3 Backscatter coefficient – Wind Speed 34

10 PARTICULAR INVESTIGATIONS 35

1 INTRODUCTION

This documents aims at reporting on the performances of the EnviSat Radar Altimeter, Microwave Radiometer and DORIS sensors, on the data quality of the corresponding Fast Delivery products (RA2_FGD_2P) as well as on the main events occurred during cycle 24.

This reports covers the period from the 2nd of February to the 8th of March 2004.

2 DISTRIBUTION LIST

This report is available in PDF format at the internet address http://earth.esa.int/pcs/envisat

3 ACRONYMS

AGC	Automatic Gain Control
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
DSR	Data Set Record
EPC	Electronic Power Converter
ERS	European Remote Sensing satellite
ESRIN	European Space Research Institute
ESOC	European Space Operations Centre
FD	Fast Delivery products
GS	Ground Segment
GTS	Global Telecommunication System
HTL	Height Tracking Loop
ICU	Instrument Control Unit
IECF	Instrument Engineering Calibration Facility
IF	Intermediate Frequency
IE	Individual Echoes
IPF	Instrument Processing Facility
LUT	Look Up Table
MCMD	MacroCommand
MPH	Main Product Header
MSS	Mean Sea Surface
MWR	MicroWave Radiometer
MPS	Mission Planning System
OBT	On-Board Time
OCM	Orbit Control Mode/Manoeuvres
PCS	ERS Products Control Service
PCF	EnviSat Product Control Facility
PDHS-E	ESRIN Processing and Data Handling Station
PDHS-K	Kiruna Processing and Data Handling Station
PLSOL	Payload Switch-Off Line

PMC	Payload Main Computer
PTR	Point Target Response
RA-2	EnviSat Radar Altimeter bi-frequency
RSL	Resolution Selection Logic
SAD	Static Auxiliary Files
SBT	Satellite Binary Time
SEU	Single Event
SFCM	Stellar Fine Control Mode
SPH	Specific Product header
SPSA	Signal Processing Sub-Assembly
S/W	Software
TM	Telemetry
TRP	Transponder
TWT	Traveling Wave Tube
UTC	Coordinated Universal Time

4 REFERENCE DOCUMENTS

[R – 1] F-PAC MONTHLY REPORT, SALP-RP-M-OP-15198-CN, February 2004
[R – 2] ENVISAT Microwave Radiometer Assessment Report Cycle 024, CLS.DOS/04.064, http://earth.esa.int/pcs/envisat/mwr/reports/
[R – 3] Envisat RA-2 IF Mask weird behavior: Investigation Report
[R – 4] Instrument Performance Evaluation and Analysis Summary, PO-TR-ALS-RA-0042
[R – 5] Instrument Corrections Applied on RA-2 Level 1b products, Paper presented at the ENVISAT Calibration Review in September 2002
[R – 6] ENVISAT Phase E Cal/Val Acquisition Plan, ENVI-SPPA-EOPG-TN-03-0008
[R – 7] RA-2 S-Band Anomaly Investigation, PO-TN-ESA-RA-1331, http://earth.esa.int/pcs/envisat/ra2/articles/
[R – 8] RA-2 Performance Results, Paper presented at the ENVISAT Calibration Review in September 2002
[R – 9] ECMWF Report on ENVISAT RA- 2 for February 2004, Report on ENVISAT Radar Altimeter - 2 (RA- 2), Wind/ Wave Product with Height Information (RA2_ WWV_ 2P), http://earth.esa.int/pcs/envisat/ra2/reports/ecmwf/
[R – 10] Envisat GDR Quality Assessment Report, SALP-RP-P2-EX-21121-CLS015
[R – 11] Envisat RA-2 Range Instrumental correction: USO clock period variations and associated auxiliary file, ENVI-GSEG-EOPG-TN-03-0009
[R – 12] Defining a Rain flag for the Envisat altimeter, G. Quartly, study presented to the final CCVT plenary meeting, http://earth.esa.int/pcs/envisat/ra2/articles/
[R – 13] ENVISAT Weekly Mission Operations Reports # 87-91, ENVI-ESOC-OPS-RP-1011-TOS-OF
[R – 14] Envisat validation and cross calibration activities during the verification phase. Synthesis Report ESTEC contract No. 16243/02/NL/FF WP6, http://earth.esa.int/pcs/envisat/ra2/articles/

5 GENERAL QUALITY ASSESSMENT

5.1 Instruments status

The RA-2 instrument didn't undergo to any instrument anomaly during this cycle, as given in par. 6.1.

The two known causes of random on-board anomalies are still present. In particular we refer to the so-called S-Band anomaly and the IF mask weird behavior described respectively in [R – 7] and [R – 3]. Only the S-Band anomaly partially affects a low number of Envisat data products as given in par. 7.1.7.

MWR sensor assessment report: refer to [R – 2].

DORIS sensor assessment report: refer to [R – 1].

5.2 Cycle quality

The summary of the RA-2 data products availability for this cycle is given in Table 1.

Start orbit	Stop orbit	Time instrum. unavailability	Time L0 gaps	Time L1b gaps	Time L2 (FGD) gaps	% instrum. avail.	% L0 avail.	% L1b avail.	% L2 (FGD) avail.
10075	10175.2	1012.028	3723.701	10091.56	12084.97	99.832667	99.216976	98.16409	97.834491
10175.2	10275.4	1077.692	12261.05	31341.56	32427.65	99.82181	97.79452	94.639673	94.460095
10275.4	10375.6	1070.933	7660.532	7687.886	43953.07	99.822928	98.556304	98.551781	92.555546
10375.6	10475.8	1047.383	6583.877	6580.572	49713.42	99.826822	98.738221	98.738767	91.607033
10475.8	10576	1089.388	545.418	545.418	552.339	99.819877	99.729695	99.729695	99.728551

Table 1: RA-2 L0, L1b and L2 FGD Data products availability summary for cycle 24

5.3 Orbit quality

On the 04-February-2004 a single burn OCM out-of-plane orbit inclination maintenance manoeuvre was executed as planned, using thruster pair 13&15 and tank pair A. As part of this orbit correction, a wheel desuspension was successfully commanded. The following table summarises the OCM observed performance:

	Burn Start Time	Nominal Delta-V	Calibrated Delta-V	Mode
First burn	2004/02/04-05:51:50	1.7545 m/sec	1.7548 m/sec	OCM

On the 5th of February 2004, a 1-burn SFCM orbit touch-up manoeuvre was executed. This manoeuvre was deemed necessary to optimise the interferometric baseline for an ASAR

acquisition over the Bam (IRAN) area scheduled on the 11th February. The following table summarises the SFCM observed performance:

	Burn Start Time	Nominal Delta-V	Calibrated Delta-V	Mode
First burn	2004/02/05-12:16:50	0.0040 m/sec	0.0037 m/sec	SFCM

On the 25-February-2004, a 1-burn SFCM orbit maintenance manoeuvre was executed as planned. The following table summarises the SFCM observed performance:

	Burn Start Time	Nominal Delta-V	Calibrated Delta-V	Mode
First burn	2004/02/25-12:48:10	0.0136 m/sec	0.0135 m/sec	SFCM

5.4 Ground Segment Processing Chain Status

5.4.1 IPF PROCESSING CHAIN

The current IPF version is V4.56, operational at the Envisat PDHS-K and PDHS-E since November the 26th 2003.

5.4.2 F-PAC PROCESSING CHAIN

Actual F-PAC CMA version is V6.2.1 installed on December the 3rd 2003. For what regards the Envisat products this version is equivalent to V6.1 installed on August the 4th 2003.

F-PAC CMA anomalies: anomalies are detailed in the F-PAC Monthly Report [R - 1].

5.4.3 AUXILIARY DATA FILE

Hereafter all the Auxiliary files used actually used by the IPF ground processing are listed:

```
RA2_CHD_AXVIEC20030402_094243_20030407_000000_20200101_000000
RA2_CON_AXVIEC20020606_164228_20020101_000000_20200101_000000
RA2_CST_AXVIEC20020621_135858_20020101_000000_20200101_000000
RA2_DIP_AXVIEC20020122_134206_20020101_000000_20200101_000000
RA2_GEO_AXVIEC20020314_093428_20020101_000000_20200101_000000
RA2_ICT_AXVIEC20031208_143628_20020101_000000_20200101_000000
RA2_IFA_AXVIEC20020313_174755_20020101_000000_20200101_000000
RA2_IFB_AXVIEC20020313_174959_20020101_000000_20200101_000000
RA2_IFF_AXVIEC20031208_151817_20030602_215929_20100101_000000
RA2_IOC_AXVIEC20020122_141121_20020101_000000_20200101_000000
RA2_MET_AXVIEC20020204_073357_20020101_000000_20200101_000000
RA2_MSS_AXVIEC20031208_145545_20020101_000000_20200101_000000
RA2_OT1_AXVIEC20040120_082051_20020101_000000_20200101_000000
RA2_OT2_AXVIEC20031208_150159_20020101_000000_20200101_000000
RA2_SET_AXVIEC20020122_150917_20020101_000000_20200101_000000
```

```
RA2_SL1_AXVIEC20030131_100228_20020101_000000_20200101_000000
RA2_SL2_AXVIEC20030131_101757_20020101_000000_20200101_000000
RA2_SOI_AXVIEC20031208_150608_20020101_000000_20200101_000000
RA2_SSB_AXVIEC20031208_150749_20020101_000000_20200101_000000
RA2_TLD_AXVIEC20031208_151137_20020101_000000_20200101_000000
```

The RA2_POL_AX, the RA2_SOL_AX and the RA2_PLA_AX have been regularly updated every week without problems.

The RA-2 Auxiliary Data Files (ADF) are accessible from the Envisat Web pages under http://envisat.esa.int/services/tools_table.html.

5.4.4 PLANNED UPGRADES

Evolution of the IPF Level 1B and Level 2 processing chain is currently planned. The next IPF version release shall nominally contain the following:

1. USO instrumental correction within the RA-2 L1b processor.
2. New MWR Side Lobes correction algorithm within MWR L1b processor
3. Correction of the mispointing evaluation algorithm within the RA-2 L2 processor
4. Inclusion of the loading tide for the GOT2000.2 model.
5. Addition of the peakiness fields in Ku and S band to the RA-2 and MWR FD/I/MAR meteorological products
6. Inclusion of the square of the significant wave height in Ku and S band
7. Inclusion of an S-band anomaly flag
8. Upgrade of the Level 1B and Level 2 processing for DORIS NRT orbital information computation.

Evolutions 3, 5 and 6 shall be reflected too in the F-PAC CMA processing chain.

6 ENVISAT PAYLOAD STATUS

6.1 Altimeter Events

The Radar Altimeter 2, during cycle 24, was never unavailable.

The HSU1 fuse problem (Ref anomaly occurrence during cycle 22) is still present. This problem does not affect nominal operations since the RA-2 instrument is heated by the nearby hardware.

The cause of the problem is still unknown. The heater fuses as well as the hardware used to report on the status of the fuses are presently under examination.

6.1.1 RA-2 INSTRUMENT PLANNING

The RA-2 instrument planning was performed as follows:

- IF Calibration Mode according the nominal operational acquisition scheme: 100 seconds of data per day over Himalayan region.
- Preset Loop Output mode for GAVDOS Range transponders, located in Creta.
- Preset Loop Output acquisition over ESA transponders, located near Rome; for both ascending and descending passes.
- Individual Echoes background planning: buffering of 20 Data block of individual Echoes and transmission of the in the following 160 Data Blocks. This repeated continuously.

Hereafter the map is reported showing the acquisition sites for both the Range and Sigma_0 transponders.

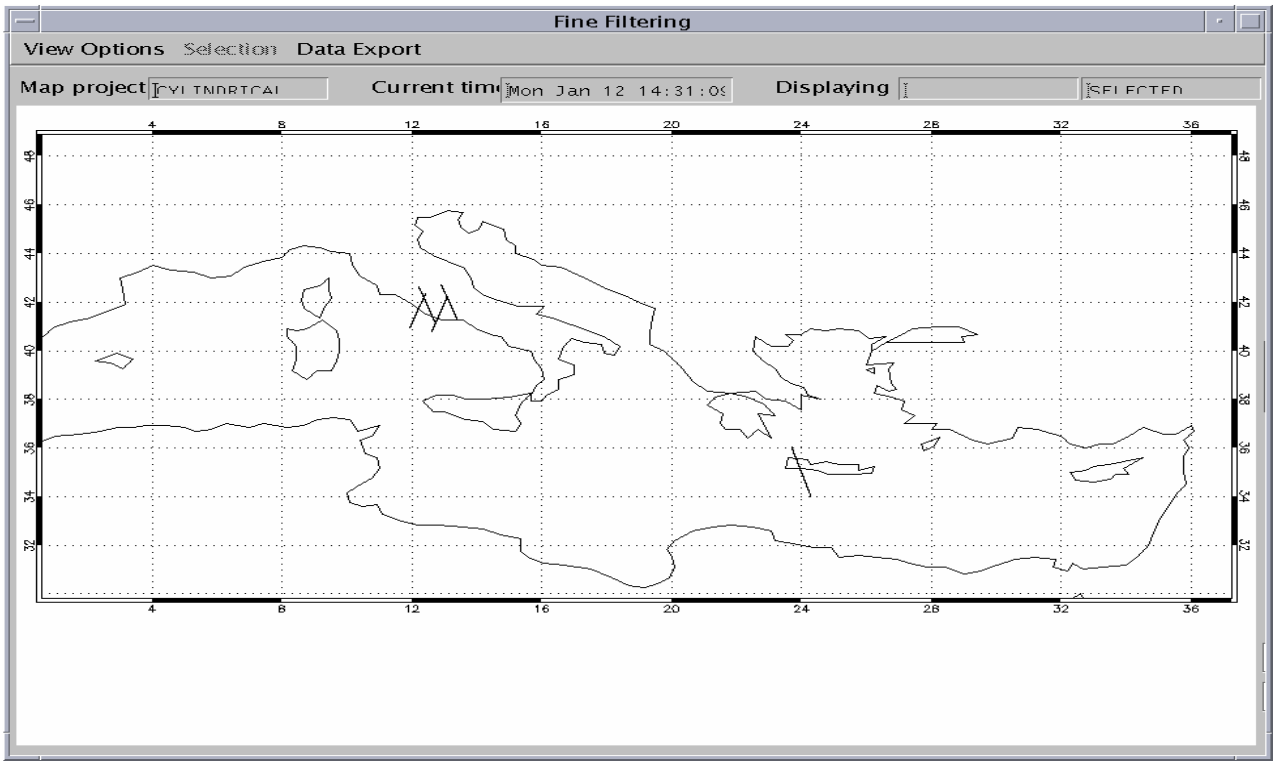

Figure 1: Transponder Acquisition sites for cycle 24

6.2 MWR Events

The MWR, during cycle 24 was never unavailable.

6.3 DORIS Events

The DORIS during cycle 24 was never unavailable.

7 INSTRUMENT PERFORMANCES

7.1 RA-2 Performances

7.1.1 IF FILTER MASK

In Figure 2 all valid IF masks retrieved by averaging the 100 seconds of data acquired daily during cycle 24 are plotted in the left panel. The on-ground measured IF mask (ref [R – 4]) is also plotted in that panel with a red solid line. In the right panel the difference of each of the calculated IF masks with respect to the on-ground measured one is reported. During cycle 24 the number of valid IF masks has been of 7, representing the 20% of the total available IF masks. Only valid IF masks are used to generate the final IF mask used in the Level 1B ground processing; the method used for editing the data is based on the comparison between each of the single IF masks and the reference one (on-ground).

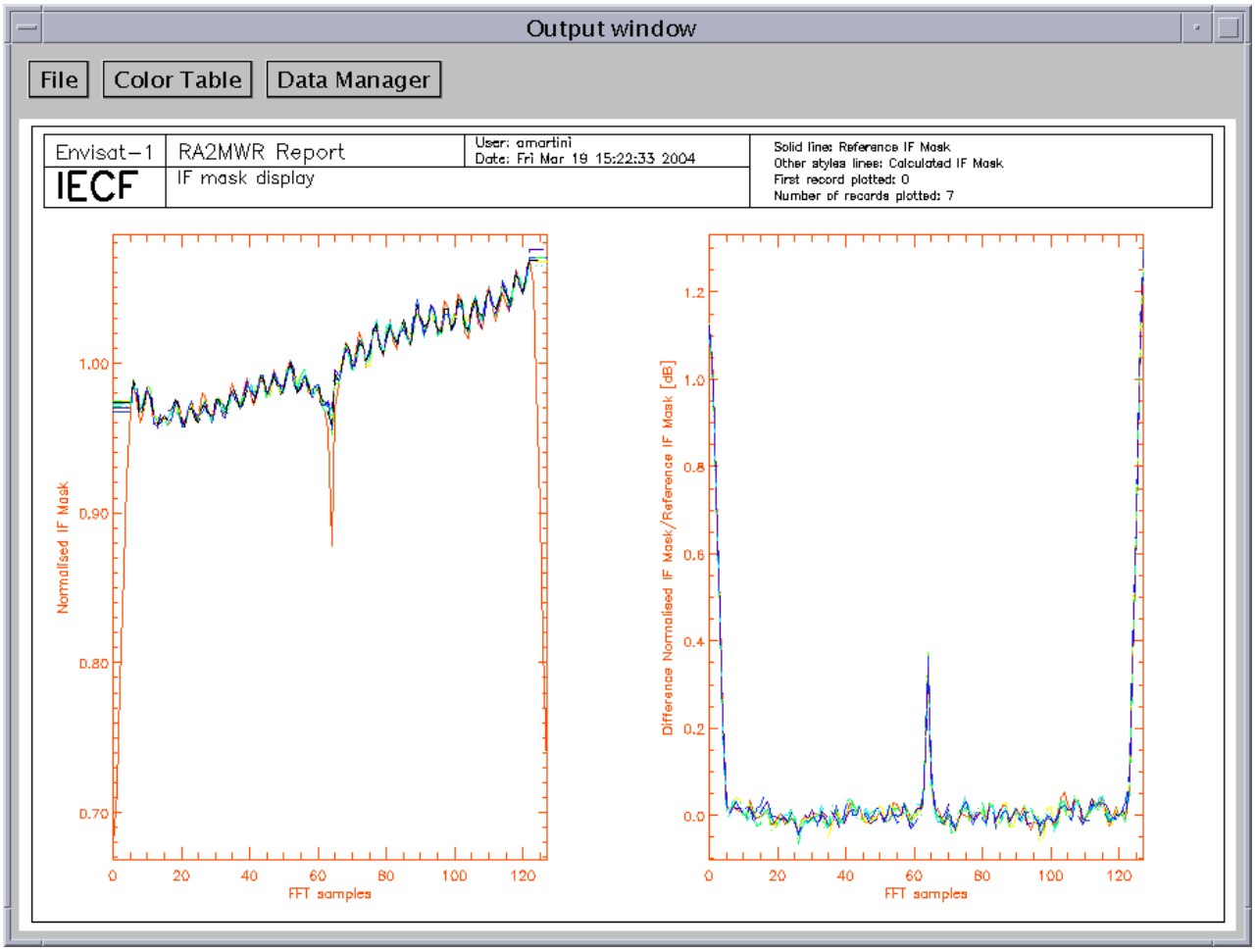

Figure 2: Valid IF masks retrieved daily during cycle 24 plotted together with the on-ground reference.

7.1.2 USO

In Figure 3 the USO clock period trend retrieved for cycle 24 is reported. In order to make the variability visible, the difference of the actual USO clock period with respect to the nominal one has been plotted, in the upper panel. In the lower panel the Range error due to the USO clock variability has been reported taking a satellite altitude of 800 Km as a nominal value.

Currently the nominal USO clock period (12500 ps) is used within the processing, this means that the data are not corrected for the bias and the drift correlated to the actual USO clock period.

A particular investigation has been performed regarding the USO clock trend and the associated auxiliary file; this is described in [R – 11]. The conclusion can be summarized as follows: the precision of 1ps available in the current USO auxiliary file is not enough to appreciate its trend and it is too rough for any altimetric application. A suitable resolution is considered to be of 10^{-6} ps. This problem will be corrected with the following upgrade of the IPF as described in par. 5.4.4.

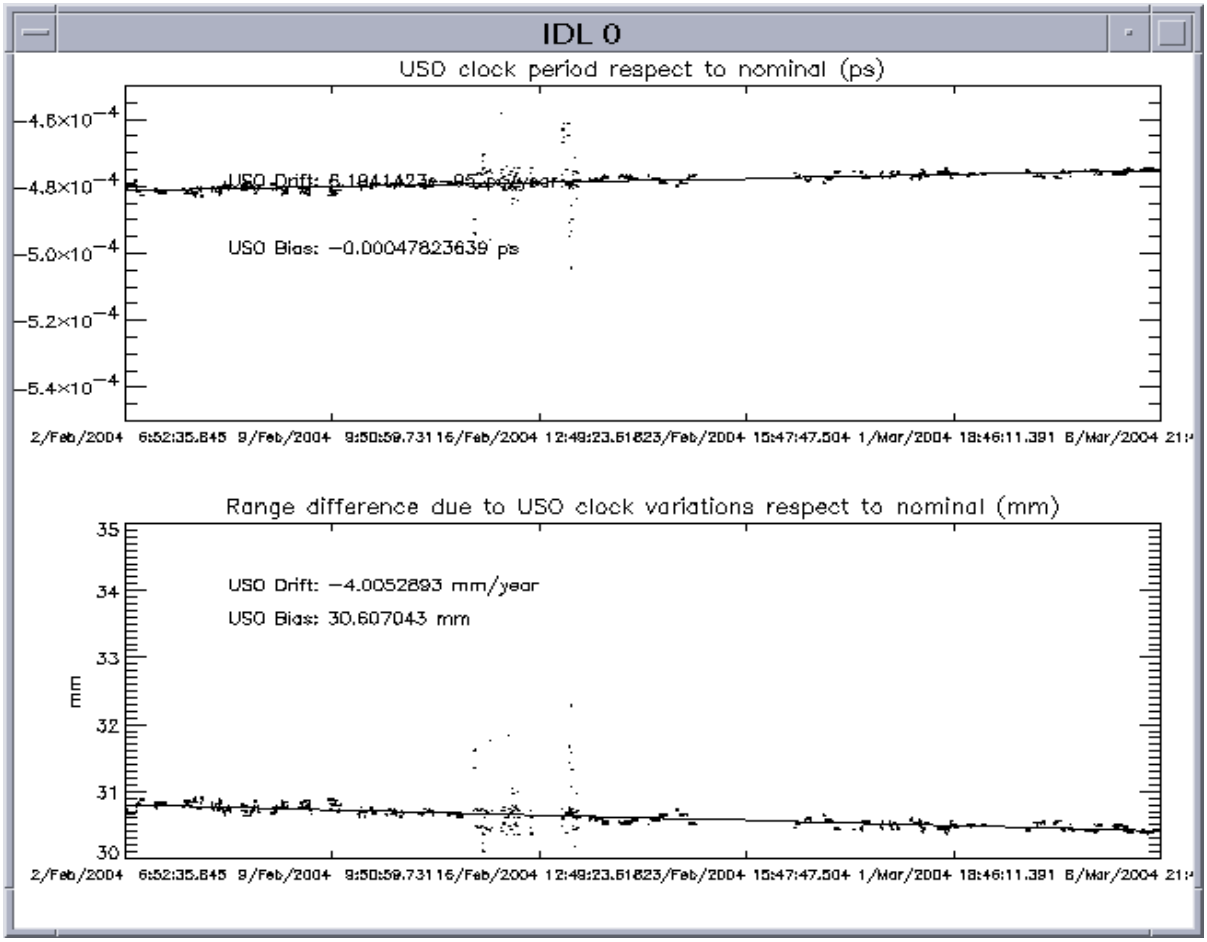

Figure 3: USO clock period for cycle 24

7.1.3 TRACKING CAPABILITY

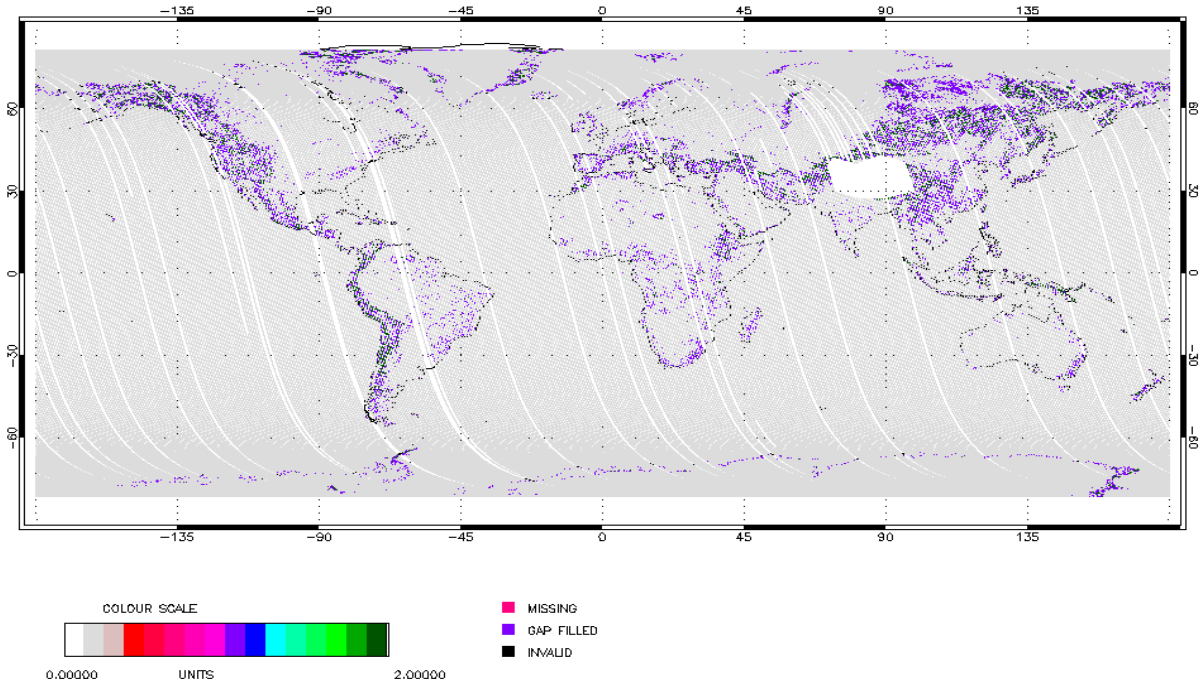

Figure 4: RA-2 Chirp ID for ascending passes during cycle 24

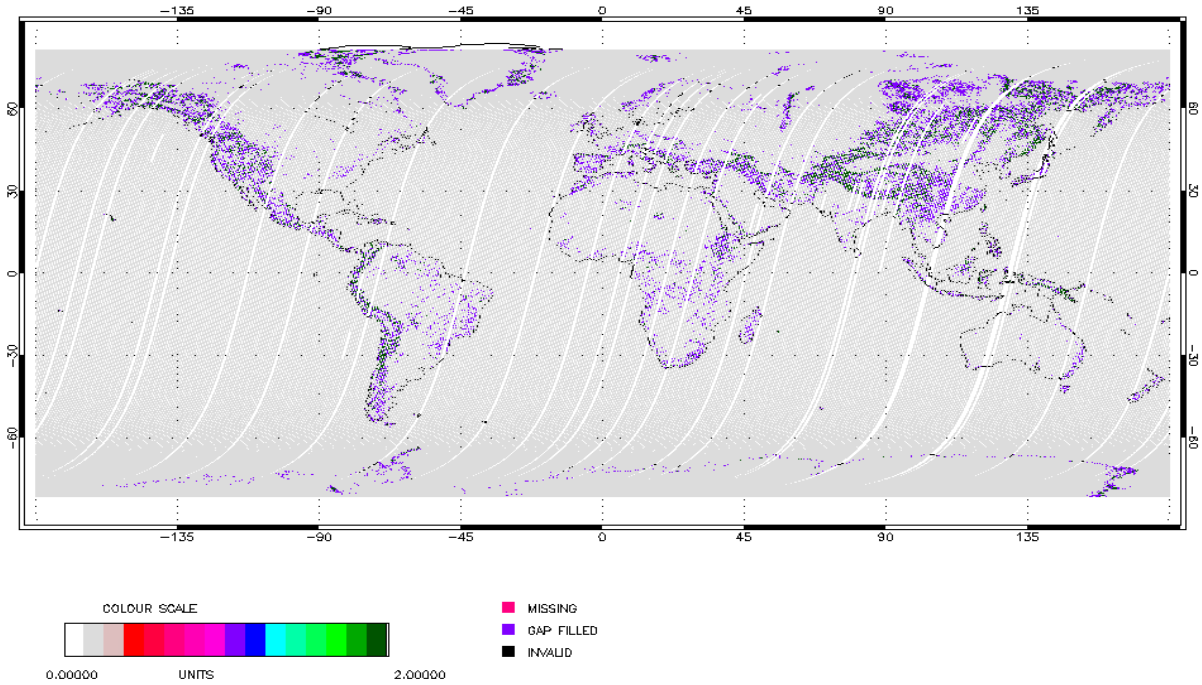

Figure 5: RA-2 Chirp ID for descending passes during cycle 24

In Figure 4 and Figure 5, the Chirp ID is plotted respectively for ascending and descending passes of cycle 24. The MDSRs acquired with 320MHz bandwidth are plotted in light gray (Chirp ID

equal to 0), the ones acquired with 80MHz bandwidth are plotted in violet (Chirp ID equal to 1) and the ones acquired with the 20MH bandwidth are plotted in dark green (Chirp ID equal to 2).

The corresponding percentages of acquisition in the different resolutions subdivided by surface type are given in Table 2:

Surface type	320 MHz	80 MHz	20MHz
Open Ocean	99.990%	0.008%	0.002%
Costal Water (ocean depth < 200 m)	98.48%	1.32%	0.20%
Sea Ice	99.15%	0.73%	0.12%
Ice Sheet	96.23%	3.02%	0.75%
Land	80.99%	13.51%	5.50%
All world	94.97%	3.72%	1.31%

Table 2: RA-2 Tracking capability: Chirp ID percentages discriminated by surface type

The figures given for the RA-2 tracking performances during this cycle are very much in line with the ones recorded at the end of the Commissioning Phase and presented in [R – 8]. The slight differences are in part due to the different algorithms used to discriminate the surface types.

Those figures completely satisfy the objectives of the Commissioning Phase "RSL and Tracking optimization" hereafter reported:

320MHz over Ocean > 99%
320 MHz within 15km of Land/Ocean boundary (Costal Water)
320 MHz over Sea Ice > 95%
320/80 MHz Fixed resolution at Ice Sheet Crossovers > 95%
320MHz over Ice Shelves > 95%

7.1.4 SIGMA0 TRANSPONDER

During cycle 24 the first two Sigma_0 Transponder measurement where successfully performed. On the other hand the acquisition of data while setting RA-2 in Preset Loop output Mode has been planned and then regularly performed on the following date/UTC times:
05-FEB-2004 20:36:23
17-FEB-2004 09:41:50
24-FEB-2004 20:39:13
04-MAR-2004 09:39:01

In Table 3 the preliminary results are reported for the measurement performed during cycle 24.

Site	Acquisition Date	Sigma_0 bias [dBs]	Wet Tropo Corr.	Sigma_0 bias corr. [dBs]
Rome	24-Feb-2004	1.04	0.15 (TBC)	1.19

Valmontone	04-March-2004	1.15	0.1 (TBC)	1.25

Table 3: Preliminary Results of Sigma_0 Absolute Calibration for cycle 24

7.1.5 DATATION

A significant part of an eventual error in the RA-2 products datation could be given by the not perfect synchronism between the Satellite Binary Time and the UTC Time due to a drift of the ICU clock period. A correlation between those two times is performed at every Kiruna orbit dump and then extrapolated for the four non-Kiruna orbits. In Figure 6 (upper panel) the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported. For the whole cycle they are well under the 20 microseconds warning threshold. In the lower panel the ICU clock step for the same period is shown.

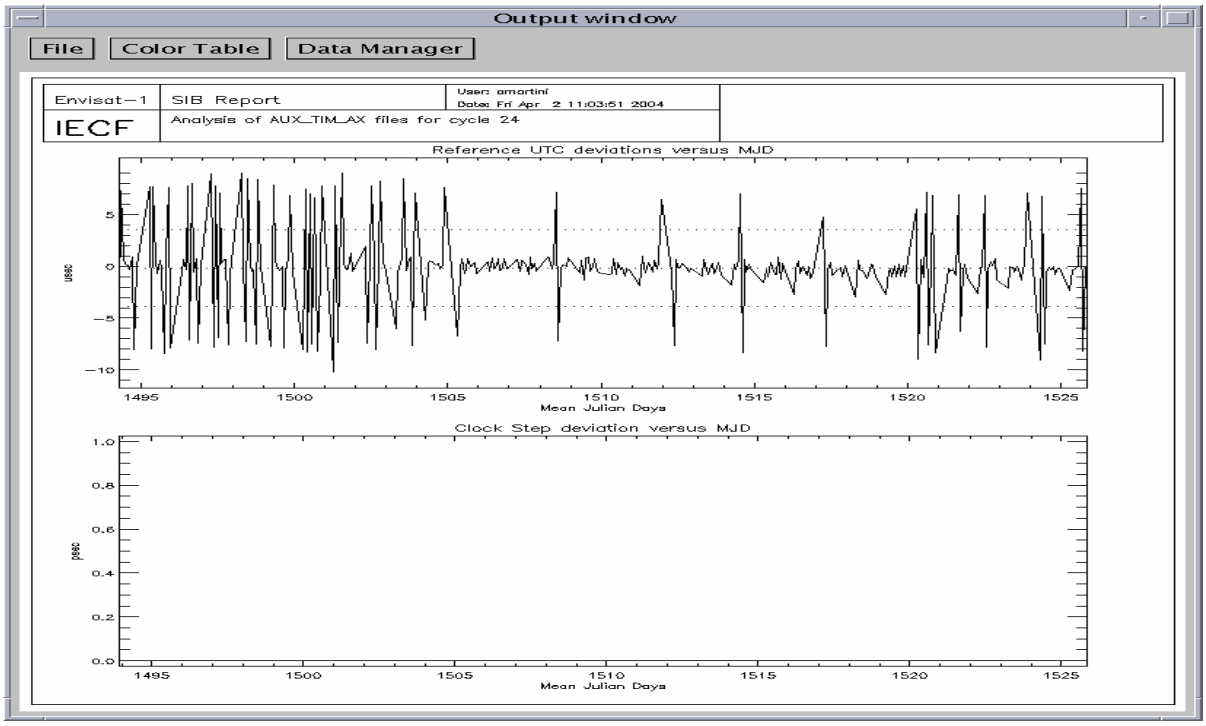

Figure 6: UTC deviations and ICU clock period for cycle 24

7.1.6 MISPOINTING

In Figure 7 and Figure 8 the trend and the histogram of the mispointing squared (smoothed over 120 s) is reported in deg^2*10e-4

The average mispointing value, as extracted from the RA2_FGD_2P data products, is around 0.025 deg^2, is known to be higher than the one reported at platform level [R – 13].

This is due to a not perfect tuning of the algorithm currently used to retrieve the mispointing value from the RA-2 waveform data. An optimization of this algorithm shall be part of the next Level 2 processors upgrade, planned for mid-2004 (ref. 5.4.4).

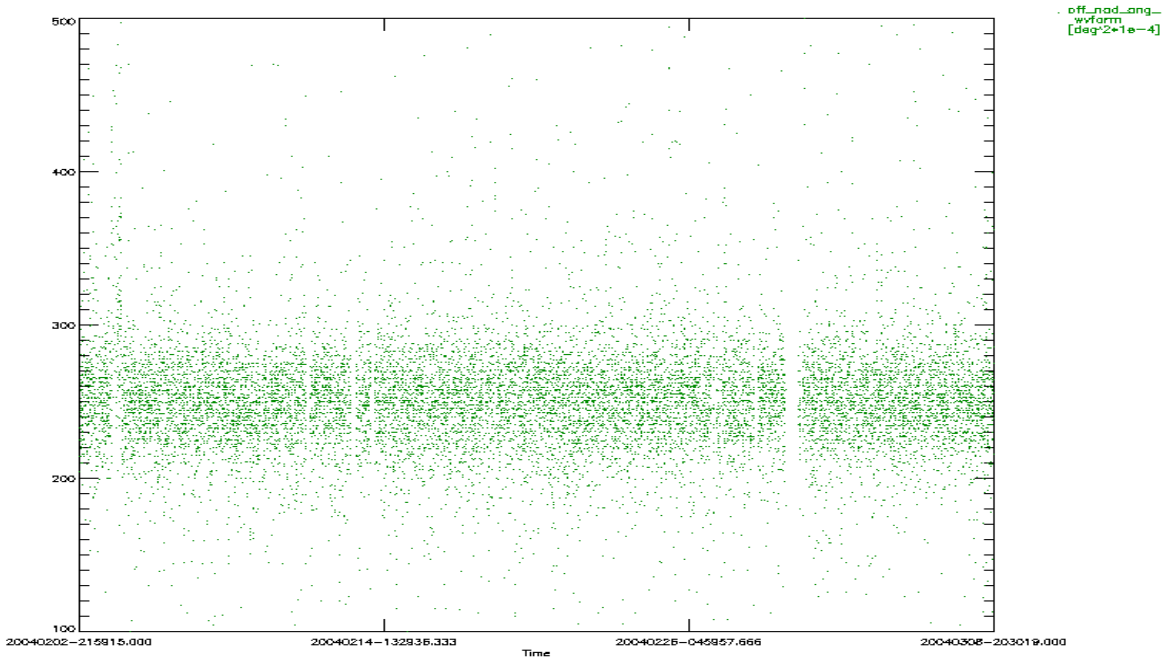

Figure 7: Smoothed mispointing squared trend and histogram for cycle 24 (deg^2*10^4)

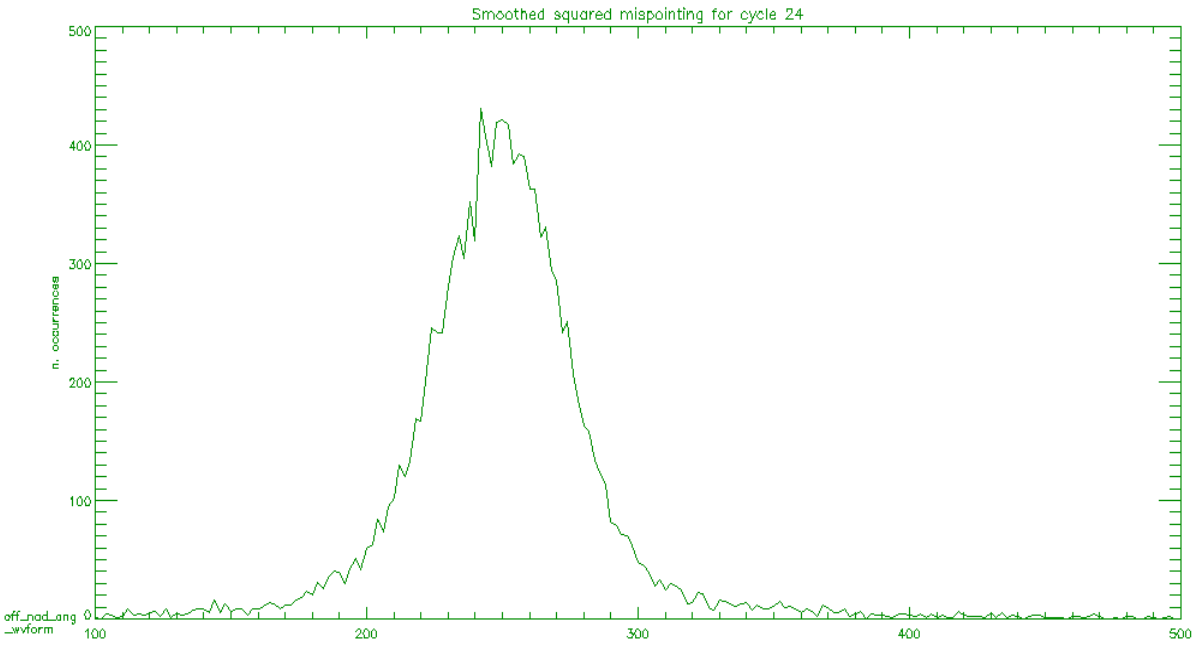

Figure 8: Smoothed mispointing squared histogram for cycle 24 (deg^2*10^4)

At the beginning of the cycle a period of few orbits is visible where the mispointing squared shows higher values, this is in correspondence with the OCM Manoeuvre (ref. par. 5.3).

7.1.7 S-BAND ANOMALY

The so-called "S-Band anomaly" affects the RA-2 data products quality. Hereafter, the table lists the products files affected by the S-band anomaly problem during cycle 24. This corresponds to a total percentage of about 4.5% of the acquired data.
Being the method used a statistical one working on ocean data; files containing less than 1000 seconds of data over ocean have not been considered. This choice is supported by the fact that the "S-Band anomaly" is associated to a particular instrumental behavior that cannot appear and disappear within a short time frame. (ref. [R – 7])

File name	Start date	Start time	Stop date	Stop time
RA2_FGD_2PNPDE20040207_011716_000062232024_00060_10134_0494.N1	07-Feb-04	01:17:16.146966	07-Feb-04	03:00:58.895031
RA2_FGD_2PNPDE20040207_025944_000061212024_00061_10135_0495.N1	07-Feb-04	02:59:44.312732	07-Feb-04	04:41:45.686796
RA2_FGD_2PNPDE20040207_044032_000061382024_00062_10136_0496.N1	07-Feb-04	04:40:32.218500	07-Feb-04	06:22:50.302564
RA2_FGD_2PNPDK20040207_062141_000062872024_00063_10137_1145.N1	07-Feb-04	06:21:41.290267	07-Feb-04	08:06:28.650322
RA2_FGD_2PNPDK20040207_080519_000060692024_00064_10138_1146.N1	07-Feb-04	08:05:19.638031	07-Feb-04	09:46:28.654101
RA2_FGD_2PNPDK20040207_094521_000060792024_00065_10139_1147.N1	07-Feb-04	09:45:21.869804	07-Feb-04	11:26:40.911869
RA2_FGD_2PNPDK20040207_112529_000058972024_00066_10140_1148.N1	07-Feb-04	11:25:29.671567	07-Feb-04	13:03:47.131641
RA2_FGD_2PNPDK20040207_130129_000060982024_00067_10141_1149.N1	07-Feb-04	13:01:29.051353	07-Feb-04	14:43:07.031419
RA2_FGD_2PNPDK20040207_144131_000051902024_00068_10142_1150.N1	07-Feb-04	14:41:31.283122	07-Feb-04	16:08:01.353193
RA2_FGD_2PNPDK20040211_055646_000063092024_00120_10194_1196.N1	11-Feb-04	05:56:46.022602	11-Feb-04	07:41:54.548654
RA2_FGD_2PNPDK20040211_074034_000060762024_00121_10195_1197.N1	11-Feb-04	07:40:34.396360	11-Feb-04	09:21:50.096426
RA2_FGD_2PNPDK20040211_092054_000059062024_00122_10196_1198.N1	11-Feb-04	09:20:54.452131	11-Feb-04	10:59:20.824205
RA2_FGD_2PNPDK20040211_105819_000061682024_00123_10197_1199.N1	11-Feb-04	10:58:19.609901	11-Feb-04	12:41:07.771963
RA2_FGD_2PNPDK20040211_124003_000059122024_00124_10198_1200.N1	11-Feb-04	12:40:03.215667	11-Feb-04	14:18:35.157740
RA2_FGD_2PNPDE20040307_010510_000063012024_00475_10549_0652.N1	07-Mar-04	01:05:10.155385	07-Mar-04	02:50:10.883448
RA2_FGD_2PNPDE20040307_024906_000060452024_00476_10550_0653.N1	07-Mar-04	02:49:06.327150	07-Mar-04	04:29:50.835220
RA2_FGD_2PNPDE20040307_042841_000061242024_00477_10551_0654.N1	07-Mar-04	04:28:41.822923	07-Mar-04	06:10:45.424990
RA2_FGD_2PNPDK20040307_060934_000064342024_00478_10552_1481.N1	07-Mar-04	06:09:34.184692	07-Mar-04	07:56:48.592742
RA2_FGD_2PNPDK20040307_075600_000058532024_00479_10553_1482.N1	07-Mar-04	07:56:00.746444	07-Mar-04	09:33:33.646524
RA2_FGD_2PNPDK20040307_093224_000061992024_00480_10554_1483.N1	07-Mar-04	09:32:24.634227	07-Mar-04	11:15:43.988290
RA2_FGD_2PNPDK20040307_111412_000059162024_00481_10555_1484.N1	07-Mar-04	11:14:12.695995	07-Mar-04	12:52:49.094070
RA2_FGD_2PNPDK20040307_125136_000060712024_00482_10556_1485.N1	07-Mar-04	12:51:36.739773	07-Mar-04	14:32:47.983843
RA2_FGD_2PNPDK20040307_143107_000051252024_00483_10557_1486.N1	07-Mar-04	14:31:07.779545	07-Mar-04	15:56:33.237614

Table 4: List of L2 FGD Files affected by S-Band anomaly during cycle 24

A valuable algorithm to detect the RA-2 DSRs affected by the S-Band anomaly within the L2 products can be found in [R- 12]. Note that the algorithm is only valid for data acquired over open-ocean.

7.2 MWR Performances

For MWR performances please refer to the Reference CLS Cyclic Report of the type of [R – 2].

7.3 DORIS Performances

For DORIS performances refer to the Reference F-PAC Monthly Report of the type of [R - 1].

8 PRODUCT PERFORMANCES

8.1 Availability of data

In Figure 9 and Table 5 the summary of unavailable RA-2 L0 products is given.
It is easy to notice that close to the Himalayan region a small gap in the data is present. This is due to the daily instrument switch-off (Heater 2 mode) performed to prevent the S-Band anomaly to last more than one day when it occurs

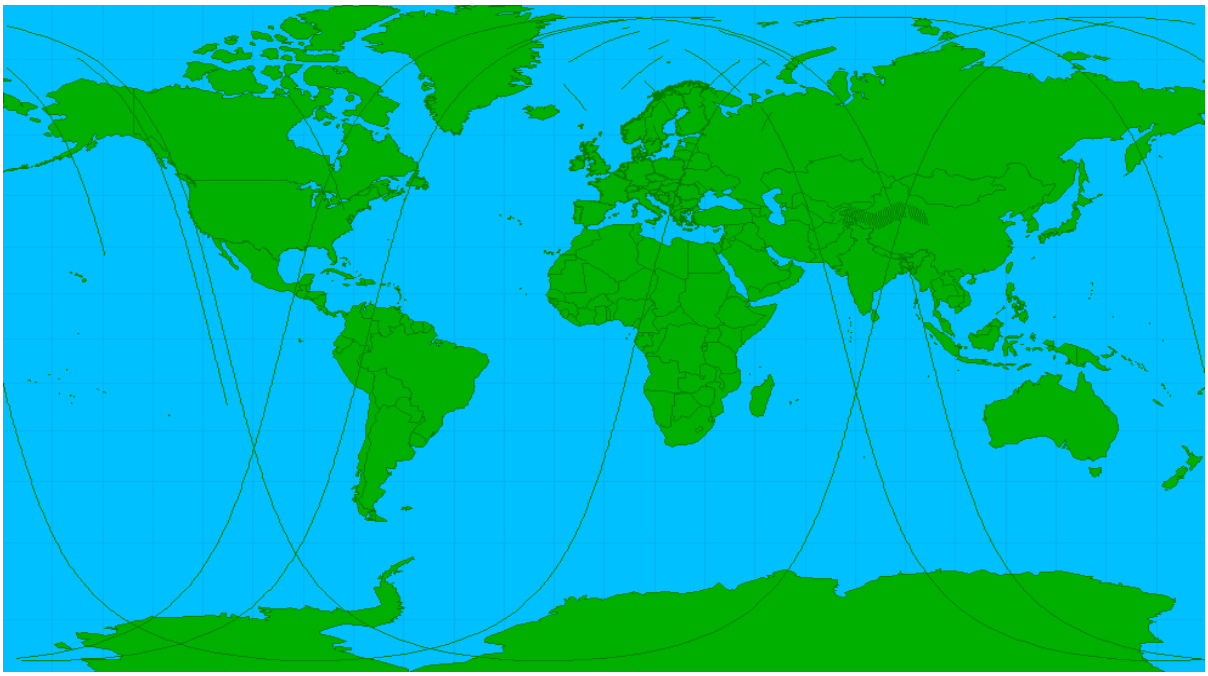

Figure 9: RA-2 L0 unavailable products for first part of cycle 24

Start date	Start time	Stop date	Stop time	Duration (s)	Start orbit	Stop orbit	Reason
03-Feb-04	16:36:40	03-Feb-04	16:37:58	78	10086	10086	PDS_UNKNOWN_FAILURE
04-Feb-04	02:41:19	04-Feb-04	02:49:44	505	10092	10092	PDS_UNKNOWN_FAILURE
04-Feb-04	05:44:43	04-Feb-04	06:12:38	1675	10093	10094	PDS_UNKNOWN_FAILURE
04-Feb-04	07:39:18	04-Feb-04	07:55:55	997	10095	10095	PDS_UNKNOWN_FAILURE
04-Feb-04	16:04:37	04-Feb-04	16:05:55	78	10100	10100	PDS_UNKNOWN_FAILURE
05-Feb-04	15:33:52	05-Feb-04	15:35:10	78	10114	10114	PDS_UNKNOWN_FAILURE
06-Feb-04	16:42:05	06-Feb-04	16:43:22	77	10129	10129	PDS_UNKNOWN_FAILURE
07-Feb-04	16:10:20	07-Feb-04	16:11:38	78	10143	10143	PDS_UNKNOWN_FAILURE

08-Feb-04	15:36:27	08-Feb-04	15:36:30	3	10157	10157	PDS_UNKNOWN_FAILURE
08-Feb-04	15:39:28	08-Feb-04	15:40:46	78	10157	10157	PDS_UNKNOWN_FAILURE
09-Feb-04	15:07:20	09-Feb-04	15:08:37	77	10171	10171	PDS_UNKNOWN_FAILURE
10-Feb-04	16:16:15	10-Feb-04	16:17:32	77	10186	10186	PDS_UNKNOWN_FAILURE
11-Feb-04	14:18:34	11-Feb-04	15:42:08	5014	10199	10200	PDS_UNKNOWN_FAILURE
11-Feb-04	15:45:04	11-Feb-04	17:33:52	6528	10200	10201	PDS_UNKNOWN_FAILURE
12-Feb-04	15:13:14	12-Feb-04	15:14:32	78	10214	10214	PDS_UNKNOWN_FAILURE
13-Feb-04	16:22:09	13-Feb-04	16:23:27	78	10229	10229	PDS_UNKNOWN_FAILURE
14-Feb-04	15:47:50	14-Feb-04	15:47:53	3	10243	10243	PDS_UNKNOWN_FAILURE
14-Feb-04	15:50:39	14-Feb-04	15:51:57	78	10243	10243	PDS_UNKNOWN_FAILURE
15-Feb-04	15:16:42	15-Feb-04	15:16:44	2	10257	10257	PDS_UNKNOWN_FAILURE
15-Feb-04	15:19:09	15-Feb-04	15:20:27	78	10257	10257	PDS_UNKNOWN_FAILURE
16-Feb-04	11:43:10	16-Feb-04	11:43:43	33	10269	10269	PDS_UNKNOWN_FAILURE
16-Feb-04	13:22:52	16-Feb-04	13:23:01	9	10270	10270	PDS_UNKNOWN_FAILURE
16-Feb-04	15:01:08	16-Feb-04	15:01:40	32	10271	10271	PDS_UNKNOWN_FAILURE
16-Feb-04	16:28:04	16-Feb-04	16:29:22	78	10272	10272	PDS_UNKNOWN_FAILURE
16-Feb-04	16:38:44	16-Feb-04	16:39:12	28	10272	10272	PDS_UNKNOWN_FAILURE
16-Feb-04	18:17:29	16-Feb-04	18:18:24	55	10273	10273	PDS_UNKNOWN_FAILURE
16-Feb-04	19:54:58	16-Feb-04	19:56:27	89	10274	10274	PDS_UNKNOWN_FAILURE
17-Feb-04	06:08:23	17-Feb-04	06:10:40	137	10280	10280	PDS_UNKNOWN_FAILURE
17-Feb-04	07:54:35	17-Feb-04	07:55:48	73	10281	10281	PDS_UNKNOWN_FAILURE
17-Feb-04	09:32:10	17-Feb-04	09:33:50	100	10282	10282	PDS_UNKNOWN_FAILURE
17-Feb-04	11:12:29	17-Feb-04	11:14:25	116	10283	10283	PDS_UNKNOWN_FAILURE
17-Feb-04	12:51:33	17-Feb-04	12:53:29	116	10284	10284	PDS_UNKNOWN_FAILURE
17-Feb-04	14:31:06	17-Feb-04	14:33:20	134	10285	10285	PDS_UNKNOWN_FAILURE
17-Feb-04	15:56:14	17-Feb-04	15:57:32	78	10286	10286	PDS_UNKNOWN_FAILURE
17-Feb-04	16:07:12	17-Feb-04	16:09:15	123	10286	10286	PDS_UNKNOWN_FAILURE
17-Feb-04	17:46:12	17-Feb-04	17:48:40	148	10287	10287	PDS_UNKNOWN_FAILURE
17-Feb-04	19:24:26	17-Feb-04	19:27:32	186	10288	10288	PDS_UNKNOWN_FAILURE
17-Feb-04	21:06:17	17-Feb-04	21:07:54	97	10289	10289	PDS_UNKNOWN_FAILURE
18-Feb-04	09:00:32	18-Feb-04	10:38:38	5886	10296	10297	PDS_UNKNOWN_FAILURE
18-Feb-04	15:25:03	18-Feb-04	15:26:21	78	10300	10300	PDS_UNKNOWN_FAILURE
19-Feb-04	16:33:58	19-Feb-04	16:35:16	78	10315	10315	PDS_UNKNOWN_FAILURE
20-Feb-04	16:01:49	20-Feb-04	16:03:07	78	10329	10329	PDS_UNKNOWN_FAILURE
21-Feb-04	15:30:58	21-Feb-04	15:32:16	78	10343	10343	PDS_UNKNOWN_FAILURE
22-Feb-04	16:39:22	22-Feb-04	16:40:40	78	10358	10358	PDS_UNKNOWN_FAILURE
23-Feb-04	16:07:25	23-Feb-04	16:08:42	77	10372	10372	PDS_UNKNOWN_FAILURE
24-Feb-04	15:36:39	24-Feb-04	15:37:57	78	10386	10386	PDS_UNKNOWN_FAILURE
25-Feb-04	16:44:46	25-Feb-04	16:46:04	78	10401	10401	PDS_UNKNOWN_FAILURE
26-Feb-04	16:13:17	26-Feb-04	16:14:35	78	10415	10415	PDS_UNKNOWN_FAILURE
27-Feb-04	15:42:16	27-Feb-04	15:43:33	77	10429	10429	PDS_UNKNOWN_FAILURE
28-Feb-04	15:10:17	28-Feb-04	15:11:35	78	10443	10443	PDS_UNKNOWN_FAILURE
29-Feb-04	16:19:12	29-Feb-04	16:20:30	78	10458	10458	PDS_UNKNOWN_FAILURE

01-Mar-04	04:19:11	01-Mar-04	05:59:48	6037	10465	10466	PDS_UNKNOWN_FAILURE
01-Mar-04	15:44:59	01-Mar-04	15:45:01	2	10472	10472	PDS_UNKNOWN_FAILURE
01-Mar-04	15:47:52	01-Mar-04	15:49:10	78	10472	10472	PDS_UNKNOWN_FAILURE
02-Mar-04	15:16:12	02-Mar-04	15:17:30	78	10486	10486	PDS_UNKNOWN_FAILURE
03-Mar-04	16:25:08	03-Mar-04	16:26:26	78	10501	10501	PDS_UNKNOWN_FAILURE
04-Mar-04	15:53:28	04-Mar-04	15:54:46	78	10515	10515	PDS_UNKNOWN_FAILURE
05-Mar-04	15:22:08	05-Mar-04	15:23:26	78	10529	10529	PDS_UNKNOWN_FAILURE
06-Mar-04	16:31:03	06-Mar-04	16:32:21	78	10544	10544	PDS_UNKNOWN_FAILURE
07-Mar-04	15:59:04	07-Mar-04	16:00:22	78	10558	10558	PDS_UNKNOWN_FAILURE
08-Mar-04	15:28:03	08-Mar-04	15:29:21	78	10572	10572	PDS_UNKNOWN_FAILURE

Table 5: List of gaps for RA-2 L0 products during cycle 24

In Figure 10 and Table 6 the summary of unavailable MWR L0 products is given.

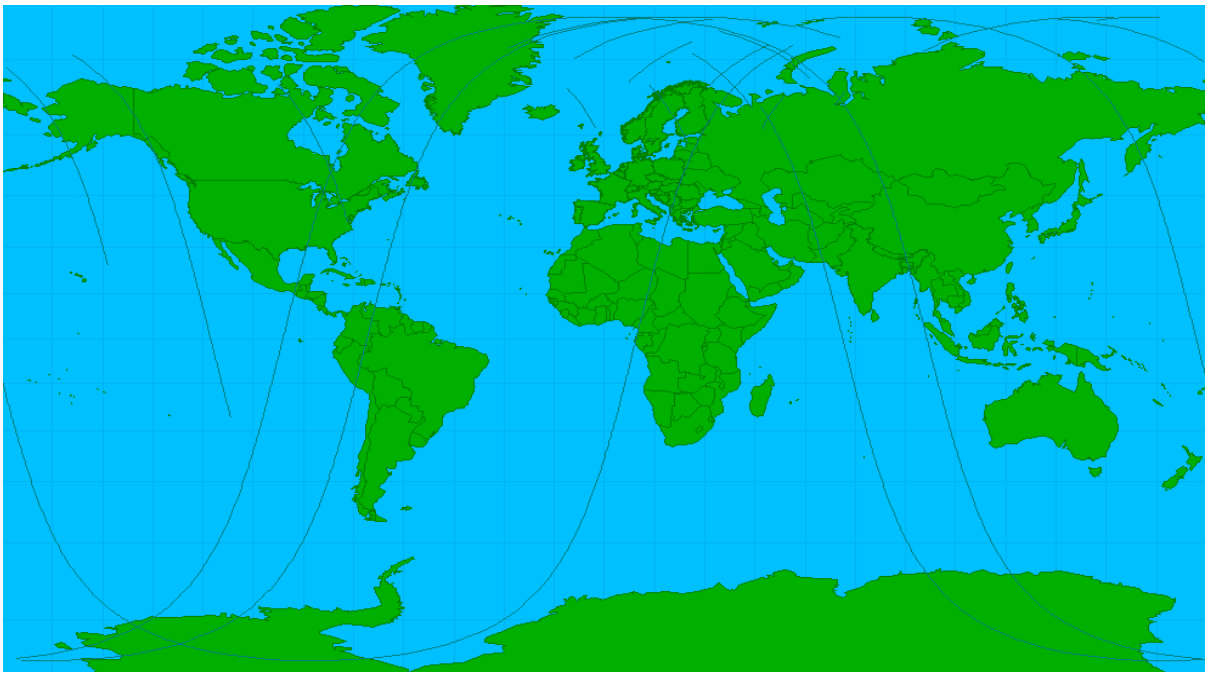

Figure 10: MWR L0 unavailable products for cycle 24

Start date	Start time	Stop date	Stop time	Duration (s)	Start orbit	Stop orbit	Reason
04-Feb-04	02:40:23	04-Feb-04	02:49:59	576	10092	10092	PDS_UNKNOWN_FAILURE
04-Feb-04	05:43:35	04-Feb-04	06:12:47	1752	10093	10094	PDS_UNKNOWN_FAILURE
04-Feb-04	07:38:24	04-Feb-04	07:56:00	1056	10095	10095	PDS_UNKNOWN_FAILURE
08-Feb-04	14:10:56	08-Feb-04	14:11:44	48	10156	10156	PDS_UNKNOWN_FAILURE
11-Feb-04	14:17:26	11-Feb-04	17:33:51	11785	10199	10201	PDS_UNKNOWN_FAILURE
16-Feb-04	04:58:24	16-Feb-04	04:59:12	48	10265	10265	PDS_UNKNOWN_FAILURE
16-Feb-04	06:44:24	16-Feb-04	06:45:12	48	10266	10266	PDS_UNKNOWN_FAILURE
17-Feb-04	06:07:14	17-Feb-04	06:10:26	192	10280	10280	PDS_UNKNOWN_FAILURE

17-Feb-04	07:53:38	17-Feb-04	07:55:38	120	10281	10281	PDS_UNKNOWN_FAILURE
17-Feb-04	09:31:14	17-Feb-04	09:33:38	144	10282	10282	PDS_UNKNOWN_FAILURE
17-Feb-04	11:11:38	17-Feb-04	11:14:02	144	10283	10283	PDS_UNKNOWN_FAILURE
17-Feb-04	12:50:26	17-Feb-04	12:53:14	168	10284	10284	PDS_UNKNOWN_FAILURE
17-Feb-04	14:30:02	17-Feb-04	14:33:14	192	10285	10285	PDS_UNKNOWN_FAILURE
17-Feb-04	16:06:27	17-Feb-04	16:09:15	168	10286	10286	PDS_UNKNOWN_FAILURE
17-Feb-04	17:45:15	17-Feb-04	17:48:27	192	10287	10287	PDS_UNKNOWN_FAILURE
17-Feb-04	19:23:39	17-Feb-04	19:27:15	216	10288	10288	PDS_UNKNOWN_FAILURE
17-Feb-04	21:05:15	17-Feb-04	21:07:39	144	10289	10289	PDS_UNKNOWN_FAILURE
18-Feb-04	08:59:40	18-Feb-04	10:38:28	5928	10296	10297	PDS_UNKNOWN_FAILURE
01-Mar-04	04:18:04	01-Mar-04	05:59:40	6096	10465	10466	PDS_UNKNOWN_FAILURE

Table 6: List of gaps for MWR L0 products during cycle 24

In Figure 11 and Table 7 the summary of unavailable RA-2 L1b products is given.

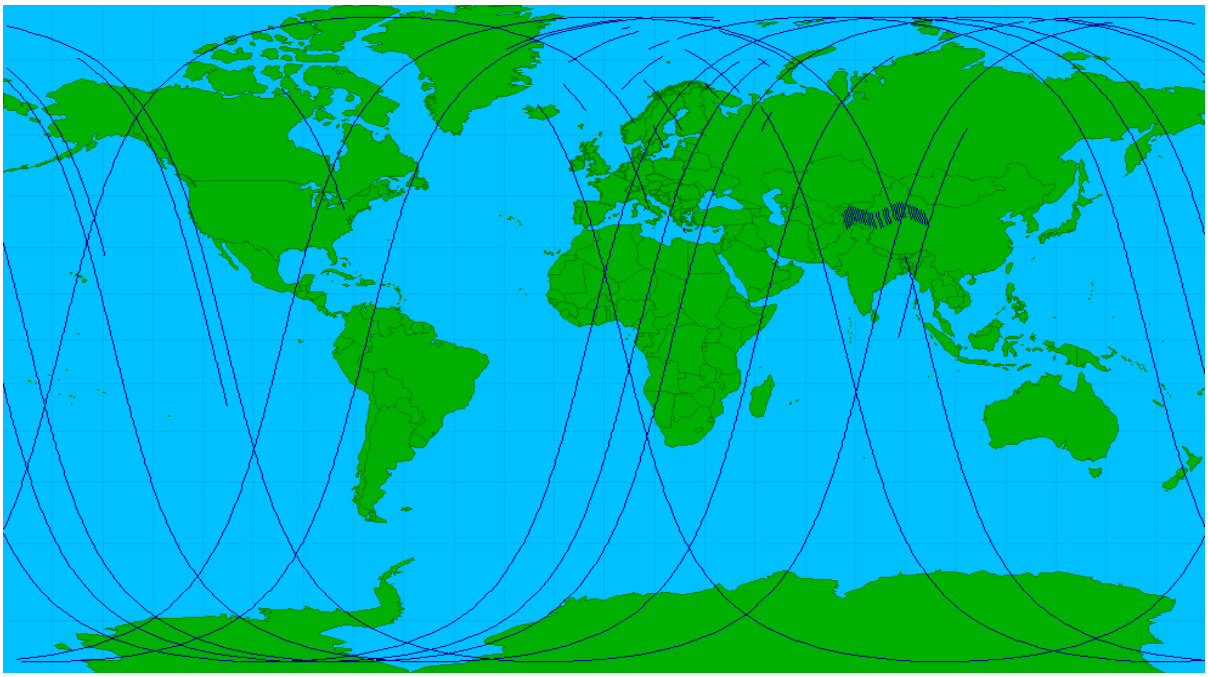

Figure 11: RA-2 L1b unavailable products for cycle 24

Start date	Start time	Stop date	Stop time	Duration (s)	Start orbit	Stop orbit	Reason
03-Feb-04	16:36:40	03-Feb-04	16:37:58	78	10086	10086	PDS_UNKNOWN_FAILURE
04-Feb-04	02:41:20	04-Feb-04	02:49:44	504	10092	10092	PDS_UNKNOWN_FAILURE
04-Feb-04	05:44:44	04-Feb-04	06:12:38	1674	10093	10094	PDS_UNKNOWN_FAILURE
04-Feb-04	07:39:19	04-Feb-04	07:55:55	996	10095	10095	PDS_UNKNOWN_FAILURE
04-Feb-04	16:04:37	04-Feb-04	16:05:55	78	10100	10100	PDS_UNKNOWN_FAILURE
05-Feb-04	15:33:52	05-Feb-04	15:35:10	78	10114	10114	PDS_UNKNOWN_FAILURE

05-Feb-04	20:36:29	05-Feb-04	20:36:44	15	10117	10117	PDS_UNKNOWN_FAILURE
05-Feb-04	20:36:48	05-Feb-04	20:41:01	253	10117	10117	PDS_UNKNOWN_FAILURE
06-Feb-04	16:42:05	06-Feb-04	16:43:22	77	10129	10129	PDS_UNKNOWN_FAILURE
07-Feb-04	16:10:20	07-Feb-04	16:11:38	78	10143	10143	PDS_UNKNOWN_FAILURE
08-Feb-04	15:39:28	08-Feb-04	15:40:46	78	10157	10157	PDS_UNKNOWN_FAILURE
09-Feb-04	15:07:20	09-Feb-04	15:08:37	77	10171	10171	PDS_UNKNOWN_FAILURE
09-Feb-04	20:16:41	09-Feb-04	21:58:27	6106	10174	10175	PDS_UNKNOWN_FAILURE
10-Feb-04	16:16:15	10-Feb-04	16:17:32	77	10186	10186	PDS_UNKNOWN_FAILURE
10-Feb-04	16:17:32	10-Feb-04	16:17:33	1	10186	10186	PDS_UNKNOWN_FAILURE
11-Feb-04	14:18:35	11-Feb-04	15:42:08	5013	10199	10200	PDS_UNKNOWN_FAILURE
11-Feb-04	15:45:04	11-Feb-04	17:33:52	6528	10200	10201	PDS_UNKNOWN_FAILURE
12-Feb-04	03:51:17	12-Feb-04	04:08:42	1045	10207	10207	PDS_UNKNOWN_FAILURE
12-Feb-04	15:13:14	12-Feb-04	15:14:32	78	10214	10214	PDS_UNKNOWN_FAILURE
13-Feb-04	06:36:35	13-Feb-04	11:37:20	18045	10223	10226	PDS_UNKNOWN_FAILURE
13-Feb-04	16:22:09	13-Feb-04	16:23:27	78	10229	10229	PDS_UNKNOWN_FAILURE
14-Feb-04	15:47:51	14-Feb-04	15:47:53	2	10243	10243	PDS_UNKNOWN_FAILURE
14-Feb-04	15:50:39	14-Feb-04	15:51:57	78	10243	10243	PDS_UNKNOWN_FAILURE
15-Feb-04	15:19:09	15-Feb-04	15:20:27	78	10257	10257	PDS_UNKNOWN_FAILURE
16-Feb-04	11:43:11	16-Feb-04	11:43:43	32	10269	10269	PDS_UNKNOWN_FAILURE
16-Feb-04	13:22:53	16-Feb-04	13:23:01	8	10270	10270	PDS_UNKNOWN_FAILURE
16-Feb-04	15:01:09	16-Feb-04	15:01:40	31	10271	10271	PDS_UNKNOWN_FAILURE
16-Feb-04	16:28:04	16-Feb-04	16:29:22	78	10272	10272	PDS_UNKNOWN_FAILURE
16-Feb-04	16:38:45	16-Feb-04	16:39:12	27	10272	10272	PDS_UNKNOWN_FAILURE
16-Feb-04	18:17:30	16-Feb-04	18:18:24	54	10273	10273	PDS_UNKNOWN_FAILURE
16-Feb-04	19:54:59	16-Feb-04	19:56:27	88	10274	10274	PDS_UNKNOWN_FAILURE
17-Feb-04	06:08:24	17-Feb-04	06:10:40	136	10280	10280	PDS_UNKNOWN_FAILURE
17-Feb-04	07:54:36	17-Feb-04	07:55:48	72	10281	10281	PDS_UNKNOWN_FAILURE
17-Feb-04	09:32:11	17-Feb-04	09:33:50	99	10282	10282	PDS_UNKNOWN_FAILURE
17-Feb-04	09:41:57	17-Feb-04	09:42:10	13	10282	10282	PDS_UNKNOWN_FAILURE
17-Feb-04	11:12:30	17-Feb-04	11:14:25	115	10283	10283	PDS_UNKNOWN_FAILURE
17-Feb-04	12:51:34	17-Feb-04	12:53:29	115	10284	10284	PDS_UNKNOWN_FAILURE
17-Feb-04	14:31:07	17-Feb-04	14:33:20	133	10285	10285	PDS_UNKNOWN_FAILURE
17-Feb-04	15:56:14	17-Feb-04	15:57:32	78	10286	10286	PDS_UNKNOWN_FAILURE
17-Feb-04	16:07:13	17-Feb-04	16:09:15	122	10286	10286	PDS_UNKNOWN_FAILURE
17-Feb-04	17:46:13	17-Feb-04	17:48:40	147	10287	10287	PDS_UNKNOWN_FAILURE
17-Feb-04	19:24:28	17-Feb-04	19:27:32	184	10288	10288	PDS_UNKNOWN_FAILURE
17-Feb-04	19:27:32	17-Feb-04	19:27:33	1	10288	10288	PDS_UNKNOWN_FAILURE
17-Feb-04	21:06:18	17-Feb-04	21:07:54	96	10289	10289	PDS_UNKNOWN_FAILURE
18-Feb-04	09:00:33	18-Feb-04	10:38:38	5885	10296	10297	PDS_UNKNOWN_FAILURE
18-Feb-04	15:25:03	18-Feb-04	15:26:21	78	10300	10300	PDS_UNKNOWN_FAILURE
19-Feb-04	16:33:58	19-Feb-04	16:35:16	78	10315	10315	PDS_UNKNOWN_FAILURE
20-Feb-04	16:01:49	20-Feb-04	16:03:07	78	10329	10329	PDS_UNKNOWN_FAILURE
21-Feb-04	15:30:58	21-Feb-04	15:32:16	78	10343	10343	PDS_UNKNOWN_FAILURE

22-Feb-04	16:39:22	22-Feb-04	16:40:40	78	10358	10358	PDS_UNKNOWN_FAILURE
22-Feb-04	19:59:55	22-Feb-04	20:00:20	25	10360	10360	PDS_UNKNOWN_FAILURE
24-Feb-04	15:36:39	24-Feb-04	15:37:57	78	10386	10386	PDS_UNKNOWN_FAILURE
25-Feb-04	16:44:46	25-Feb-04	16:46:04	78	10401	10401	PDS_UNKNOWN_FAILURE
26-Feb-04	16:13:17	26-Feb-04	16:14:35	78	10415	10415	PDS_UNKNOWN_FAILURE
27-Feb-04	15:42:16	27-Feb-04	15:43:33	77	10429	10429	PDS_UNKNOWN_FAILURE
28-Feb-04	15:10:17	28-Feb-04	15:11:35	78	10443	10443	PDS_UNKNOWN_FAILURE
29-Feb-04	16:19:12	29-Feb-04	16:20:30	78	10458	10458	PDS_UNKNOWN_FAILURE
01-Mar-04	04:19:12	01-Mar-04	05:59:48	6036	10465	10466	PDS_UNKNOWN_FAILURE
02-Mar-04	15:16:12	02-Mar-04	15:17:30	78	10486	10486	PDS_UNKNOWN_FAILURE
03-Mar-04	16:25:08	03-Mar-04	16:26:26	78	10501	10501	PDS_UNKNOWN_FAILURE
04-Mar-04	15:53:28	04-Mar-04	15:54:46	78	10515	10515	PDS_UNKNOWN_FAILURE
05-Mar-04	15:22:08	05-Mar-04	15:23:26	78	10529	10529	PDS_UNKNOWN_FAILURE
06-Mar-04	16:31:03	06-Mar-04	16:32:21	78	10544	10544	PDS_UNKNOWN_FAILURE
07-Mar-04	15:59:04	07-Mar-04	16:00:22	78	10558	10558	PDS_UNKNOWN_FAILURE

Table 7: List of gaps for RA-2 L1b products during cycle 24

8.2 RA-2 Altimeter Parameters

Hereafter a summary of the main Altimetric parameters performances is reported; these results have been obtained with the editing criteria mentioned in par. 8.3.

8.2.1 ALTIMETER RANGE

No current results for the time being. The monitoring of the RA-2 FD altimetric range shall be done once the NRT products shall be upgraded with the DORIS navigator NRT orbital information.

8.2.2 SIGNIFICANT WAVE HEIGHT

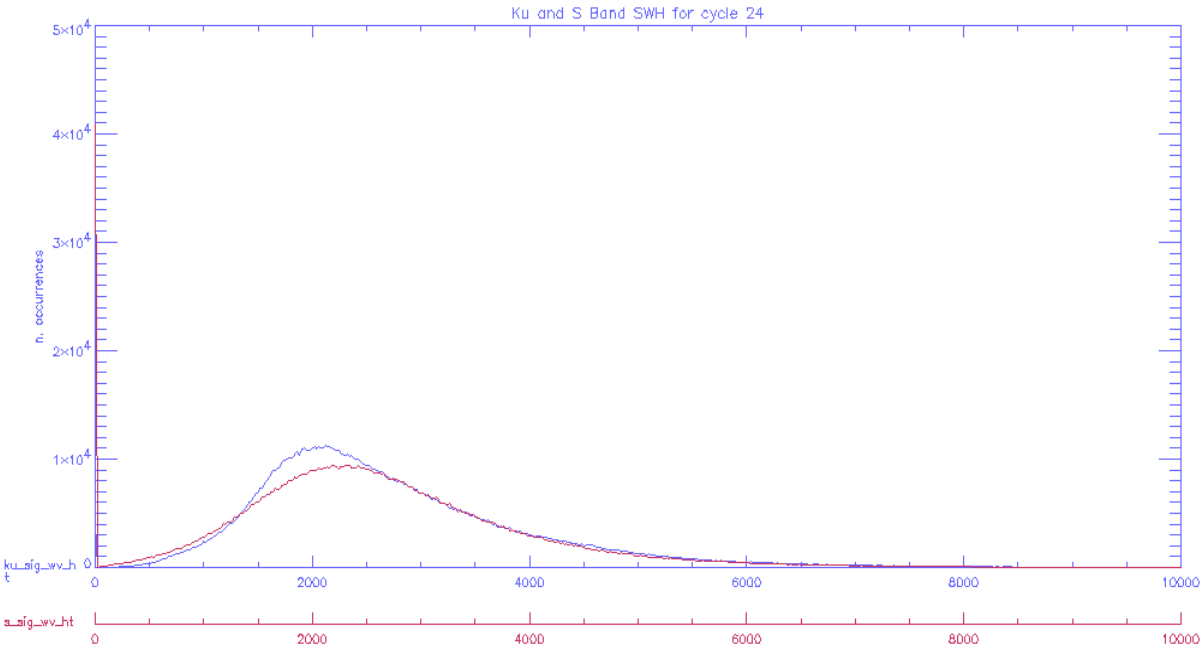

Figure 12: Histogram of Ku and S Band SWH for cycle 24 (mm)

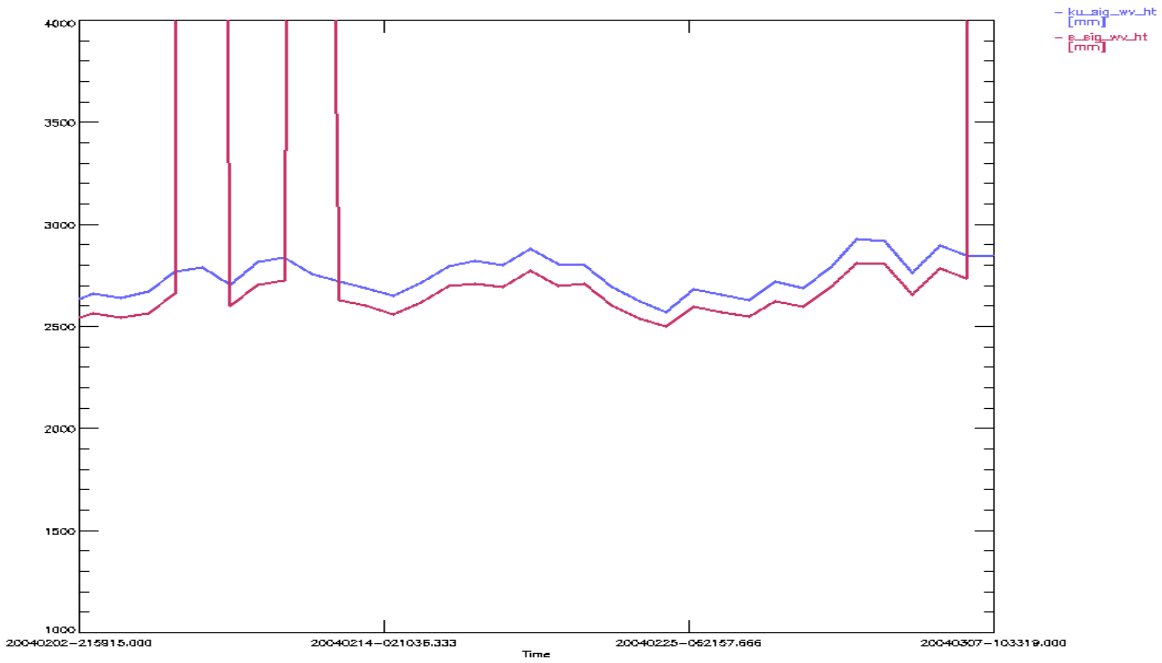

Figure 13: Ku and S SWH daily average for cycle 24 (mm)

The trend and the histogram of the SWH show a nominal behavior for this cycle; the high daily means reported for the S-Band values are due to the so-called S-Band anomaly (ref. par.7.1.7).

8.2.3 BACKSCATTER COEFFICIENT – WIND SPEED

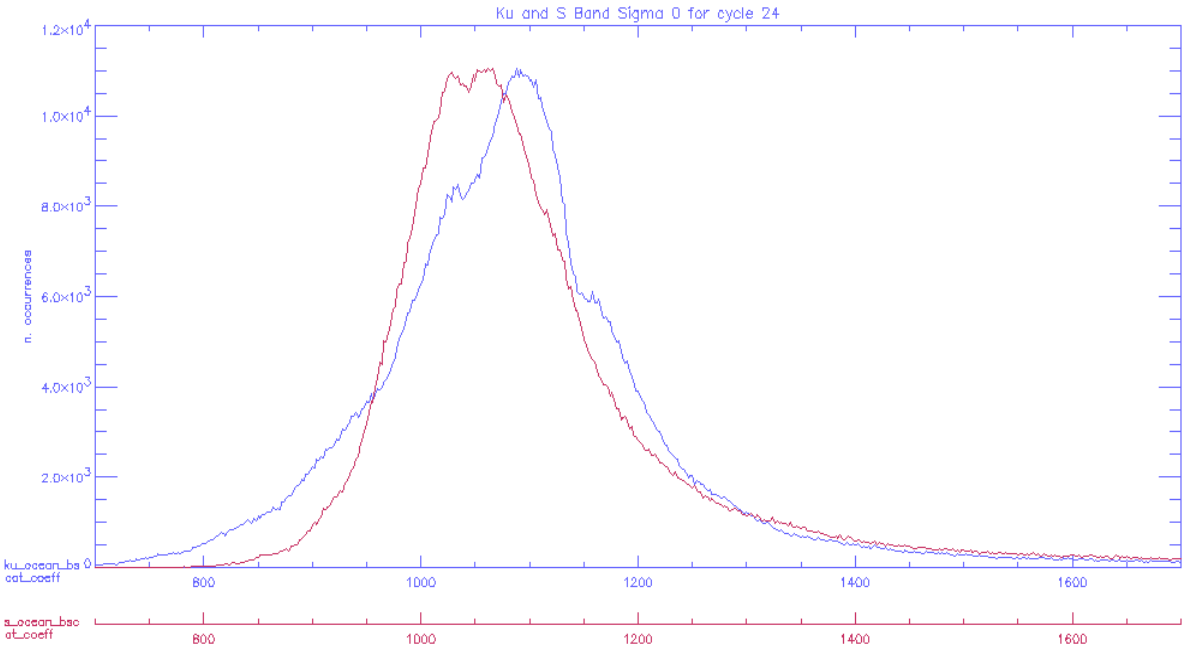

Figure 14: Histogram of Ku and S Band Backscattering Coefficient for cycle 24 (dB/100)

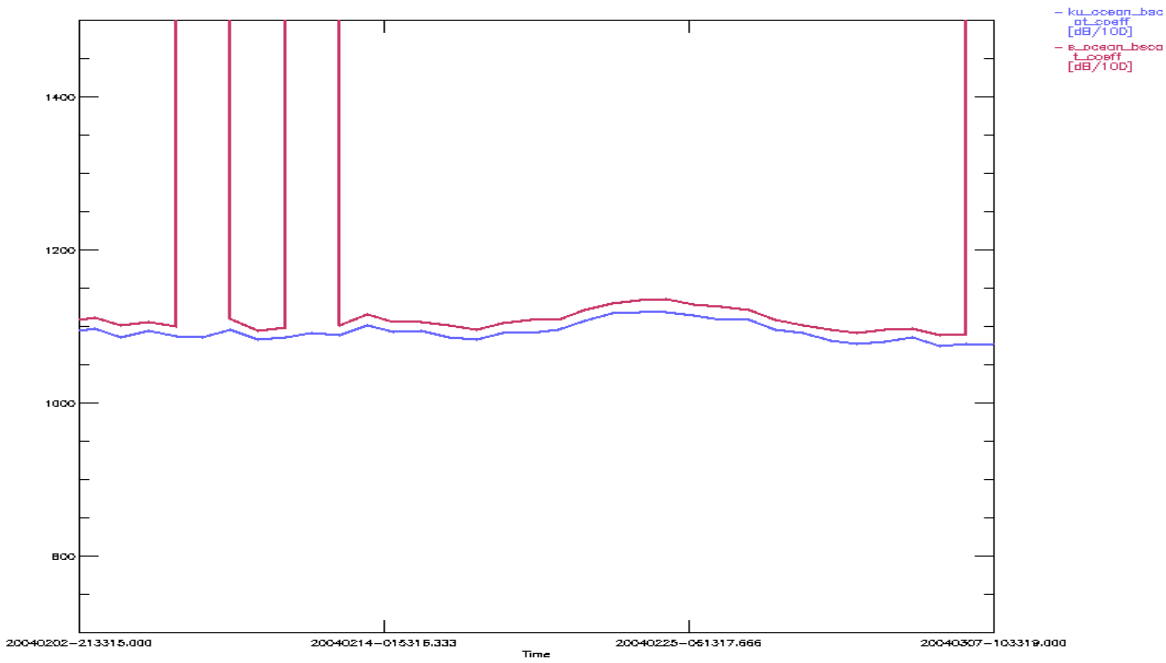

Figure 15: Ku and S Sigma_0 daily average for cycle 24 (dB/100)

The trend and the histogram of the Sigma_0 show a nominal behavior for this cycle; the high daily means reported for the S-Band values are due to the so-called S-Band anomaly (ref. par. 7.1.7).

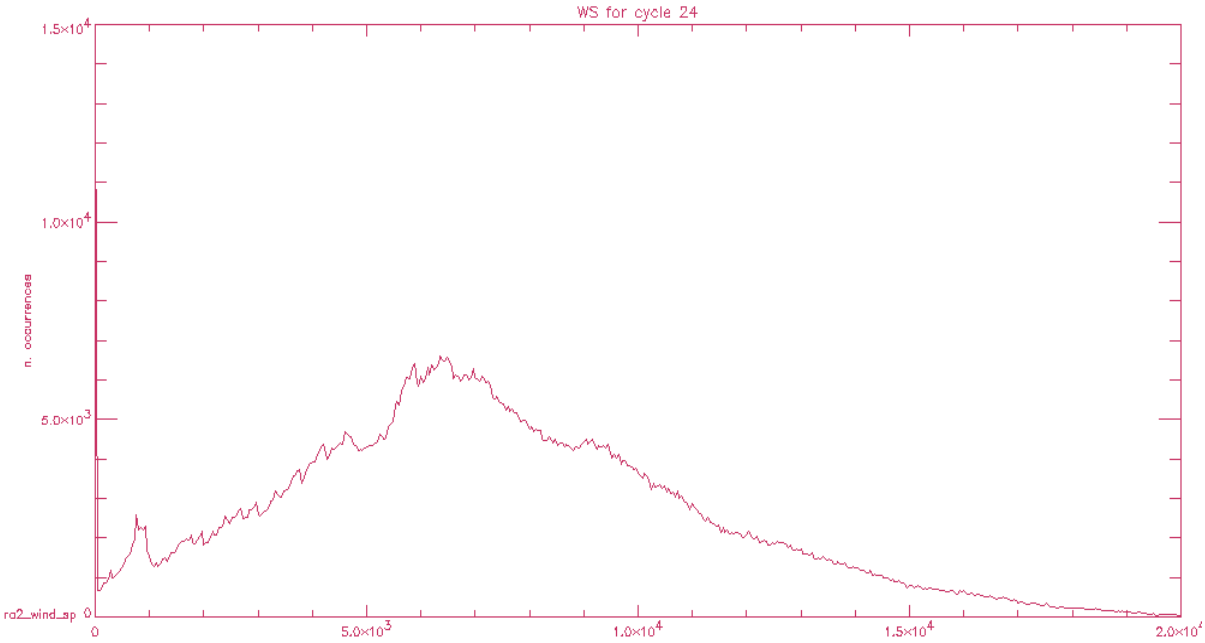

Figure 16: Histogram of Ku Wind Speed for cycle 24 (mm/s)

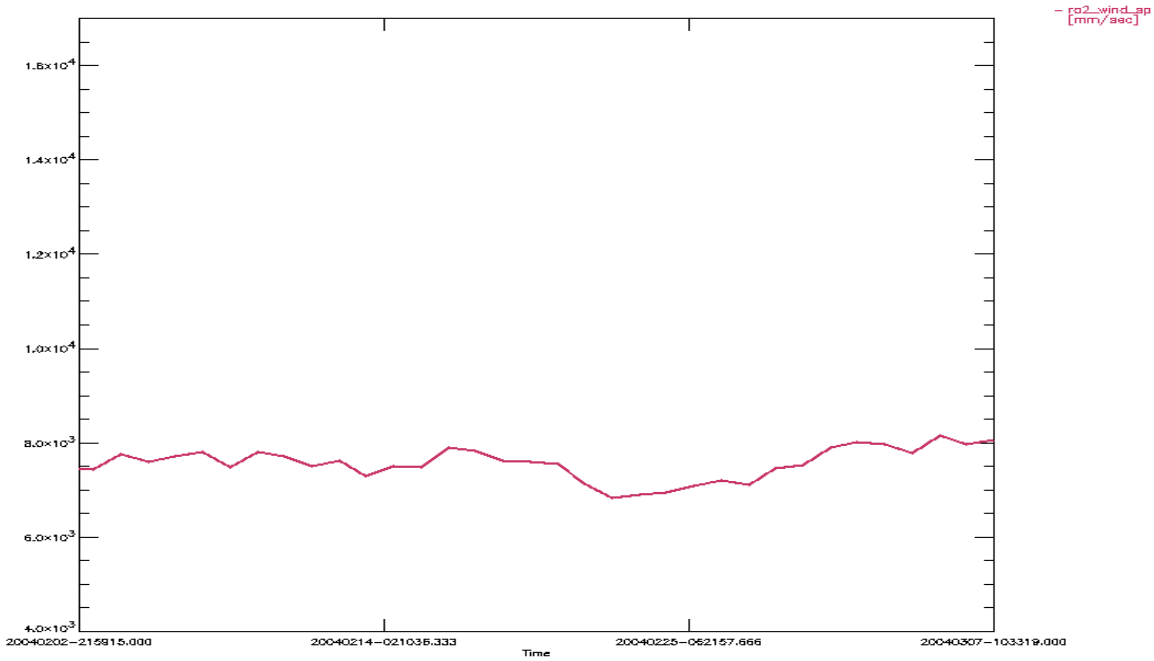

Figure 17: Wind Speed daily average for cycle 24 (mm/s)

8.3 Edited measurements

In order to produce the statistics reported in 8.2 the following editing criteria have been used before using RA2_FGD products:

Parameter	Surface type	Zone	Range
Ku SWH	Open Ocean	All world	[0, 10] (m)
Ku Backscattering Coeff.	Open ocean	All world	[7, 17] (dBs)
Ku Wind Speed	Open ocean	All world	[0, 20] (m/s)

Table 8: Editing criteria for RA-2 parameters statistics

8.4 Product disclaimer

For the product disclaimers please refer to the following web link:
http://envisat.esa.int/dataproducts/availability/

8.5 Data handling recommendations

8.5.1 SEA-ICE FLAG

The following algorithm is proposed for the determination of a sea-ice flag, presently missing in the Level 2 Ra-2 and MWR data products. (See [R – 14]):

|Latitude *(lat: field#4 of L2 data)*| >50 deg
AND
The number of 20Hz valid data *(num_18hz_ku_ocean: field#23 of L2 data)* < 17
OR
|MWR Wet Tropospheric Correction *(mwr_wet_tropo_corr: field#42 of L2 data)*–ECMWF Wet Tropospheric Correction *(mod_wet_tropo_corr: field#41 of L2 data)*| > 10 cm
OR
Peakiness *(Ku_peak: field#139 of L2 data)* >2

8.5.2 OCEAN S-BAND ANOMALIES DETECTION

A valuable algorithm to detect the Level 2 DSR affected by the RA-2 S-Band anomaly is proposed in [R- 12]. Note that its validity is limited to the data acquired over open-ocean.

8.5.3 WARNING ON IPF 4.56 VERSION IDENTIFICATION FIELD

All RA-2 and MWR level 1B and NRT Level 2 products generated after November 26, 2003 report a software version as being 4.54 (available in MPH field 8).

Nevertheless those products have been generated with the IPF V4.56 operational since November 26, 2003. The first nominal generated product, using the new SW version, will be the one relevant to the absolute orbit number 9094.

The software version ID is correct since December 4, 2003.

8.5.4 S-BAND BACKSCATTERING COEFFICIENT

For the data processed with IPF version 4.56 on, the S-Band Backscattering coefficient has been demonstrated to be in average about 0.65 dBs higher than for the previous versions of the processor. This is due to the algorithm used for the retrieval of the AGC in S-Band, corrected in IPF version 4.56 to be more coherent with the real functioning of the instrument.

An average value of 0.65 dBs is suggested to be added to the old software versions S-Band Sigma0 in order to be in line with the new IPF V4.56 version.

As a consequence of the IPF V4.56 s/w version installation, the rain flag validity is currently affected. This shall be corrected with the loading of a new ADF table.

8.5.5 USO RANGE CORRECTION

The actual data have to be corrected to compensate for the Ultra Stable Oscillator drift shown in Figure 19. The measured Range shall be corrected considering a drift of –2.90 mm per year. Eventually it could also be corrected for the given bias (33.66 mm) that has to be subtracted from the measured value.

8.6 Wind & Wave quality assessment

Refer to the ECMWF report given in [R – 9].

9 LONG TERM MONITORING

9.1 RA-2 Instrument monitoring

9.1.1 IF FILTER MASK

In Figure 18 the evolution of the IF mask quality parameters evaluated as in [R – 4] is reported only for valid data. It can be observed that the difference with respect to the on-ground reference stays quite constant around 0.07 dBs. Two peaks are visible on the plot that correspond to the data acquired on September the 27th at 15:48 and on October the 29th at 15:42. The reason of this could be found in the instrument warming up considering that the IF Cal acquisition has been made, in the two cases, only a couple of hours after an anomaly recovery. The residual noise and the accuracy show a very constant behavior over the whole period.

During cycle 24 the IF Calibration Mode still shows the weird behavior described in [R – 3]. This problem, present since the beginning of the mission, is under investigation. The anomaly directly affects the number of valid RA-2 IF masks obtained per cycle, but does not refrain from the generation of the IF mask correction file, used in input to the Level 1 B ground processing.

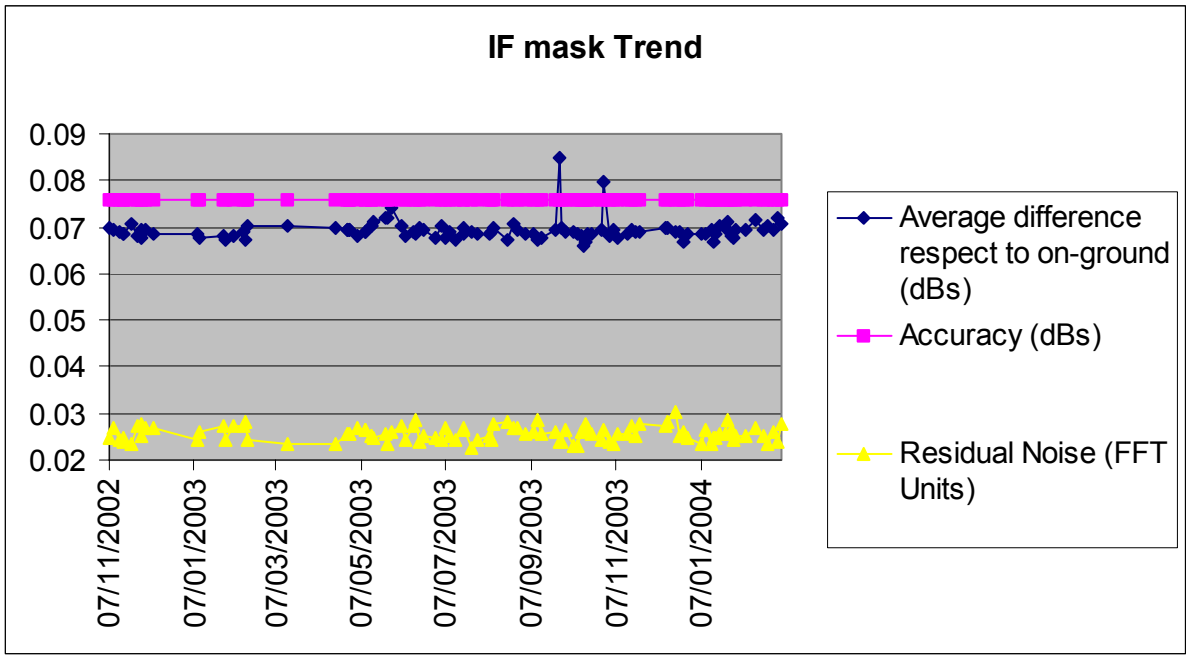

Figure 18: Evolution of the IF mask related parameters for valid IF masks retrieved until cycle 24.

9.1.2 USO

In Figure 19 the USO clock period trend retrieved until the end of cycle 24 is reported. In order to make the variability visible, the difference of the actual USO clock period with respect to the nominal one has been plotted, in the upper panel. In the lower panel the Range error due to the USO clock variability has been reported taking a satellite altitude of 800 Km as a nominal value.

Currently the nominal USO clock period (12500 ps) is used within the processing, this means that the data are not corrected for the bias and the drift correlated to the actual USO clock period. Those values, translated into altimetric range figures, are respectively of 32.66 mm and –2.90 mm/year as calculated with data covering the period 13 June 2003 to 8 March 2004. The given bias and drift have to subtracted from the original altimetric range.

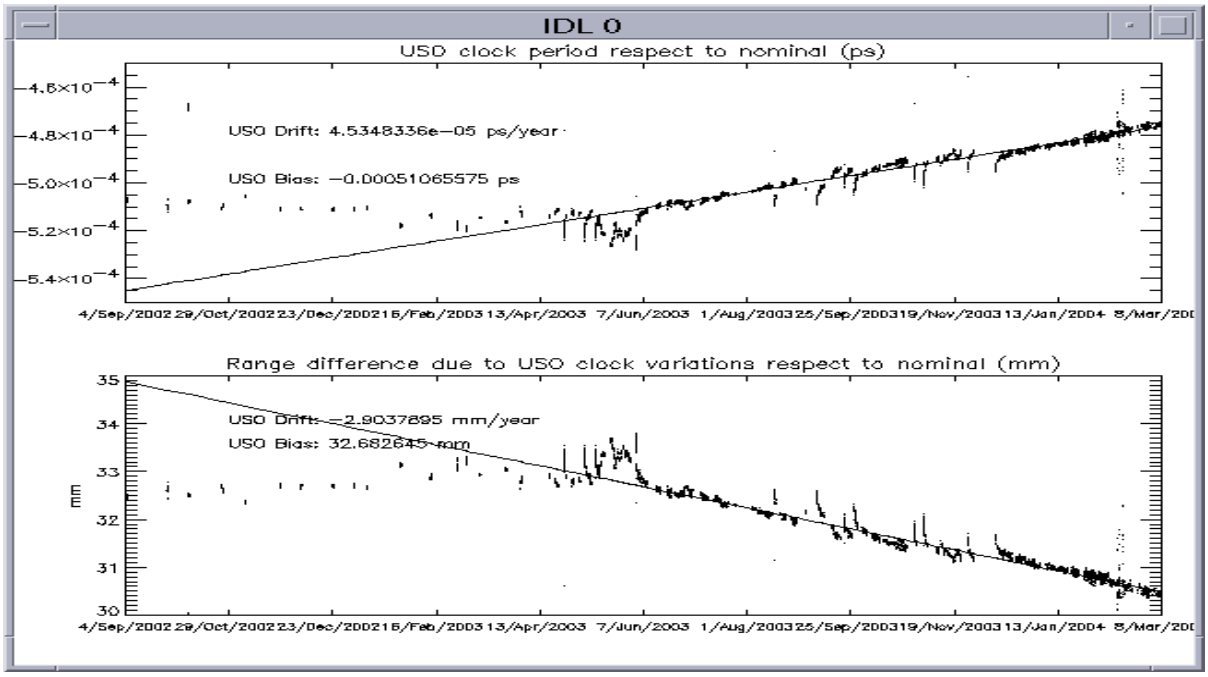

Figure 19: USO clock period until end of cycle 24

9.1.3 TRACKING CAPABILITY

In Figure 20, Figure 21 and Figure 22, the cyclic tracking percentages for the three RA-2 bandwidths are reported.
The worsening in performances noticeable for cycle 20 was due to the up-load of wrong on-board software parameters for the lasted for about three days.

In general, even if a tiny evolution can be observed, the tracking performances are well in line with the output figures and objectives of the Commissioning Phase as given in par. 7.1.3.

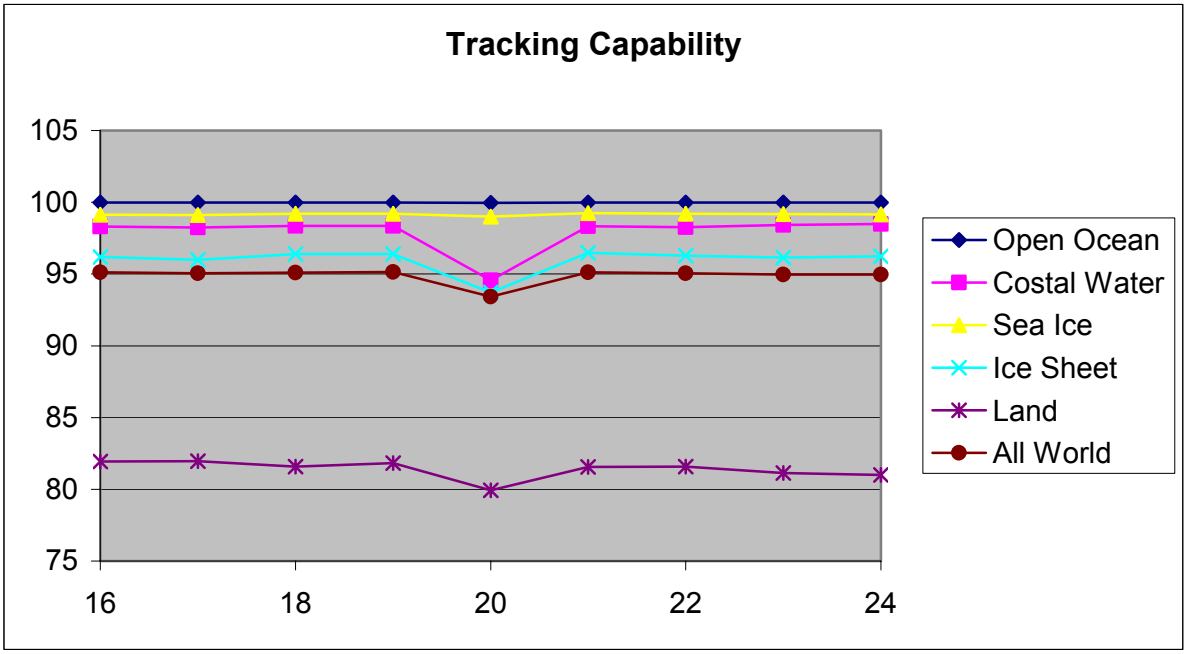

Figure 20: RA-2 Tracking percentage at 320MHz for different surfaces

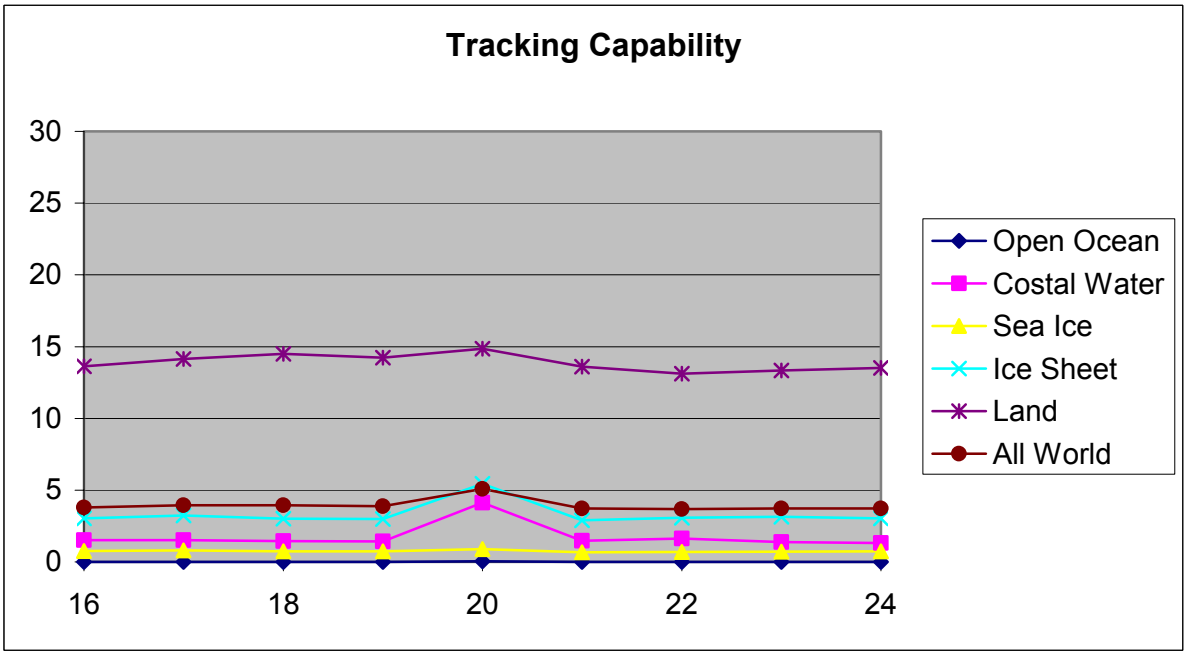

Figure 21: RA-2 Tracking percentage at 80MHz for different surfaces

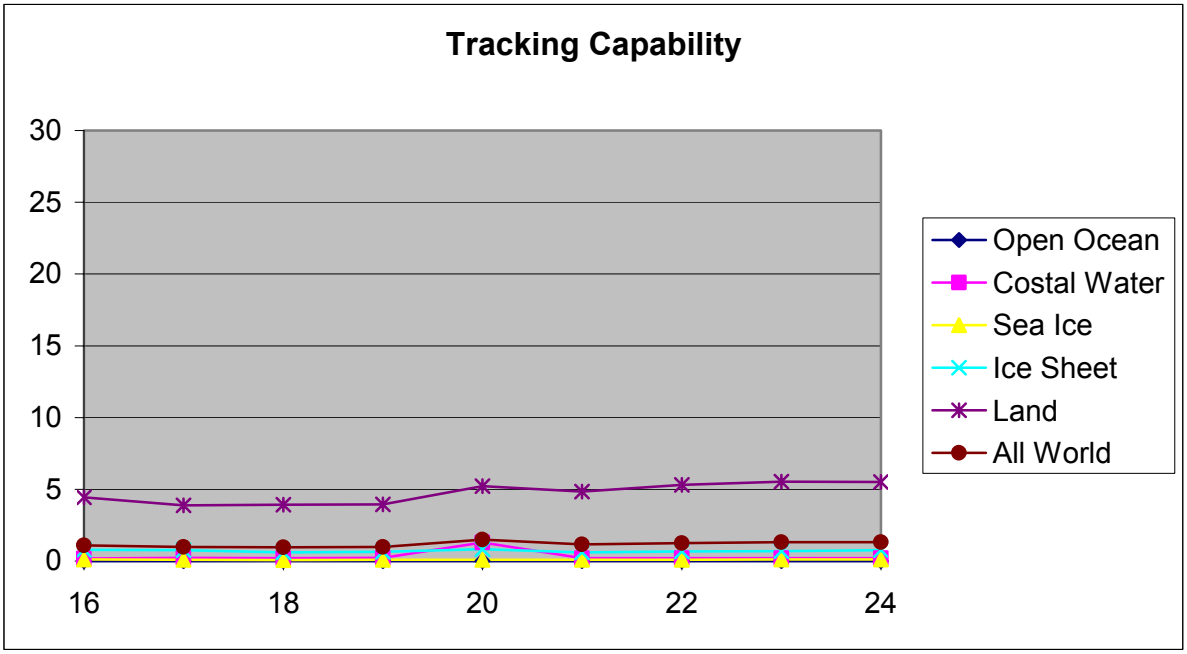

Figure 22: RA-2 Tracking percentage at 20MHz for different surfaces

9.1.4 DATATION

In Figure 23 (upper panel) the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported. Only few anomalous events can be observed at the beginning of the period (cycles 16/17) for which the difference rises above the 20 microseconds warning threshold. However, during the last cycle, the number of small differences (10 microseconds plus or minus) has increased a lot; this problem is under investigation.

In the lower panel the ICU clock step for the same period is shown where big variations are reported. This is however not a problem because the ICU clock period variations are included in the algorithm for the SBT/UTC correlation evaluation.

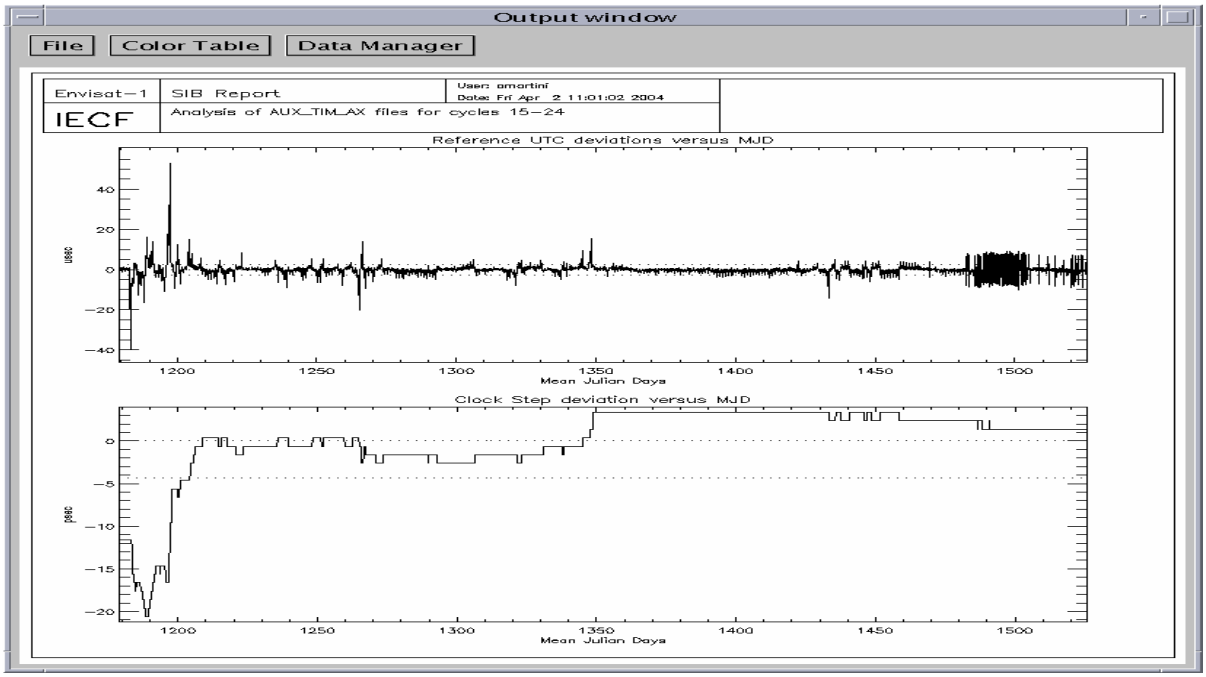

Figure 23: UTC deviations and ICU clock period up to cycle 24

9.1.5 MISPOINTING

In Figure 24 the overall mispointing squared trend is plotted for cycles 15 to 24. The two big jumps occurred on April the 7th and on November the 26th 2003 are correlated to the upload of IPF 4.54 and 4.56 respectively. In the second case the abrupt decreasing of the mispointing squared value is due to the usage of a new RA2_IFF_AX IF mask auxiliary file.
On the other hand, it can be noticed that the mispointing squared assumes lower values just after an instrument anomaly; showing an increasing trend until it reaches back a standard mispointing value. This particular behavior can be explained by the different shape that the over-ocean average waveform has before and after an anomalous event as visible in Figure 25. Observe, in particular, the disappearance of the small dip in the waveforms acquired after the anomaly. This problem will be solved with the introduction of an updated mispointing retrieval algorithm with the next version of the processing software as described in par. 5.4.4.

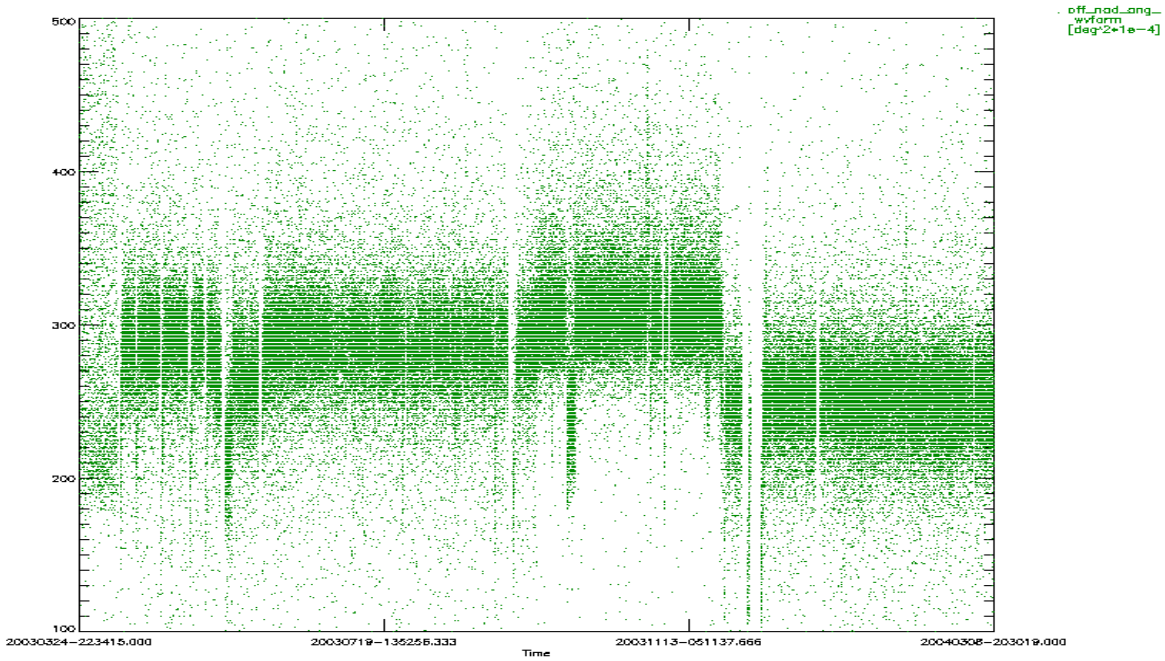

Figure 24: Smoothed mispointing squared trend until end of cycle 24 (deg^2*10e-4)

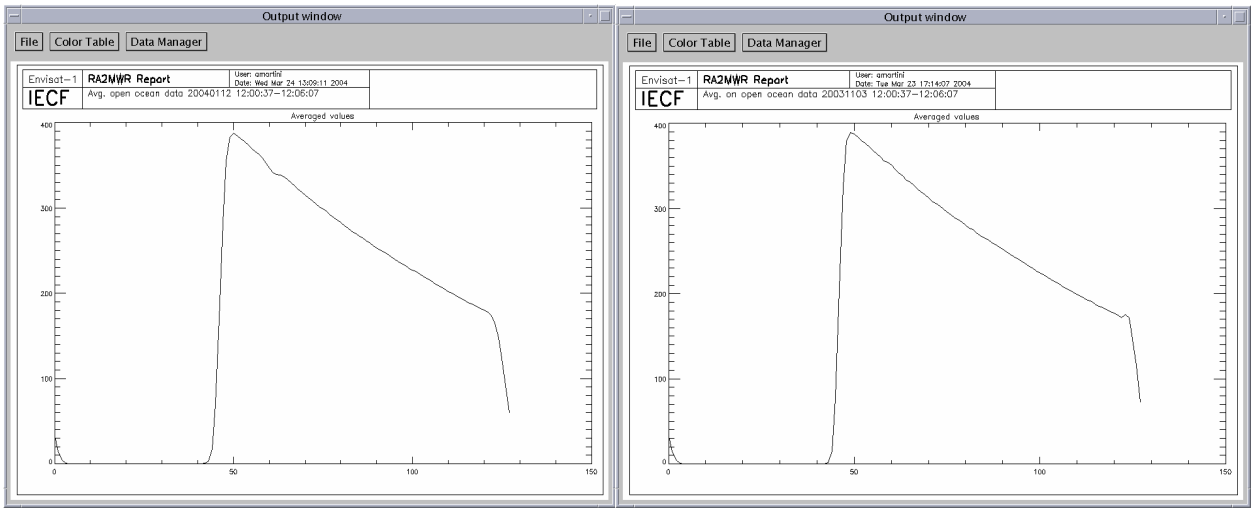

Figure 25: Open Ocean average waveforms before (left) and after an anomaly (right)

9.1.6 S-BAND ANOMALY

In the percentage of data per cycle that are affected by the so-called “S-Band” anomaly is reported. The figures are quite stable between 2.5% and 6.5%.

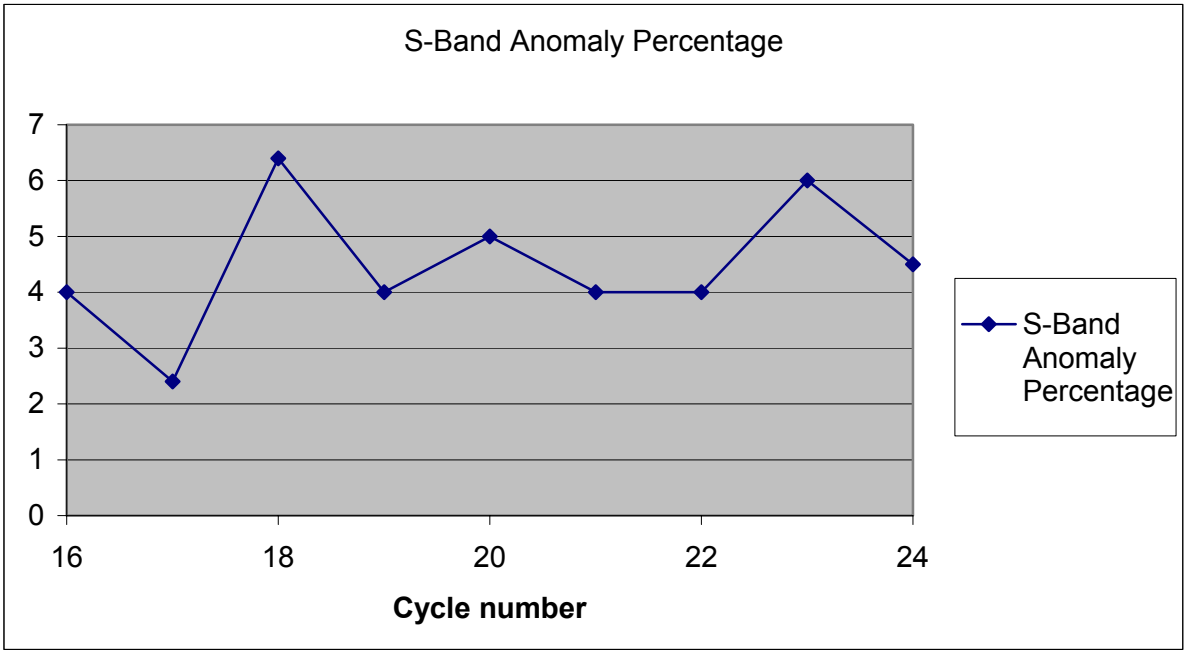

Figure 26: Percentage of data affected by the "S-Band Anomaly" for cycles 16-24

9.2 Products Monitoring

9.2.1 AVAILABILITY OF DATA

Hereafter the percentage of the different levels of products unavailability is reported for different cycles up to number 24. Considering as reference the instrument unavailability, it is possible to notice that in the last four months the situation is greatly improved for all levels of products.

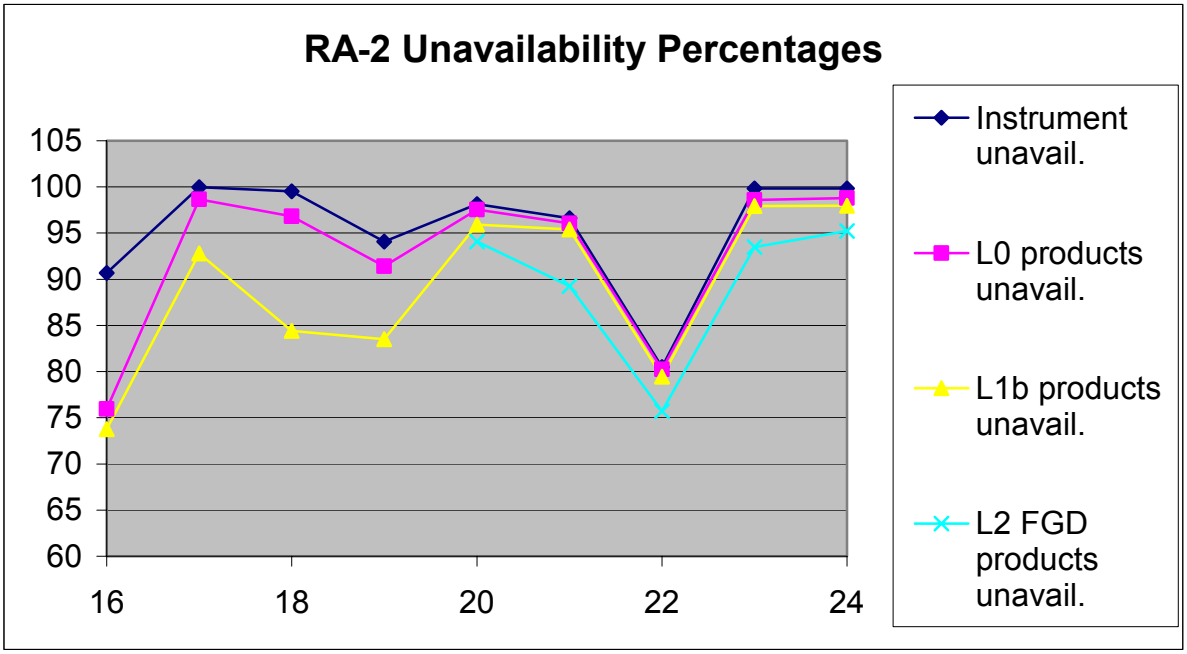

Figure 27: Percentage of Products unavailability up to cycle 24

9.2.2 RA-2 ALTIMETER PARAMETERS

Hereafter a summary of the main Altimetric parameters performances is reported; these results have been obtained with the editing criteria mentioned in par. 8.3.

9.2.2.1 Altimeter range

No current results for the time being. The monitoring of the RA-2 FD altimetric range shall be done once the NRT products shall be upgraded with the DORIS navigator NRT orbital information.

9.2.2.2 Significant Wave Height

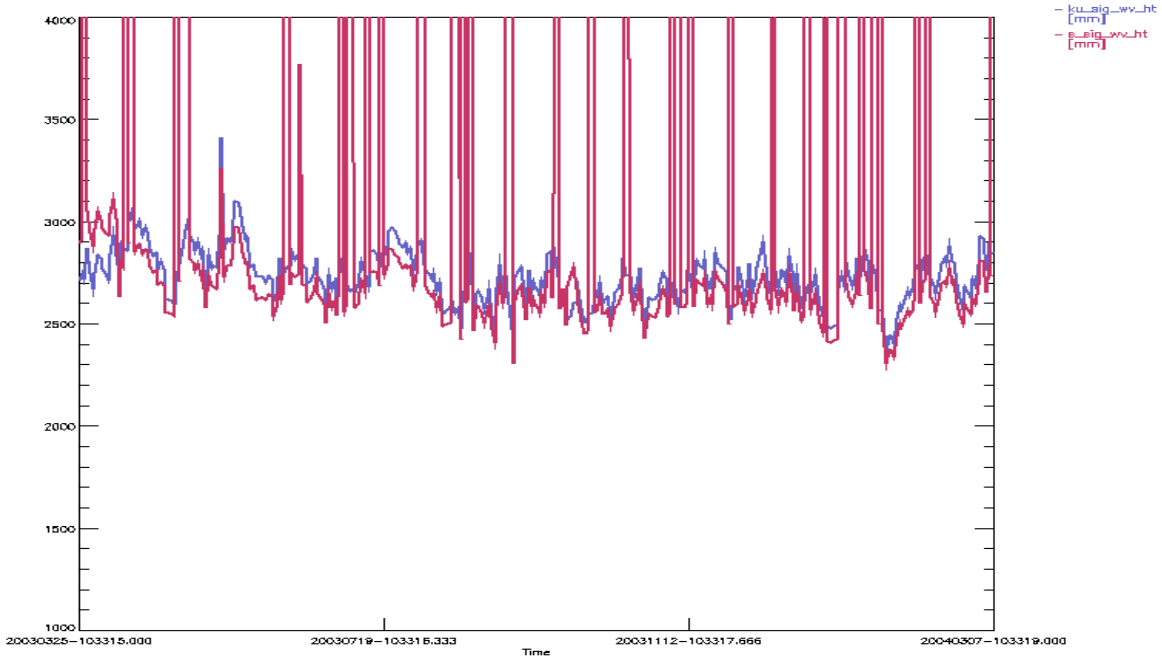

Figure 28: Ku and S SWH daily average up to cycle 24 (mm)

The Ku-Band SWH shows a stable behavior during the whole period. On the other hand, the S-Band SWH shows a drop on April the 9th 2003 corresponding to the operational up-load of IPF version 4.54; furthermore the high daily means reported are due to the so-called S-Band anomaly (ref. par.7.1.7).

9.2.2.3 Backscatter coefficient – Wind Speed

The Ku-Band Sigma_0 trend, reported hereafter, is characterized by a jump of in average 3.24 dBs concomitant with the operational up-load of IPF version 4.54 occurred on the 9th of April 2004. To be said that this change is due to the upload of a new RA2_CHD_AX ADF file that artificially shifted the RA-2 real Sigma_0 in order to align it with ERS-2 Sigma_0 and make it coherent with the Witter and Chelton empirical wind model. A similar change in trend, but in the opposite direction, is also visible in the Wind Speed trend reported afterwards.

Beyond the huge jump occurred in April 2003, the S-Band Sigma_0 reports a smaller jump occurring on November the 26th 2003. Following the installation of the IPF processing chain V4.56, the average values of the RA-2 S-Band backscattering parameter, shows an increase of ~0.65 dBs, the new S-band sigma0 being higher with respect to the previous versions. See chapter 8.5.4.

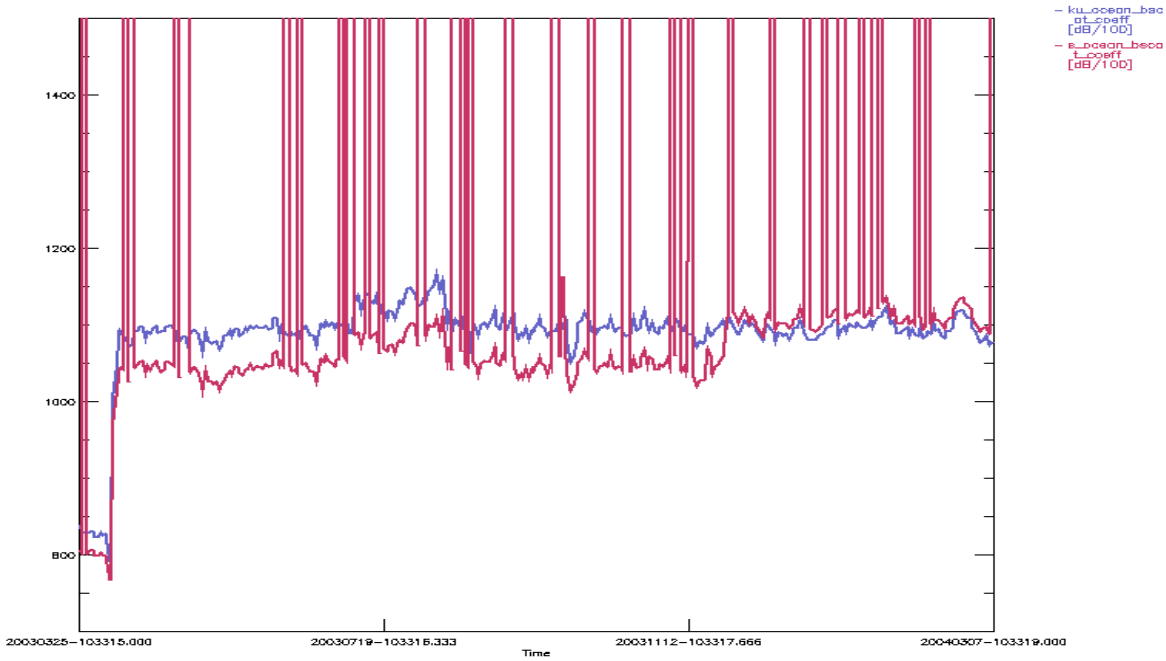

Figure 29: Ku and S Sigma_0 daily average up to cycle 24 (dB/100)

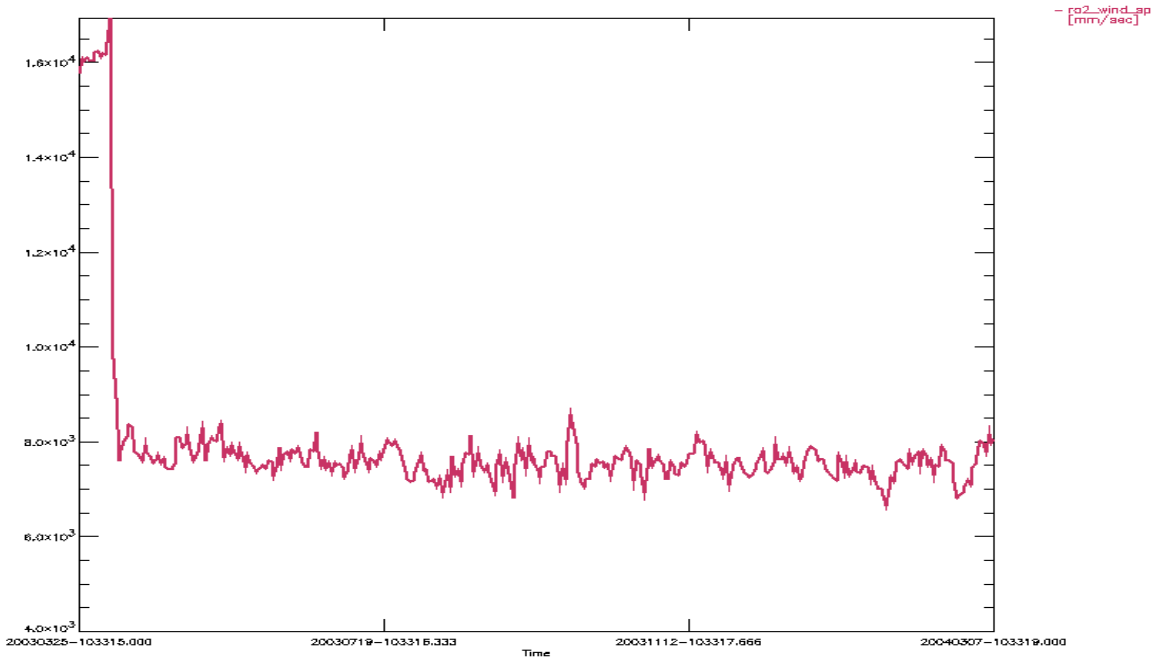

Figure 30: Wind Speed daily average for cycle 24 (mm/s)

10 PARTICULAR INVESTIGATIONS

No particular investigation has been performed on this cycle.