DOCUMENT

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# ENVISAT CYCLIC ALTIMETRIC REPORT

## CYCLE 26 from 12-04-2004 to 17-05-2004

## 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* | 15 June 2004 |
| status/*état* | |
| Document type/*type de document* | Technical Note |
| Distribution/*distribution* | |

**European Space Agency**
***Agence spatiale européenne***

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# 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 26.

This reports covers the period from the 12th of April and the 17th of May 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-15247-CN, April 2004
[R – 2] ENVISAT Microwave Radiometer Assessment Report Cycle 026, CLS.DOS/04.119, 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 April 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 # 97-101, 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/
[R – 15] ENVISAT-1 Products Specifications SPECIFICATIONS - Vol. 14: RA-2 Products Specifications, PO-RS-MDA-GS-2009, Iss 3, Rev. K, 24/05/2004

# 5 GENERAL QUALITY ASSESSMENT

## *5.1 Instruments status*

The RA-2 instrument, during this cycle underwent two instrument anomalies 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. |
|---|---|---|---|---|---|---|---|---|---|
| 11077 | 11177.2 | 1012.016 | 6896.925 | 25252.76 | 74509.68 | 99.83267 | 98.69231 | 95.65728 | 87.51296 |
| 11177.2 | 11277.4 | 7766.691 | 546.785 | 543.762 | 30886.69 | 98.71583 | 98.62542 | 98.62592 | 93.6089 |
| 11277.4 | 11377.6 | 1070.932 | 543.687 | 544.687 | 553.392 | 99.82293 | 99.73303 | 99.73287 | 99.73143 |
| 11377.6 | 11477.8 | 34706.38 | 629.021 | 619.808 | 631.765 | 94.26152 | 94.15752 | 94.15904 | 94.15706 |
| 11477.8 | 11578 | 1089.389 | 732.598 | 725.211 | 735.477 | 99.81988 | 99.69875 | 99.69997 | 99.69827 |

**Table 1: RA-2 L0, L1b and L2 FGD Data products availability summary for cycle 26**

## *5.3 Orbit quality*

On the 14-April-2004 a single burn OCM out-of-plane orbit inclination maintenance manoeuvre was executed as planned, using thruster pair 7&9 and tank pair A. AOCS mode change from Stellar Yaw Steering Mode to Yaw Steering Mode was successfully commanded by ground at 105.03.43.01. This was followed by a transition to Fine Pointing Mode executed at 105.03.45.13. 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** | 2004/04/14-05:42:29 | 1.7500 m/sec | 1.7307 m/sec | OCM |

On the 07-May-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** | 2004/05/07-02:08:28 0.0161 m/sec | 0.0158 m/sec | SFCM |

## *5.4 Ground Segment Processing Chain Status*

### 5.4.1 IPF PROCESSING CHAIN

The current IPF version is V4.57, operational at the Envisat PDHS-K and PDHS-E since April 29th and 28th[th] 2004 respectively.

### 5.4.2 F-PAC PROCESSING CHAIN

**Apr. 29, 2004**: Version installed CMA V6.3. This version includes a tuning of the ice verification chainas well as the inclusion of a new pass number field (available from the SPH) and an orbit quality flag (ref. [R – 15])

Before that date the F-PAC CMA version was 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 26, was unavailable twice, in the following time periods:
Start: 22 Apr 2004 15:15:36 Orbit = 11216 RA-2 into Standby/Refuse due to IE MCMD
Stop: 22 Apr 2004 17:07:05 Orbit = 11217 time-out

Start: 10 May 2004 02:06:31 Orbit = 11465 RA-2 to Suspend mode (Reset/Wait/Init)
Stop: 10 May 2004 11:27:30 Orbit = 11471 due to a multiple reporting of a SEU-problem.

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.

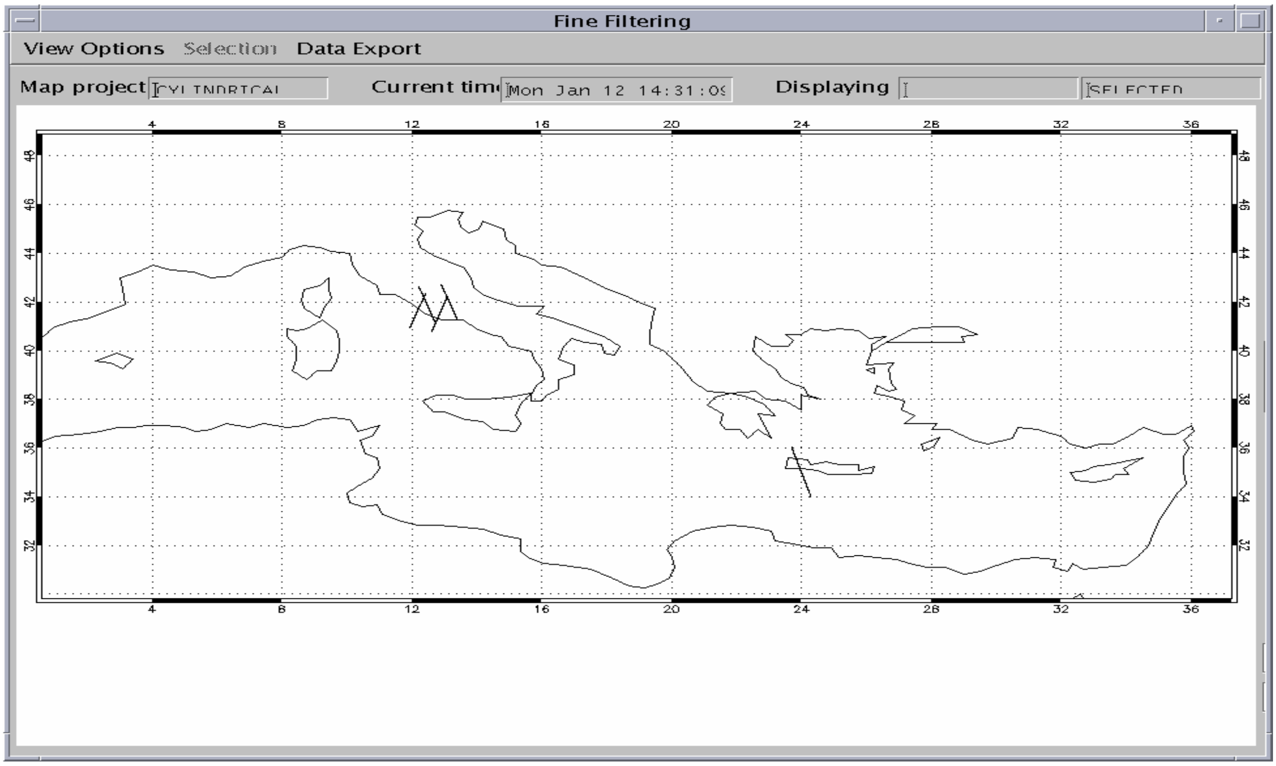


**Figure 1: Transponder Acquisition sites for cycle 26**

## *6.2 MWR Events*

The MWR, during cycle 26 was never unavailable.

## *6.3 DORIS Events*

The DORIS during cycle 26 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 26 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 26 the number of valid IF masks has been of 10, representing about the 28% 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).

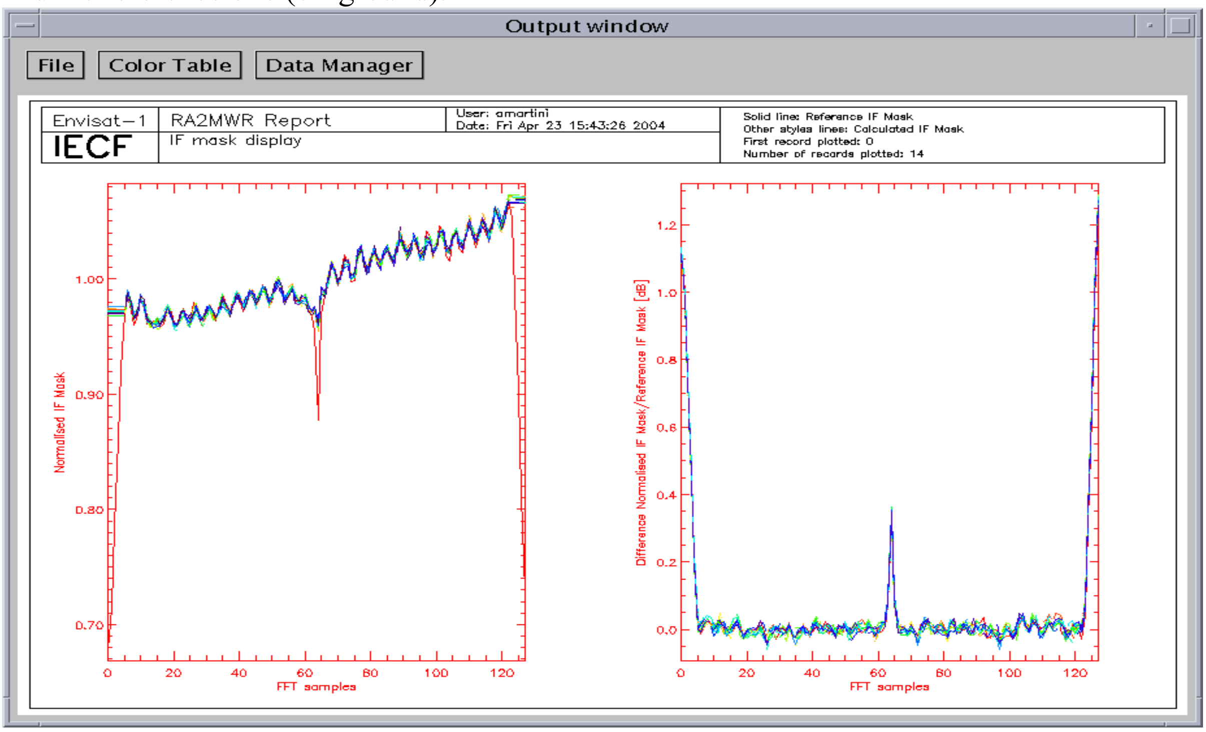


**Figure 2: Valid IF masks retrieved daily during cycle 26 plotted together with the on-ground reference.**

### 7.1.2 USO

In Figure 3 the USO clock period trend retrieved for cycle 26 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.

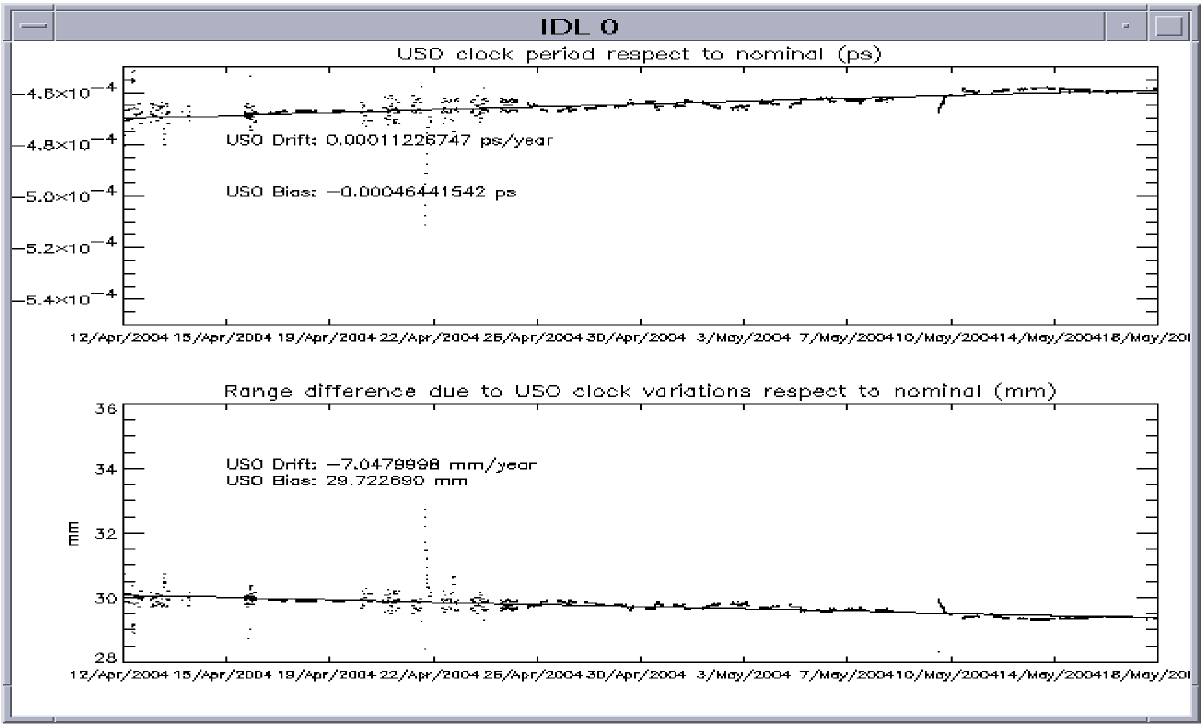


**Figure 3: USO clock period for cycle 26**

In particular, for this cycle, the USO recovery periods after the two anomalies are visible in the plot (ref. par. 6.1)

### 7.1.3 TRACKING CAPABILITY

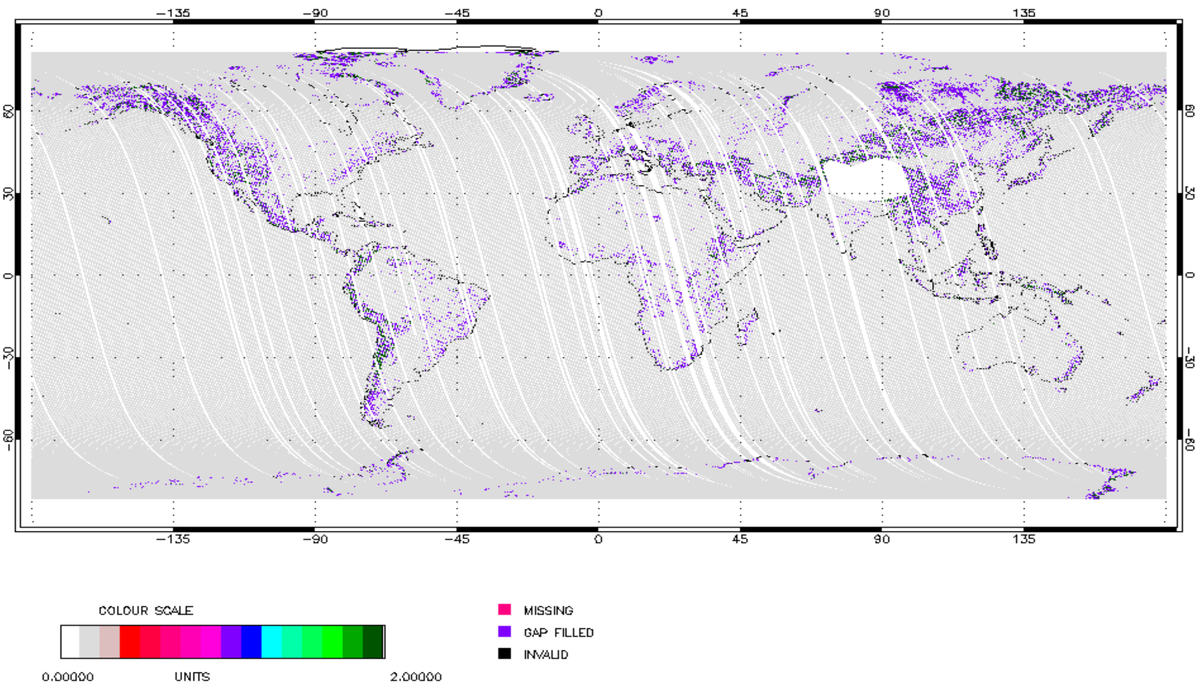


**Figure 4: RA-2 Chirp ID for ascending passes during cycle 26**

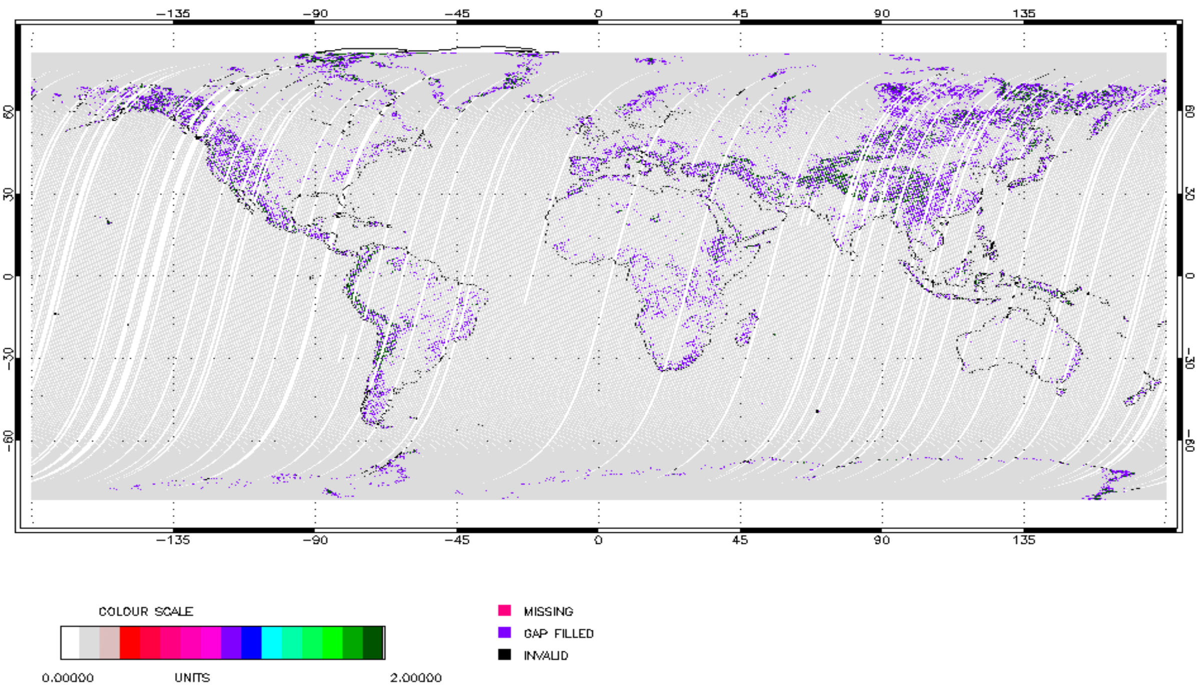


**Figure 5: RA-2 Chirp ID for descending passes during cycle 26**

In Figure 4 and Figure 5, the Chirp ID is plotted respectively for ascending and descending passes of cycle 26. 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 | 99.99% | 0.009% | 0.001% |
| Costal Water (ocean depth < 200 m) | 98.47% | 1.35% | 0.18% |
| Sea Ice | 99.16% | 0.72% | 0.12% |
| Ice Sheet | 95.19% | 3.61% | 1.20% |
| Land | 81.28% | 13.86% | 4.86% |
| All world | 94.82% | 3.91% | 1.27% |

**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. However during this cycle, the percentage of acquisitions at the highest resolution over Ice Sheet has decreased of about 1% respect to the previous cycles. On the other hand the percentages of the other two resolutions have increased of 0.5% each. The behavior of RA-2 will be, from now on, strictly monitored in this respect and an investigation will be opened to try and explain it.

In any case 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 26 four Sigma_0 Transponder measurement where performed on the following dates:

15-APR-2004 20:36:23
27-APR-2004 09:41:51
04-MAY-2004 20:39:17
13-MAY-2004 09:39:01

The first three acquisitions have been performed at high resolution. Among them only the first one was successful while for the other two the transponder re-transmitted signal was not visible in the RA-2 receiving window. Investigation is on-going in order to understand the problem occurred and avoid to make it for future measurements, in the meantime, and so also for the fourth one of this cycle, all the acquisitions are performed at low resolution.

### 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.

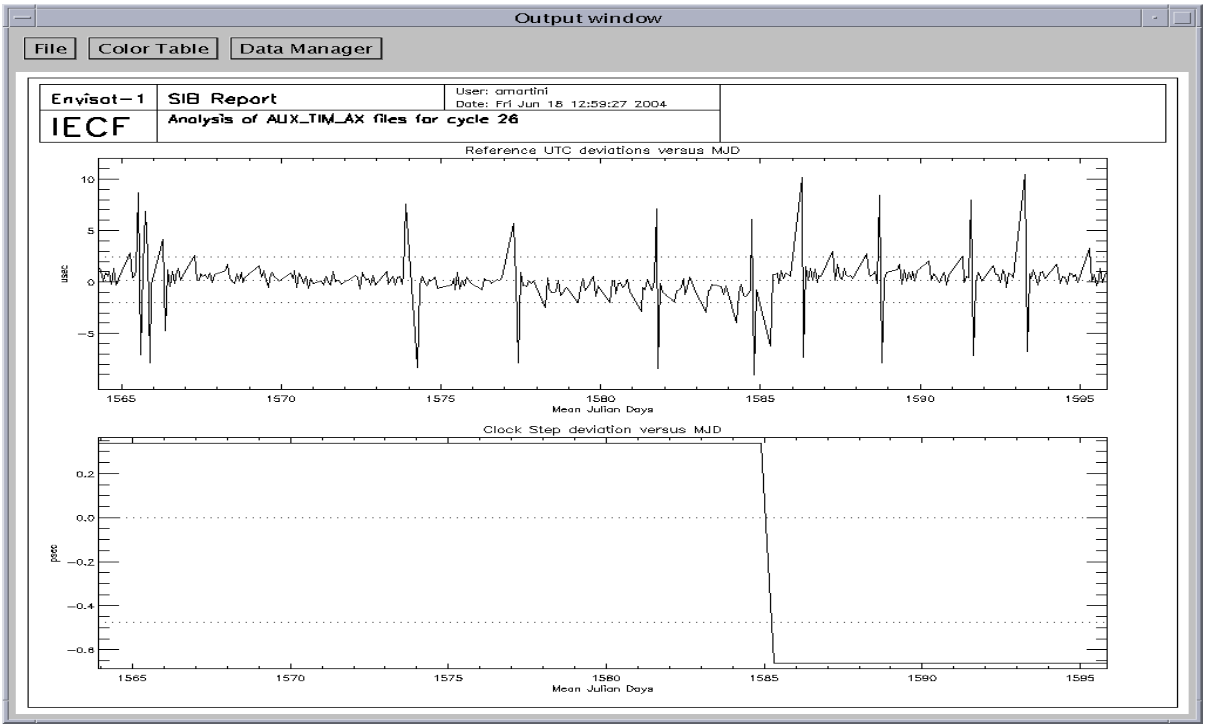


**Figure 6: UTC deviations and ICU clock period for cycle 26**

### 7.1.6 MISPOINTING

In Figure 7 the trend of the mispointing squared (smoothed over 2 minutes of time) is reported in deg^2*10e-4

The average mispointing value, as extracted from the RA2_FGD_2P data products, is around 0.027 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 end-2004 (ref. 5.4.4).
In particular for this cycle two events of low mispointing values are visible in the plot, in correlation with the occurrence of the two instrument anomalies, the rational after this is given in 7.1.6. On the other also the occurrence of the OCM manoeuvre (see par. 5.3) can be noticed in relation to mispointing values higher than average.

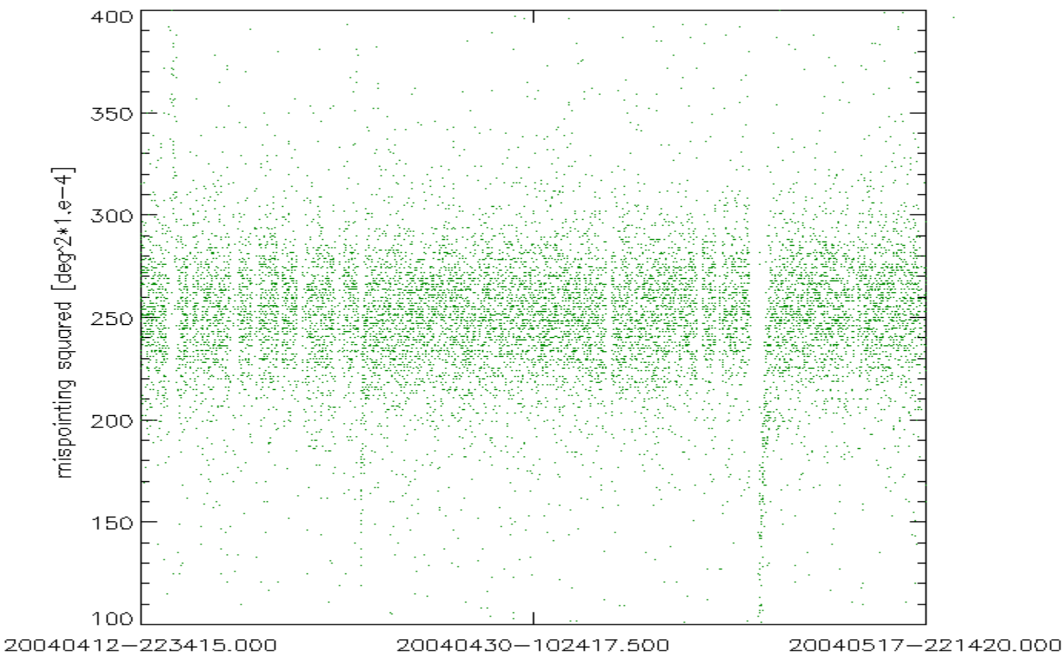


**Figure 7: Smoothed mispointing squared trend for cycle 26 (deg^2*10^4)**

### 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 26. This corresponds to a total percentage of about 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_2PNPDE20040427_042553_000061432026_00205_11281_0066.N1 | 27-Apr-04 | 04:25:53.235241 | 27-Apr-04 | 06:08:15.775312 |
| RA2_FGD_2PNPDK20040427_060730_000062472026_00206_11282_0665.N1 | 27-Apr-04 | 06:07:30.157013 | 27-Apr-04 | 07:51:37.413078 |
| RA2_FGD_2PNPDK20040427_075049_000060422026_00207_11283_0666.N1 | 27-Apr-04 | 07:50:49.566779 | 27-Apr-04 | 09:31:31.846853 |
| RA2_FGD_2PNPDK20040427_093045_000006712026_00208_11284_0668.N1 | 27-Apr-04 | 09:30:45.114555 | 27-Apr-04 | 09:41:56.583632 |
| RA2_FGD_2PNPDK20040501_054353_000062002026_00263_11339_0717.N1 | 01-May-04 | 05:43:53.901314 | 01-May-04 | 07:27:14.369381 |

| | | | | |
|---|---|---|---|---|
| RA2_FGD_2PNPDK20040501_072626_000060262026_00264_11340_0718.N1 | 01-May-04 | 07:26:26.523084 | 01-May-04 | 09:06:52.093162 |
| RA2_FGD_2PNPDK20040501_090617_000059722026_00265_11341_0719.N1 | 01-May-04 | 09:06:17.614861 | 01-May-04 | 10:45:49.712942 |
| RA2_FGD_2PNPDK20040501_104513_000060282026_00266_11342_0720.N1 | 01-May-04 | 10:45:13.006643 | 01-May-04 | 12:25:40.804719 |
| RA2_FGD_2PNPDK20040501_122506_000059872026_00267_11343_0721.N1 | 01-May-04 | 12:25:06.326420 | 01-May-04 | 14:04:52.906499 |
| RA2_FGD_2PNPDK20040501_140417_000050242026_00268_11344_0722.N1 | 01-May-04 | 14:04:17.314200 | 01-May-04 | 15:28:01.398279 |
| RA2_FGD_2PNPDK20040514_085716_000060702026_00451_11527_0880.N1 | 14-May-04 | 08:57:16.907052 | 14-May-04 | 10:38:27.037128 |
| RA2_FGD_2PNPDK20040514_103739_000060042026_00452_11528_0881.N1 | 14-May-04 | 10:37:39.190829 | 14-May-04 | 12:17:43.594910 |
| RA2_FGD_2PNPDK20040514_135543_000050322026_00454_11530_0883.N1 | 14-May-04 | 13:55:43.342396 | 14-May-04 | 15:19:35.224517 |

**Table 3: List of L2 FGD Files affected by S-Band anomaly during cycle 26**

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 8 and Table 4 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

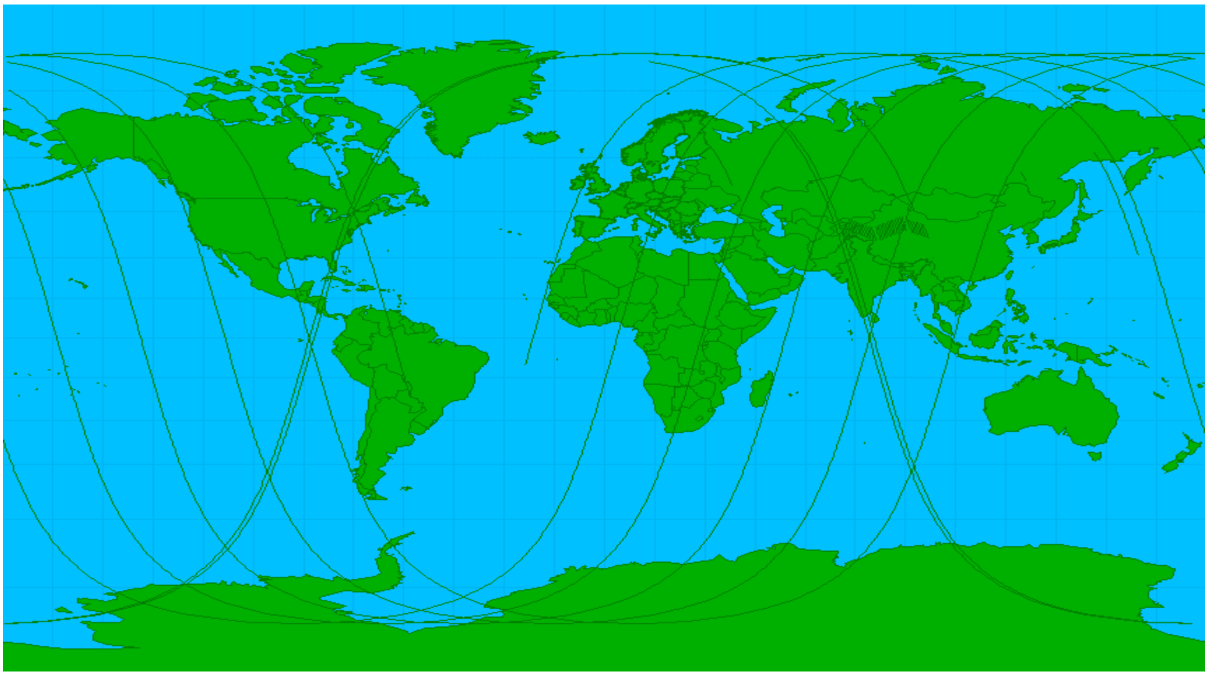

**Figure 8: RA-2 L0 unavailable products for first part of cycle 26**

| Start date | Start time | Stop date | Stop time | Duration (s) | Start orbit | Stop orbit | Reason |
|---|---|---|---|---|---|---|---|
| 13-Apr-04 | 16:36:40 | 13-Apr-04 | 16:37:58 | 78 | 11088 | 11088 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 11:01:26 | 14-Apr-04 | 11:10:17 | 531 | 11099 | 11099 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 12:48:34 | 14-Apr-04 | 12:49:24 | 50 | 11100 | 11100 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 16:04:37 | 14-Apr-04 | 16:05:55 | 78 | 11102 | 11102 | PDS_UNKNOWN_FAILURE |
| 15-Apr-04 | 15:33:52 | 15-Apr-04 | 15:35:10 | 78 | 11116 | 11116 | PDS_UNKNOWN_FAILURE |
| 16-Apr-04 | 16:40:11 | 16-Apr-04 | 16:40:13 | 2 | 11131 | 11131 | PDS_UNKNOWN_FAILURE |
| 16-Apr-04 | 16:42:05 | 16-Apr-04 | 16:43:22 | 77 | 11131 | 11131 | PDS_UNKNOWN_FAILURE |
| 17-Apr-04 | 16:10:20 | 17-Apr-04 | 16:11:38 | 78 | 11145 | 11145 | PDS_UNKNOWN_FAILURE |
| 18-Apr-04 | 15:39:28 | 18-Apr-04 | 15:40:46 | 78 | 11159 | 11159 | PDS_UNKNOWN_FAILURE |
| 19-Apr-04 | 15:07:20 | 19-Apr-04 | 15:08:38 | 78 | 11173 | 11173 | PDS_UNKNOWN_FAILURE |
| 19-Apr-04 | 15:20:34 | 19-Apr-04 | 16:56:44 | 5770 | 11173 | 11174 | PDS_UNKNOWN_FAILURE |
| 20-Apr-04 | 16:16:15 | 20-Apr-04 | 16:17:33 | 78 | 11188 | 11188 | PDS_UNKNOWN_FAILURE |
| 21-Apr-04 | 15:45:04 | 21-Apr-04 | 15:46:22 | 78 | 11202 | 11202 | PDS_UNKNOWN_FAILURE |
| 22-Apr-04 | 15:13:15 | 22-Apr-04 | 15:14:32 | 77 | 11216 | 11216 | PDS_UNKNOWN_FAILURE |
| 22-Apr-04 | 15:15:34 | 22-Apr-04 | 17:07:06 | 6692 | 11216 | 11217 | UNAV_RA2 |
| 23-Apr-04 | 16:22:10 | 23-Apr-04 | 16:23:28 | 78 | 11231 | 11231 | PDS_UNKNOWN_FAILURE |
| 24-Apr-04 | 15:50:39 | 24-Apr-04 | 15:51:57 | 78 | 11245 | 11245 | PDS_UNKNOWN_FAILURE |
| 25-Apr-04 | 15:16:42 | 25-Apr-04 | 15:16:45 | 3 | 11259 | 11259 | PDS_UNKNOWN_FAILURE |
| 25-Apr-04 | 15:19:09 | 25-Apr-04 | 15:20:27 | 78 | 11259 | 11259 | PDS_UNKNOWN_FAILURE |
| 26-Apr-04 | 16:28:05 | 26-Apr-04 | 16:29:22 | 77 | 11274 | 11274 | PDS_UNKNOWN_FAILURE |
| 27-Apr-04 | 15:56:15 | 27-Apr-04 | 15:57:33 | 78 | 11288 | 11288 | PDS_UNKNOWN_FAILURE |
| 28-Apr-04 | 15:25:04 | 28-Apr-04 | 15:26:22 | 78 | 11302 | 11302 | PDS_UNKNOWN_FAILURE |
| 29-Apr-04 | 16:33:59 | 29-Apr-04 | 16:35:16 | 77 | 11317 | 11317 | PDS_UNKNOWN_FAILURE |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 30-Apr-04 | 16:01:50 | 30-Apr-04 | 16:03:08 | 78 | 11331 | 11331 | PDS_UNKNOWN_FAILURE |
| 01-May-04 | 15:30:59 | 01-May-04 | 15:32:16 | 77 | 11345 | 11345 | PDS_UNKNOWN_FAILURE |
| 02-May-04 | 16:39:23 | 02-May-04 | 16:40:40 | 77 | 11360 | 11360 | PDS_UNKNOWN_FAILURE |
| 04-May-04 | 15:33:38 | 04-May-04 | 15:33:40 | 2 | 11388 | 11388 | PDS_UNKNOWN_FAILURE |
| 04-May-04 | 15:36:40 | 04-May-04 | 15:37:58 | 78 | 11388 | 11388 | PDS_UNKNOWN_FAILURE |
| 05-May-04 | 16:44:47 | 05-May-04 | 16:46:04 | 77 | 11403 | 11403 | PDS_UNKNOWN_FAILURE |
| 06-May-04 | 16:13:17 | 06-May-04 | 16:14:35 | 78 | 11417 | 11417 | PDS_UNKNOWN_FAILURE |
| 07-May-04 | 15:42:15 | 07-May-04 | 15:43:33 | 78 | 11431 | 11431 | PDS_UNKNOWN_FAILURE |
| 08-May-04 | 15:08:14 | 08-May-04 | 15:08:17 | 3 | 11445 | 11445 | PDS_UNKNOWN_FAILURE |
| 08-May-04 | 15:10:17 | 08-May-04 | 15:11:35 | 78 | 11445 | 11445 | PDS_UNKNOWN_FAILURE |
| 09-May-04 | 16:19:12 | 09-May-04 | 16:20:30 | 78 | 11460 | 11460 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 02:06:21 | 10-May-04 | 02:06:31 | 10 | 11465 | 11465 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 02:06:31 | 10-May-04 | 11:27:30 | 33659 | 11465 | 11471 | UNAV_RA2 |
| 10-May-04 | 11:27:30 | 10-May-04 | 11:28:36 | 66 | 11471 | 11471 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 15:44:58 | 10-May-04 | 15:45:01 | 3 | 11474 | 11474 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 15:47:52 | 10-May-04 | 15:49:10 | 78 | 11474 | 11474 | PDS_UNKNOWN_FAILURE |
| 11-May-04 | 15:13:54 | 11-May-04 | 15:13:56 | 2 | 11488 | 11488 | PDS_UNKNOWN_FAILURE |
| 11-May-04 | 15:16:13 | 11-May-04 | 15:17:30 | 77 | 11488 | 11488 | PDS_UNKNOWN_FAILURE |
| 11-May-04 | 18:41:45 | 11-May-04 | 18:44:45 | 180 | 11490 | 11490 | PDS_UNKNOWN_FAILURE |
| 12-May-04 | 16:25:08 | 12-May-04 | 16:26:26 | 78 | 11503 | 11503 | PDS_UNKNOWN_FAILURE |
| 13-May-04 | 15:50:44 | 13-May-04 | 15:50:47 | 3 | 11517 | 11517 | PDS_UNKNOWN_FAILURE |
| 13-May-04 | 15:53:28 | 13-May-04 | 15:54:46 | 78 | 11517 | 11517 | PDS_UNKNOWN_FAILURE |
| 14-May-04 | 15:22:08 | 14-May-04 | 15:23:26 | 78 | 11531 | 11531 | PDS_UNKNOWN_FAILURE |
| 15-May-04 | 16:31:04 | 15-May-04 | 16:32:22 | 78 | 11546 | 11546 | PDS_UNKNOWN_FAILURE |
| 16-May-04 | 15:56:31 | 16-May-04 | 15:56:33 | 2 | 11560 | 11560 | PDS_UNKNOWN_FAILURE |
| 16-May-04 | 15:59:05 | 16-May-04 | 16:00:23 | 78 | 11560 | 11560 | PDS_UNKNOWN_FAILURE |

**Table 4: List of gaps for RA-2 L0 products during cycle 26**

In Figure 9 and Table 5 the summary of unavailable MWR L0 products is given.

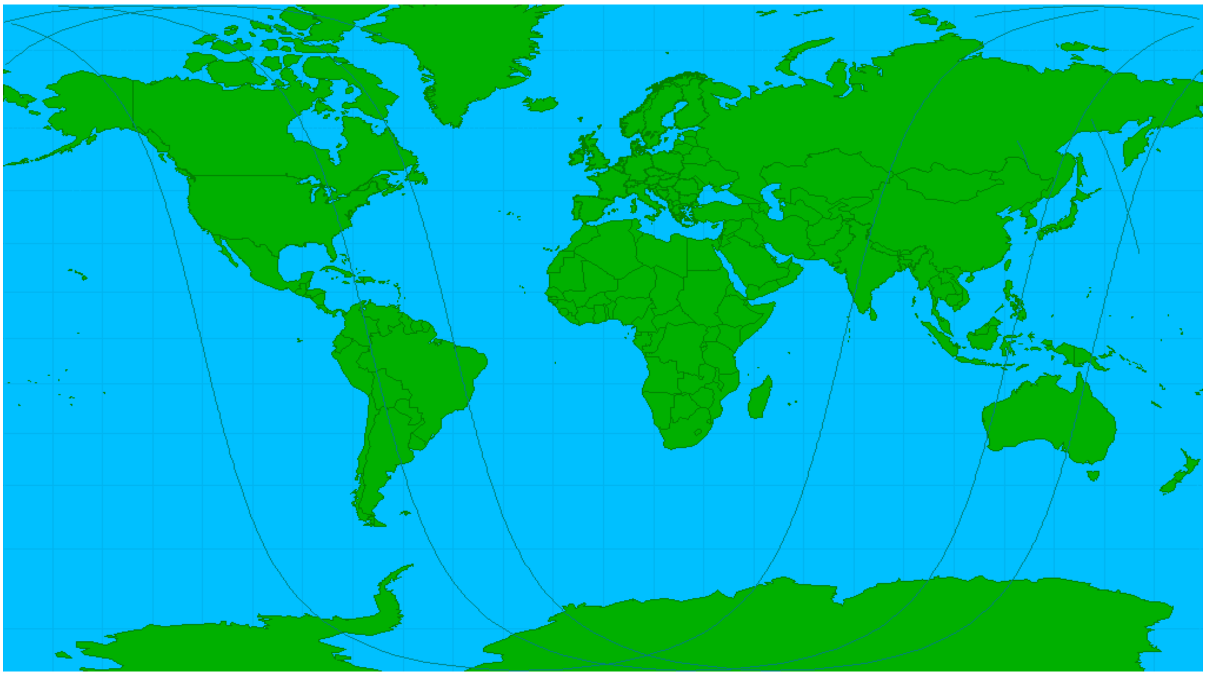

**Figure 9: MWR L0 unavailable products for cycle 26**

| Start date | Start time | Stop date | Stop time | Duration (s) | Start orbit | Stop orbit | Reason |
|---|---|---|---|---|---|---|---|
| 14-Apr-04 | 11:00:23 | 14-Apr-04 | 11:10:23 | 600 | 11099 | 11099 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 12:47:35 | 14-Apr-04 | 12:49:35 | 120 | 11100 | 11100 | PDS_UNKNOWN_FAILURE |
| 19-Apr-04 | 23:42:10 | 20-Apr-04 | 03:06:11 | 12241 | 11178 | 11180 | PDS_UNKNOWN_FAILURE |
| 20-Apr-04 | 04:47:47 | 20-Apr-04 | 06:28:59 | 6072 | 11181 | 11182 | PDS_UNKNOWN_FAILURE |
| 30-Apr-04 | 02:50:56 | 30-Apr-04 | 02:51:44 | 48 | 11323 | 11323 | PDS_UNKNOWN_FAILURE |

**Table 5: List of gaps for MWR L0 products during cycle 26**

In Figure 10 and Table 6 the summary of unavailable RA-2 L1b products is given. Please note that in this case, only the gaps due to problems with the PDS are reported.

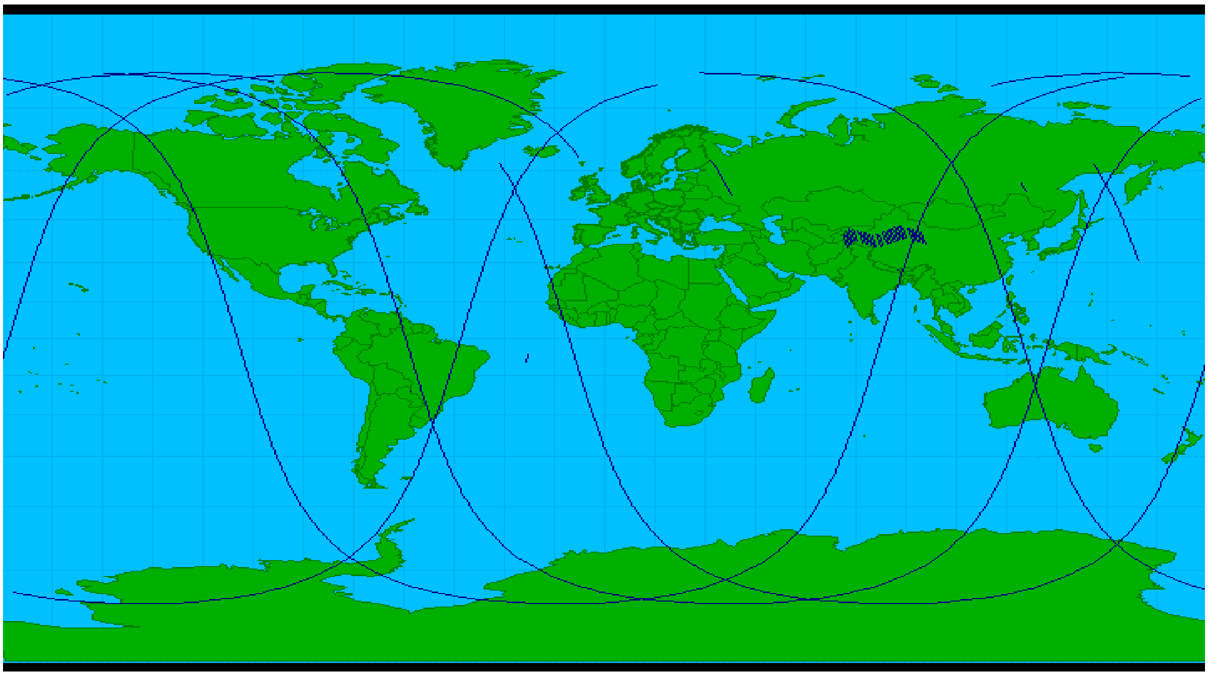

**Figure 10: RA-2 L1b unavailable products for cycle 26**

| Start date | Start time | Stop date | Stop time | Duration (s) | Start orbit | Stop orbit | Reason |
|---|---|---|---|---|---|---|---|
| 13-Apr-04 | 16:36:40 | 13-Apr-04 | 16:37:58 | 78 | 11088 | 11088 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 11:01:28 | 14-Apr-04 | 11:10:17 | 529 | 11099 | 11099 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 12:48:35 | 14-Apr-04 | 12:49:24 | 49 | 11100 | 11100 | PDS_UNKNOWN_FAILURE |
| 14-Apr-04 | 16:04:37 | 14-Apr-04 | 16:05:55 | 78 | 11102 | 11102 | PDS_UNKNOWN_FAILURE |
| 15-Apr-04 | 00:41:10 | 15-Apr-04 | 02:22:58 | 6108 | 11107 | 11108 | PDS_UNKNOWN_FAILURE |
| 15-Apr-04 | 04:04:50 | 15-Apr-04 | 05:46:16 | 6086 | 11109 | 11110 | PDS_UNKNOWN_FAILURE |
| 15-Apr-04 | 12:28:36 | 15-Apr-04 | 14:07:24 | 5928 | 11114 | 11115 | PDS_UNKNOWN_FAILURE |
| 15-Apr-04 | 15:33:52 | 15-Apr-04 | 15:35:10 | 78 | 11116 | 11116 | PDS_UNKNOWN_FAILURE |
| 16-Apr-04 | 16:42:05 | 16-Apr-04 | 16:43:22 | 77 | 11131 | 11131 | PDS_UNKNOWN_FAILURE |
| 17-Apr-04 | 16:10:20 | 17-Apr-04 | 16:11:38 | 78 | 11145 | 11145 | PDS_UNKNOWN_FAILURE |
| 17-Apr-04 | 21:20:10 | 17-Apr-04 | 23:00:19 | 6009 | 11148 | 11149 | PDS_UNKNOWN_FAILURE |
| 18-Apr-04 | 15:39:28 | 18-Apr-04 | 15:40:46 | 78 | 11159 | 11159 | PDS_UNKNOWN_FAILURE |
| 20-Apr-04 | 16:16:15 | 20-Apr-04 | 16:17:33 | 78 | 11188 | 11188 | PDS_UNKNOWN_FAILURE |
| 21-Apr-04 | 15:45:04 | 21-Apr-04 | 15:46:22 | 78 | 11202 | 11202 | PDS_UNKNOWN_FAILURE |
| 22-Apr-04 | 15:13:15 | 22-Apr-04 | 15:14:32 | 77 | 11216 | 11216 | PDS_UNKNOWN_FAILURE |
| 23-Apr-04 | 16:22:10 | 23-Apr-04 | 16:23:28 | 78 | 11231 | 11231 | PDS_UNKNOWN_FAILURE |
| 24-Apr-04 | 15:50:39 | 24-Apr-04 | 15:51:57 | 78 | 11245 | 11245 | PDS_UNKNOWN_FAILURE |
| 25-Apr-04 | 15:19:09 | 25-Apr-04 | 15:20:27 | 78 | 11259 | 11259 | PDS_UNKNOWN_FAILURE |
| 27-Apr-04 | 15:56:15 | 27-Apr-04 | 15:57:33 | 78 | 11288 | 11288 | PDS_UNKNOWN_FAILURE |
| 28-Apr-04 | 15:25:04 | 28-Apr-04 | 15:26:22 | 78 | 11302 | 11302 | PDS_UNKNOWN_FAILURE |
| 29-Apr-04 | 16:33:59 | 29-Apr-04 | 16:35:16 | 77 | 11317 | 11317 | PDS_UNKNOWN_FAILURE |
| 30-Apr-04 | 16:01:50 | 30-Apr-04 | 16:03:08 | 78 | 11331 | 11331 | PDS_UNKNOWN_FAILURE |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 01-May-04 | 15:30:59 | 01-May-04 | 15:32:16 | 77 | 11345 | 11345 | PDS_UNKNOWN_FAILURE |
| 02-May-04 | 16:39:23 | 02-May-04 | 16:40:40 | 77 | 11360 | 11360 | PDS_UNKNOWN_FAILURE |
| 02-May-04 | 16:40:40 | 02-May-04 | 16:40:41 | 1 | 11360 | 11360 | PDS_UNKNOWN_FAILURE |
| 04-May-04 | 15:36:40 | 04-May-04 | 15:37:58 | 78 | 11388 | 11388 | PDS_UNKNOWN_FAILURE |
| 05-May-04 | 16:44:47 | 05-May-04 | 16:46:04 | 77 | 11403 | 11403 | PDS_UNKNOWN_FAILURE |
| 06-May-04 | 16:13:17 | 06-May-04 | 16:14:35 | 78 | 11417 | 11417 | PDS_UNKNOWN_FAILURE |
| 07-May-04 | 15:42:15 | 07-May-04 | 15:43:33 | 78 | 11431 | 11431 | PDS_UNKNOWN_FAILURE |
| 08-May-04 | 15:10:17 | 08-May-04 | 15:11:35 | 78 | 11445 | 11445 | PDS_UNKNOWN_FAILURE |
| 09-May-04 | 16:19:12 | 09-May-04 | 16:20:30 | 78 | 11460 | 11460 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 02:06:22 | 10-May-04 | 02:06:31 | 9 | 11465 | 11465 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 11:27:30 | 10-May-04 | 11:28:36 | 66 | 11471 | 11471 | PDS_UNKNOWN_FAILURE |
| 10-May-04 | 15:47:52 | 10-May-04 | 15:49:10 | 78 | 11474 | 11474 | PDS_UNKNOWN_FAILURE |
| 11-May-04 | 15:16:13 | 11-May-04 | 15:17:30 | 77 | 11488 | 11488 | PDS_UNKNOWN_FAILURE |
| 11-May-04 | 18:41:47 | 11-May-04 | 18:44:45 | 178 | 11490 | 11490 | PDS_UNKNOWN_FAILURE |
| 12-May-04 | 16:25:08 | 12-May-04 | 16:26:26 | 78 | 11503 | 11503 | PDS_UNKNOWN_FAILURE |
| 13-May-04 | 15:50:45 | 13-May-04 | 15:50:47 | 2 | 11517 | 11517 | PDS_UNKNOWN_FAILURE |
| 13-May-04 | 15:53:28 | 13-May-04 | 15:54:46 | 78 | 11517 | 11517 | PDS_UNKNOWN_FAILURE |
| 14-May-04 | 15:22:08 | 14-May-04 | 15:23:26 | 78 | 11531 | 11531 | PDS_UNKNOWN_FAILURE |
| 15-May-04 | 16:31:04 | 15-May-04 | 16:32:22 | 78 | 11546 | 11546 | PDS_UNKNOWN_FAILURE |
| 16-May-04 | 15:59:05 | 16-May-04 | 16:00:23 | 78 | 11560 | 11560 | PDS_UNKNOWN_FAILURE |

**Table 6: List of gaps for RA-2 L1b products during cycle 26**

## *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

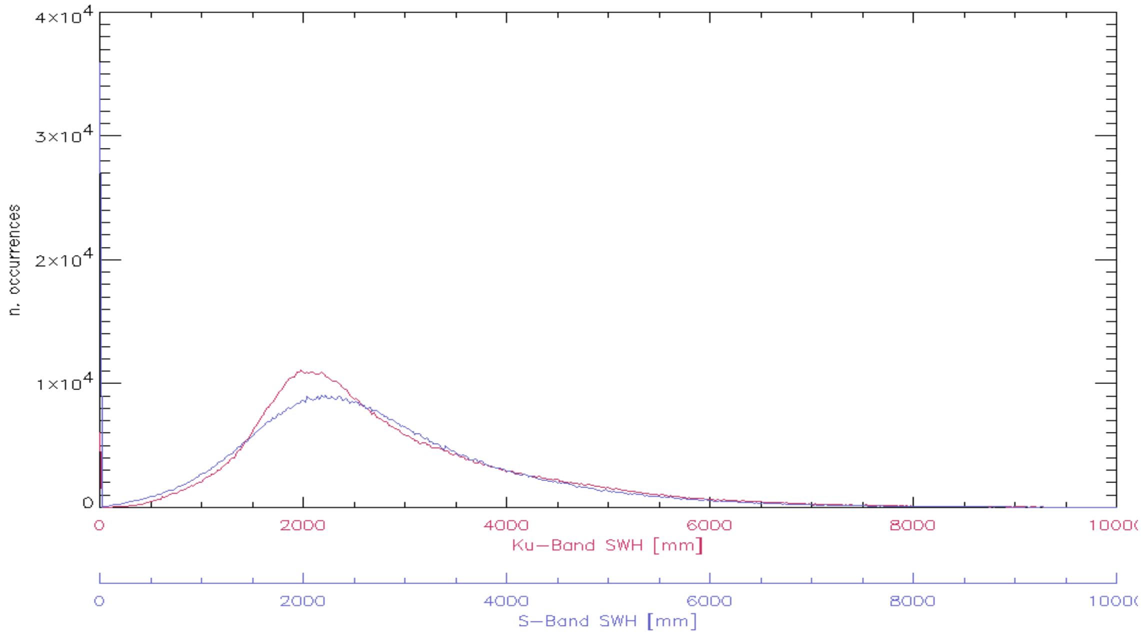


**Figure 11: Histogram of Ku and S Band SWH for cycle 26 (mm)**

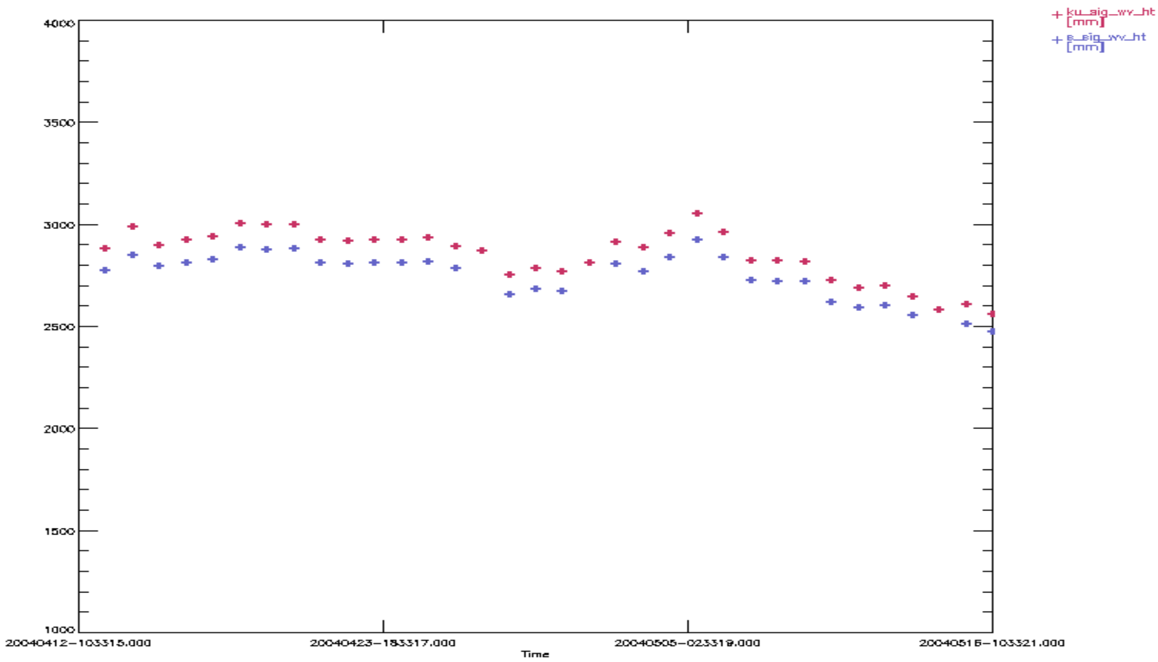


**Figure 12: Ku and S SWH daily average for cycle 26 (mm)**

The trend and the histogram of the SWH show a nominal behavior for this cycle; the high daily means (sometimes plotted outside the figure range) 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

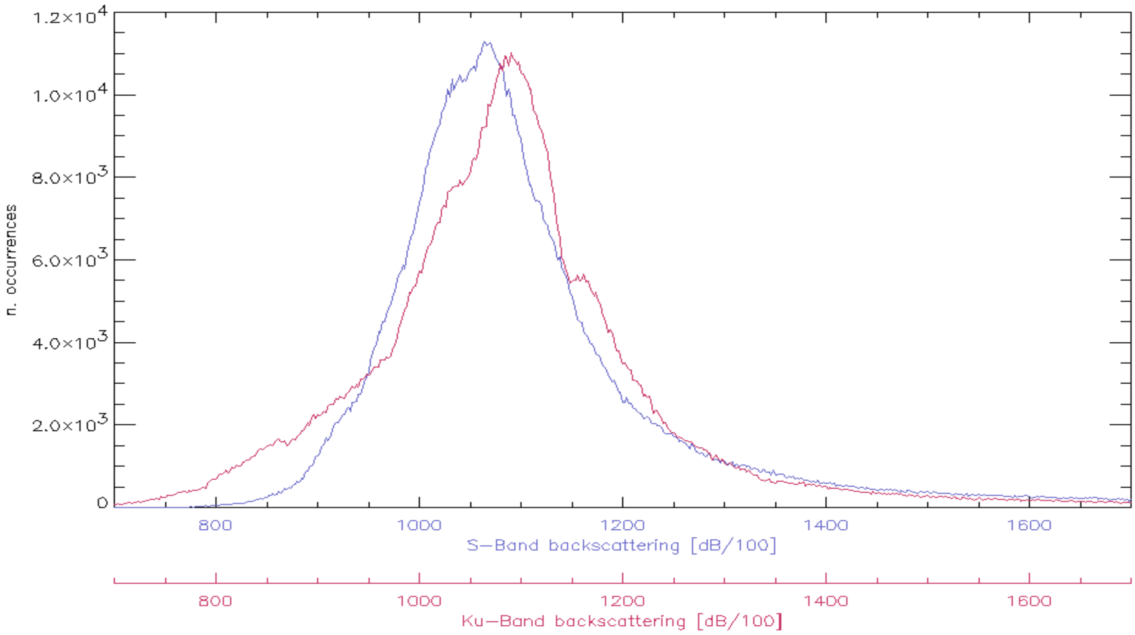


**Figure 13: Histogram of Ku and S Band Backscattering Coefficient for cycle 26 (dB/100)**

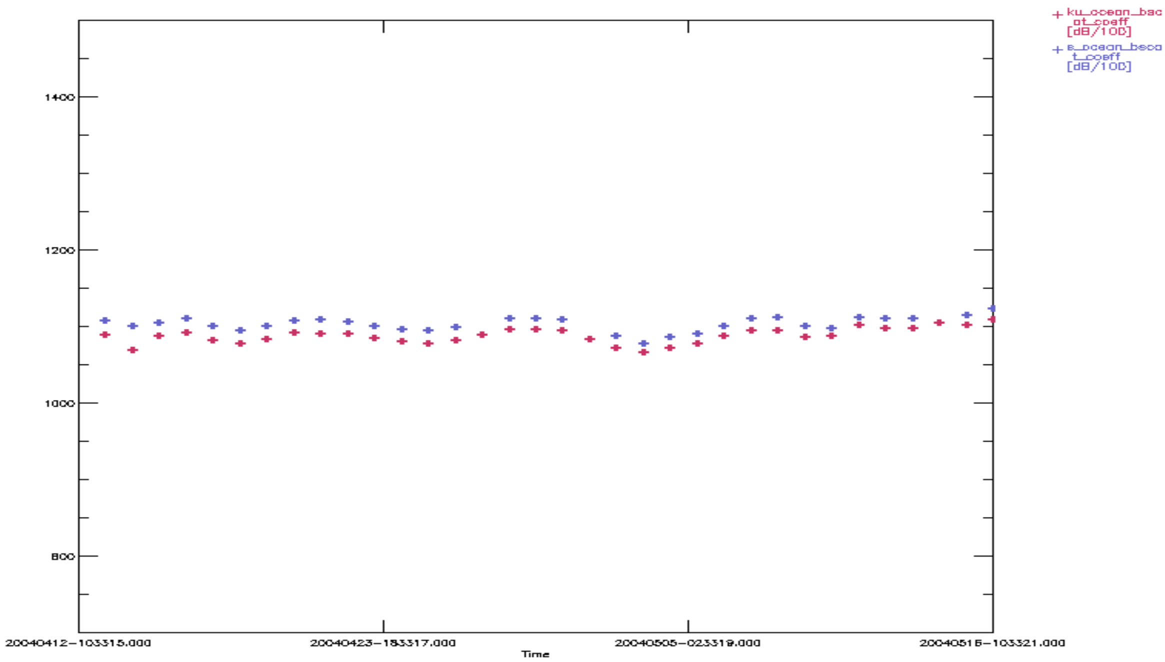


**Figure 14: Ku and S Sigma_0 daily average for cycle 26 (dB/100)**

The trend and the histogram of the Ku-Band Sigma_0 show a nominal behavior for this cycle. The S-Band Sigma_0 histogram double peak, noticed for cycles 24 and 25, is not present anymore; for this reason we are keen on thinking that it was due to a seasonal effect. The high daily means (sometimes plotted outside the figure range) reported for the S-Band Sigma_0 trend are due to the so-called S-Band anomaly (ref. par. 7.1.7).

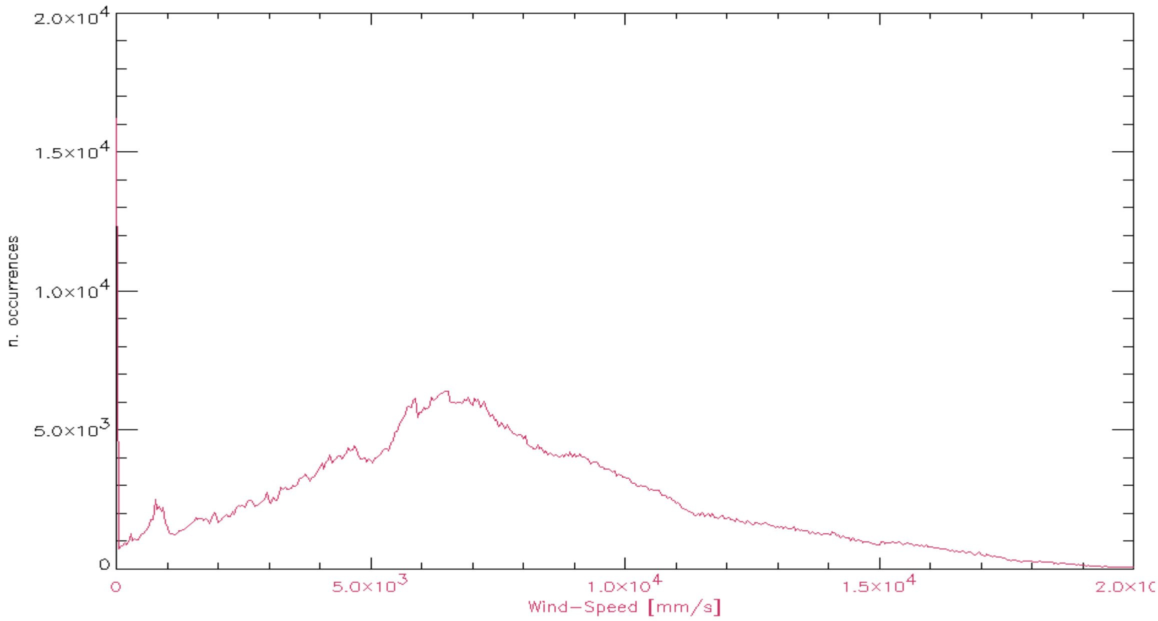


**Figure 15: Histogram of Ku Wind Speed for cycle 26 (mm/s)**

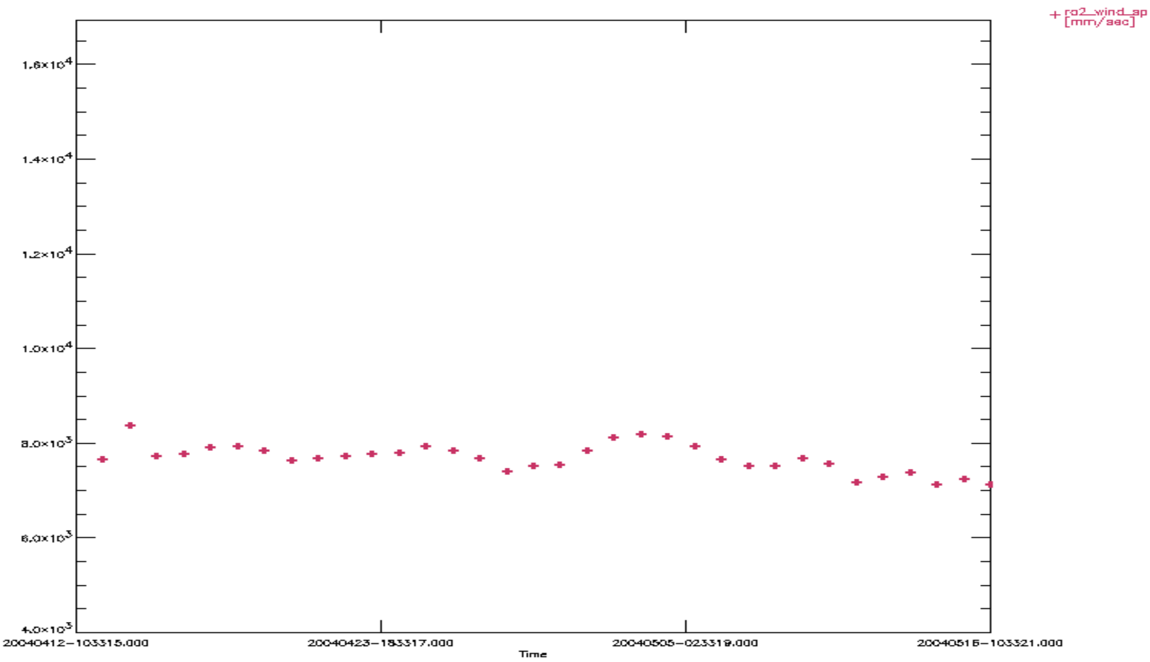


**Figure 16: Wind Speed daily average for cycle 26 (mm/s)**

## *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 7: 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 of cycle 26 have to be corrected to compensate for the Ultra Stable Oscillator drift shown in Figure 3. The measured Range shall be corrected considering a drift of –7.05 mm per year. Eventually it could also be corrected for the cyclic average given bias (29.72 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 17 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, on October the 29th at 15:42 and on May the 10th at 15:45. The reason of this could be found in the instrument warming up considering that the IF Cal acquisition has been made, in all the 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.

Despite the quite constant IF mask trend, a weird behavior has been observed during the validation of several newly created IF mask correction auxiliary files. This phenomenon is currently under investigation but in the meantime the decision has been taken to avoid updating the auxiliary file in question.

During cycle 26 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.

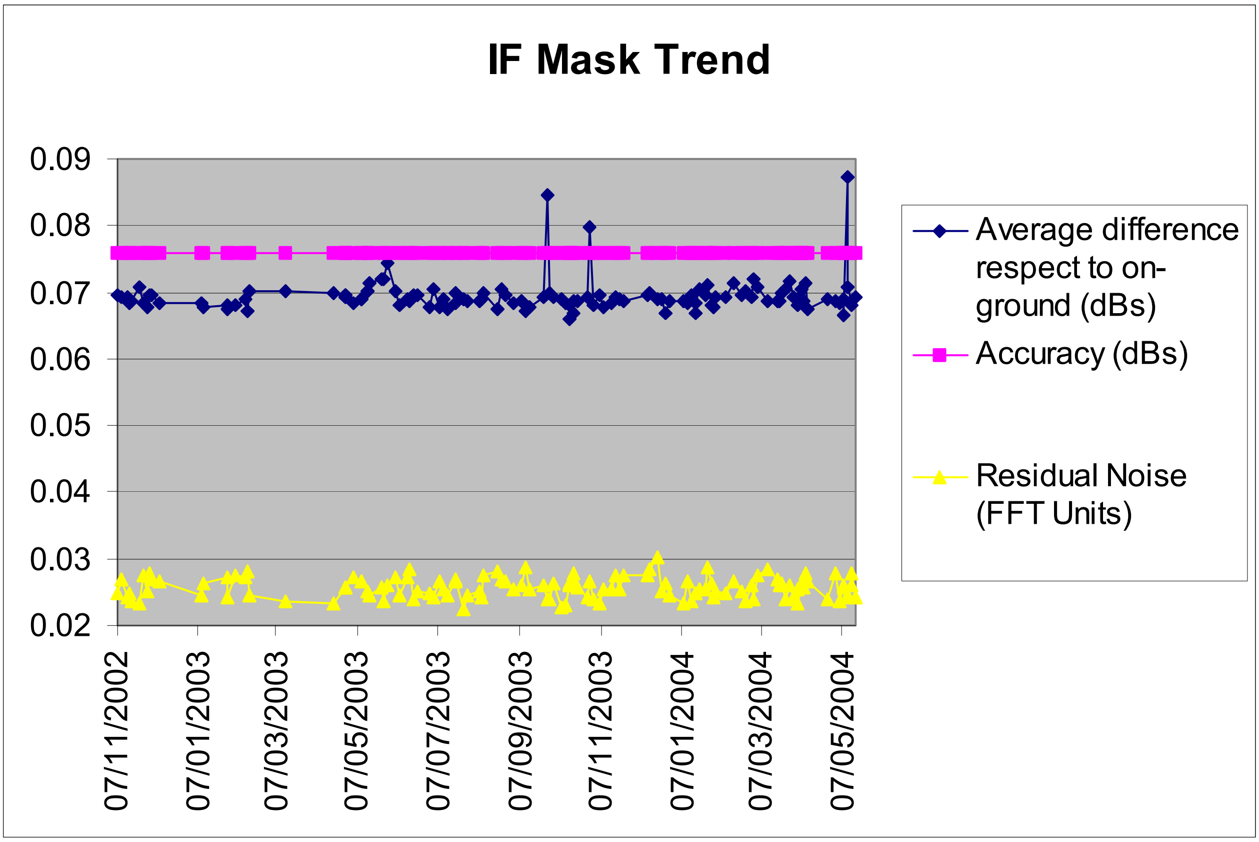


**Figure 17: Evolution of the IF mask related parameters for valid IF masks retrieved until cycle 26.**

### 9.1.2 USO

In Figure 18 the USO clock period trend retrieved until the end of cycle 26 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 32.48 mm and –3.26 mm/year as calculated with data covering the period 13 June 2003 to 18 May 2004. The given bias and drift have to subtracted from the original altimetric range.

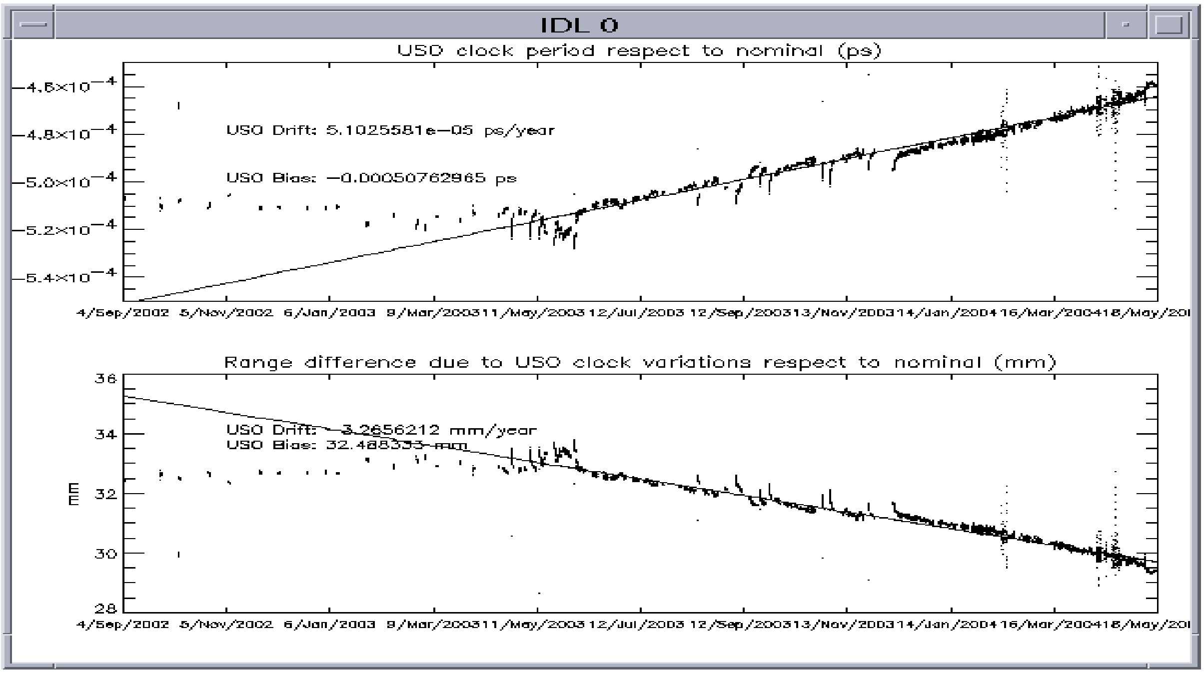


**Figure 18: USO clock period until end of cycle 26**

### 9.1.3 TRACKING CAPABILITY

In Figure 19, Figure 20 and Figure 21, 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.

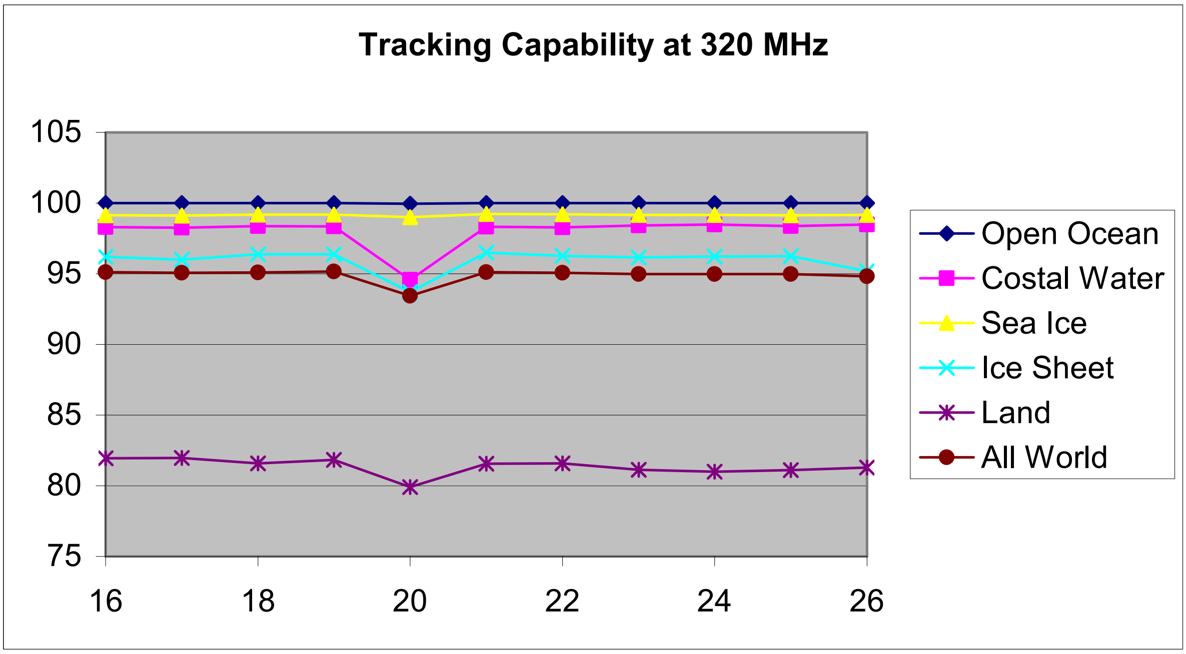


**Figure 19: RA-2 Tracking percentage at 320MHz for different surfaces**

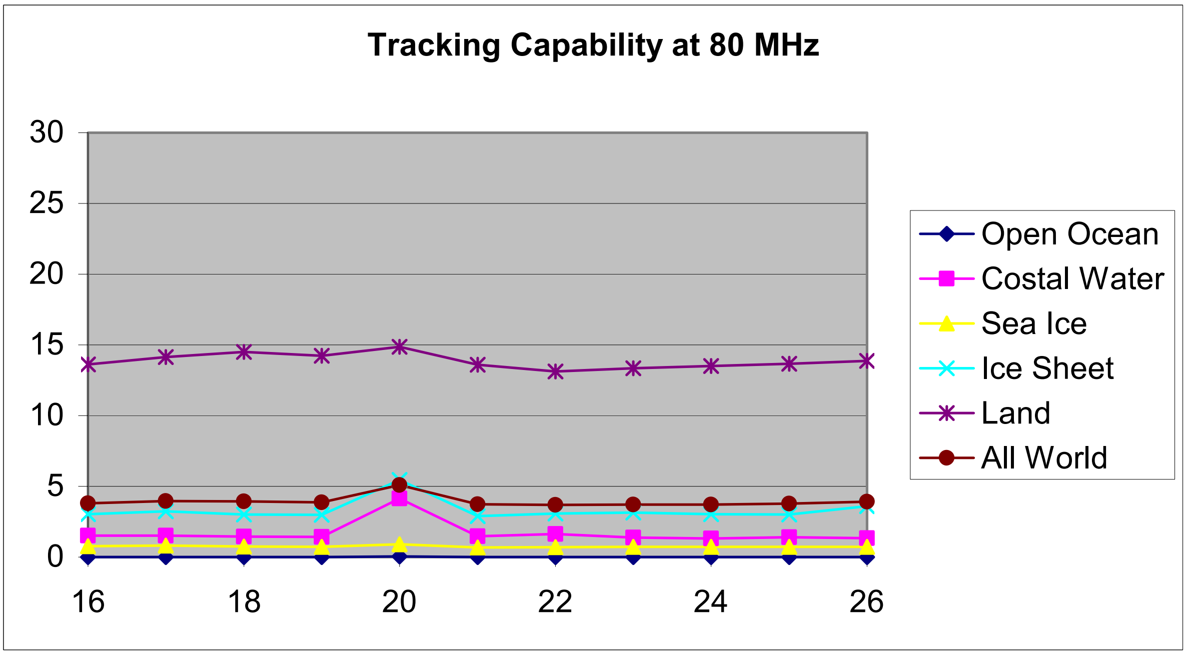


**Figure 20: RA-2 Tracking percentage at 80MHz for different surfaces**

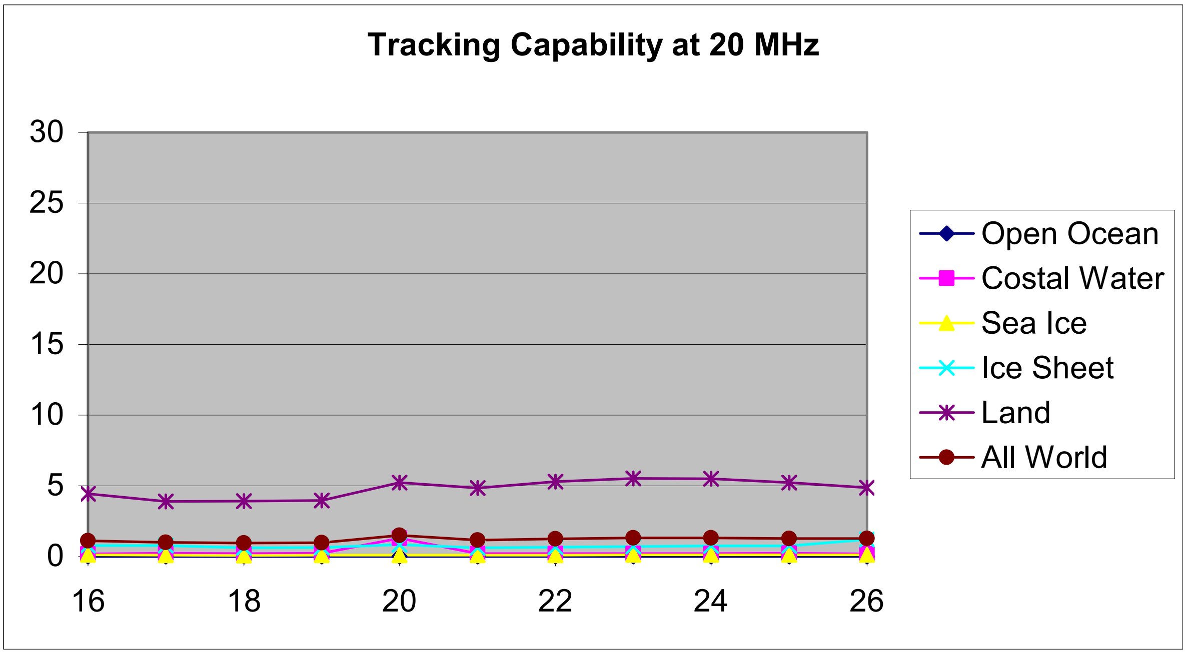


**Figure 21: RA-2 Tracking percentage at 20MHz for different surfaces**

### 9.1.4 DATATION

In Figure 22 (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 currently 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.

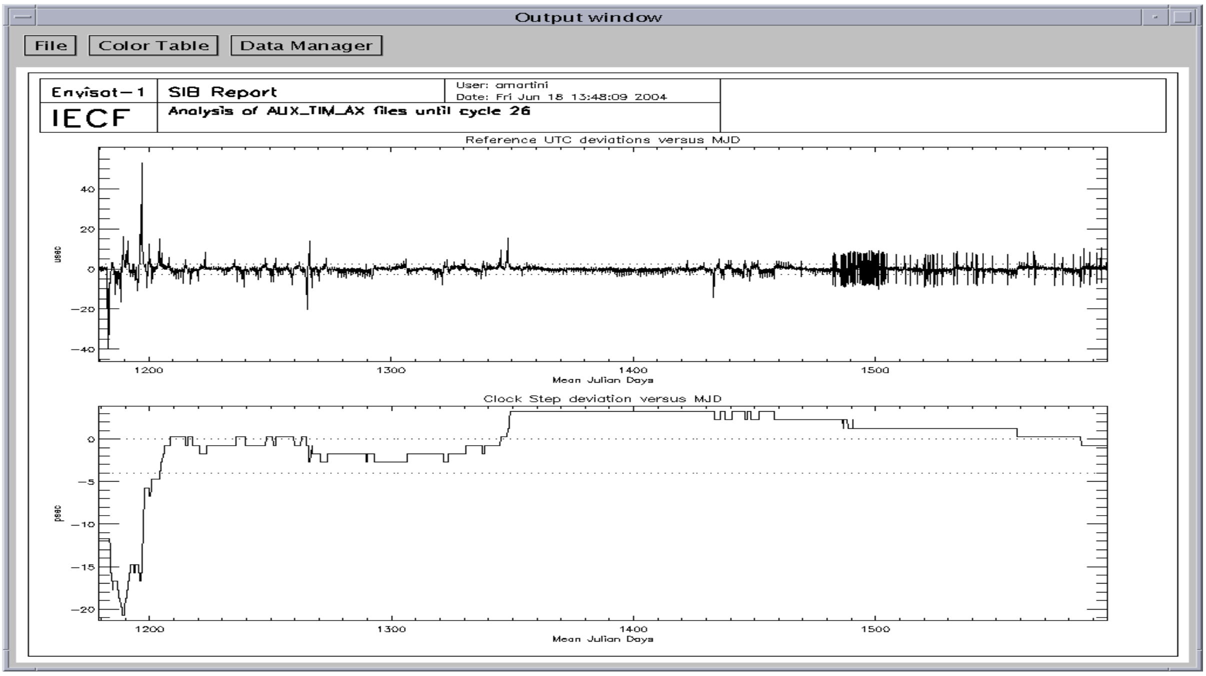


**Figure 22: UTC deviations and ICU clock period up to cycle 26**

## 9.1.5 MISPOINTING

In Figure 23 the overall mispointing squared trend is plotted for cycles 15 to 26. 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 24. 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.

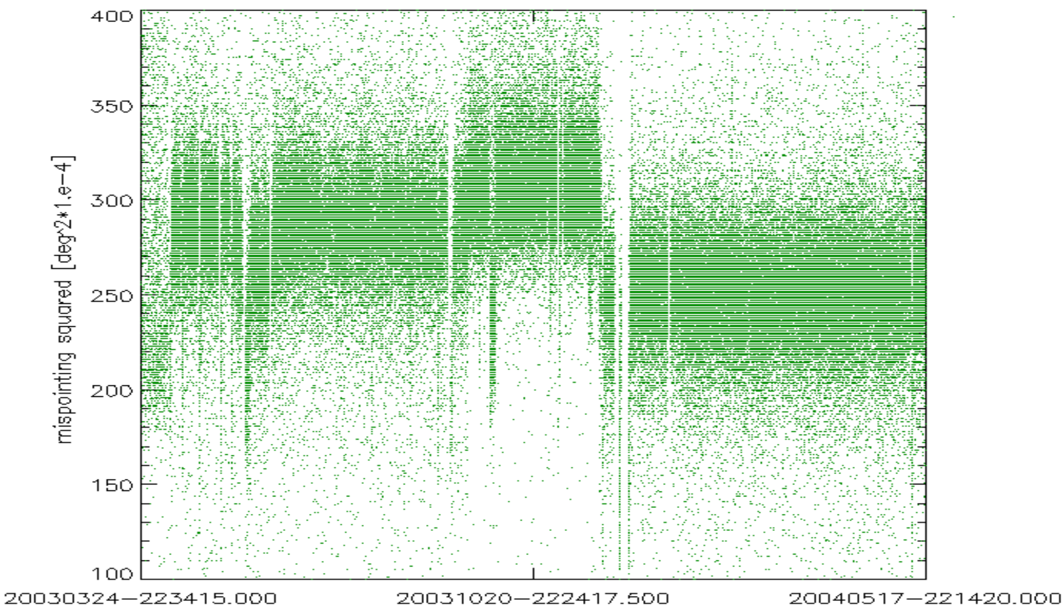


**Figure 23: Smoothed mispointing squared trend until end of cycle 26 (deg^2*10e-4)**

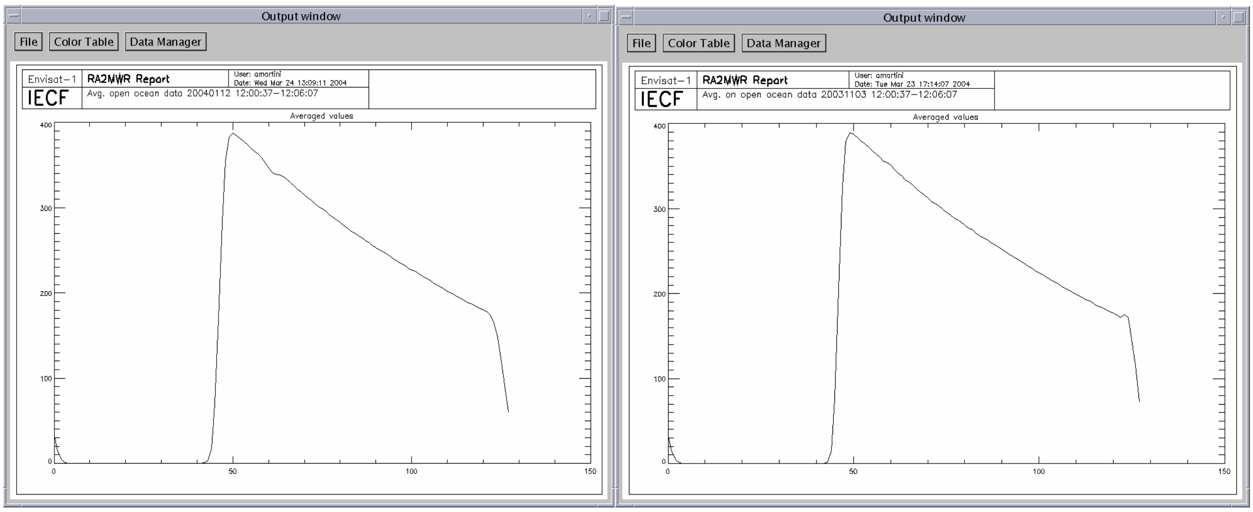


**Figure 24: Open Ocean average waveforms before (left) and after an anomaly (right)**

## 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%.

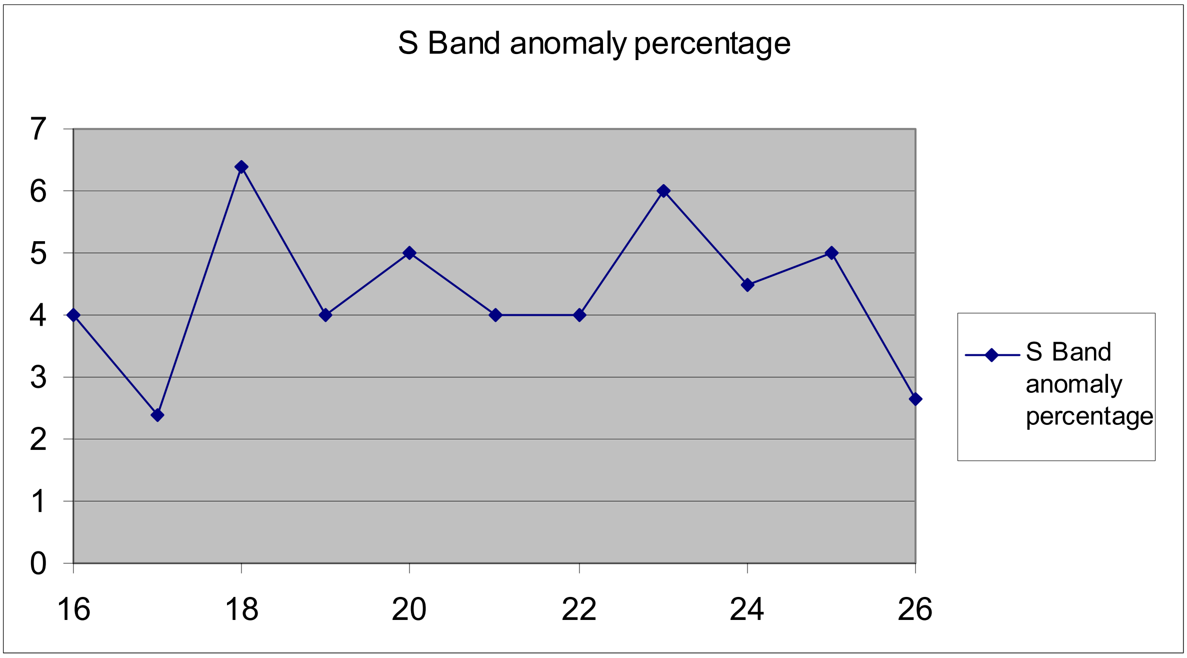


**Figure 25: Percentage of data affected by the "S-Band Anomaly" for cycles 16-26**

## *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 26. 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.

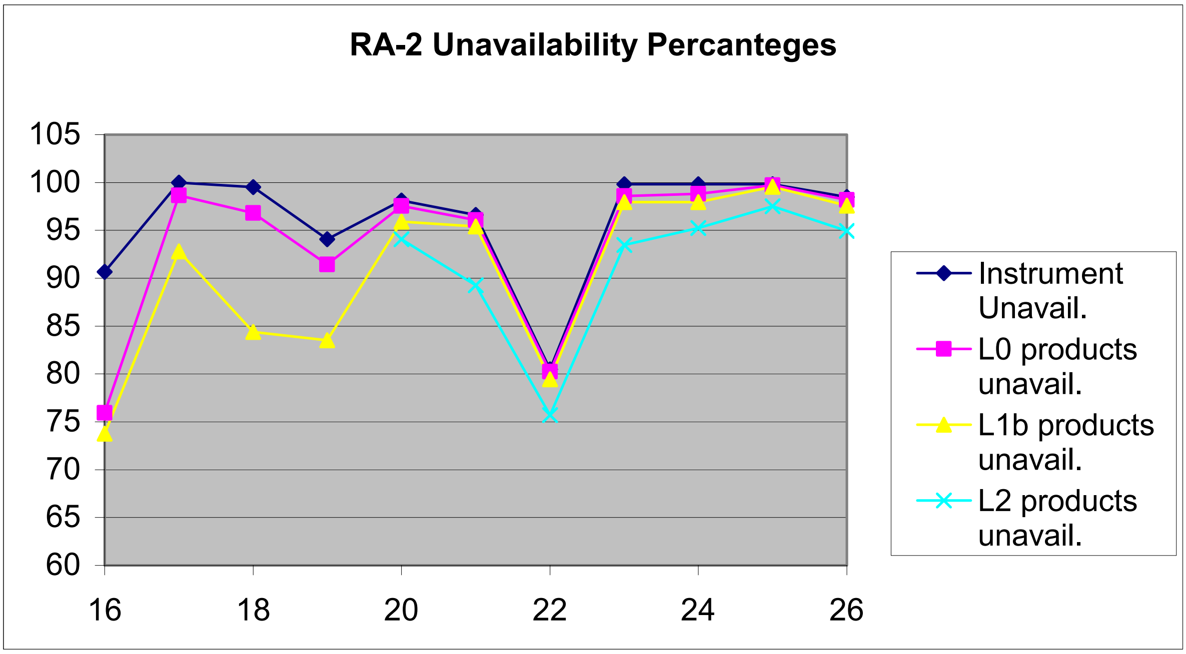


**Figure 26: Percentage of Products unavailability up to cycle 26**

### 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

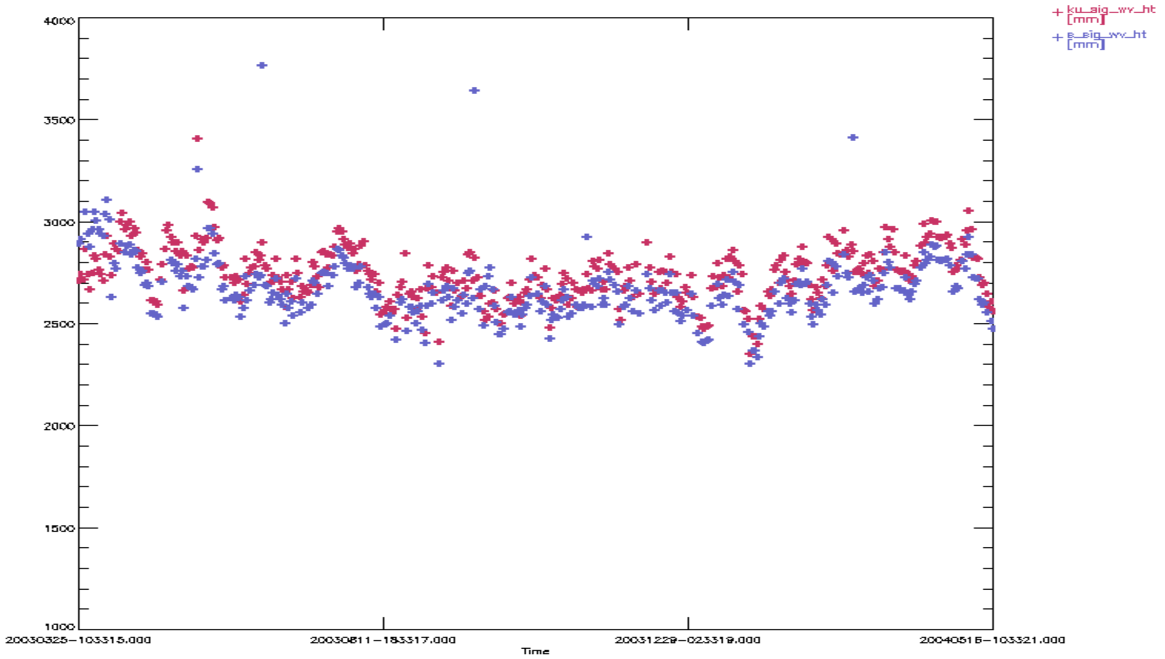


**Figure 27: Ku and S SWH daily average up to cycle 26 (mm)**

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 (sometimes plotted outside the figure range) 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.

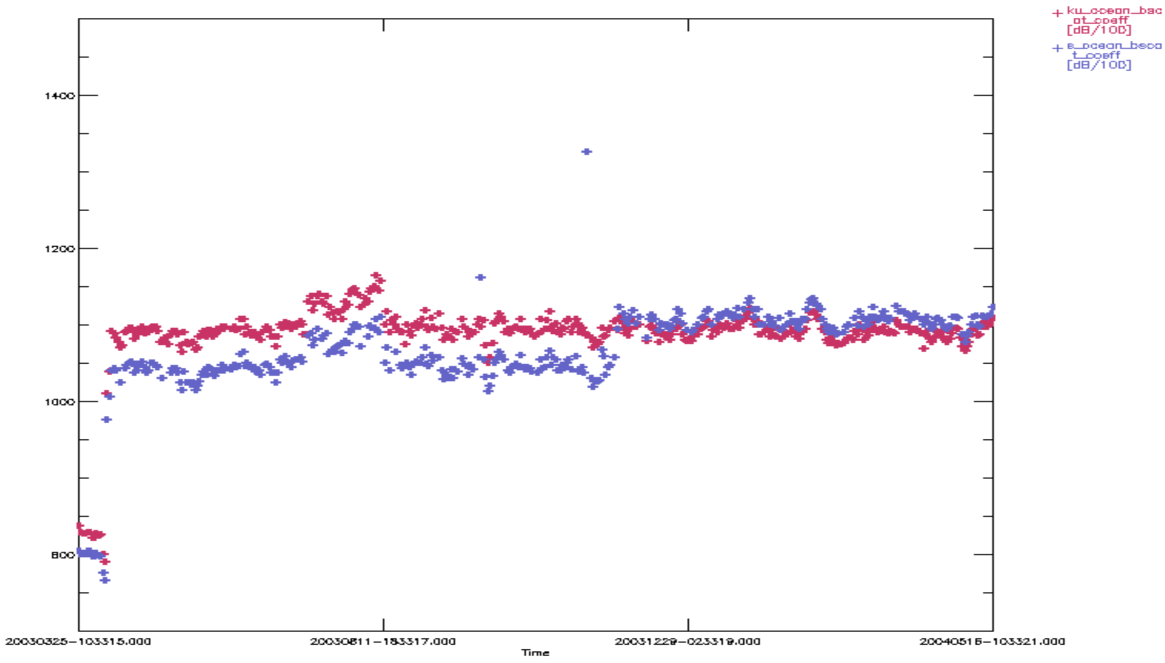


**Figure 28: Ku and S Sigma_0 daily average up to cycle 26 (dB/100)**

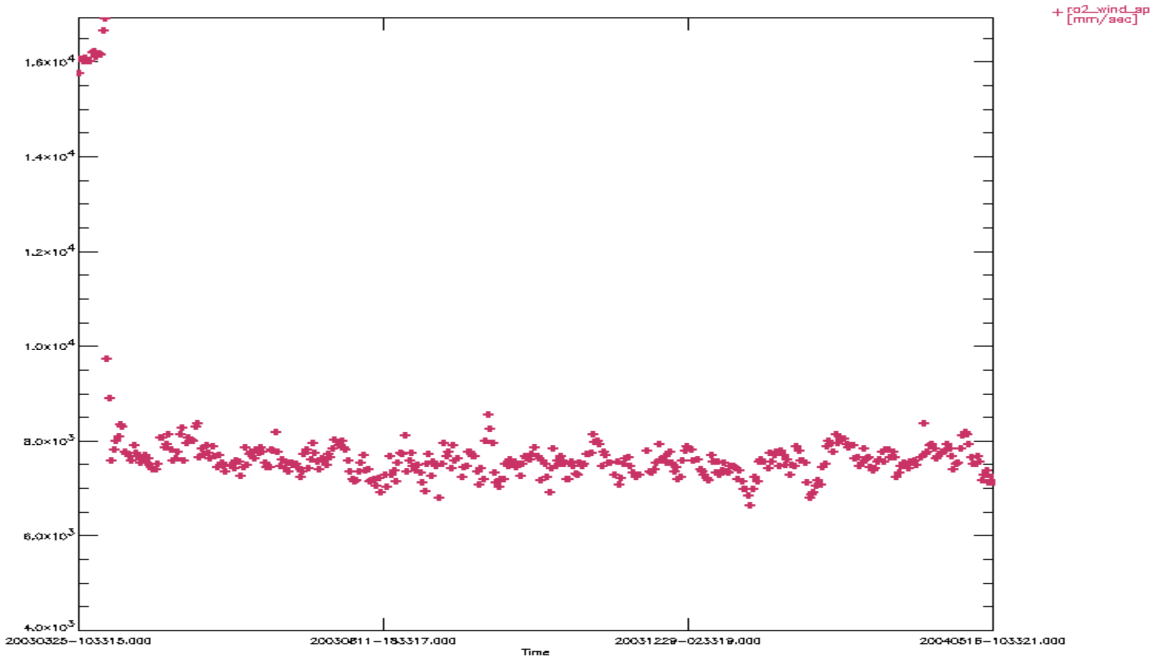


**Figure 29: Wind Speed daily average for cycle 26 (mm/s)**

# 10 PARTICULAR INVESTIGATIONS

During cycle 26 no special investigation has been performed.