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ENVISAT CYCLIC ALTIMETRIC REPORT

CYCLE 63 from 29-10-2007 to 03-12-2007

Quality Assessment Report

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1 INTRODUCTION

This document aims at reporting on the performance of the EnviSat Radar Altimeter, Microwave Radiometer and DORIS sensors, on the data quality of the corresponding Fast Delivery products as well as on the main events which occurred during cycle 63.

This report covers the period from 29th of October 2007 until 3rd of December 2007.

2 DISTRIBUTION LIST

This report is available in PDF format at the internet address
http://earth.esa.int/pcs/envisat/ra2/reports/pcs_cyclic/

3 ACRONYMS

AGC	Automatic Gain Control
APC	Antenna Pointing Controller
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
MR	Microwave Receiver
NRT	Near Real Time
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
PSO	On-orbit Position
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
SLA	Sea Level Anomalies
SFCM	Stellar Fine Control Mode
SPH	Specific Product header
SPSA	Signal Processing Sub-Assembly
SYSM	Stellar Yaw Steering Mode
S/W	Software
TM	Telemetry
TRP	Transponder
TWT	Traveling Wave Tube
UTC	Coordinated Universal Time
USO	Ultra Stable Oscillator
YSM	Yaw Stellar Mode

4 REFERENCE DOCUMENTS

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[R – 4] Instrument Performance Evaluation and Analysis Summary, PO-TR-ALS-RA-0042
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[R – 11] Envisat RA-2 Range Instrumental correction: USO clock period variations and associated auxiliary file, ENVI-GSEG-EOPG-TN-03-0009
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[R – 15] ENVISAT-1 Products Specifications - Vol. 14: RA-2 Products Specifications, PO-RS-MDA-GS-2009, Iss 3, Rev. N, 24/05/2004
[R – 16] Algorithm for Flag identification and waveforms reconstruction of RA-2 data affected by “S-Band anomaly”, ENVI-GSEG-TN-04-0004, Issue 1.4
[R-17] Envisat Cyclic Report Cycle 28, ENVI-GSOP-EOPG-03-0011
[R-18] ENVISAT RA-2 IF MASK AUX FILE - Updating Strategy: Investigation Report; C. Bignami and C.Loddo and N. Pierdicca.

5 GENERAL QUALITY ASSESSMENT

5.1 Cycle Overview

- No orbits were affected by the S Band Anomaly on cycle 63. The patch correcting the SW/HW anomaly, the original cause of the S Band Anomaly, was successfully uploaded for the second time on date 27 June 2007.
- The RA-2 Ultra-Stable Oscillator (USO) anomaly present since the 27th of September at 11:13:30 has remained present for almost the entire cycle. It only disappeared at the end of the cycle, on the 3rd of December at 03:00.

WARNING: Users are strongly advised not to use the range parameter in Ku and S Band during the current cycle without applying the USO correction.

- Three USO corrections have been developed for the different Envisat Level 2 altimetry data products for correcting the abnormal RA-2 USO behaviour affecting the Altimetric Range by few meters w.r.t. the Mean Sea Surface:
  1. NRT orbit basis USO correction for FDGDR products , available from `http://earth.esa.int/pcs/envisat/ra2/auxdata/`;
  2. An Interim daily USO correction for IGDR products, available at the same F-PAC location as for IGDR, in the directory igdr_ous_corr
  3. An OFL cycle USO correction for GDR products, available at the same F-PAC location as for GDR, in the directory gdr_ous_corr.

- A software routine has been developed to allow users to insert the RA-2 Ultra-Stable Oscillator (USO) corrections into Envisat Level 2 altimetry data products and is available in the same web site as the correction files, see above.
- The NRT USO correction has been made available from July 24, 2006 onwards.
- On Cycle 63, the new IF Masks acquisition planning used on cycle 62 has been used again in order to consolidate the results obtained with the In-Flight Tests. These tests were proposed by Alenia in order to understand the origin of the IF Masks Anomaly. The planning consisted on a new calibration procedure and it was implemented on the Rocky Mountains site only, whilst the old procedure was implemented in the Himalaya. The tests were successful: all IF Masks acquired with the new procedure on the Rocky Mountains are valid.
- Over the 85 IF masks acquired and processed, there are 64 valid IF masks over the two defined zones (75% of acquired and processed masks). The auxiliary file RA2_IFF_AX was updated on date 19 November 2007.
- Tracking performances in the different resolutions are well in line with the output figures and objectives of the Commissioning Phase.
- During cycle 63, RA2_SOL_AX has never been updated..
- RA2 was unavailable once, data availability was around 98 %
- MWR was never unavailable, data availability was around 99%
- DORIS was never unavailable, data availability was around 99 %

5.2 Payload status

5.2.1 ALTIMETER EVENTS

The Radar Altimeter 2, during cycle 63, was unavailable once, as described below.

Start: 8 Nov 2007 13:31:47 Orbit = 29752
Stop: 8 Nov 2007 17:24:30 Orbit = 29754

The instrument was switched to Suspend by the PMC following consecutive TM format errors. The mode was commanded back to Measurement on the same day.

5.2.1.1 RA-2 instrument planning

Starting on Cycle 56, a new calibration site has been defined for the IF masks mode acquisition. The new site is on the Rocky Mountains. The nominal operational acquisition over Himalaya is still being performed, but only on ascending passes. In Figure1 a map is reported indicating the two calibration sites.
On Cycle 63 the II In-Flight Tests aimed to understand the origin of the IF Mask anomaly has been consolidated. The scope of the test was to verify if the AGC used for the IF Calibration mode, sent

from the SPSA to the MR, was correct. The tests have been performed by using new IF Calibration procedure on the Rocky Mountains site only. The new procedure consisted in setting all the AGC's to 3dB before entering the IF Calibration Mode. These parameters have all been restored to the original values when the IF Calibration mode has expired, before entering in the Measurement mode.

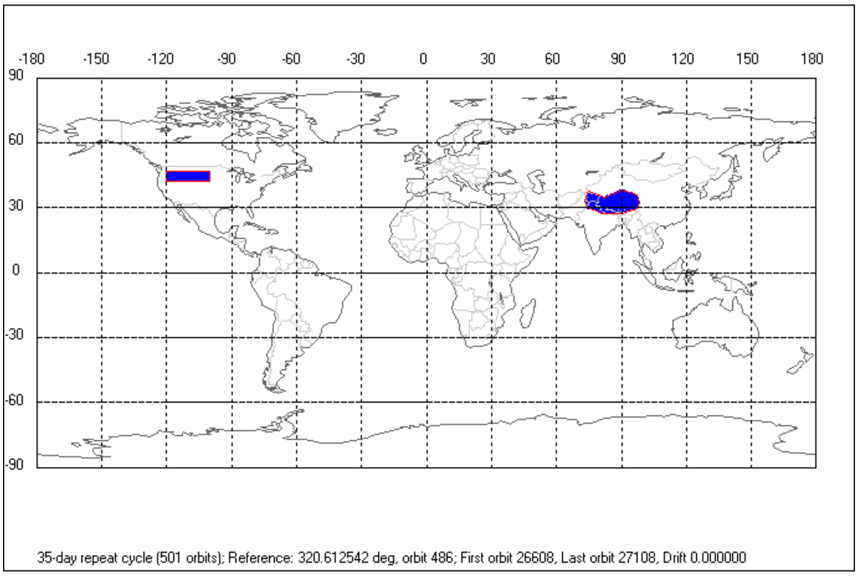

Figure 1: IF Calibration Acquisition sites

The RA-2 instrument planning was performed as follows:

- IF calibration over Himalayas for the entire cycle, 1 ascending pass per day
- New procedure for IF calibration (through Digital BITE Mode command) over Rocky Mountains for the entire cycle, each ascending and descending pass
- Individual Echoes background planning: the buffering of 20 Data Blocks of Individual Echoes (1.114 sec.) transmitted every 160 Data Blocks starts after flying over the Himalayan region (both ascending and descending passes) and is operated for half a day.
- Individual Echoes acquisitions during PLO activity over ESA transponder located in Rome (1 second length acquisition, 1 repetition)
- Individual Echoes acquisition (1 second length acquisition, 1 repetition) over the following sites:
  Capraia, Toulon D, Vostok , Dome C. Appendix 6 contains a table with the coordinates.
- Individual Echoes acquisitions over the Uyuni Salar
- Preset Loop Output mode for GAVDOS Range transponders, located in Creta.
- Preset Loop Output mode over the ESA transponder located in Rome (permanent location); high chirp resolution.

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

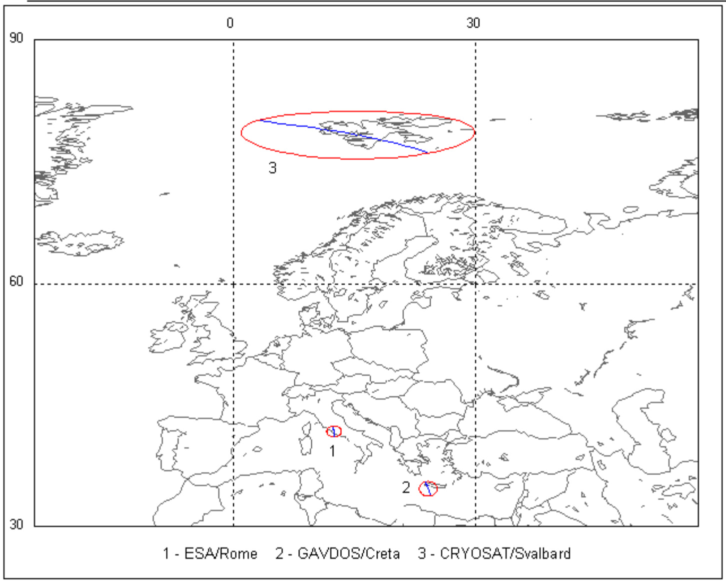

Figure 2A: Transponder Acquisition sites

5.2.2 MWR EVENTS

The MWR, during cycle 63, was never unavailable .

5.2.3 DORIS EVENTS

DORIS, during cycle 63, was never .unavailable.

5.3 Availability

The summary of the RA-2 data products availability for the current cycle is reported in Appendix 2. Data availability was around 99% for RA-2 products, 99% for MWR products and 99% for DORIS products.

5.4 Orbit quality

During the rest of the period covered by this report the spacecraft ground track remained within the +/- 200 m deadband around the reference ground track at ascending node without any orbit control manoeuvre.

5.5 Ground Segment Processing Chain Status

5.5.1 IPF PROCESSING CHAIN

5.5.1.1 Version

Cycle 63 has been processed with IPF processing chain V5.06, installed in both PDHS-E and PDHS-K on 20th June 2007, orbit 27729.

IPF V5.06 contains the following main evolutions:

1. Increase performance in the usage of DORIS Navigator in NRT products due to DORIS Navigator threshold update to 900 seconds coverage RA2/DORIS;

2. Alignment of Chain B to Prod Spec 3/N

A complete table of IPF Level1b and Level2 upgrades is reported in Appendix 1.

5.5.1.2 Auxiliary Data File

The Auxiliary files actually used by the IPF ground processing are reported in Appendix 3.
The RA2_POL_AX, RA2_SOL_AX and RA2_PLA_AX have been regularly updated without problems. The RA2_IFF_AX has been updated during the reporting period. The RA2_USO_AX has never been updated during the reporting period . Data are corrected with the RA2_USO_AX estimated before the USO Clock anomaly (USO_Clock_Period = 12499999726, USO_Range_Correction= 17.3 mm).

The RA-2 Auxiliary Data Files (ADF) are accessible from the Envisat Web pages under:
http://www.envisat.esa.int/services/auxiliary_data/ra2mwr/ .

6 INSTRUMENT PERFORMANCE

6.1 RA-2 Performance

6.1.1 TRACKING CAPABILITY

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

Surface type	320 MHz	Commissioning Phase objectives 320 MHz	80 MHz	20MHz
Open Ocean	**99.99**	**>99%**	**0.01**	**0.00**
Costal Water (ocean depth < 200 m)	**98.38**	**No specific requirement**	**1.47**	**0.15**
Sea Ice	**99.24**	**>95%**	**0.68**	**0.09**
Ice Sheet	**96.29**	**>95%**	**3.10**	**0.61**
Land	**81.68**	**No specific requirement**	**13.88**	**4.43**
All world	**95.31**		**3.60**	**1.08**

Table 1: RA-2 Tracking capability: Chirp ID percentages discriminated by surface type

The figures given for the RA-2 tracking performances during this cycle are in line with the ones recorded at the end of the Commissioning Phase reported in the last column and presented in [R – 8].

In Figure 2, Figure 3 and Figure 4 the cyclic tracking percentages for the three RA-2 bandwidths are reported.
The worsening in performance noticeable for cycle 20 was due to the up-load of wrong on-board software parameters which lasted for about three days whilst for cycle 47 a special operation has been performed to limit RA-2 Chirp Bandwidth to fixed values.

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 Table 1.

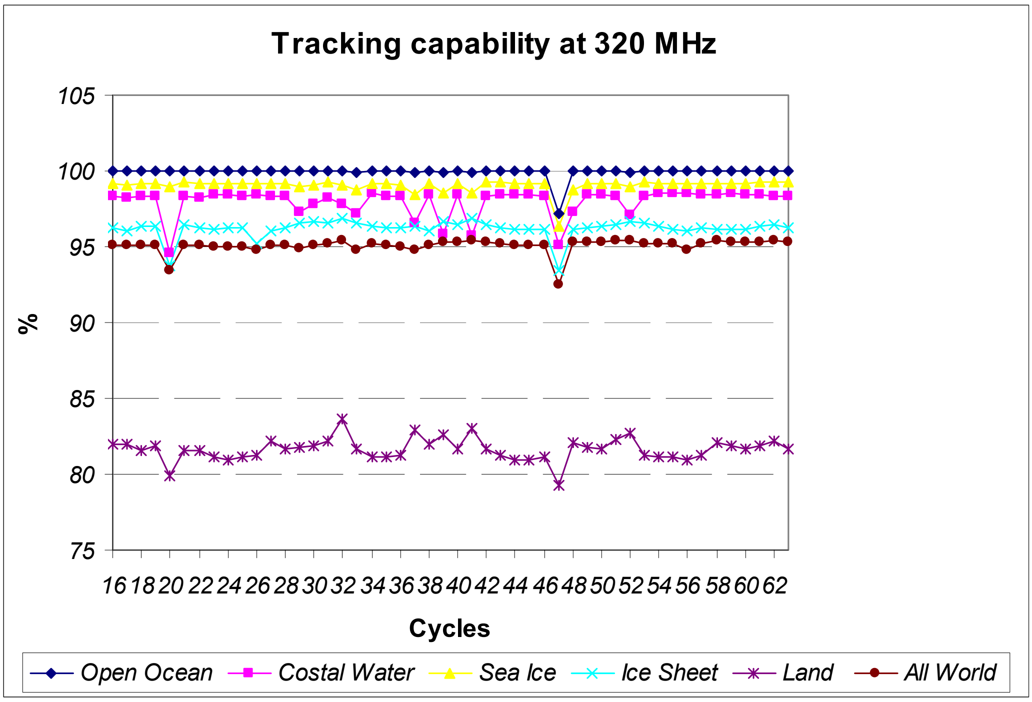

Figure 2: RA-2 Tracking percentage at 320MHz for different surfaces

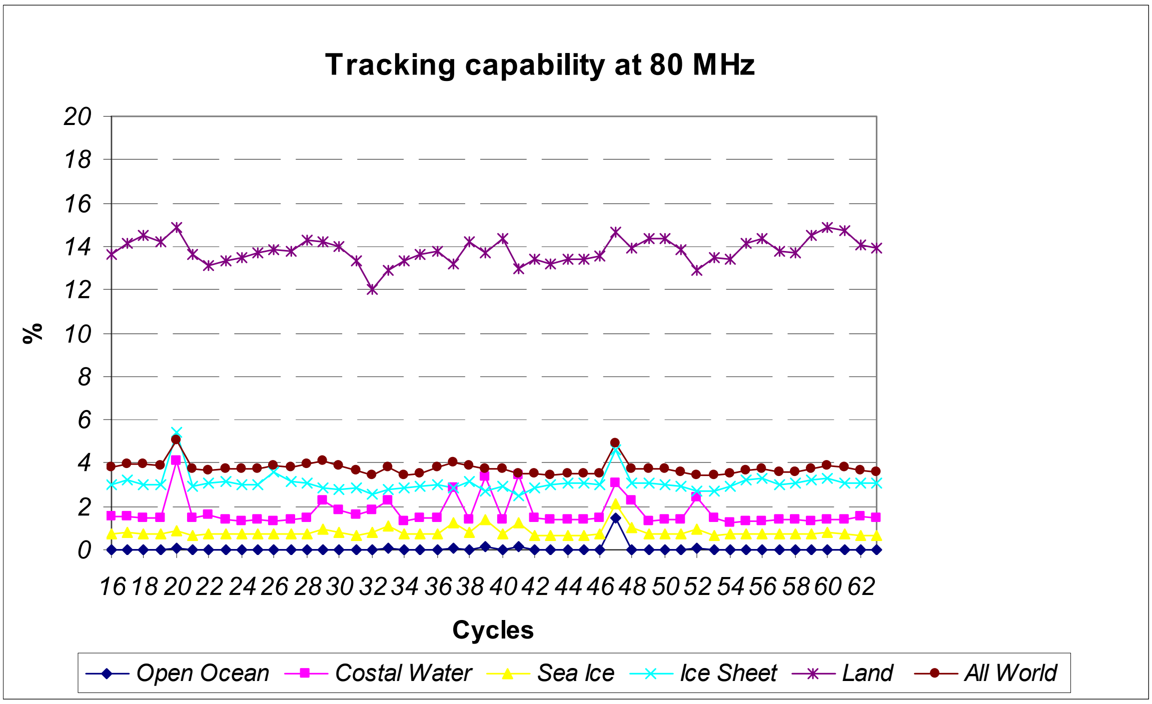

Figure 3: RA-2 Tracking percentage at 80MHz for different surfaces

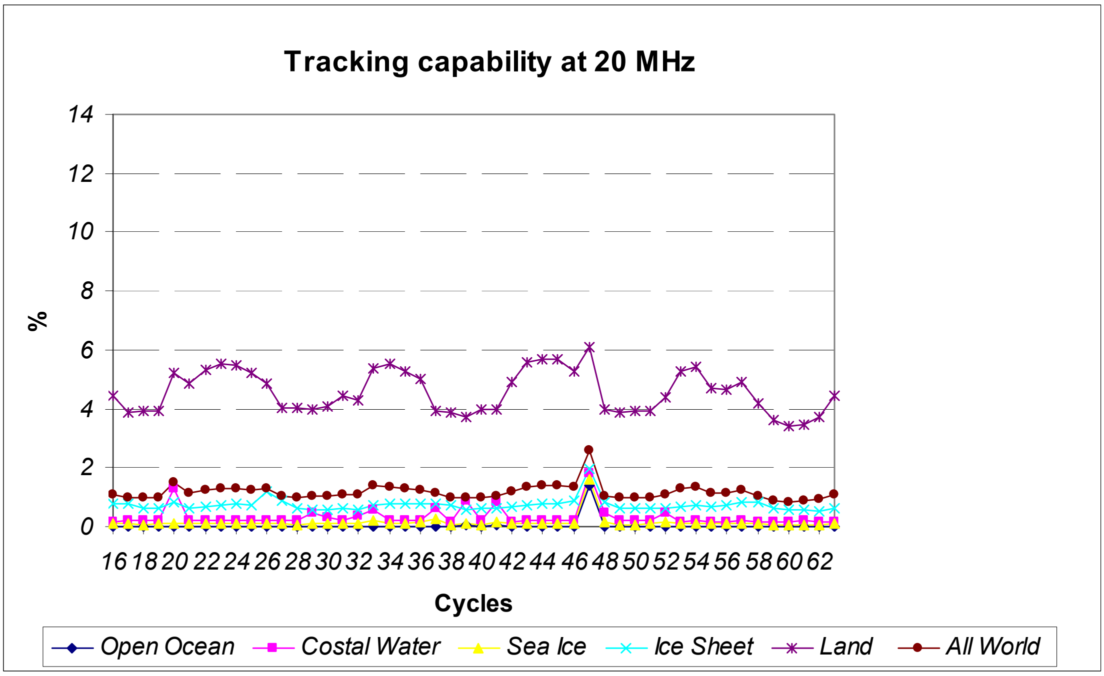

Figure 4: RA-2 Tracking percentage at 20MHz for different surfaces

6.1.2 IF FILTER MASK

In Figure 5 all valid IF masks retrieved during cycle 63 are plotted in the left panel. The on-ground measured IF mask (ref [R – 4]) is also plotted in that panel with a 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. The average difference with respect to the on-ground is used as the criteria for defining valid masks: if it is lower than 0.01 dbs, the mask is considered valid.

According to the new planning defined for the IF Calibration acquisition from cycle 56 onwards (ref. Par. 5.2.1.1), one daily pass over the site Himalaya (35 ascending passes) and 61 passes over Rocky Mountains (both ascending and descending tracks; less than two per day) have been performed.

On Cycle 63 a consolidation of the II In-Flight Tests aimed to understand the origin of the IF Mask anomaly has been performed. The scope of the test was to verify if the AGC used for the IF Calibration mode, sent from the SPSA to the MR, was correct. The test was performed by using a new calibration procedure consisting in setting all the AGC's to 3dB before entering the IF Calibration Mode and resetting all the parameters to the original values before entering in the Measurement mode.
The new procedure was used on the Rocky Mountains site only.

The Test was successful: all IF Masks acquired with the new procedure on the Rocky Mountains were valid.

- The number of valid IF Masks acquired on the Rocky Mountains site was 55
- The number of valid IF Masks acquired on the Himalaya site was 9

The overall number of valid IF masks has been 64, representing 75 % of the 85 acquired and processed 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 generating it consists in a monthly average according to the strategy defined in [R-18] with an editing criteria based on the comparison between each of the single IF masks and the reference one (on-ground).

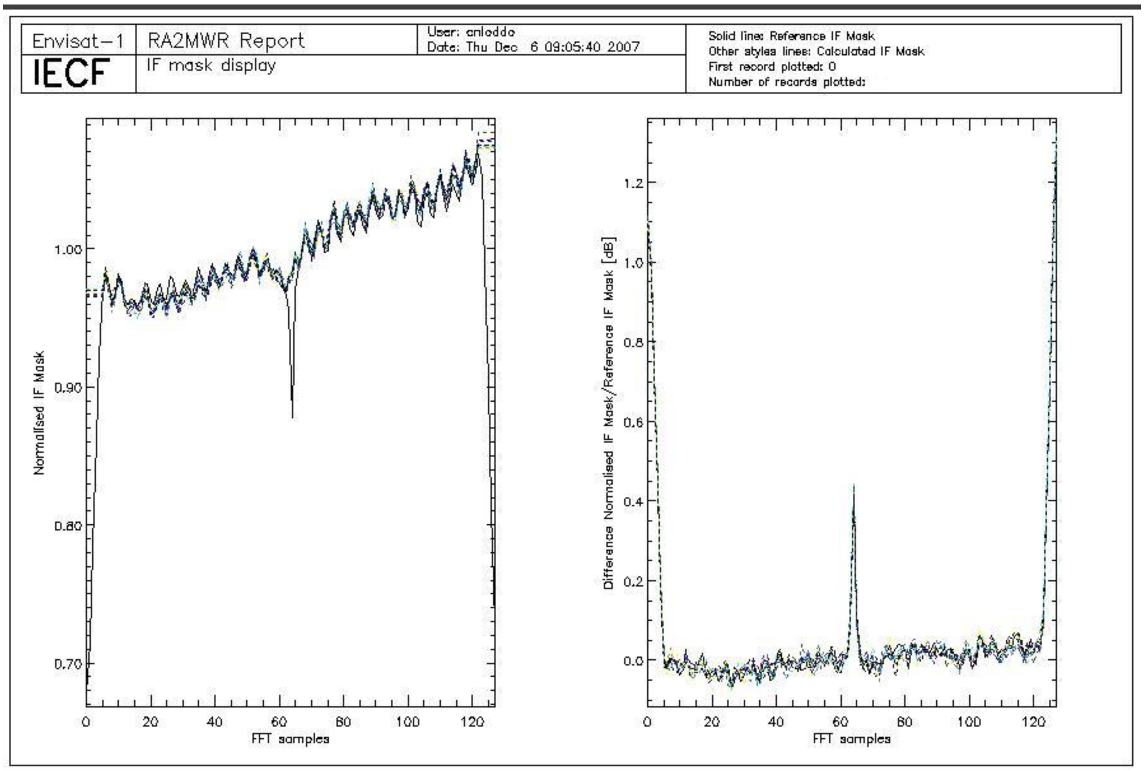

Figure 5: Valid IF masks retrieved during cycle 63 plotted together with the on-ground reference.

In Figure 6 the IF Mask, updated on the 19th of November 2007, and the previous IF Mask used for processing are plotted.

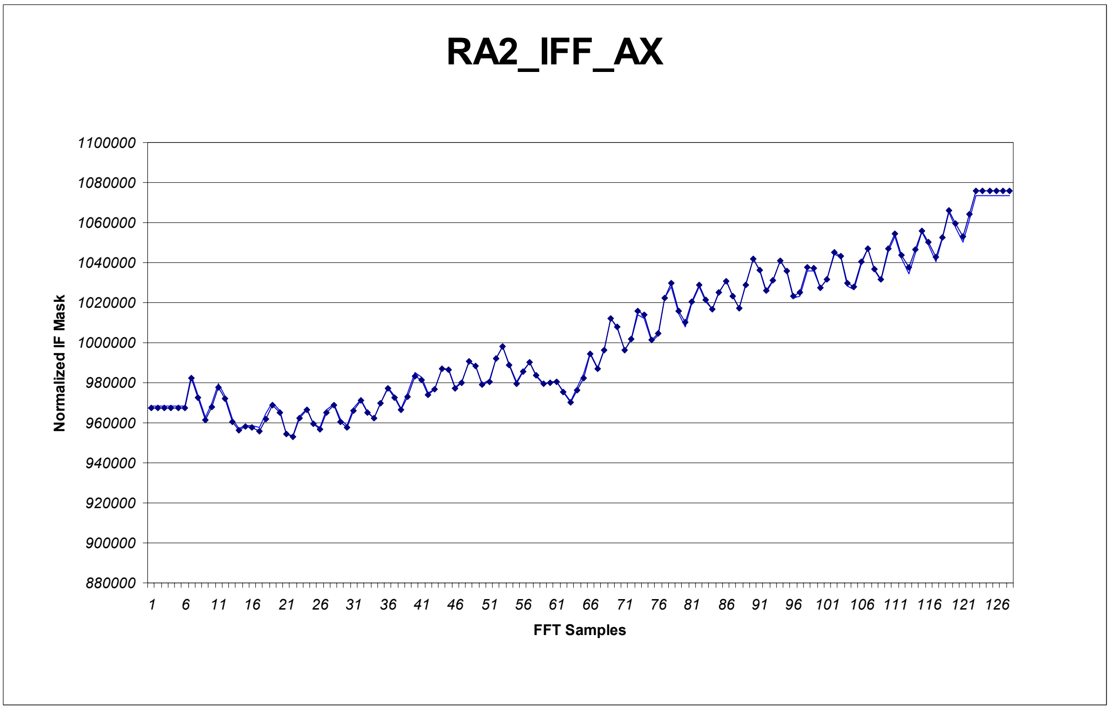

Figure 6: Previous and IF Mask updated on 19th of November 2007

In Figure 7 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 presents an increasing trend due to the ageing of the instrument. These differences have significantly increased in the current cycle probably due to the implementation of the In-Flight tests, described in the beginning of this chapter. This is under investigation.

Some peaks are visible on the plot that correspond to the data acquired on September the 27th 2003 at 15:48, on October the 29th 2003 at 15:42, on May the 10th 2004 at 15:45, on April 9th 2006, on December 16th 2006 and on September 27th . The reason of this could be found in the instrument warming up considering that the IF Cal acquisition has been made, in the three first cases, only a couple of hours after an anomaly recovery. In the two last cases the unavailability was very long, more than two days, and the warming up effect lasted longer. The residual noise and the accuracy show a very constant behavior over the whole period.

During the current cycle the IF Calibration Mode showed the weird behavior described in [R – 3] only in data acquired in the Himalaya site. According to the In-Flight Tests performed on cycle 62 and 63, this problem, present since the beginning of the mission, seems to be related to the AGC used for the calibration mode. The anomaly directly affects the number of valid RA-2 IF masks obtained per cycle, but does not prevent the generation of the IF mask correction file, used in input to the Level 1B ground processing as far as at least 10 of them are valid Mask.

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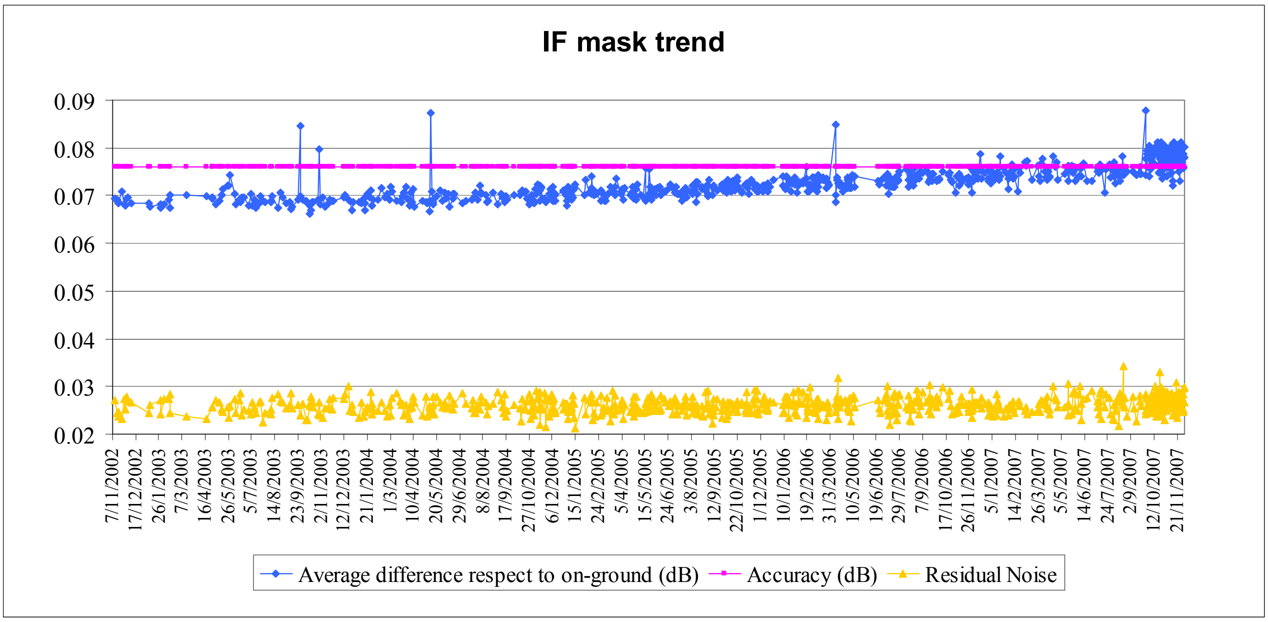

Figure 7: Evolution of the IF mask related parameters for valid IF masks retrieved up to cycle 63

In Figure 8 the percentages of valid IF masks from cycle 20 onwards is reported. This percentage is computed with reference to the acquired masks per cycle. The higher number of valid IF Masks in cycle 48 is a consequence of the special IF Calibration operations which took place on 8 and 9 June 2006 when the altimeter was on its side B. The number of valid IF Masks has decrease from cycle 56 onwards. The high number of valid IF Masks in cycle 62 and 63 is related to the In-Flight Tests described at the beginning of this chapter.

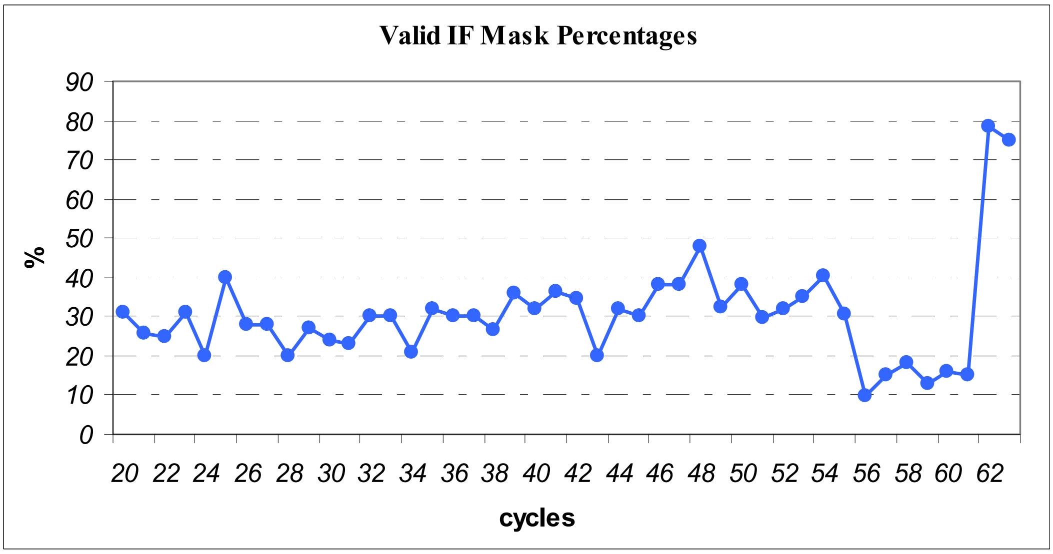

Figure 8: Percentages of valid IF Mask up to cycle 63

6.1.3 USO

The RA-2 Ultra-Stable Oscillator (USO) anomaly which appeared again following the recovery of the RA-2 sensor on 27 September 2007 at 11:13:30 was present for almost the entire cycle 63. It only disappeared some hours before the end of the cycle, on the 3rd of December at 03:00:00. This anomaly appeared for the first time on cycle 44 and it lasted for about 11 cycles, until the beginning of cycle 56.

In Figure 9 the USO clock period trend 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.

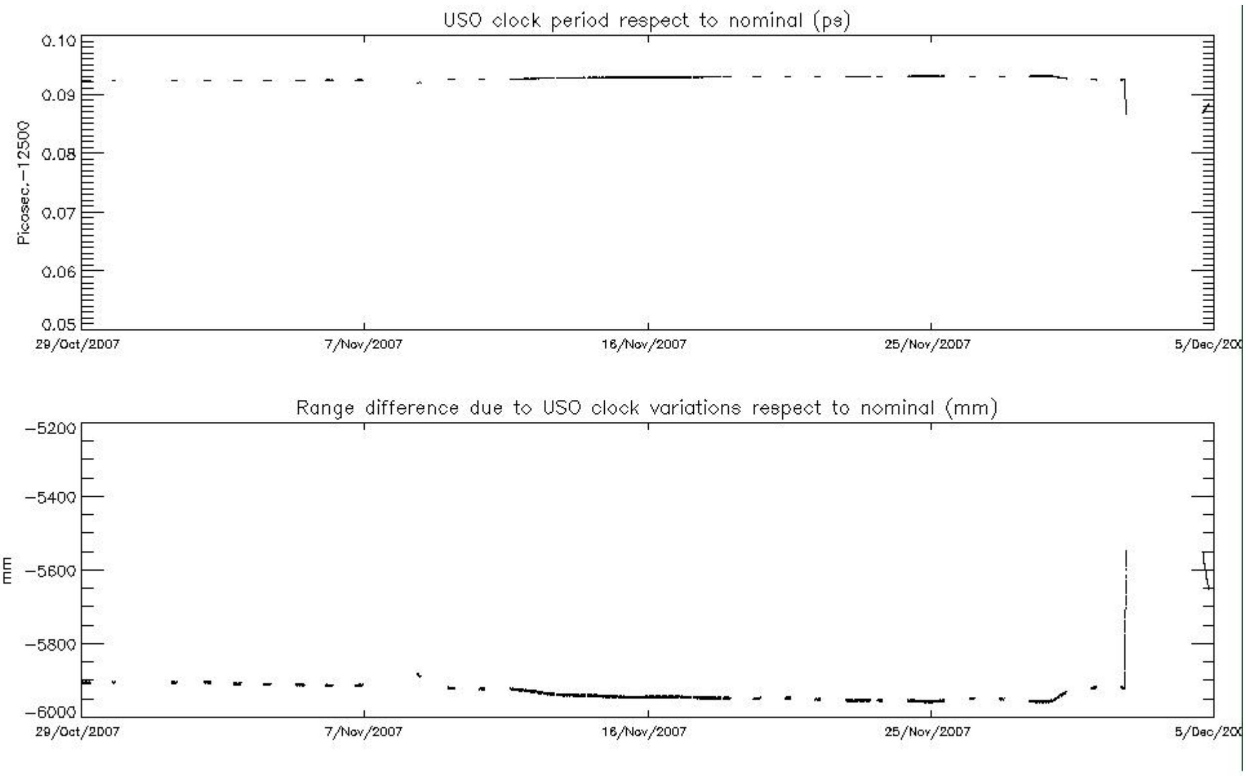

Figure 9: USO clock period for cycle 63

The USO Clock Period anomaly was almost permanently present during the last year. It started in cycle 44, on date 1 Feb 2006 12:04:30, Orbit = 205181. It directly happened after the recovery of the RA-2 on-board anomaly which occurred on the 2006/02/01 at 05:17:56. During the anomalous period, the altimetric range jumped by several meters (about 5.6m) w.r.t. the Mean Sea Surface due to an anomaly in the USO clock period. Moreover, oscillations at the orbital period with an amplitude of 20-30 cm affect the Sea Level Anomaly making the range unusable for both Ku and S Band. The anomaly persisted intermittently until the 15th of May 2006 14:21:50, Orbit = 21994, when the instrument was configured to its RFSS B-side. It appeared again when the instrument was reconfigured to its nominal RFSS A-side on date 21 June 2006 13:20:15, Orbit = 22523. The anomaly reappeared after the instrument recovery on date 27th of September 2007 11:13:30 and disappeared again for an unknown reason on date 3rd of December 2007 03:00:00. Note that the correction comes back to its nominal value in several steps, causing small uncertainties on the associated correction.

In Figure 10, the USO clock period trend retrieved from the beginning of the mission until the last week of cycle 49 is reported. In Figure 10A, the USO clock period trend retrieved from cycle 50 onwards is reported. The actual value of the USO clock period has been used within the L1b processing; only from the 24th of October 2005 (IPF V5.02) until the 1st of February 2006. This means that, during this period, the data are corrected for the bias and the drift correlated to the actual USO clock period. The evaluation of the actual USO clock period is performed off-line respect to the IPF processing and it is updated once per week in the auxiliary file RA2_USO_AX. The method to correct the data from the USO period changes outside of this period is detailed in Part 7.2.

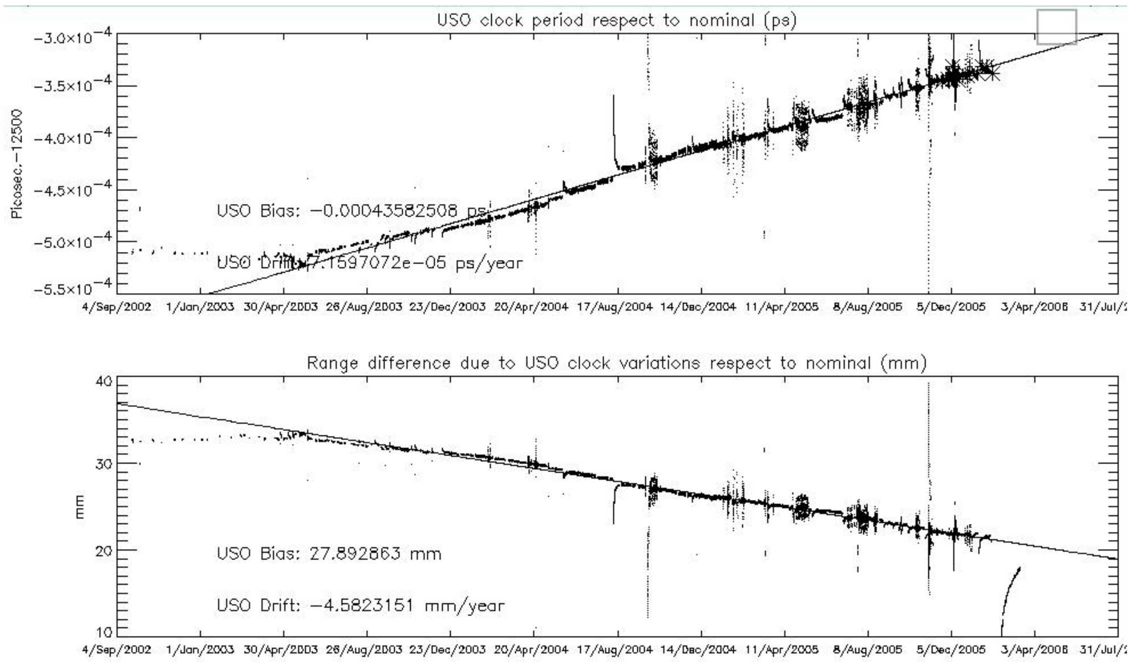

Figure 10: USO clock period until cycle 49

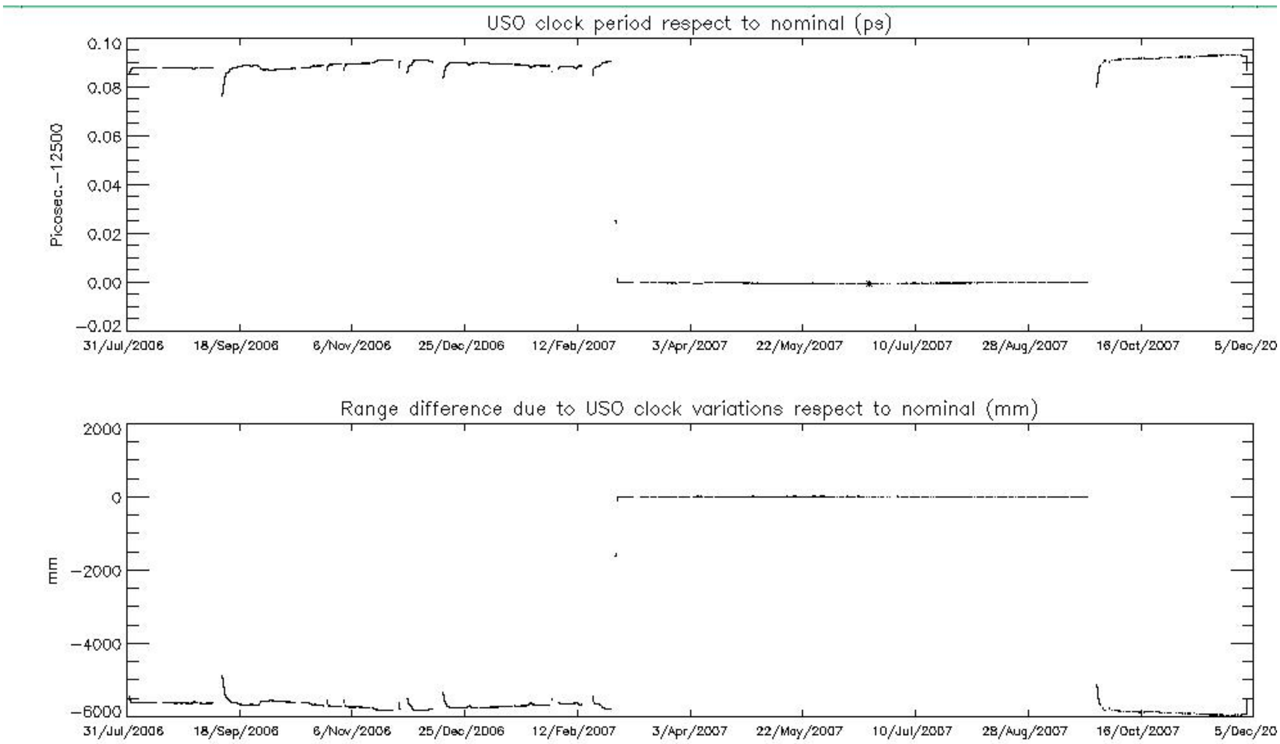

Figure 10A: USO clock period from cycle 50 onwards

6.1.4 DATATION

A significant part of an eventual error in the RA-2 products datation could result from imperfect synchronisation 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 the upper panel of Figure 11, the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported. In the lower panel, the ICU clock step for the same period is shown.

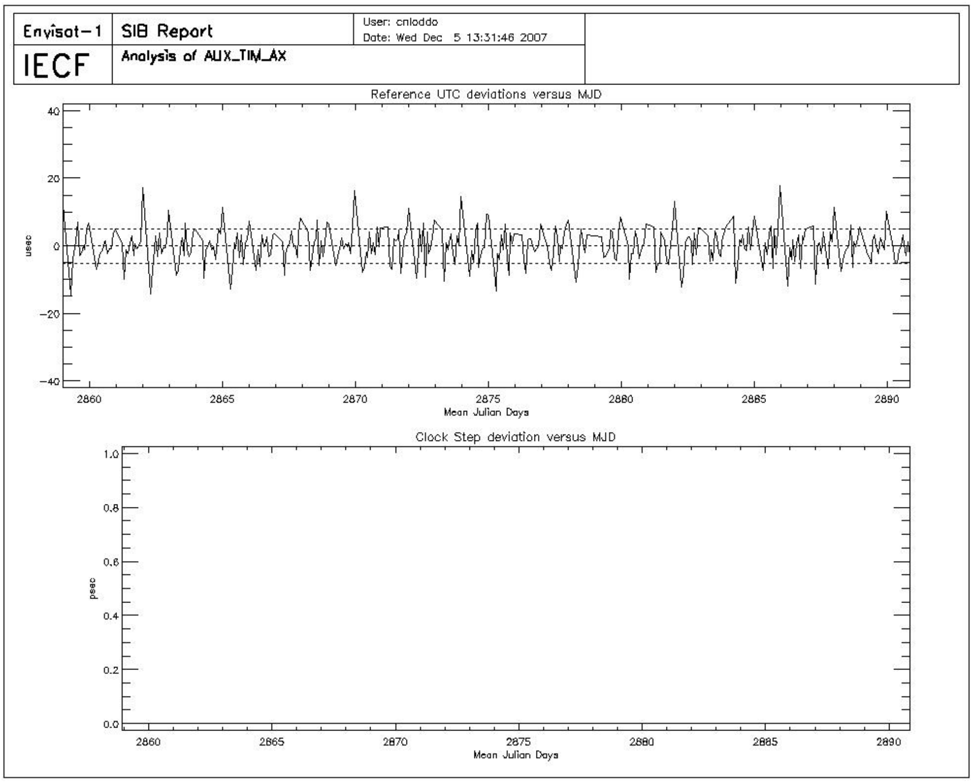

Figure 11: UTC deviations and ICU clock period for cycle 63

In Figure 12 (upper panel) the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported for data up to cycle 32. The UTC deviations for cycle 33 onwards reported in Figure 13 could not be updated due to operational problems.

Only a 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, starting from cycles 22/23, the number of small differences (10 microseconds plus or minus) has increased a lot. Furthermore, during the last ten days of the cycle 32 and for all cycle 33 and 34, the variability of the deviations has increased reporting many peaks just over the 20 microseconds threshold (first part of Figure 12); this phenomenon is now fixed. In the lower panel of both figures the ICU clock step for the same period is shown where big variations are reported. The jump observed around MJD 2288 (07-APR-2006) on Figure 13 is related to the reconfiguration of the Precise Time Correlation process, which became blocked with invalid data after the Service Module anomaly and reconfiguration occurred on 6 April 2006. This is however not a problem because the ICU clock period variations are included in the algorithm for the SBT/UTC correlation evaluation.

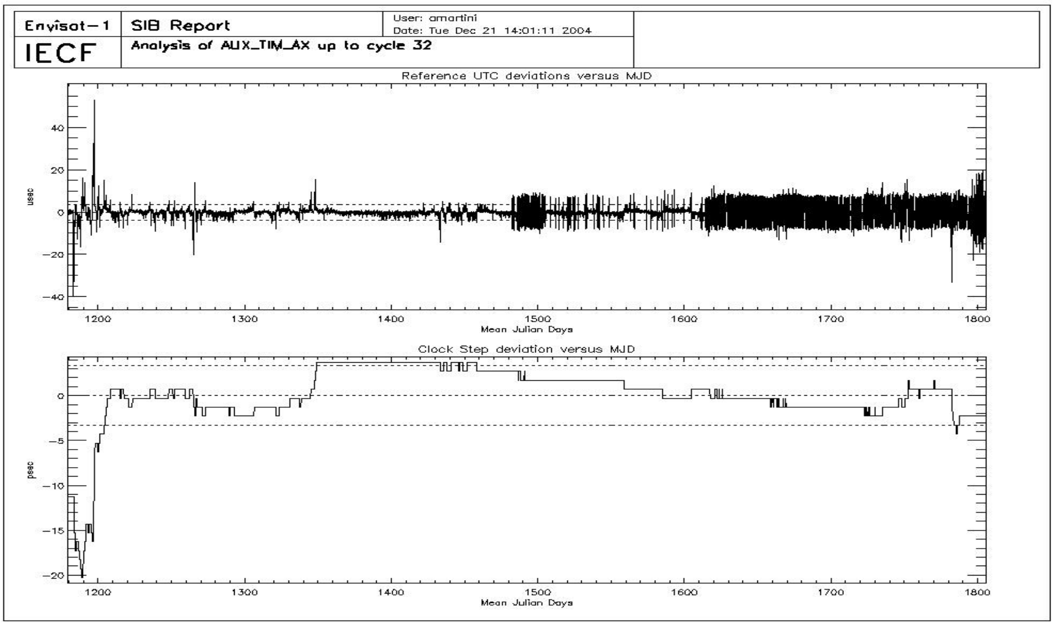

Figure 12: UTC deviations and ICU clock period up to cycle 32

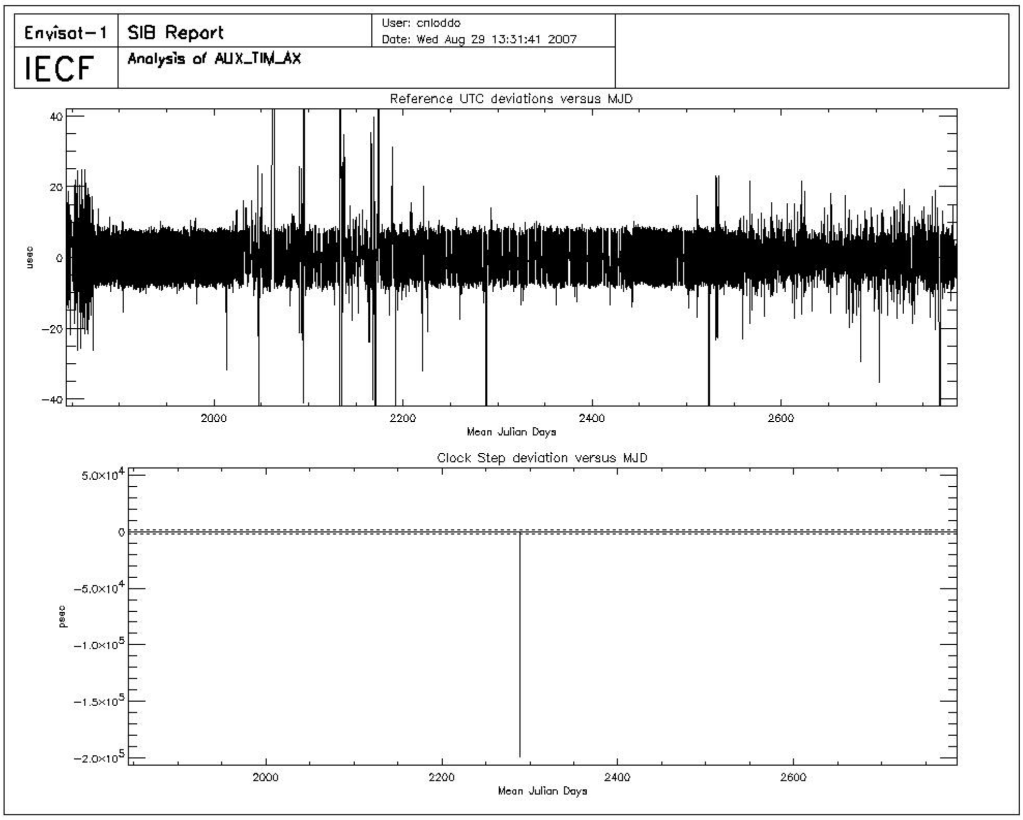

Figure 13: UTC deviations and ICU clock period from cycle 33 onwards

6.1.5 IN-FLIGHT INTERNAL CALIBRATION

The RA-2 Range and Sigma0 measurements are corrected to take into account the internal path delay and attenuation, respectively. This is done by measuring those two variables in relation to the internal Point Target Response. The two correction factors are calculated during the L1b processing and directly applied. They are also continuously monitored and the results for the current cycle (averaged per day) are reported in the next figures.

The Time delay in-flight calibration factor, reported in Figure 14, shows a regular behavior as observed on previous cycles. The Ku band Sigma0 calibration factor, reported in red in Figures 15, presents a decreasing trend. The gap followed by high values of Ku band Sigma0 observed in the plot are related to the Instrument Unavailability (ref.Par.5.2.1).

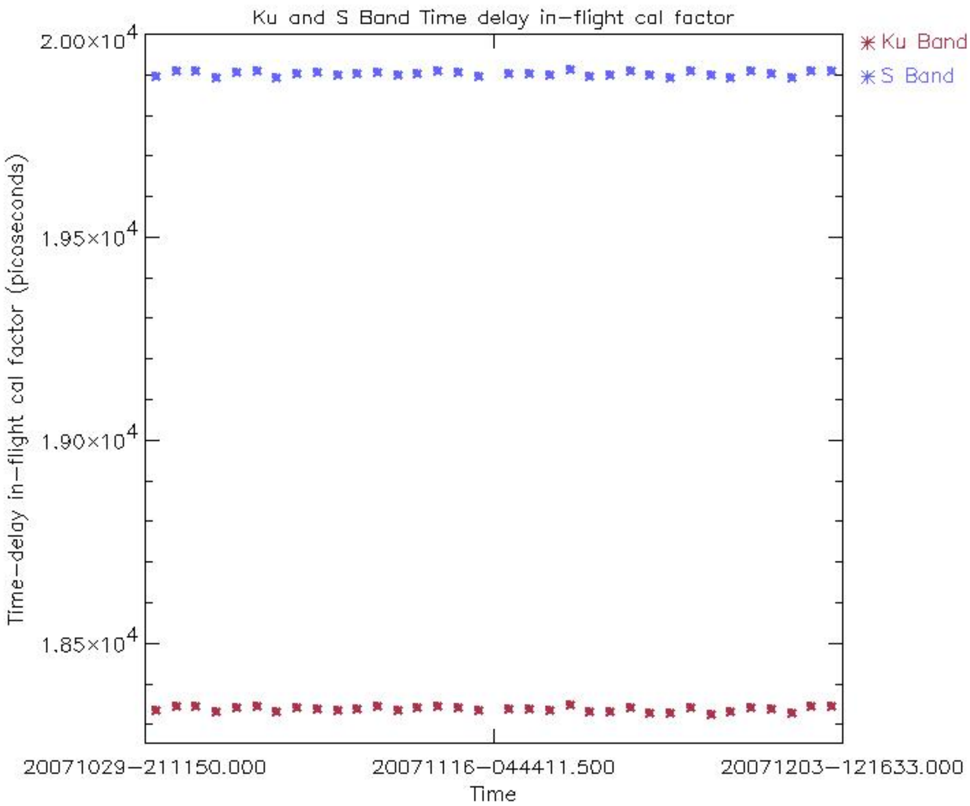

Figure 14: Ku and S Band in-flight time delay calibration factor for cycle 63 (averaged per day)

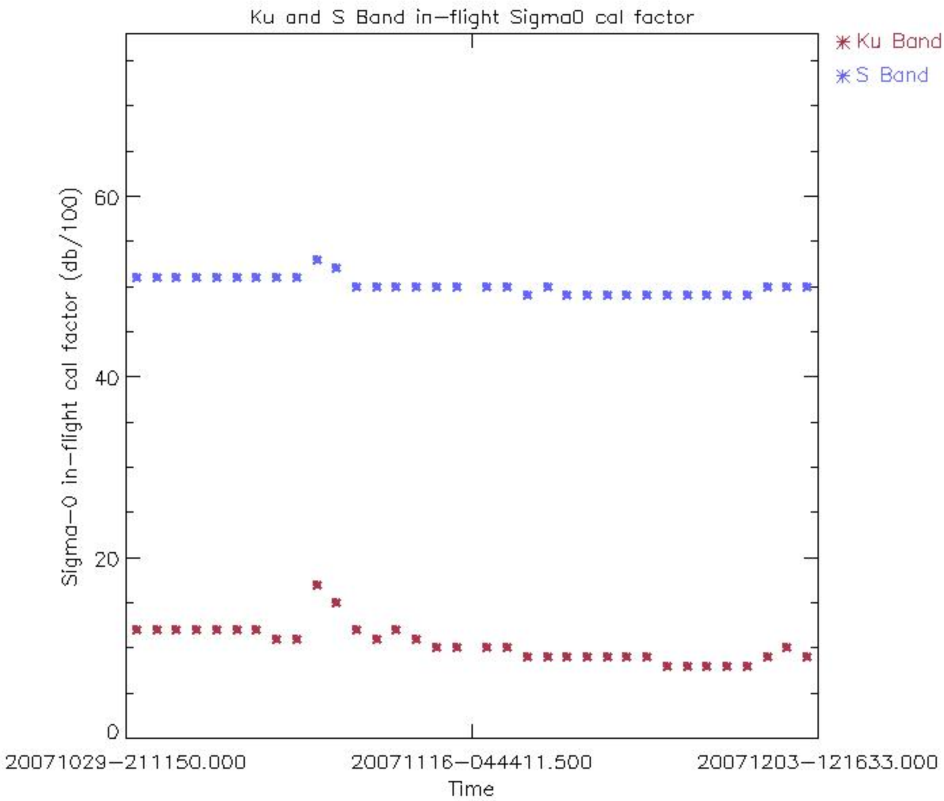

Figure 15: Ku and S Band in-flight Sigma0 calibration factor for cycle 63 (averaged per day)

Figure 16 and Figure 17 report Ku and S Band in-flight calibration factors for Time Delay and Sigma0 respectively, daily averaged, up to the current cycle. The Time Delay factor is shown to be very stable for both the working frequencies. The Ku band Sigma0 factor reveals a decrease of about 0.4 dBs over the period starting from cycle 16. As this instability is quite small, it is not being considered a problem for the moment, since the calibration factor is indeed introduced especially to correct for eventual instrumental changes. However, special attention is kept on the monitoring of this parameter. The jump observed on the last part of the plot is related to the period on which the instrument sub-system Radio Frequency Module (RFM) was switched to its B-side, occurred between 15 May and 21 June 2006.

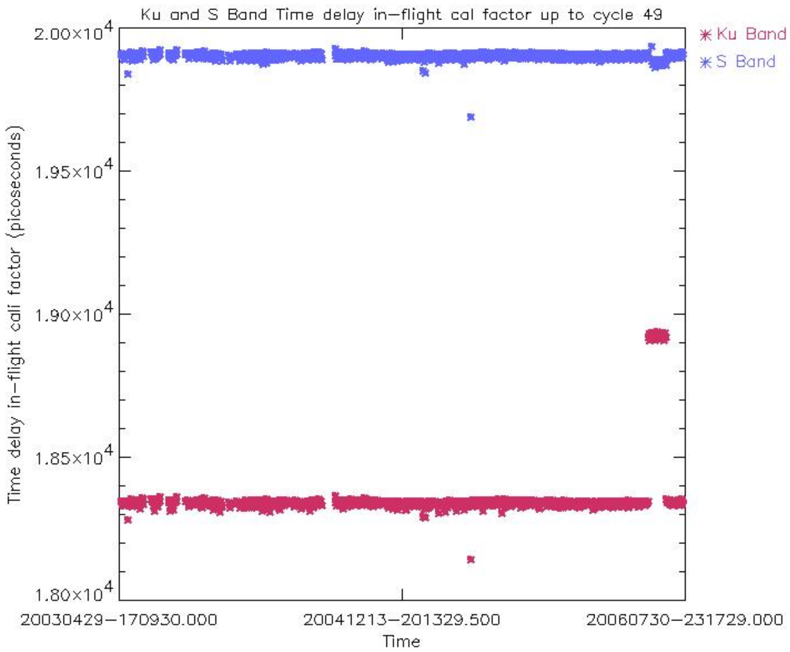

Figure 16: Ku and S Band in-flight time delay calibration factor up to cycle 49 (averaged per day)

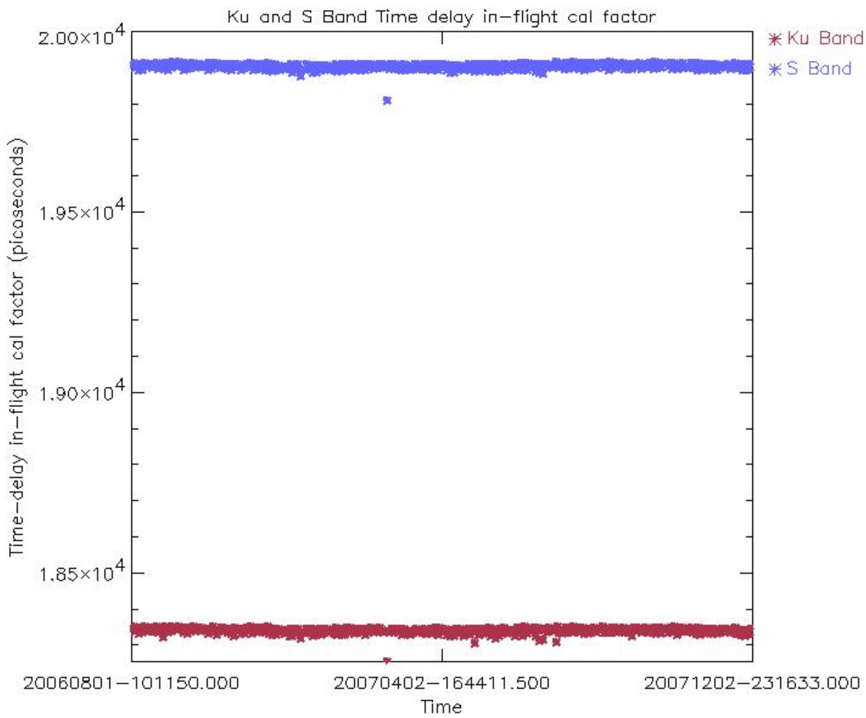

Figure 16A: Ku and S Band in-flight time delay calibration factor from cycle 50 onwards (averaged per day)

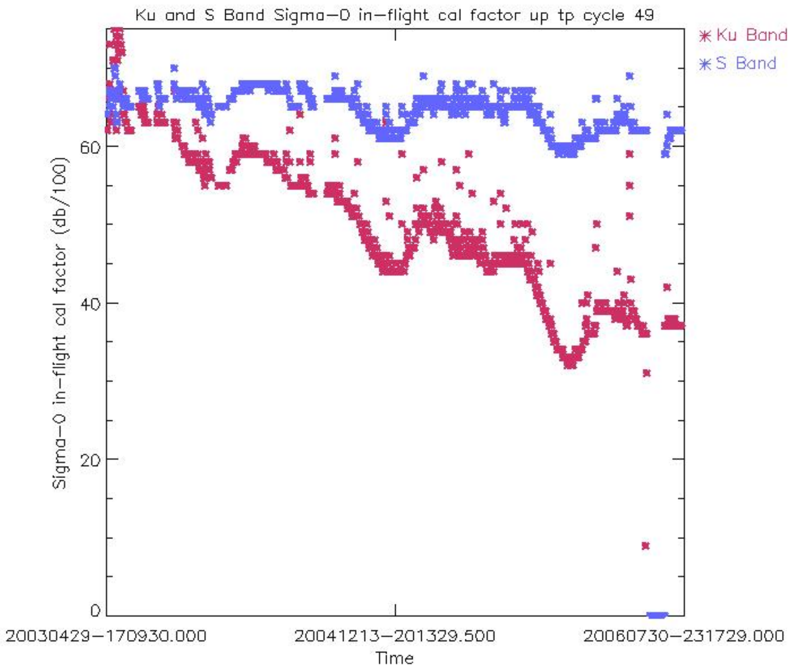

Figure 17: Ku and S Band in-flight Sigma0 calibration factor up to cycle 49 (averaged per day)

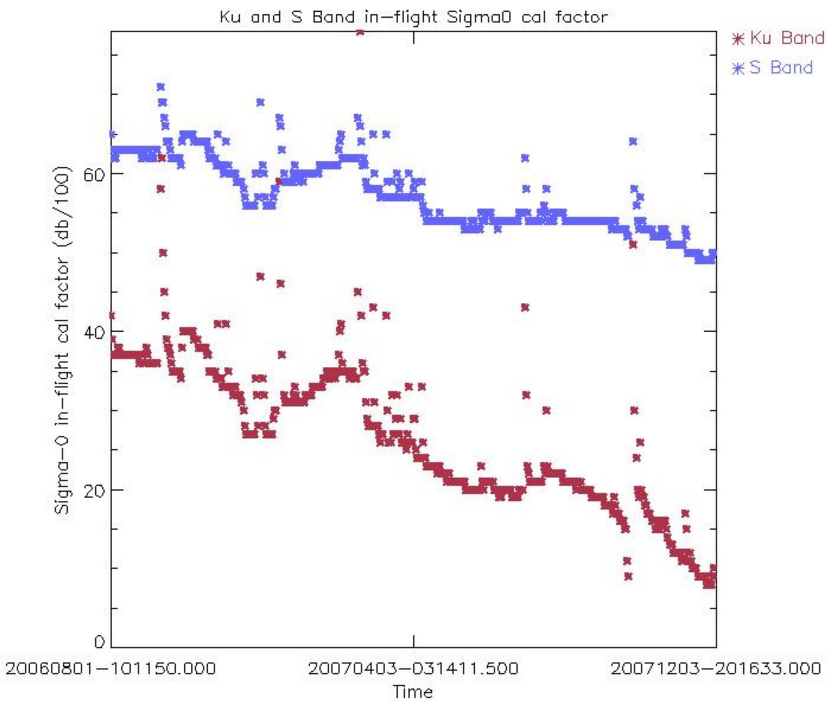

Figure 17A: Ku and S Band in-flight Sigma0 calibration factor from cycle 50 onwards (averaged per day)

6.1.6 SIGMA0 TRANSPONDER

The σ° absolute calibration of the RA-2 is performed using a reference target given by a transponder that has been developed at ESTEC. This has been exploited during the 6 month Commissioning phase to generate early calibration results. In order to consolidate the calibration results and to monitor the RA-2 calibration of σ° during the Envisat lifetime, continual monitoring is accomplished by operating the transponder for as many Envisat overpasses as possible.
Since the 11th of October the transponder has been moved to a permanent site located in Rome.

The acquisition planned for the 20th of November has been successfully performed.

Absolute Orbit nb	Date of Measurement	Location / Rel. track	RA-2 resolution	Transponder Bias [dB]	ECMWF Wet Tropo. Corr. [dB]
29928	20 Nov-2007	Perm Site Rome/315	High	1,04	0,14

Appendix 4 reports the transponder measurements from cycle 24 onwards.
The mean value of the estimated bias at High Resolution is 0.98 dB with a standard deviation of 0.2 dB. It is possible to notice that the Low Resolution measurements are coherent among themselves but there is a bias with respect to the High Resolution ones. This is due to a processing problem with the internal calibration factor not taken into account in Low Resolution Mode.

In Figure 18, the time behavior of the bias is plotted for both Low and High Resolution. The green line represents the corrected bias for the internal calibration factor (only for the Low Resolution data) and the tropospheric attenuation. The latter is estimated by using the ECMWF meteorological data. The low value of the corrected bias for the orbit 14397 is due to the dew air condition and a probable underestimation of the tropo-attenuation.

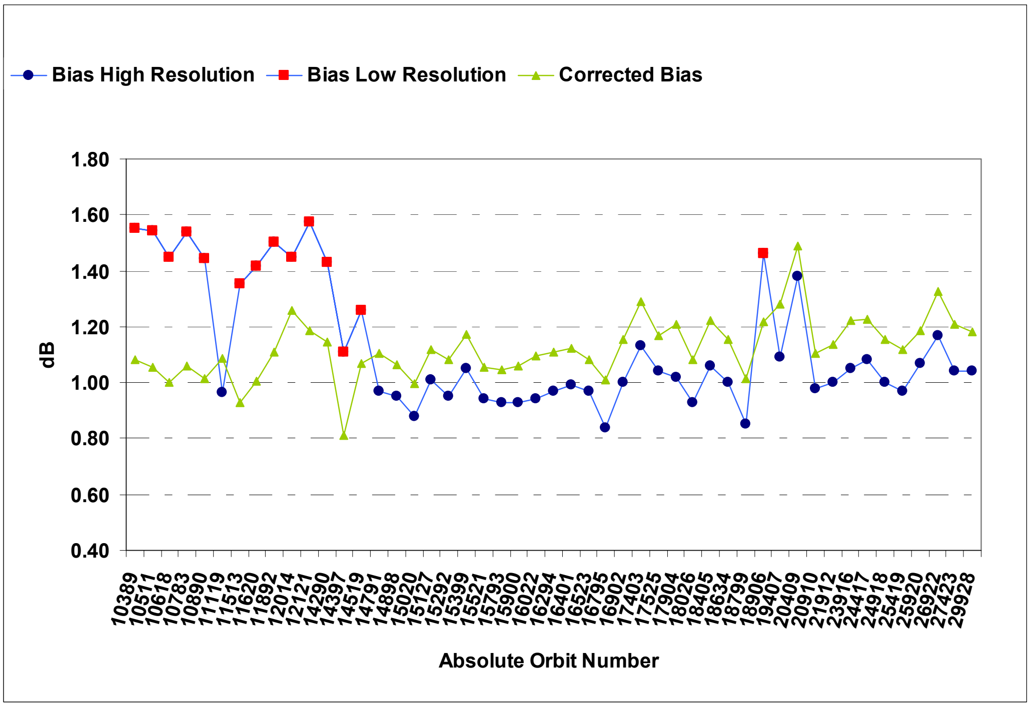

Figure 18: Time behavior of the transponder bias

6.1.7 MISPOINTING

In Figure 19, the trend of the mispointing squared (averaged every orbit) is reported in deg^2*10e-4.

The average squared mispointing value, as extracted from the RA2_FGD_2P data products, has decreased from about 0.028 deg^2, to 0.0075 deg^2. This is due to the new algorithm currently used to retrieve the mispointing value from the RA-2 waveform data, see section 5.1.1.1.

Since IPF version 5.02, the mispointing is estimated through the waveform trailing edge slope using an optimum and fixed gate and no longer an adaptive window as defined previously. This allows avoidance of the filter bump effect that leads to high values of the mispointing.

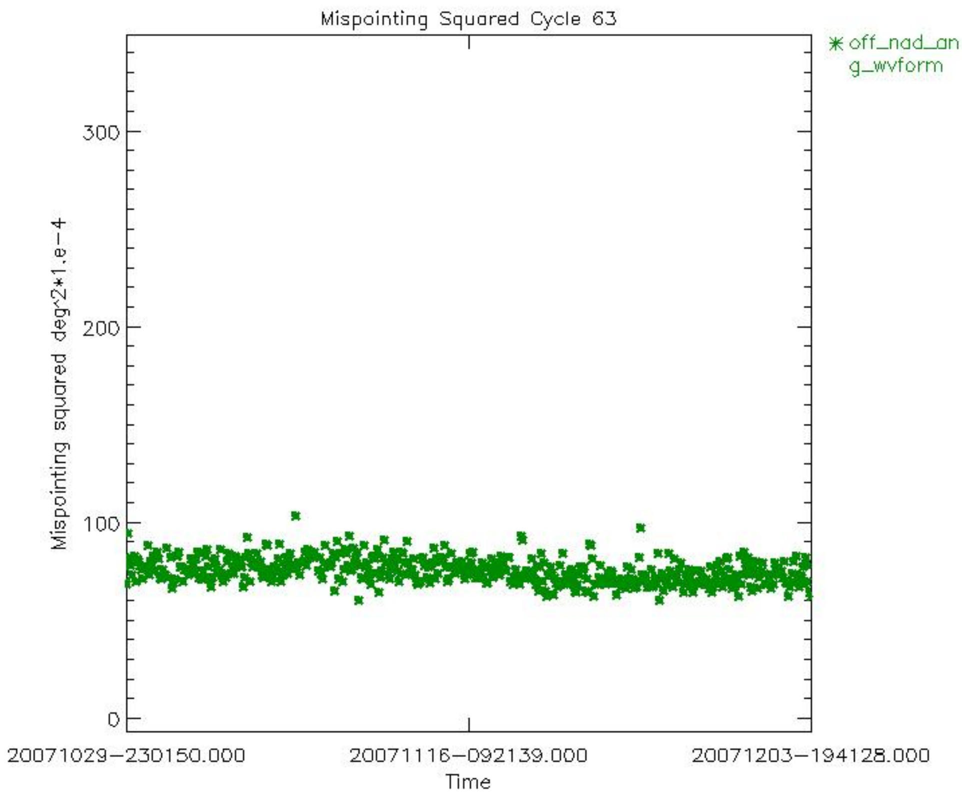

Figure 19: Smoothed mispointing squared trend for cycle 63 (deg^2*10^-4)

In Figures 20 and 20A, the overall mispointing squared trend (averaged over each orbit) is plotted for cycles 16 onwards.

The low values at the end of the plot are related to the acquisition in RFFS B-Side, occurred between 15 May and 21 June 2006.
The jump which occurred on date October 24th is related to the upload of IPF version 5.02. The abrupt decreasing of the mispointing squared value is related to the new algorithm, as described in the previous paragraph.
The jump which occurred on November the 26th 2003 is correlated to the upload of IPF version 4.56; the abrupt decrease of the mispointing squared value is due to the usage of a new RA2_IFF_AX IF mask auxiliary file. After the drop a very tiny increase of the mispointing squared could eventually be detectable. The most probable cause of this phenomenon could be a change in the Intermediate Frequency Filter slope due to ageing effects. For this reason, the RA2_IFF_AX will be updated regularly, once per month.

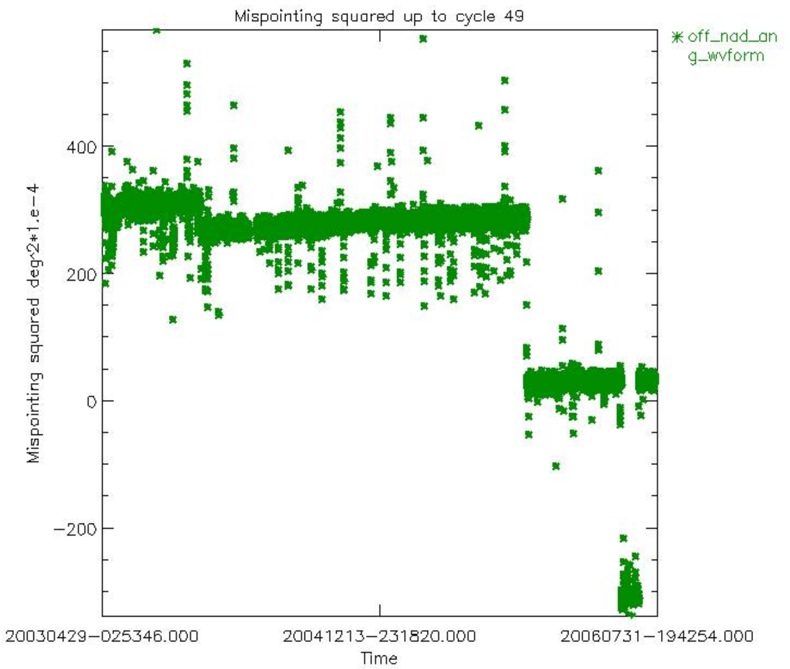

Figure 20: Smoothed mispointing squared trend until end of cycle 49 (deg^2*10e-4)

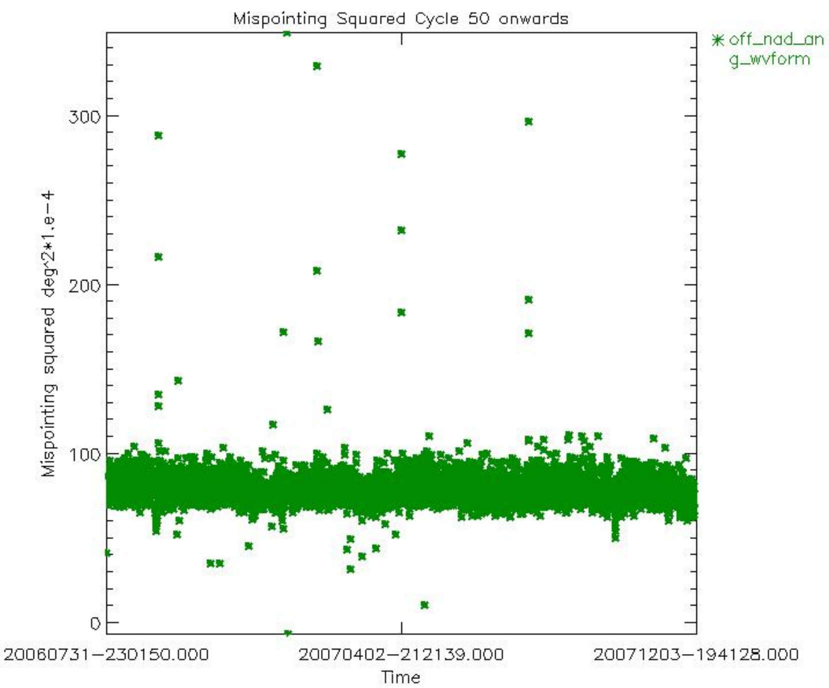

Figure 20A: Smoothed mispointing squared trend until from cycle 50 onwards (deg^2*10e-4)

It can be noticed that the mispointing squared assumes lower values just after an instrument anomaly, showing an increasing trend until it reaches a standard mispointing value.
This problem has been reduced with the introduction of the updated mispointing retrieval algorithm as described in the previous paragraph.
This particular behavior has always been explained by the different shape that the over-ocean average waveform has before and after an anomalous event as visible in Figure 21, i.e the disappearance of the small dip in the waveforms acquired after the anomaly. Since the new strategy of updating once per month the RA2_IFF_AX file, the small bump is not present anymore in the waveforms, see Figure 21_A, so a new explanation is currently under investigation.

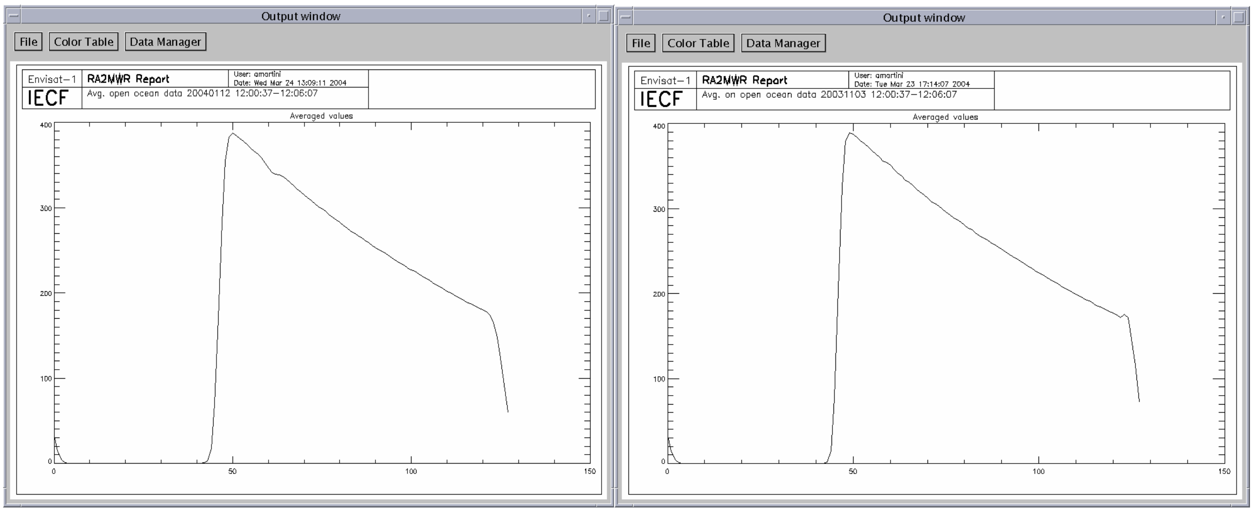

Figure 21: Open Ocean average waveforms before (left) and after an anomaly (right)

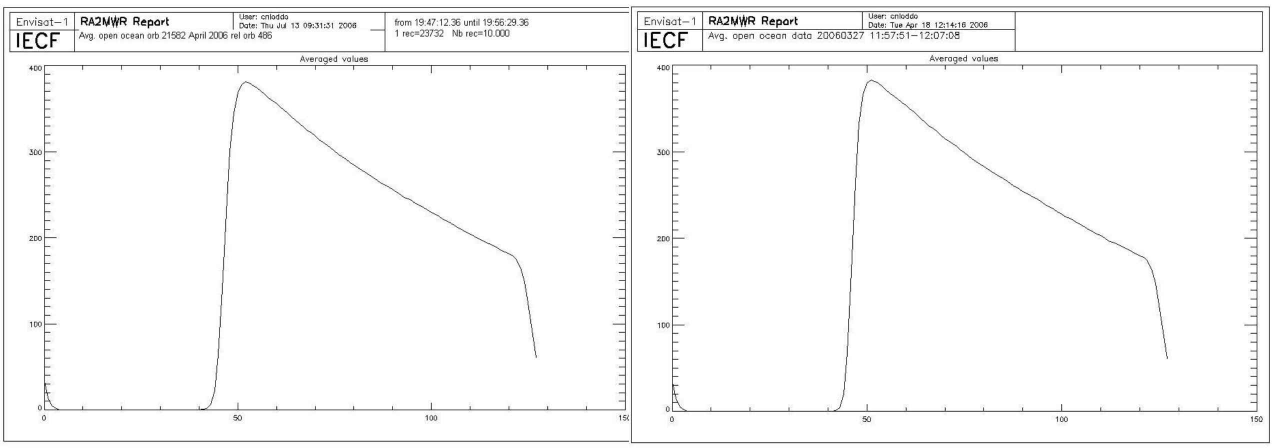

Figure 21_A: Open Ocean average waveforms before (left) and after an anomaly (right)

6.1.8 S-BAND ANOMALY

The Patch that prevents the S Band Anomaly by correcting the SW/HW malfunctioning has been successfully uploaded on 27th of June. The Patch has been uploaded for the first time on 16th of January 2007, but it has been dismissed on 9th of April because it was causing the Instrument to switch down to Heater 0/Refuse Mode. An investigation has been carried out and some parameter monitoring thresholds causing the instrument to switch down have been modified.

No orbits were affected by the S Band Anomaly on the current cycle.

The method used for the identification of the "S-Band anomaly" is statistical and requires a minimum of 1000 seconds of data over ocean. This choice is supported by the fact that the "S-Band anomaly" is associated with a particular instrumental behavior that cannot appear and disappear within a short time frame. (ref. [R – 7])
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.
The IPF version 5.03 includes an algorithm that can detect the presence of the so-called "S-Band anomaly" over any surface. In case of S-Band anomaly detection, bit 1 of the L1b products MCD is set to one; the anomaly is properly detected in 99.9% of the cases.

In Figure 22, the percentage of data per cycle that are affected by the so-called "S-Band" anomaly is reported. The figures are variable between 0% and 8.1%.
The number of occurrences of the S Band anomaly decreased from a mean value of 4% to 2% from cycle 31 onwards due to the implementation of the IF CAL procedure (including Heater 2 for S Band anomaly suppression) twice per day over the Himalayan region.
The relatively high value recorded for cycle 27 is due to the fact that on the day 1st of June 2004, the S-band anomaly started at around 14:30 while the instrument didn't switch to mode Heater 2 when foreseen (at about 15:50). For this reason the S-Band anomaly continued for the next 24 hours until the next Heater 2 mode on June the 2nd.

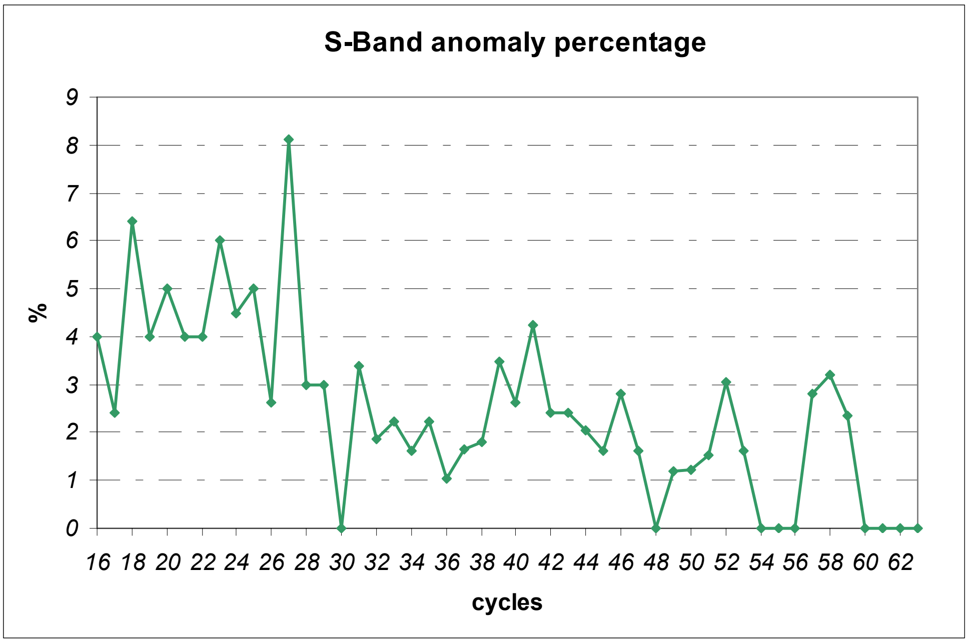

Figure 22: Percentage of data affected by the "S-Band Anomaly" for cycles 16 onwards

6.2 MWR Performance

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

6.3 DORIS Performance

For DORIS performance please refer to the Reference F-PAC Monthly Report of the type of [R – 1a] and [R-1b].

7 PRODUCT PERFORMANCE

7.1 Product disclaimer

A summary of the products released to users and disclaimers on product quality have been established for some products and are available in the following web link: http://envisat.esa.int/dataproducts/availability/

7.2 Data handling recommendations

7.2.1 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#42 of L2 data)*| > 10 cm
> OR
> Peakiness *(Ku_peak: field#139 of L2 data)* >2

7.2.2 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].

7.2.3 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.

7.2.4 S-BAND BACKSCATTERING COEFFICIENT

For the data processed with IPF version 4.56 on, the S-Band Backscattering coefficient has been demonstrated to be on 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 closer to 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.

7.2.5 USO RANGE CORRECTION

Three different periods can be distinguished:
1) 1st period
From the beginning of the mission until the 24th of October 2005 the Nominal USO clock period has been used in the processing. The data was not corrected for the bias and the drift correlated to the actual USO clock period. All data acquired before 24th October 2005, beginning of cycle 42, have thus to be corrected using the old correction files available on the web site:
http://earth.esa.int/pcs/envisat/ra2/auxdata/OldCorrection.
The measured Range shall be corrected considering a drift of -4.58 mm per year and a bias of 29.6 mm.
Warning for data acquired before cycle 42: bias and drift have to be **SUBTRACTED** from the original altimetric range, according to the following equation:
Rtrue=Roriginal-dR
where Roriginal is the range in the GDR products and Rtrue is the true (corrected) range.

2nd period
From the 24th of October 2005 until the 13th of March 2006, outside of the anomaly periods, the actual USO clock period has been used within the processing. The data was corrected for the bias and the drift correlated to the actual USO clock period. Those values, translated into altimetric range figures, are respectively of 28.5 mm and –4.58 mm/year as calculated with data covering the period 13 June 2003 to 01 February 2006.

3rd period
From the 13th of March 2006 onwards, and during the early occurrences of the USO anomaly, data have not been corrected with the proper value of the USO Clock period. All data acquired during this period have thus to be corrected using the new correction files. Three USO corrections have been developed for the different Envisat Level 2 altimetry data products for correcting the abnormal RA-2 USO behaviour affecting the Altimetric Range by few meters w.r.t. the Mean Sea Surface:

- A NRT orbit based USO correction for FDGDR products , available from http://earth.esa.int/pcs/envisat/ra2/auxdata/NewCorrection; or ftp://ftp.esrin.esa.it/pub/RA2_MWR/USO/auxdata/
- An Interim daily USO correction for IGDR products, available at the same F-PAC location as for IGDR, in the directory igdr_ous_corr
- An OFL cycle USO correction for GDR products, available at the same F-PAC location as for GDR, in the directory gdr_ous_corr.

Warning for data acquired after 1st February 2006: This correction has to be **ADDED** to the Ku and S Band altimetric range.

A software routine has been developed to allow users to insert the RA-2 Ultra-Stable Oscillator (USO) corrections into Envisat Level 2 altimetry data products and is available in the same web site than the new correction files.

WARNING: Users are still advised to apply the correction auxiliary files even during the non-anomalous period in order to correct for the nominal ageing drift of the USO device.

7.2.6 KU-BAND BACKSCATTERING COEFFICIENT CALIBRATION

The results of the Ku-Band Sigma0 absolute calibration performed with a transponder have been presented in par. 6.1.4. Those results are going to be consolidated and are summarized in appendix 4, table 12. In order to absolutely calibrate the backscattering coefficient given in the RA2 L2 products, the following shall be used by the end user to get to the real Sigma0 measurement:

Sigma_0_true = Sigma_0_prod + G_tx_rx_prod - G_tx_rx_real - Bias [dB]

Where:
Bias: Bias retrieved from the Sigma0 Absolute Calibration (see 9.1.4)
G_tx_rx_prod: Current effective Tx-Rx Gain value used in the operational ground processing chain (ADF file RA2_CHD_AX). The value nominally used since IPF V4.54 is (for configuration RFSS=A and HPA=A) is 170.70 dB
G_tx_rx_real: Pre-launch characterization value (configuration value RFSS=A and HPA=A is 167.46 dB)

7.2.7 RA-2 RADIO FREQUENCY MODULE SWITCHED BACK TO A-SIDE

The Envisat RA-2 sensor has been successfully reconfigured on its nominal side (RFSS A-side) and was commanded back into Measurement Mode on June 21, 2006 at 13.20.15.000 UTC time, Orbit = 22523 after a switch to RFSS B-Side on 15 May at 14:21:50 UTC Orbit=21994
The analysis of the RA-2 data shows an expected behaviour of the RA-2 parameters but also confirmed the persistence of the abnormal RA-2 Ultra-Stable Oscillator (USO) behaviour affecting the Altimetric Range by few meters.

Data from 15 May 2006 until 21 June 2006 was acquired with RFSS B-side and on-ground data processing has been performed with ADFs configured for A-side. For this reason data should be used with maximum care.

7.3 Availability of data

7.3.1 RA-2

In Figure 23 and Table 9 (Appendix 2) the summary of unavailable RA-2 L0 products is given.
It is easy to notice that close to the Himalayan and Rocky Mountain region one small gap, about 77 seconds, in the data is present. This is due to the daily instrument switch-offs (Heater 2 mode) performed to prevent the S-Band anomaly lasting more than half a day if it occurs.

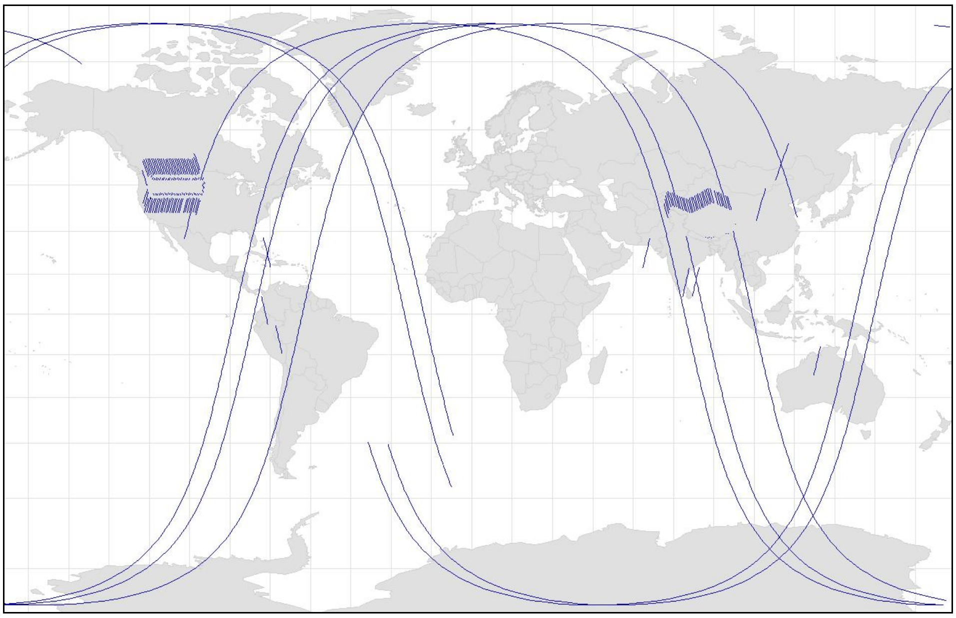

Figure 23: RA-2 L0 unavailable products for cycle 63

In Figure 24 and Table 11 (Appendix 2) the summary of unavailable RA-2 L1b products is given.

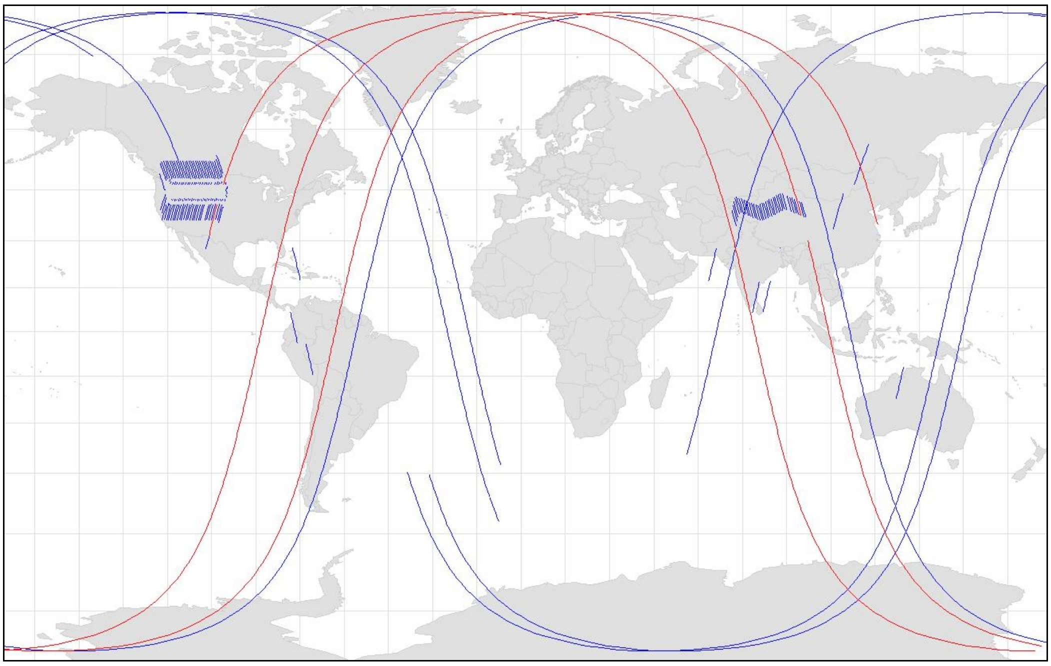

Figure 24: RA-2 L1b unavailable products for cycle 63 (red=instrument unavailability; blue=data gaps)

Hereafter the percentage of the different levels of products availability is reported.
Considering as reference the instrument unavailability, it is possible to notice that since cycle 32 the situation is slightly improved for all levels of products. The low percentage of data from cycle 56 until cycle 59 is due to the high number of RA-2 Instrument Unavailability occurred as side effect of the SPSA Patch uploaded to prevent the S Band anomaly.

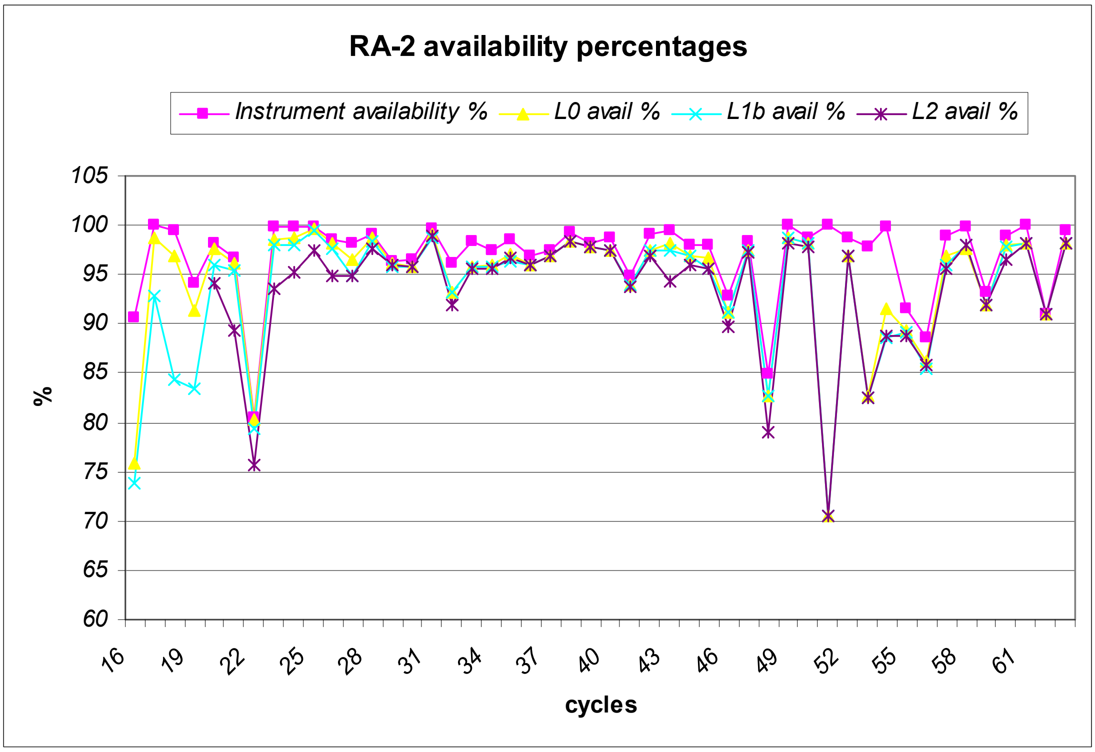

Figure 25: Percentage of Products unavailability

7.3.2 MWR

In Figure 26 and Table 10 (Appendix 2) the summary of unavailable MWR L0 products is given.

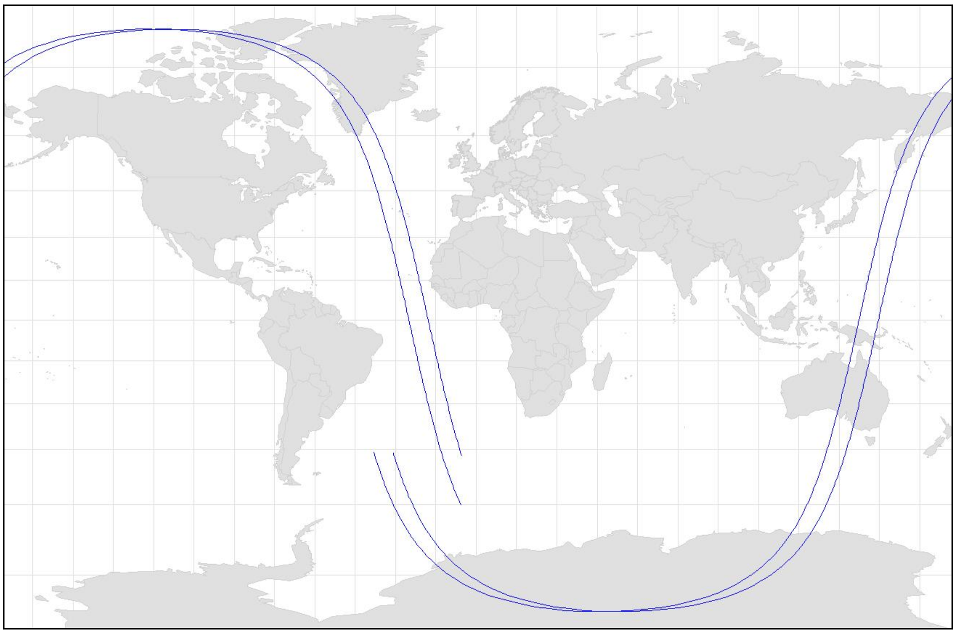

Figure 26: MWR L0 unavailable products for cycle 63

7.4 RA-2 Altimeter Parameters

Hereafter a summary of the main Altimetric parameters performances is reported; these results have been obtained using only ocean surface type and all world zone criteria for RA2_FGD products.

7.4.1 ORBIT

Since the 20th of June 2007, operations date of IPF version 5.06, the DORIS Navigator usage on NRT processing has increased. The usage of DORIS on NRT processing increases the quality of FDGDR SLA. The SLA variability has decreased from 20m to about 50 cm.

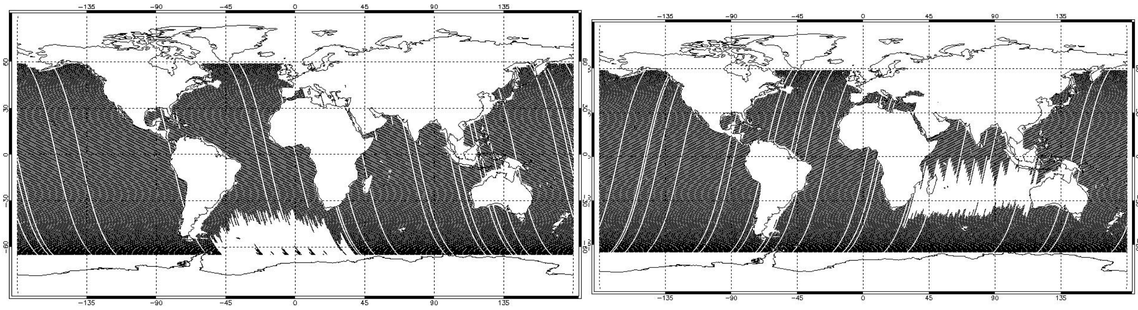

Figure 27: Ascending and Descending passes processed with DORIS on cycle 63

The quality of this Doris Navigator orbit is estimated by comparison to the MOE orbit available in the IGDR products. Figure 27A shows the [Doris navigator-MOE] radial differences on ascending and descending passes. We can observe that the differences are between -0.4 and 0.4m with systematic ascending/descending + North/South differences.
The statistics of differences are

- mean[Doris navigator-MOE] ~-0.7cm
- standard deviation [Doris navigator-MOE] ~14.4cm

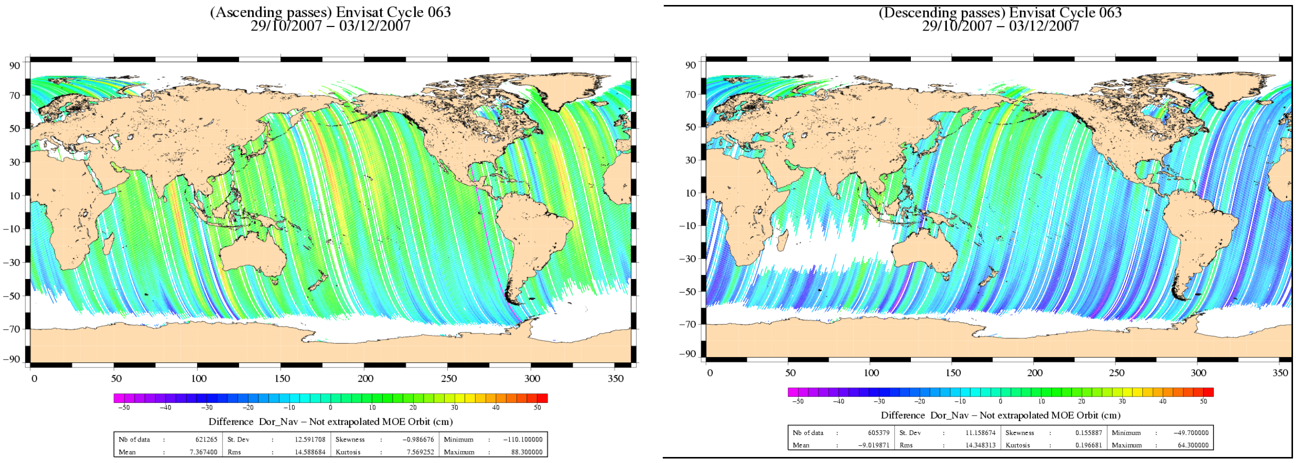

Figure 27A: [Doris navigator-MOE] differences on ascending and descending passes

7.4.2 ALTIMETER RANGE

On Figure 27B, it can be observed that the altimetric range was anomalous over the main part of cycle 63. This anomalous range is related to the un-expected behaviour of the Envisat RA-2 sensor, the USO Clock Period Anomaly, which appeared again after instrument recovery on the 27th of September (ref.Par.6.1.3). The range was nominal at the end of the cycle because the USO Clock Period Anomaly stopped for some hours on the 3rd of December.
Small gaps can be observed in Figure27B and are related to some PDS failures which prevented the usage of DORIS on NRT products.

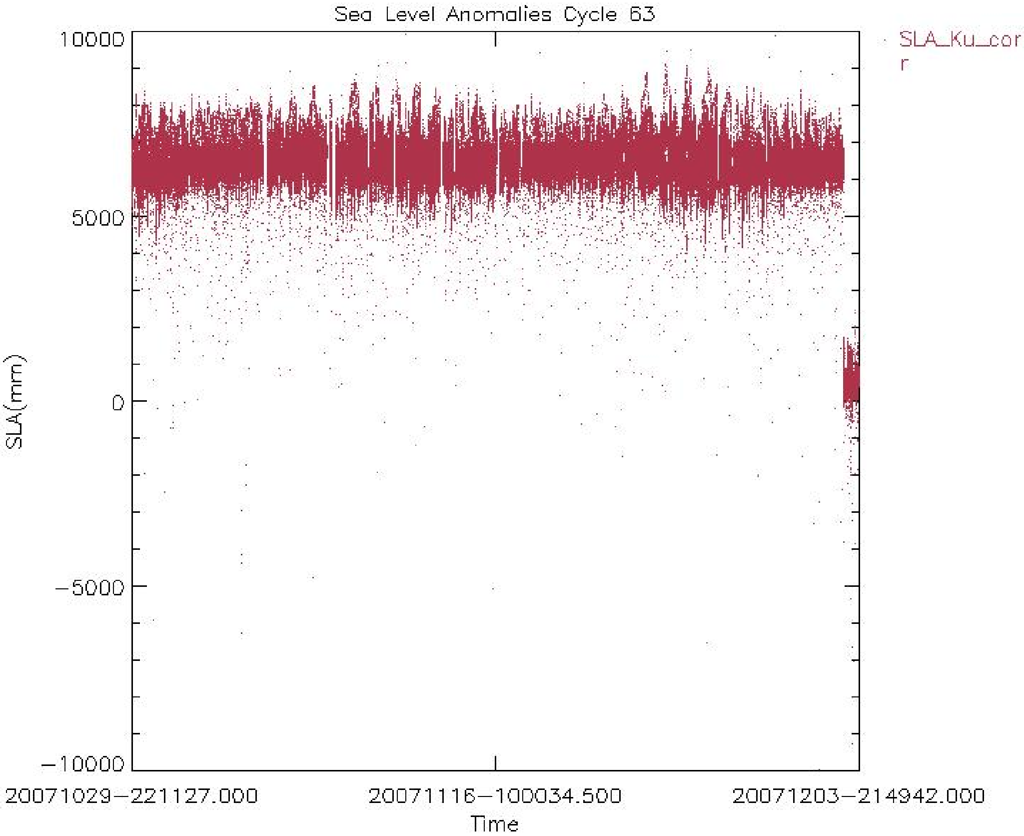

Figure 27B: Sea Level Anomalies Cycle 63, only MDSRs with valid DORIS Flag

SLA has been computed for the Ku Band, with the following corrections:
RA2_Ku_IONO, MWR_WET_TROPO, DRY_TROPO, INV_BMETER_HEIGHT, SEA_KU_BIAS

In Figure 27C the Histogram of Sea Level Anomalies is reported for the Ku Band. Only MDSRs processed with DORIS have been considered. The main peak of the histogram is slightly more than 6 meter due to the un-expected behaviour of the USO Clock Period, which was present almost the entire cycle (ref.Par.6.1.3). A second small peak can be observed with SLA slightly less then 0.5 meters. This small peak is due to the disappearance of the USO Clock Period Anomaly at the very end of the cycle.

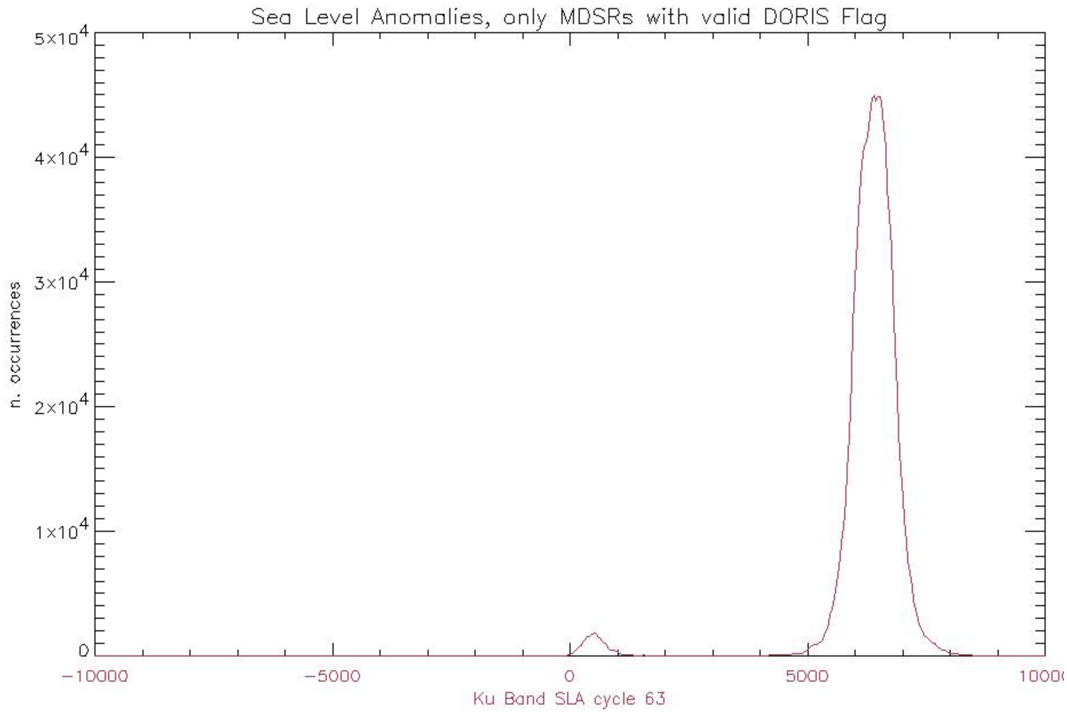

Figure 27C: Histogram of Sea Level Anomalies on Ku Band computed on MDSRs with valid DORIS Flag

7.4.3 SIGNIFICANT WAVE HEIGHT

The histogram of the SWH reported in Figure 28 shows a nominal behavior for the current cycle. The trend goes on following the behavior as detected for the previous cycle. The largest peak (about 60000 data for SWH = 0m) was removed from the plot in order to have the complete picture of the SWH histogram.
Figure 29 shows the SWH daily mean.

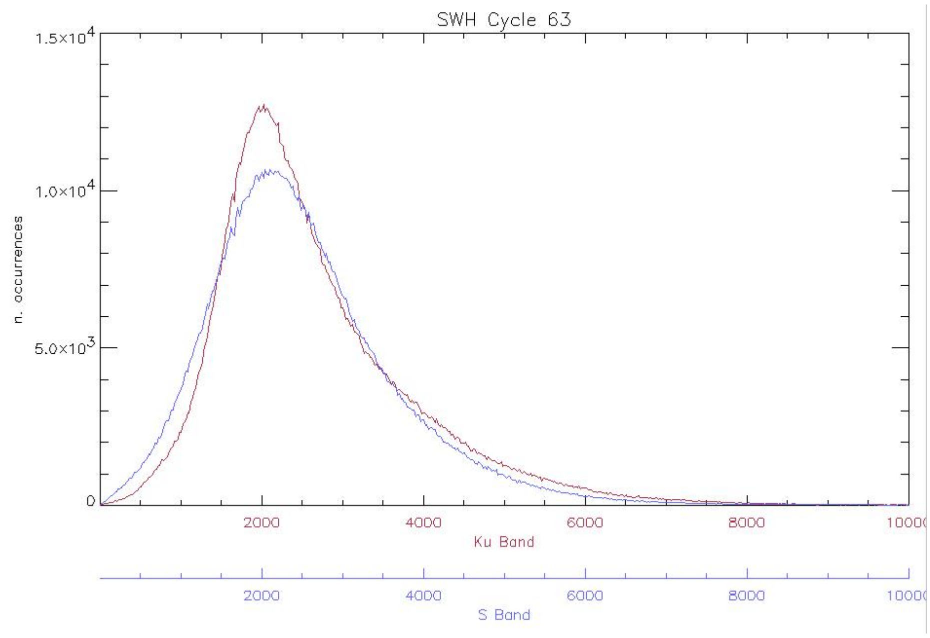

Figure 28: Histogram of Ku and S Band SWH for cycle 63

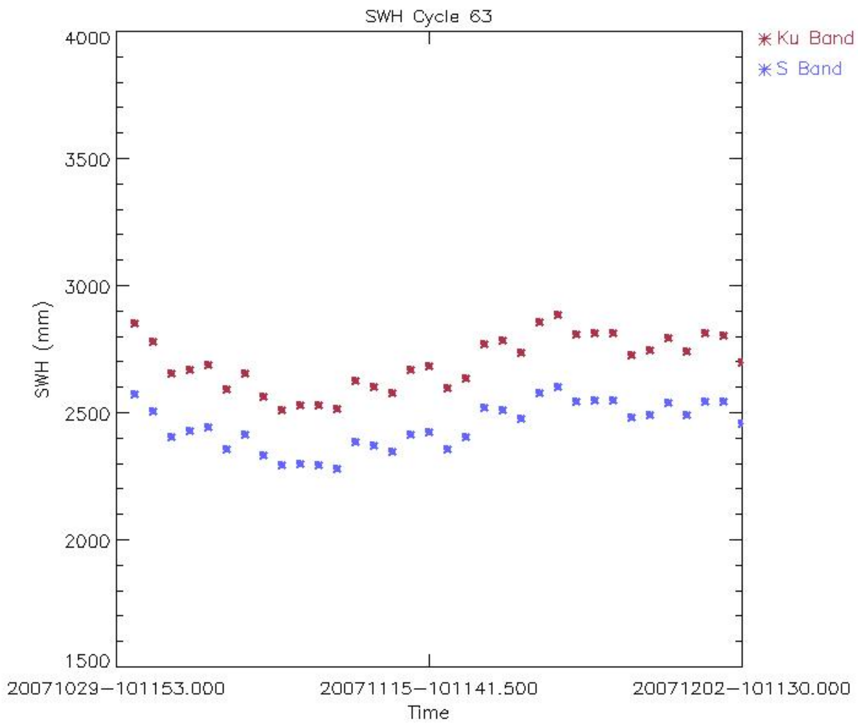

Figure 29: Ku and S SWH daily average for Cycle 63 (mm)

The SWH long term plot is reported in two plots, cycle 16 until cycle 49 on Figure 30 and cycle 50 onwards on Figure 30A. It can be noticed that the SWH in both bands shows a trend which follows the seasonal variability. The high daily averages reported (sometimes plotted outside the figure's range) are due to the so-called S-Band anomaly (ref. par.6.1.8).

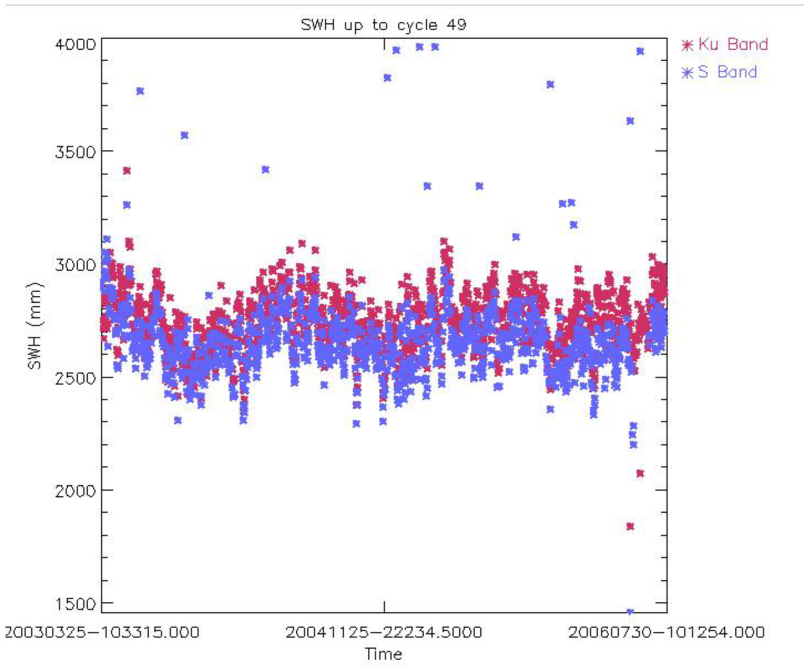

Figure 30: Ku and S SWH daily average up to cycle 49 (mm)

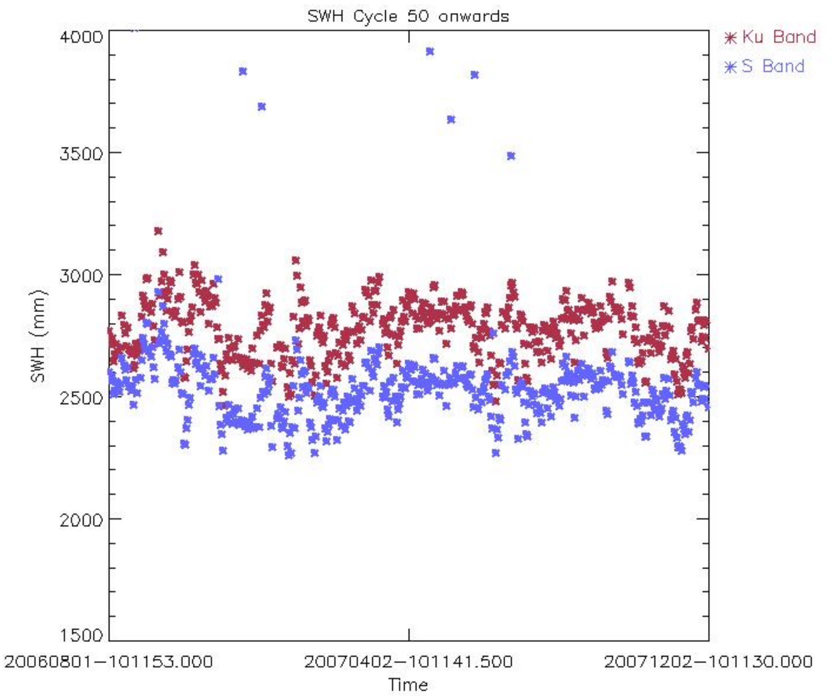

Figure 30A: Ku and S SWH daily average from cycle 50 onwards (mm)

7.4.4 BACKSCATTER COEFFICIENT – WIND SPEED

The Sigma_0 histogram both in Ku and S Band, shows secondary peaks, see Figure 31. A small investigation on this problem, performed on the data of cycle 29, demonstrated that the backscattering distribution assumes a different behavior for different sea conditions [R-17]. Indeed, for both bands, the majority of the data is concentrated on lower values for rough sea state (southern hemisphere, winter conditions) and on higher values for calm sea state (northern hemisphere, summer conditions).

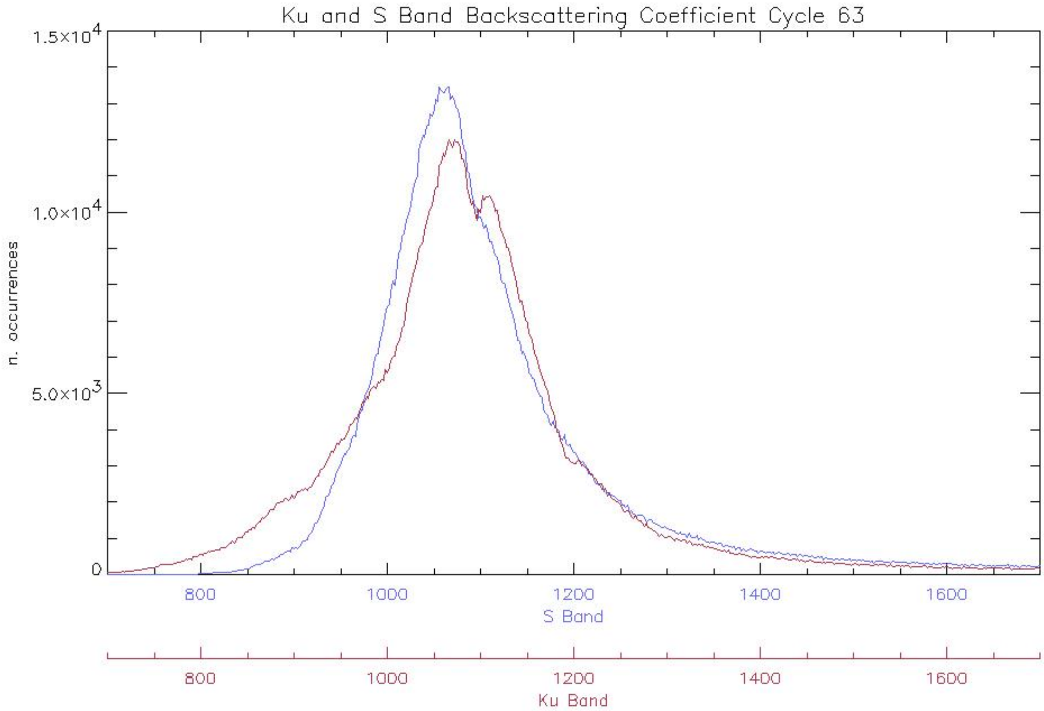

Figure 31: Histogram of Ku and S Band Backscattering Coefficient for cycle 63

In Figure 32, the backscattering coefficient daily average, computed for only ocean data, trend is reported. The trend shows a nominal behavior for both bands.

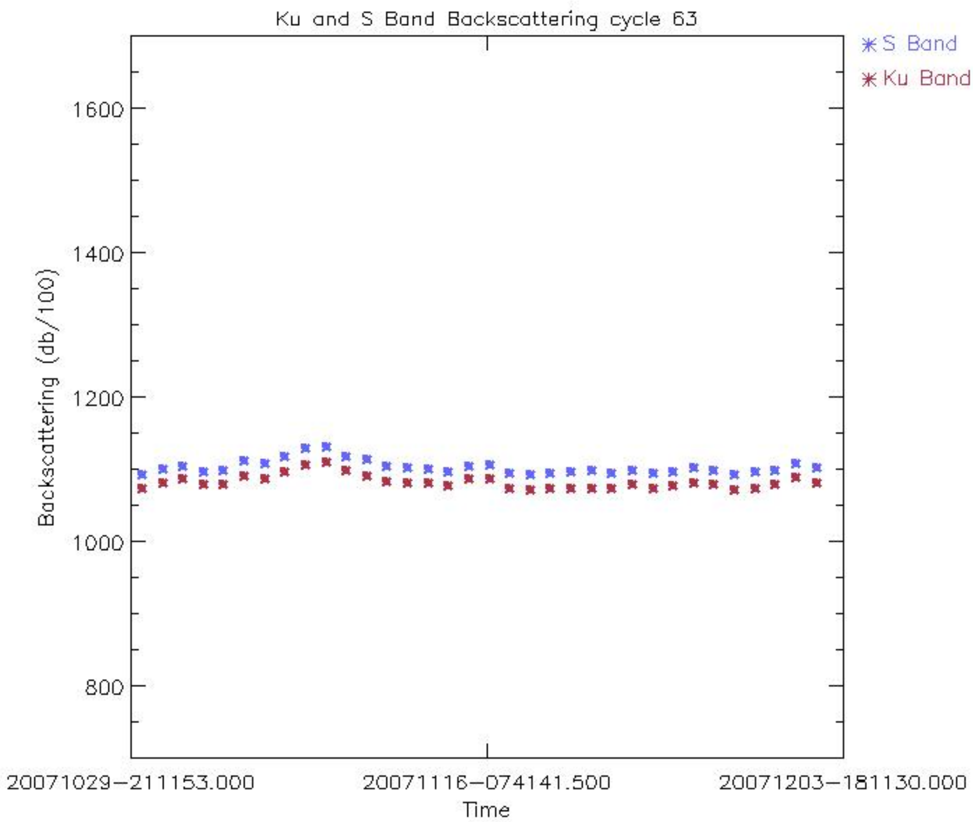

Figure 32: Ku and S Sigma_0 daily average for cycle 63 (dB/100)

The histograms of Wind Speed computed for the Ku-band and the time behavior during the current cycle are reported in Figure 33 and 34, respectively. Given that the wind table has been updated since IPF version 5.02, S.Abdallah Table is now used, the wind takes values between 1.18m/ and 21.30m/s.

The largest peak present in the histogram (about 50000 data for Wind < 1.2m/s) was removed from the plot in order to have the complete picture of the wind histogram.

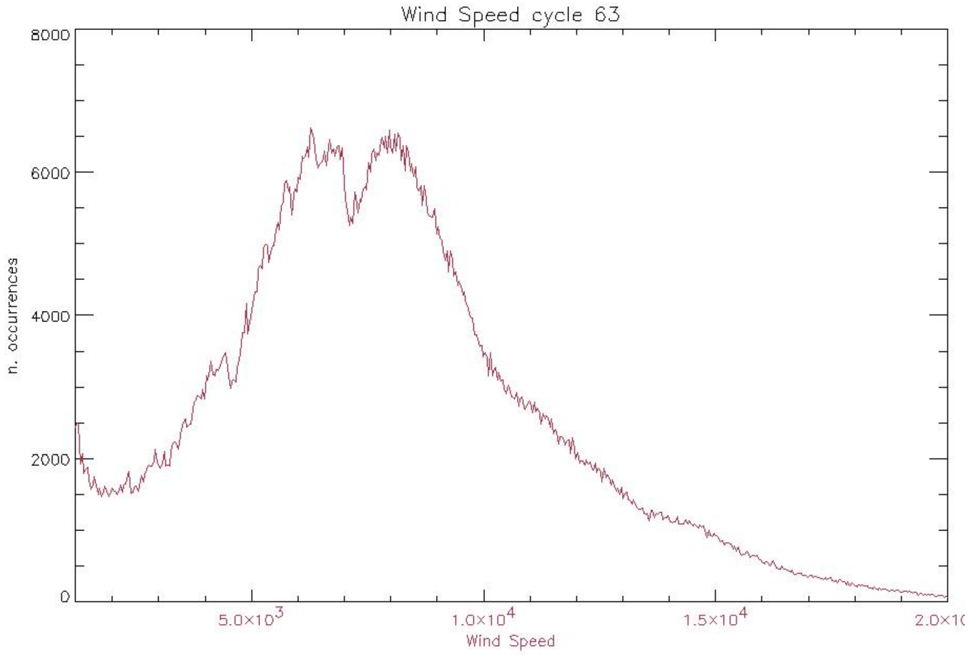

Figure 33: Histogram of Ku Wind Speed for cycle 63 (mm/sec)

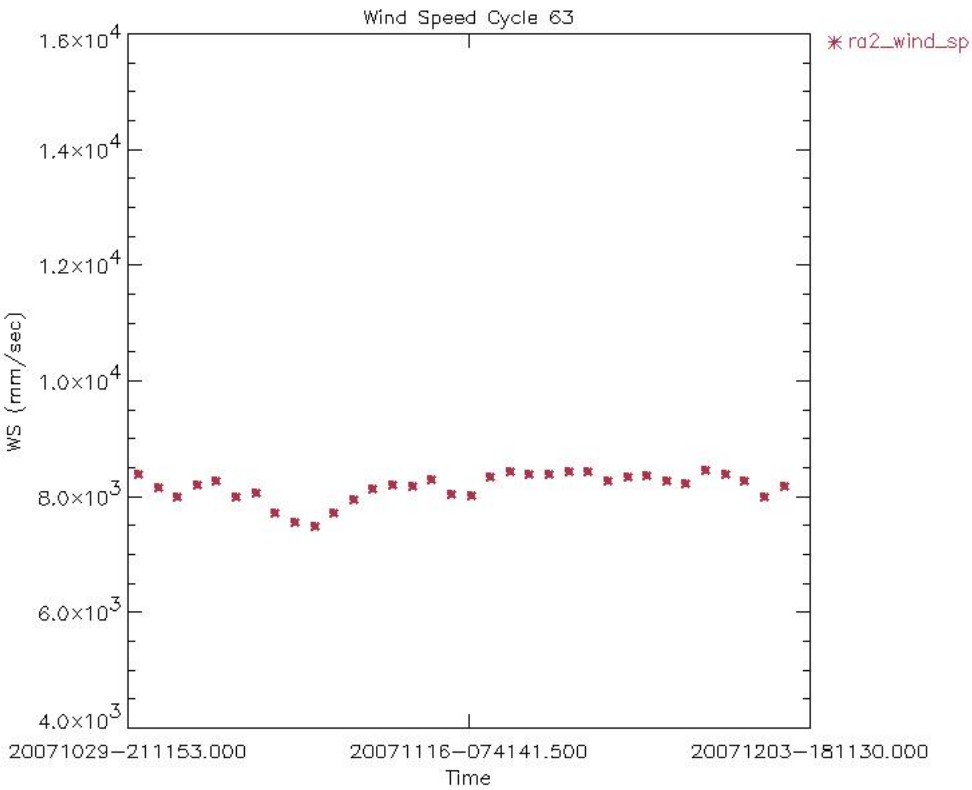

Figure 34: Ku Band Wind Speed daily average for cycle 63 (mm/s)

The Ku-Band Sigma_0 trend, reported hereafter (Figure 35 and 35A), is characterized by a jump of on average 3.24 dBs concomitant with the operational up-load of IPF version 4.54 which occurred on the 9th of April 2003. 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 in Figure 36.
Beyond the huge jump that 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. The very low values of the S Band Backscattering around 30 July 2006 are related to the S Band Power Drop Anomaly occurred when the instrument was operating on RFFS B-side from 15 May until 21 June 2006. The S-Band Sigma_0 daily means that are plotted outside the figure range can be traced back to the so-called S-Band anomaly (ref. par. 6.1.8).

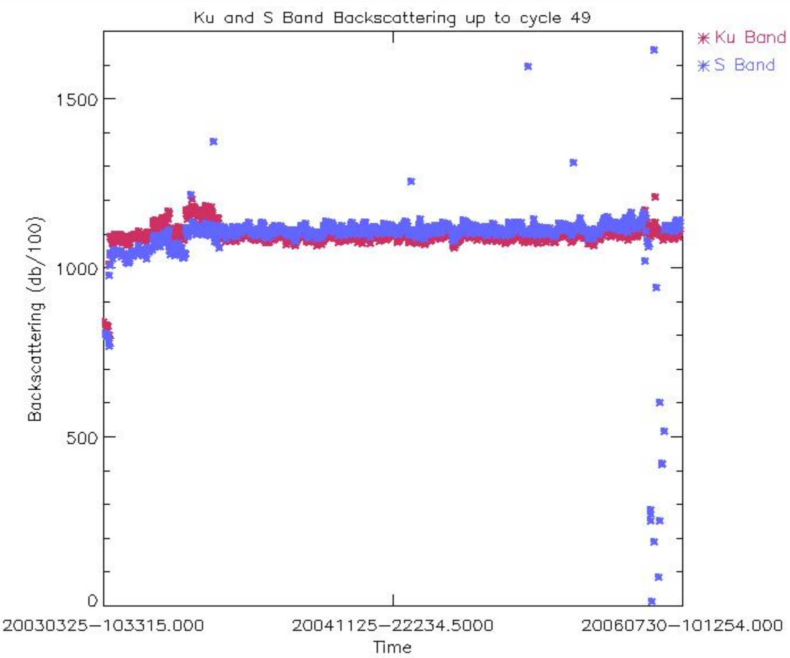

Figure 35: Ku and S band Backscattering daily averages up to cycle 49 (dB/100)

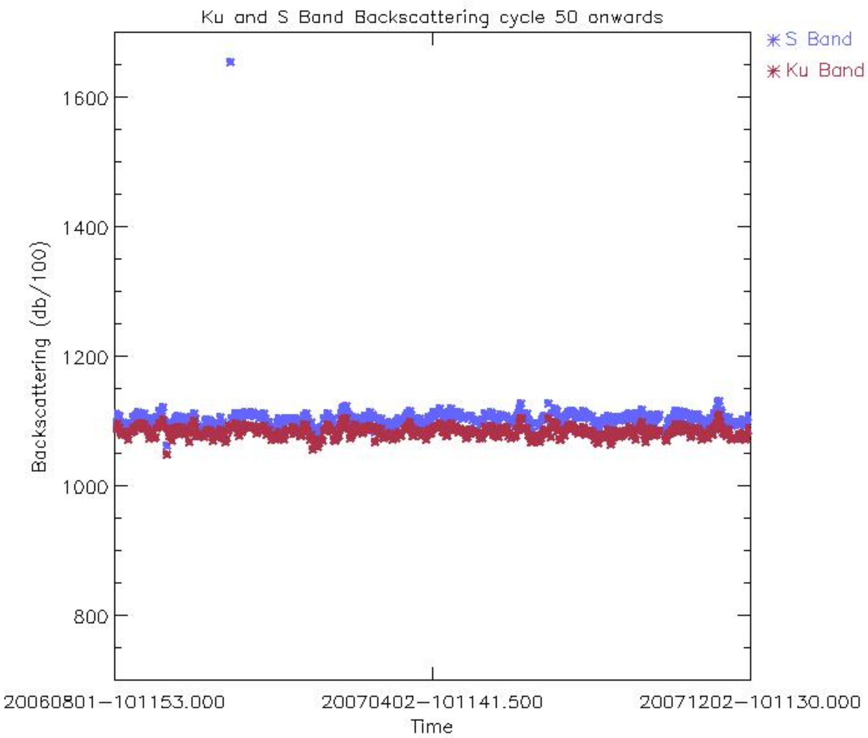

Figure 35A: Ku and S band Backscattering daily averages from cycle 50 onwards (dB/100)

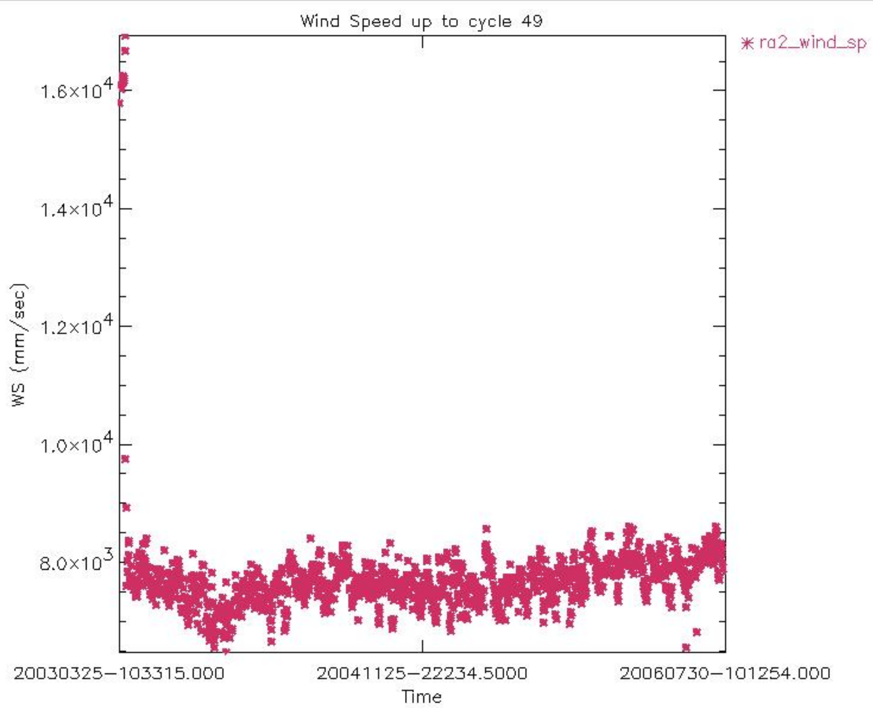

Figure 36: Wind Speed daily averages up to cycle 49 (mm/s)

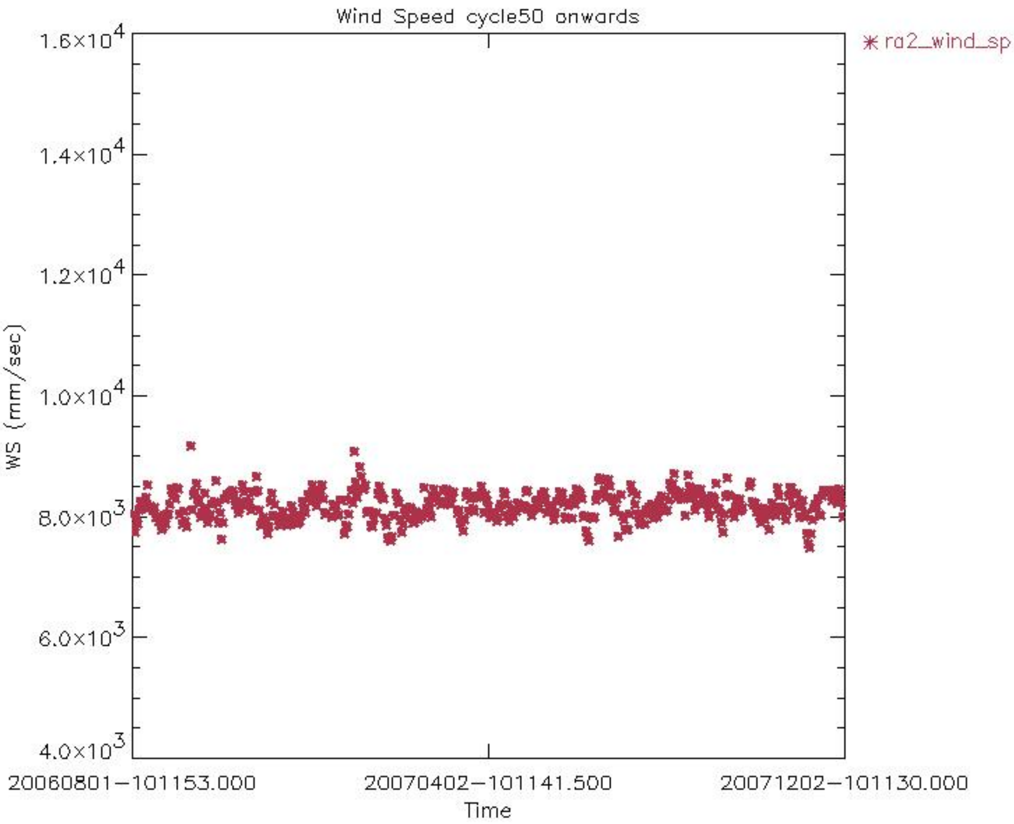

Figure 36A: Wind Speed daily averages from cycle 50 onwards (mm/s)

8 PARTICULAR INVESTIGATIONS

The Patch that prevents the S Band Anomaly by correcting the SW/HW malfunctioning has been uploaded again on 27th of June 2007. The Patch has been uploaded for the first time on 16th of January 2007, but it has been dismissed on 9th of April because it was causing the Instrument to switch down to Heater 0/Refuse Mode. An investigation has been carried out and some parameter monitoring thresholds causing the instrument to switch down have been modified.

On Cycle 63 the II In-Flight Tests aimed to understand the origin of the IF Mask anomaly has been consolidated. The scope of the test was to verify if the AGC used for the IF Calibration mode, sent from the SPSA to the MR, was correct. The test was performed by using a new calibration procedure consisting in setting all the AGC's to 3dB before entering the IF Calibration Mode and resetting all the parameters to the original values before entering in the Measurement mode.
The new procedure was used on the Rocky Mountains site only.

The Test was successful: all IF Masks acquired with the new procedure on the Rocky Mountains were valid.

APPENDIX 1: IPF UPGRADES

Table 4: L1B IPF version

IPF Version	Date of issue PDHSK& E, LRAC	L1B Algortihm upgrades	L1B ADF updates	ADF filename
V4.53	Nov. 27, 2002			
V4.54	Apr. 7, 2003	*Wrong sign in AGC calibration estimation *Missing integrity check for the Data Block number read from the Level 0 Data Blocks *The altitude above CoG and the altitude rate have to be included in the records also in case of dummy records *1Hz data should be referenced to data block 9.5 not block 10	Correction of the Tx-Rx gain of Ku and S band parameters (3.5 dB)	RA2_CHD_AX
V4.56	Nov. 26, 2003	1- Extrapolation of AGC value to the Waveform center (49.5) for both Ku- and Sband. 2 - Correction for an error found in the evaluation of S band AGC.	RA2 IF Mask	RA2_IFF_AX
V4.57	PDHS-K: 29-04-2004 PDHS-E: 28-04-2004			
V4.58	Aug. 9, 2004			
V5.0.2	Oct. 24, 2005	MWR Side Lobe correction upgrade USO clock period units correction RA-2 alignment: OBDH & USO datation, IE flags correction Rain Flag tunning to compensate for the increase of the S band	side lobe table and Config param New ADF format - clock period unit New table in SOI file	MWR_SLT_AX MWR_CON_AX RA2_USO_AX RA2_CHD_AX RA2_CON_AX RA2_SOI_AX

		Sigma0 Monthly IF estimation Level 1B S-Band anomaly flag DORIS Navigator CFI upgrade (RA-2 & MWR) Correction of the Rx_dist_fine from the Level 0 product, leading to an error in the calculation of the Window_delay (SPR-058).	 New format	 RA2_IFF_AX RA2_CON_AX
V5.03	Sep. 19, 2006	Level 1B S-Band anomaly flag well implemented Orbit Flag Correction of the Rx_dist_fine (for 80 and 20 MHz) from the Level 0 product, leading to an error when applying the IF mask correction on to the waveforms (SPR-059)		
V 5.06	Jun. 20, 2007	DORIS Navigator threshold update to 900 seconds coverage RA2/DORIS Alignment of Chain B to Prod Spec 3/N		

Table 5: L2 IPF version

PF Version	Date of issue PDHS	L2 Algortihm upgrades	L2 ADF updates	ADF filename
V4.53	Nov. 27, 2002			
V4.54	Apr. 7, 2003			
V4.56	Nov. 26, 2003	SPR 26 Tuning of the Ice2 retracking New MWR NN algorithm	MSS CLS01 Rain flag Updated OCOG retracker thresholds Ice1/Sea Ice Conf file Sea State Bias Table file	RA2_MSS_AX RA2_SOI_AX RA2_ICT_AX RA2_SSB_AX

			GOT00.2 Ocean Tide Sol 1 Map file FES 2002 Ocean Tide Sol 2 Map file FES 2002 Tidal Loading Coeff Map	RA2_OT1_AX RA2_OT2_AX RA2_TLD_AX
V4.57	PDHS-K: 29-04-2004 PDHS-E: 28-04-2004	ECMWF meteo files handling		
V4.58	Aug. 9, 2004	Addition of a Pass Number Field in FD Level		
V5.0.2	Oct. 24, 2005	- Handling of the new RA2_CHD_AX ADF - Rain Flag tuning to compensate for the increase of the S band Sigma0 - Improving the mispointing estimation - Export of the Level 1B S-band flag into the Level 2 data product - Export of the Level 1B NRT orbit quality flag - Addition of a Pass Number Field in FD Level 2 SPH product - Addition of peakiness in Ku and S band in FDMAR - Addition of square of the SWH in Ku and S band - Correction of MCD flag - SPH pass number (field 8) set to 0 in SPH NRT Level 2 data products	New table in SOI file Two needed parameters in SOI file New format Addition of GOT2000.2 TLD New DEM AUX file (MACESS) merge of ACE land elevation data and Smith and Sandwell ocean bathymetry	RA2_CHD_AX RA2_SOI_AX RA2_SOI_AX RA2_SOI_AX RA2_TLG_AX AUX_DEM_AX
V 5.03	Sep. 19, 2006			
V 5.06	Jun. 20, 2007			

APPENDIX 2: AVAILABILITY:

Table 6: RA-2 L0, L1b and L2 FGD Data products availability summary for Cycle 63

Start orbit	Stop orbit	Time [sec] instrum.	Data Unav Time	Time [sec] L0 gaps	Time [sec] L1b gaps	Time [sec] L2 (FGD)	% instrum.	% data	% L0 avail.	% L1b avail.	% L2 (FGD)

		Unavail-ability	[sec]			gaps	avail.	avail.			avail.
29614	29714	0.00	1878.85	7884.45	7865.90	7892.15	100.00	99.69	98.39	98.39	98.38
29714	29814	13740.63	16055.02	1722.93	1701.45	1725.23	97.73	97.35	97.06	97.06	97.06
29814	29915	2816.39	4972.97	8168.61	10936.77	10965.92	99.53	99.18	97.83	97.37	97.36
29915	30015	0.00	2068.42	2352.24	2332.54	2362.14	100.00	99.66	99.27	99.27	99.27
30015	30115	0.00	2249.00	7746.63	8212.90	2302.22	100.00	99.63	98.35	98.27	99.25

Table 7: MWR L0 Data products availability summary for Cycle 63

Start orbit	Stop orbit	Time [sec] instrum. unavailability	Time [sec] L0 gaps	% instrum. avail.	% L0 avail.
29614	29714	0.00	6288.00	100.00	98.96
29714	29814	0.00	0.00	100.00	100.00
29814	29915	2816.39	6049.00	99.53	98.53
29915	30015	0.00	0.00	100.00	100.00
30015	30115	0.00	6008.22	100.00	99.01

Table 8: DORIS L0 Data products availability summary for Cycle 63

Start orbit	Stop orbit	Time [sec] instrum. unavailability	Time [sec] L0 gaps	% instrum. avail.	% L0 avail.
29614	29714	0.00	13837.00	604799.67	0.00
29714	29814	0.00	1656.00	604799.40	0.00
29814	29915	5632.77	13392.00	601982.68	0.00
29915	30015	0.00	1530.00	604798.73	0.00
30015	30115	0.00	14020.43	604799.42	0.00

Table 9: List of gaps for RA-2 L0 Cycle 63

Start date	Start time	Stop date	Stop time	Duration [sec]	Start orbit	Stop orbit	Reason
29-Oct-07	23:23:36	29-Oct-07	23:25:19	103	29614	29614	PDS_UNKNOWN_FAILURE
29-Oct-07	23:25:23	30-Oct-07	01:07:50	6147	29614	29615	PDS_UNKNOWN_FAILURE
30-Oct-07	04:53:29	30-Oct-07	04:53:41	12	29618	29618	PDS_UNKNOWN_FAILURE
30-Oct-07	04:55:16	30-Oct-07	04:56:35	79	29618	29618	PDS_UNKNOWN_FAILURE
30-Oct-07	16:36:35	30-Oct-07	16:37:53	78	29625	29625	PDS_UNKNOWN_FAILURE
31-Oct-07	04:21:52	31-Oct-07	04:22:04	12	29632	29632	PDS_UNKNOWN_FAILURE
31-Oct-07	04:23:39	31-Oct-07	04:24:58	79	29632	29632	PDS_UNKNOWN_FAILURE

31-Oct-07	16:04:32	31-Oct-07	16:05:49	77	29639	29639	PDS_UNKNOWN_FAILURE
31-Oct-07	18:11:47	31-Oct-07	18:11:59	12	29640	29640	PDS_UNKNOWN_FAILURE
31-Oct-07	18:13:34	31-Oct-07	18:14:52	78	29640	29640	PDS_UNKNOWN_FAILURE
01-Nov-07	15:33:46	01-Nov-07	15:35:04	78	29653	29653	PDS_UNKNOWN_FAILURE
01-Nov-07	17:40:10	01-Nov-07	17:40:22	12	29654	29654	PDS_UNKNOWN_FAILURE
01-Nov-07	17:41:57	01-Nov-07	17:43:15	78	29654	29654	PDS_UNKNOWN_FAILURE
02-Nov-07	03:05:41	02-Nov-07	03:08:40	179	29659	29660	PDS_UNKNOWN_FAILURE
02-Nov-07	04:59:14	02-Nov-07	04:59:26	12	29661	29661	PDS_UNKNOWN_FAILURE
02-Nov-07	05:01:01	02-Nov-07	05:02:20	79	29661	29661	PDS_UNKNOWN_FAILURE
02-Nov-07	16:41:46	02-Nov-07	16:43:03	77	29668	29668	PDS_UNKNOWN_FAILURE
03-Nov-07	04:27:37	03-Nov-07	04:27:49	12	29675	29675	PDS_UNKNOWN_FAILURE
03-Nov-07	04:29:24	03-Nov-07	04:30:42	78	29675	29675	PDS_UNKNOWN_FAILURE
03-Nov-07	16:10:14	03-Nov-07	16:11:32	78	29682	29682	PDS_UNKNOWN_FAILURE
03-Nov-07	18:17:31	03-Nov-07	18:17:44	13	29683	29683	PDS_UNKNOWN_FAILURE
03-Nov-07	18:19:18	03-Nov-07	18:20:37	79	29683	29683	PDS_UNKNOWN_FAILURE
04-Nov-07	15:39:22	04-Nov-07	15:40:40	78	29696	29696	PDS_UNKNOWN_FAILURE
04-Nov-07	17:45:55	04-Nov-07	17:46:07	12	29697	29697	PDS_UNKNOWN_FAILURE
04-Nov-07	17:47:41	04-Nov-07	17:49:00	79	29697	29697	PDS_UNKNOWN_FAILURE
05-Nov-07	05:04:59	05-Nov-07	05:05:11	12	29704	29704	PDS_UNKNOWN_FAILURE
05-Nov-07	05:06:46	05-Nov-07	05:08:04	78	29704	29704	PDS_UNKNOWN_FAILURE
05-Nov-07	15:05:54	05-Nov-07	15:05:57	3	29710	29710	PDS_UNKNOWN_FAILURE
05-Nov-07	15:07:13	05-Nov-07	15:08:31	78	29710	29710	PDS_UNKNOWN_FAILURE
05-Nov-07	17:14:44	05-Nov-07	17:14:56	12	29711	29711	PDS_UNKNOWN_FAILURE
05-Nov-07	17:16:04	05-Nov-07	17:17:23	79	29711	29711	PDS_UNKNOWN_FAILURE
06-Nov-07	04:33:22	06-Nov-07	04:33:34	12	29718	29718	PDS_UNKNOWN_FAILURE
06-Nov-07	04:35:08	06-Nov-07	04:36:27	79	29718	29718	PDS_UNKNOWN_FAILURE
06-Nov-07	16:16:08	06-Nov-07	16:17:26	78	29725	29725	PDS_UNKNOWN_FAILURE
06-Nov-07	18:23:16	06-Nov-07	18:23:29	13	29726	29726	PDS_UNKNOWN_FAILURE
06-Nov-07	18:25:03	06-Nov-07	18:26:22	79	29726	29726	PDS_UNKNOWN_FAILURE
07-Nov-07	04:02:44	07-Nov-07	04:02:56	12	29732	29732	PDS_UNKNOWN_FAILURE
07-Nov-07	04:03:55	07-Nov-07	04:05:13	78	29732	29732	PDS_UNKNOWN_FAILURE
07-Nov-07	15:41:59	07-Nov-07	15:42:02	3	29739	29739	PDS_UNKNOWN_FAILURE
07-Nov-07	15:44:57	07-Nov-07	15:46:15	78	29739	29739	PDS_UNKNOWN_FAILURE
07-Nov-07	17:51:40	07-Nov-07	17:51:51	11	29740	29740	PDS_UNKNOWN_FAILURE
07-Nov-07	17:53:26	07-Nov-07	17:54:45	79	29740	29740	PDS_UNKNOWN_FAILURE
08-Nov-07	05:10:44	08-Nov-07	05:10:56	12	29747	29747	PDS_UNKNOWN_FAILURE
08-Nov-07	05:12:30	08-Nov-07	05:13:49	79	29747	29747	PDS_UNKNOWN_FAILURE
08-Nov-07	13:31:44	08-Nov-07	13:31:47	3	29752	29752	PDS_UNKNOWN_FAILURE
08-Nov-07	13:31:47	08-Nov-07	15:11:00	5953	29752	29753	UNAV_RA2
08-Nov-07	15:13:08	08-Nov-07	17:20:14	7626	29753	29754	UNAV_RA2
08-Nov-07	17:24:30	08-Nov-07	17:25:36	66	29754	29754	PDS_UNKNOWN_FAILURE
08-Nov-07	17:21:49	08-Nov-07	17:24:30	161	29754	29754	UNAV_RA2

09-Nov-07	04:39:07	09-Nov-07	04:39:19	12	29761	29761	PDS_UNKNOWN_FAILURE
09-Nov-07	04:40:53	09-Nov-07	04:42:12	79	29761	29761	PDS_UNKNOWN_FAILURE
09-Nov-07	16:22:03	09-Nov-07	16:23:21	78	29768	29768	PDS_UNKNOWN_FAILURE
09-Nov-07	18:29:01	09-Nov-07	18:29:13	12	29769	29769	PDS_UNKNOWN_FAILURE
09-Nov-07	18:30:48	09-Nov-07	18:32:07	79	29769	29769	PDS_UNKNOWN_FAILURE
10-Nov-07	04:07:45	10-Nov-07	04:07:58	13	29775	29775	PDS_UNKNOWN_FAILURE
10-Nov-07	04:09:16	10-Nov-07	04:10:35	79	29775	29775	PDS_UNKNOWN_FAILURE
10-Nov-07	15:47:44	10-Nov-07	15:47:47	3	29782	29782	PDS_UNKNOWN_FAILURE
10-Nov-07	15:50:32	10-Nov-07	15:51:50	78	29782	29782	PDS_UNKNOWN_FAILURE
10-Nov-07	17:57:24	10-Nov-07	17:57:36	12	29783	29783	PDS_UNKNOWN_FAILURE
10-Nov-07	17:59:11	10-Nov-07	18:00:30	79	29783	29783	PDS_UNKNOWN_FAILURE
11-Nov-07	05:16:28	11-Nov-07	05:16:40	12	29790	29790	PDS_UNKNOWN_FAILURE
11-Nov-07	05:18:15	11-Nov-07	05:19:34	79	29790	29790	PDS_UNKNOWN_FAILURE
11-Nov-07	15:19:02	11-Nov-07	15:20:20	78	29796	29796	PDS_UNKNOWN_FAILURE
11-Nov-07	17:25:47	11-Nov-07	17:25:59	12	29797	29797	PDS_UNKNOWN_FAILURE
11-Nov-07	17:27:34	11-Nov-07	17:28:52	78	29797	29797	PDS_UNKNOWN_FAILURE
12-Nov-07	04:44:51	12-Nov-07	04:45:03	12	29804	29804	PDS_UNKNOWN_FAILURE
12-Nov-07	04:46:38	12-Nov-07	04:47:57	79	29804	29804	PDS_UNKNOWN_FAILURE
12-Nov-07	16:27:57	12-Nov-07	16:29:15	78	29811	29811	PDS_UNKNOWN_FAILURE
12-Nov-07	18:34:31	12-Nov-07	18:34:43	12	29812	29812	PDS_UNKNOWN_FAILURE
12-Nov-07	18:35:42	12-Nov-07	18:37:01	79	29812	29812	PDS_UNKNOWN_FAILURE
13-Nov-07	04:13:15	13-Nov-07	04:13:26	11	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	04:15:01	13-Nov-07	04:16:19	78	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	04:46:54	13-Nov-07	04:49:54	180	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	15:53:29	13-Nov-07	15:53:31	2	29825	29825	PDS_UNKNOWN_FAILURE
13-Nov-07	15:56:08	13-Nov-07	15:57:25	77	29825	29825	PDS_UNKNOWN_FAILURE
13-Nov-07	18:03:08	13-Nov-07	18:03:21	13	29826	29826	PDS_UNKNOWN_FAILURE
13-Nov-07	18:04:55	13-Nov-07	18:06:14	79	29826	29826	PDS_UNKNOWN_FAILURE
14-Nov-07	05:22:13	14-Nov-07	05:22:25	12	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	05:23:51	14-Nov-07	05:25:10	79	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	05:52:50	14-Nov-07	05:55:49	179	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	15:22:13	14-Nov-07	15:22:16	3	29839	29839	PDS_UNKNOWN_FAILURE
14-Nov-07	15:24:57	14-Nov-07	15:26:14	77	29839	29839	PDS_UNKNOWN_FAILURE
14-Nov-07	17:31:32	14-Nov-07	17:31:44	12	29840	29840	PDS_UNKNOWN_FAILURE
14-Nov-07	17:33:18	14-Nov-07	17:34:37	79	29840	29840	PDS_UNKNOWN_FAILURE
15-Nov-07	04:50:36	15-Nov-07	04:50:48	12	29847	29847	PDS_UNKNOWN_FAILURE
15-Nov-07	04:52:22	15-Nov-07	04:53:41	79	29847	29847	PDS_UNKNOWN_FAILURE
15-Nov-07	16:33:51	15-Nov-07	16:35:09	78	29854	29854	PDS_UNKNOWN_FAILURE
16-Nov-07	03:00:44	16-Nov-07	03:03:44	180	29860	29860	PDS_UNKNOWN_FAILURE
16-Nov-07	04:18:59	16-Nov-07	04:19:11	12	29861	29861	PDS_UNKNOWN_FAILURE
16-Nov-07	04:20:45	16-Nov-07	04:22:04	79	29861	29861	PDS_UNKNOWN_FAILURE
16-Nov-07	16:01:43	16-Nov-07	16:03:00	77	29868	29868	PDS_UNKNOWN_FAILURE

16-Nov-07	18:08:53	16-Nov-07	18:09:05	12	29869	29869	PDS_UNKNOWN_FAILURE
16-Nov-07	18:10:40	16-Nov-07	18:11:59	79	29869	29869	PDS_UNKNOWN_FAILURE
17-Nov-07	05:27:37	17-Nov-07	05:27:50	13	29876	29876	PDS_UNKNOWN_FAILURE
17-Nov-07	05:28:49	17-Nov-07	05:30:07	78	29876	29876	PDS_UNKNOWN_FAILURE
17-Nov-07	15:30:51	17-Nov-07	15:32:09	78	29882	29882	PDS_UNKNOWN_FAILURE
17-Nov-07	17:37:16	17-Nov-07	17:37:28	12	29883	29883	PDS_UNKNOWN_FAILURE
17-Nov-07	17:39:03	17-Nov-07	17:40:22	79	29883	29883	PDS_UNKNOWN_FAILURE
18-Nov-07	04:56:20	18-Nov-07	04:56:32	12	29890	29890	PDS_UNKNOWN_FAILURE
18-Nov-07	04:58:07	18-Nov-07	04:59:26	79	29890	29890	PDS_UNKNOWN_FAILURE
18-Nov-07	16:39:14	18-Nov-07	16:40:31	77	29897	29897	PDS_UNKNOWN_FAILURE
18-Nov-07	22:59:04	19-Nov-07	00:38:55	5991	29900	29901	PDS_UNKNOWN_FAILURE
19-Nov-07	04:26:30	19-Nov-07	04:27:48	78	29904	29904	PDS_UNKNOWN_FAILURE
19-Nov-07	04:24:42	19-Nov-07	04:24:55	13	29904	29904	PDS_UNKNOWN_FAILURE
19-Nov-07	16:07:18	19-Nov-07	16:08:35	77	29911	29911	PDS_UNKNOWN_FAILURE
19-Nov-07	18:14:37	19-Nov-07	18:14:50	13	29912	29912	PDS_UNKNOWN_FAILURE
19-Nov-07	18:16:24	19-Nov-07	18:17:43	79	29912	29912	PDS_UNKNOWN_FAILURE
20-Nov-07	01:13:43	20-Nov-07	01:16:42	179	29916	29916	PDS_UNKNOWN_FAILURE
20-Nov-07	15:36:32	20-Nov-07	15:37:50	78	29925	29925	PDS_UNKNOWN_FAILURE
20-Nov-07	17:43:01	20-Nov-07	17:43:13	12	29926	29926	PDS_UNKNOWN_FAILURE
20-Nov-07	17:44:47	20-Nov-07	17:46:06	79	29926	29926	PDS_UNKNOWN_FAILURE
21-Nov-07	05:02:04	21-Nov-07	05:02:17	13	29933	29933	PDS_UNKNOWN_FAILURE
21-Nov-07	05:03:51	21-Nov-07	05:05:10	79	29933	29933	PDS_UNKNOWN_FAILURE
21-Nov-07	16:44:14	21-Nov-07	16:45:32	78	29940	29940	PDS_UNKNOWN_FAILURE
21-Nov-07	17:12:11	21-Nov-07	17:12:23	12	29940	29940	PDS_UNKNOWN_FAILURE
21-Nov-07	17:13:22	21-Nov-07	17:14:41	79	29940	29940	PDS_UNKNOWN_FAILURE
22-Nov-07	03:15:53	22-Nov-07	03:18:52	179	29946	29946	PDS_UNKNOWN_FAILURE
22-Nov-07	04:30:28	22-Nov-07	04:30:40	12	29947	29947	PDS_UNKNOWN_FAILURE
22-Nov-07	04:32:14	22-Nov-07	04:33:33	79	29947	29947	PDS_UNKNOWN_FAILURE
22-Nov-07	16:13:09	22-Nov-07	16:14:27	78	29954	29954	PDS_UNKNOWN_FAILURE
22-Nov-07	18:20:22	22-Nov-07	18:20:34	12	29955	29955	PDS_UNKNOWN_FAILURE
22-Nov-07	18:22:09	22-Nov-07	18:23:28	79	29955	29955	PDS_UNKNOWN_FAILURE
23-Nov-07	04:32:26	23-Nov-07	04:35:25	179	29961	29961	PDS_UNKNOWN_FAILURE
23-Nov-07	15:42:07	23-Nov-07	15:43:25	78	29968	29968	PDS_UNKNOWN_FAILURE
23-Nov-07	17:48:45	23-Nov-07	17:48:57	12	29969	29969	PDS_UNKNOWN_FAILURE
23-Nov-07	17:50:32	23-Nov-07	17:51:50	78	29969	29969	PDS_UNKNOWN_FAILURE
24-Nov-07	05:07:49	24-Nov-07	05:08:01	12	29976	29976	PDS_UNKNOWN_FAILURE
24-Nov-07	05:09:36	24-Nov-07	05:10:54	78	29976	29976	PDS_UNKNOWN_FAILURE
24-Nov-07	15:10:08	24-Nov-07	15:11:26	78	29982	29982	PDS_UNKNOWN_FAILURE
24-Nov-07	17:17:08	24-Nov-07	17:17:20	12	29983	29983	PDS_UNKNOWN_FAILURE
24-Nov-07	17:18:54	24-Nov-07	17:20:13	79	29983	29983	PDS_UNKNOWN_FAILURE
25-Nov-07	02:48:42	25-Nov-07	02:51:41	179	29989	29989	PDS_UNKNOWN_FAILURE
25-Nov-07	04:36:12	25-Nov-07	04:36:24	12	29990	29990	PDS_UNKNOWN_FAILURE

25-Nov-07	04:37:58	25-Nov-07	04:39:17	79	29990	29990	PDS_UNKNOWN_FAILURE
25-Nov-07	16:19:03	25-Nov-07	16:20:21	78	29997	29997	PDS_UNKNOWN_FAILURE
25-Nov-07	18:26:06	25-Nov-07	18:26:19	13	29998	29998	PDS_UNKNOWN_FAILURE
25-Nov-07	18:27:53	25-Nov-07	18:29:12	79	29998	29998	PDS_UNKNOWN_FAILURE
26-Nov-07	04:05:17	26-Nov-07	04:05:30	13	30004	30004	PDS_UNKNOWN_FAILURE
26-Nov-07	04:06:29	26-Nov-07	04:07:47	78	30004	30004	PDS_UNKNOWN_FAILURE
26-Nov-07	15:44:49	26-Nov-07	15:44:52	3	30011	30011	PDS_UNKNOWN_FAILURE
26-Nov-07	15:47:42	26-Nov-07	15:49:00	78	30011	30011	PDS_UNKNOWN_FAILURE
26-Nov-07	17:54:30	26-Nov-07	17:54:41	11	30012	30012	PDS_UNKNOWN_FAILURE
26-Nov-07	17:56:16	26-Nov-07	17:57:35	79	30012	30012	PDS_UNKNOWN_FAILURE
27-Nov-07	05:13:34	27-Nov-07	05:13:45	11	30019	30019	PDS_UNKNOWN_FAILURE
27-Nov-07	05:15:20	27-Nov-07	05:16:39	79	30019	30019	PDS_UNKNOWN_FAILURE
27-Nov-07	15:16:02	27-Nov-07	15:17:20	78	30025	30025	PDS_UNKNOWN_FAILURE
27-Nov-07	17:22:52	27-Nov-07	17:23:04	12	30026	30026	PDS_UNKNOWN_FAILURE
27-Nov-07	17:24:39	27-Nov-07	17:25:57	78	30026	30026	PDS_UNKNOWN_FAILURE
28-Nov-07	04:41:56	28-Nov-07	04:42:08	12	30033	30033	PDS_UNKNOWN_FAILURE
28-Nov-07	04:43:43	28-Nov-07	04:45:02	79	30033	30033	PDS_UNKNOWN_FAILURE
28-Nov-07	14:59:04	28-Nov-07	16:22:20	4996	30039	30040	PDS_UNKNOWN_FAILURE
28-Nov-07	16:24:57	28-Nov-07	16:34:36	579	30040	30040	PDS_UNKNOWN_FAILURE
28-Nov-07	18:31:50	28-Nov-07	18:32:03	13	30041	30041	PDS_UNKNOWN_FAILURE
28-Nov-07	18:33:06	28-Nov-07	18:34:25	79	30041	30041	PDS_UNKNOWN_FAILURE
29-Nov-07	04:10:19	29-Nov-07	04:10:31	12	30047	30047	PDS_UNKNOWN_FAILURE
29-Nov-07	04:12:06	29-Nov-07	04:13:24	78	30047	30047	PDS_UNKNOWN_FAILURE
29-Nov-07	15:50:33	29-Nov-07	15:50:36	3	30054	30054	PDS_UNKNOWN_FAILURE
29-Nov-07	15:53:17	29-Nov-07	15:54:35	78	30054	30054	PDS_UNKNOWN_FAILURE
29-Nov-07	18:00:13	29-Nov-07	18:00:26	13	30055	30055	PDS_UNKNOWN_FAILURE
29-Nov-07	18:02:00	29-Nov-07	18:03:19	79	30055	30055	PDS_UNKNOWN_FAILURE
30-Nov-07	05:19:18	30-Nov-07	05:19:30	12	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	05:21:04	30-Nov-07	05:22:23	79	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	05:29:00	30-Nov-07	05:31:59	179	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	15:19:21	30-Nov-07	15:19:24	3	30068	30068	PDS_UNKNOWN_FAILURE
30-Nov-07	15:21:57	30-Nov-07	15:23:15	78	30068	30068	PDS_UNKNOWN_FAILURE
30-Nov-07	17:28:36	30-Nov-07	17:28:49	13	30069	30069	PDS_UNKNOWN_FAILURE
30-Nov-07	17:30:23	30-Nov-07	17:31:42	79	30069	30069	PDS_UNKNOWN_FAILURE
01-Dec-07	02:51:10	01-Dec-07	02:54:10	180	30074	30074	PDS_UNKNOWN_FAILURE
01-Dec-07	04:47:41	01-Dec-07	04:47:53	12	30076	30076	PDS_UNKNOWN_FAILURE
01-Dec-07	04:49:27	01-Dec-07	04:50:46	79	30076	30076	PDS_UNKNOWN_FAILURE
01-Dec-07	16:30:52	01-Dec-07	16:32:10	78	30083	30083	PDS_UNKNOWN_FAILURE
02-Dec-07	04:16:04	02-Dec-07	04:16:16	12	30090	30090	PDS_UNKNOWN_FAILURE
02-Dec-07	04:17:50	02-Dec-07	04:19:09	79	30090	30090	PDS_UNKNOWN_FAILURE
02-Dec-07	15:58:53	02-Dec-07	16:00:10	77	30097	30097	PDS_UNKNOWN_FAILURE
02-Dec-07	18:05:59	02-Dec-07	18:06:11	12	30098	30098	PDS_UNKNOWN_FAILURE

02-Dec-07	18:07:45	02-Dec-07	18:09:04	79	30098	30098	PDS_UNKNOWN_FAILURE
03-Dec-07	05:25:00	03-Dec-07	05:25:12	12	30105	30105	PDS_UNKNOWN_FAILURE
03-Dec-07	05:26:11	03-Dec-07	05:27:30	79	30105	30105	PDS_UNKNOWN_FAILURE
03-Dec-07	15:27:51	03-Dec-07	15:29:09	78	30111	30111	PDS_UNKNOWN_FAILURE
03-Dec-07	17:34:22	03-Dec-07	17:34:33	11	30112	30112	PDS_UNKNOWN_FAILURE
03-Dec-07	17:36:08	03-Dec-07	17:37:27	79	30112	30112	PDS_UNKNOWN_FAILURE

Table 10: List of gaps for MWR L0 Cycle 63

Start date	Start time	Stop date	Stop time	Duration [sec]	Start orbit	Stop orbit	Reason
29-Oct-07	23:22:44	30-Oct-07	01:07:32	6288	29614	29615	PDS_UNKNOWN_FAILURE
18-Nov-07	22:57:55	19-Nov-07	00:38:44	6049	29900	29901	PDS_UNKNOWN_FAILURE
28-Nov-07	14:58:19	28-Nov-07	16:34:19	5760	30039	30040	PDS_UNKNOWN_FAILURE

Table 11: List of gaps for RA-2 L1b Cycle 63

Start date	Start time	Stop date	Stop time	Duration [sec]	Start orbit	Stop orbit	Reason
29-Oct-07	23:23:37	29-Oct-07	23:25:19	102	29614	29614	PDS_UNKNOWN_FAILURE
29-Oct-07	23:25:24	30-Oct-07	01:07:50	6146	29614	29615	PDS_UNKNOWN_FAILURE
30-Oct-07	04:53:31	30-Oct-07	04:53:41	10	29618	29618	PDS_UNKNOWN_FAILURE
30-Oct-07	04:55:16	30-Oct-07	04:56:35	79	29618	29618	PDS_UNKNOWN_FAILURE
30-Oct-07	16:36:35	30-Oct-07	16:37:53	78	29625	29625	PDS_UNKNOWN_FAILURE
31-Oct-07	04:21:54	31-Oct-07	04:22:04	10	29632	29632	PDS_UNKNOWN_FAILURE
31-Oct-07	04:23:39	31-Oct-07	04:24:58	79	29632	29632	PDS_UNKNOWN_FAILURE
31-Oct-07	16:04:32	31-Oct-07	16:05:49	77	29639	29639	PDS_UNKNOWN_FAILURE
31-Oct-07	18:11:48	31-Oct-07	18:11:59	11	29640	29640	PDS_UNKNOWN_FAILURE
31-Oct-07	18:13:34	31-Oct-07	18:14:52	78	29640	29640	PDS_UNKNOWN_FAILURE
01-Nov-07	15:33:46	01-Nov-07	15:35:04	78	29653	29653	PDS_UNKNOWN_FAILURE
01-Nov-07	17:40:12	01-Nov-07	17:40:22	10	29654	29654	PDS_UNKNOWN_FAILURE
01-Nov-07	17:41:57	01-Nov-07	17:43:15	78	29654	29654	PDS_UNKNOWN_FAILURE
02-Nov-07	03:05:42	02-Nov-07	03:08:40	178	29659	29660	PDS_UNKNOWN_FAILURE
02-Nov-07	04:59:15	02-Nov-07	04:59:26	11	29661	29661	PDS_UNKNOWN_FAILURE
02-Nov-07	05:01:01	02-Nov-07	05:02:20	79	29661	29661	PDS_UNKNOWN_FAILURE
02-Nov-07	16:41:46	02-Nov-07	16:43:03	77	29668	29668	PDS_UNKNOWN_FAILURE
03-Nov-07	04:27:38	03-Nov-07	04:27:49	11	29675	29675	PDS_UNKNOWN_FAILURE
03-Nov-07	04:29:24	03-Nov-07	04:30:42	78	29675	29675	PDS_UNKNOWN_FAILURE
03-Nov-07	16:10:14	03-Nov-07	16:11:32	78	29682	29682	PDS_UNKNOWN_FAILURE
03-Nov-07	18:17:32	03-Nov-07	18:17:44	12	29683	29683	PDS_UNKNOWN_FAILURE
03-Nov-07	18:19:18	03-Nov-07	18:20:37	79	29683	29683	PDS_UNKNOWN_FAILURE
04-Nov-07	15:39:22	04-Nov-07	15:40:40	78	29696	29696	PDS_UNKNOWN_FAILURE

04-Nov-07	17:45:56	04-Nov-07	17:46:07	11	29697	29697	PDS_UNKNOWN_FAILURE
04-Nov-07	17:47:41	04-Nov-07	17:49:00	79	29697	29697	PDS_UNKNOWN_FAILURE
05-Nov-07	05:05:00	05-Nov-07	05:05:11	11	29704	29704	PDS_UNKNOWN_FAILURE
05-Nov-07	05:06:46	05-Nov-07	05:08:04	78	29704	29704	PDS_UNKNOWN_FAILURE
05-Nov-07	15:07:13	05-Nov-07	15:08:31	78	29710	29710	PDS_UNKNOWN_FAILURE
05-Nov-07	17:14:45	05-Nov-07	17:14:56	11	29711	29711	PDS_UNKNOWN_FAILURE
05-Nov-07	17:16:04	05-Nov-07	17:17:23	79	29711	29711	PDS_UNKNOWN_FAILURE
06-Nov-07	04:33:23	06-Nov-07	04:33:34	11	29718	29718	PDS_UNKNOWN_FAILURE
06-Nov-07	04:35:08	06-Nov-07	04:36:27	79	29718	29718	PDS_UNKNOWN_FAILURE
06-Nov-07	16:16:08	06-Nov-07	16:17:26	78	29725	29725	PDS_UNKNOWN_FAILURE
06-Nov-07	18:23:17	06-Nov-07	18:23:29	12	29726	29726	PDS_UNKNOWN_FAILURE
06-Nov-07	18:25:03	06-Nov-07	18:26:22	79	29726	29726	PDS_UNKNOWN_FAILURE
07-Nov-07	04:02:45	07-Nov-07	04:02:56	11	29732	29732	PDS_UNKNOWN_FAILURE
07-Nov-07	04:03:55	07-Nov-07	04:05:13	78	29732	29732	PDS_UNKNOWN_FAILURE
07-Nov-07	15:44:57	07-Nov-07	15:46:15	78	29739	29739	PDS_UNKNOWN_FAILURE
07-Nov-07	17:51:41	07-Nov-07	17:51:51	10	29740	29740	PDS_UNKNOWN_FAILURE
07-Nov-07	17:53:26	07-Nov-07	17:54:45	79	29740	29740	PDS_UNKNOWN_FAILURE
08-Nov-07	05:10:45	08-Nov-07	05:10:56	11	29747	29747	PDS_UNKNOWN_FAILURE
08-Nov-07	05:12:30	08-Nov-07	05:13:49	79	29747	29747	PDS_UNKNOWN_FAILURE
08-Nov-07	13:31:47	08-Nov-07	15:11:00	5953	29752	29753	UNAV_RA2
08-Nov-07	15:13:08	08-Nov-07	17:20:14	7626	29753	29754	UNAV_RA2
08-Nov-07	17:24:30	08-Nov-07	17:25:36	66	29754	29754	PDS_UNKNOWN_FAILURE
08-Nov-07	17:21:49	08-Nov-07	17:24:30	161	29754	29754	UNAV_RA2
09-Nov-07	04:39:08	09-Nov-07	04:39:19	11	29761	29761	PDS_UNKNOWN_FAILURE
09-Nov-07	04:40:53	09-Nov-07	04:42:12	79	29761	29761	PDS_UNKNOWN_FAILURE
09-Nov-07	16:22:03	09-Nov-07	16:23:21	78	29768	29768	PDS_UNKNOWN_FAILURE
09-Nov-07	18:29:02	09-Nov-07	18:29:13	11	29769	29769	PDS_UNKNOWN_FAILURE
09-Nov-07	18:30:48	09-Nov-07	18:32:07	79	29769	29769	PDS_UNKNOWN_FAILURE
10-Nov-07	04:07:46	10-Nov-07	04:07:58	12	29775	29775	PDS_UNKNOWN_FAILURE
10-Nov-07	04:09:16	10-Nov-07	04:10:35	79	29775	29775	PDS_UNKNOWN_FAILURE
10-Nov-07	15:50:32	10-Nov-07	15:51:50	78	29782	29782	PDS_UNKNOWN_FAILURE
10-Nov-07	17:57:25	10-Nov-07	17:57:36	11	29783	29783	PDS_UNKNOWN_FAILURE
10-Nov-07	17:59:11	10-Nov-07	18:00:30	79	29783	29783	PDS_UNKNOWN_FAILURE
11-Nov-07	05:16:29	11-Nov-07	05:16:40	11	29790	29790	PDS_UNKNOWN_FAILURE
11-Nov-07	05:18:15	11-Nov-07	05:19:34	79	29790	29790	PDS_UNKNOWN_FAILURE
11-Nov-07	15:19:02	11-Nov-07	15:20:20	78	29796	29796	PDS_UNKNOWN_FAILURE
11-Nov-07	17:25:48	11-Nov-07	17:25:59	11	29797	29797	PDS_UNKNOWN_FAILURE
11-Nov-07	17:27:34	11-Nov-07	17:28:52	78	29797	29797	PDS_UNKNOWN_FAILURE
12-Nov-07	04:44:52	12-Nov-07	04:45:03	11	29804	29804	PDS_UNKNOWN_FAILURE
12-Nov-07	04:46:38	12-Nov-07	04:47:57	79	29804	29804	PDS_UNKNOWN_FAILURE

12-Nov-07	16:27:57	12-Nov-07	16:29:15	78	29811	29811	PDS_UNKNOWN_FAILURE
12-Nov-07	18:34:32	12-Nov-07	18:34:43	11	29812	29812	PDS_UNKNOWN_FAILURE
12-Nov-07	18:35:42	12-Nov-07	18:37:01	79	29812	29812	PDS_UNKNOWN_FAILURE
13-Nov-07	04:13:16	13-Nov-07	04:13:26	10	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	04:15:01	13-Nov-07	04:16:19	78	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	04:46:55	13-Nov-07	04:49:54	179	29818	29818	PDS_UNKNOWN_FAILURE
13-Nov-07	15:56:08	13-Nov-07	15:57:25	77	29825	29825	PDS_UNKNOWN_FAILURE
13-Nov-07	18:03:09	13-Nov-07	18:03:21	12	29826	29826	PDS_UNKNOWN_FAILURE
13-Nov-07	18:04:55	13-Nov-07	18:06:14	79	29826	29826	PDS_UNKNOWN_FAILURE
14-Nov-07	05:22:14	14-Nov-07	05:22:25	11	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	05:23:51	14-Nov-07	05:25:10	79	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	05:52:51	14-Nov-07	05:55:49	178	29833	29833	PDS_UNKNOWN_FAILURE
14-Nov-07	15:24:57	14-Nov-07	15:26:14	77	29839	29839	PDS_UNKNOWN_FAILURE
14-Nov-07	17:31:33	14-Nov-07	17:31:44	11	29840	29840	PDS_UNKNOWN_FAILURE
14-Nov-07	17:33:18	14-Nov-07	17:34:37	79	29840	29840	PDS_UNKNOWN_FAILURE
15-Nov-07	04:50:37	15-Nov-07	04:50:48	11	29847	29847	PDS_UNKNOWN_FAILURE
15-Nov-07	04:52:22	15-Nov-07	04:53:41	79	29847	29847	PDS_UNKNOWN_FAILURE
15-Nov-07	16:33:51	15-Nov-07	16:35:09	78	29854	29854	PDS_UNKNOWN_FAILURE
16-Nov-07	03:00:45	16-Nov-07	03:03:44	179	29860	29860	PDS_UNKNOWN_FAILURE
16-Nov-07	04:19:00	16-Nov-07	04:19:11	11	29861	29861	PDS_UNKNOWN_FAILURE
16-Nov-07	04:20:45	16-Nov-07	04:22:04	79	29861	29861	PDS_UNKNOWN_FAILURE
16-Nov-07	16:01:43	16-Nov-07	16:03:00	77	29868	29868	PDS_UNKNOWN_FAILURE
16-Nov-07	18:08:54	16-Nov-07	18:09:05	11	29869	29869	PDS_UNKNOWN_FAILURE
16-Nov-07	18:10:40	16-Nov-07	18:11:59	79	29869	29869	PDS_UNKNOWN_FAILURE
17-Nov-07	05:27:39	17-Nov-07	05:27:50	11	29876	29876	PDS_UNKNOWN_FAILURE
17-Nov-07	05:28:49	17-Nov-07	05:30:07	78	29876	29876	PDS_UNKNOWN_FAILURE
17-Nov-07	15:30:51	17-Nov-07	15:32:09	78	29882	29882	PDS_UNKNOWN_FAILURE
17-Nov-07	17:37:17	17-Nov-07	17:37:28	11	29883	29883	PDS_UNKNOWN_FAILURE
17-Nov-07	17:39:03	17-Nov-07	17:40:22	79	29883	29883	PDS_UNKNOWN_FAILURE
18-Nov-07	04:56:21	18-Nov-07	04:56:32	11	29890	29890	PDS_UNKNOWN_FAILURE
18-Nov-07	04:58:07	18-Nov-07	04:59:26	79	29890	29890	PDS_UNKNOWN_FAILURE
18-Nov-07	04:59:26	18-Nov-07	05:45:57	2791	29890	29890	PDS_UNKNOWN_FAILURE
18-Nov-07	16:39:14	18-Nov-07	16:40:31	77	29897	29897	PDS_UNKNOWN_FAILURE
18-Nov-07	22:59:05	19-Nov-07	00:38:55	5990	29900	29901	PDS_UNKNOWN_FAILURE
19-Nov-07	04:24:44	19-Nov-07	04:24:55	11	29904	29904	PDS_UNKNOWN_FAILURE
19-Nov-07	04:26:30	19-Nov-07	04:27:48	78	29904	29904	PDS_UNKNOWN_FAILURE
19-Nov-07	16:07:18	19-Nov-07	16:08:35	77	29911	29911	PDS_UNKNOWN_FAILURE
19-Nov-07	18:14:38	19-Nov-07	18:14:50	12	29912	29912	PDS_UNKNOWN_FAILURE
19-Nov-07	18:16:24	19-Nov-07	18:17:43	79	29912	29912	PDS_UNKNOWN_FAILURE
20-Nov-07	01:13:44	20-Nov-07	01:16:42	178	29916	29916	PDS_UNKNOWN_FAILURE

20-Nov-07	15:36:32	20-Nov-07	15:37:50	78	29925	29925	PDS_UNKNOWN_FAILURE
20-Nov-07	17:43:02	20-Nov-07	17:43:13	11	29926	29926	PDS_UNKNOWN_FAILURE
20-Nov-07	17:44:47	20-Nov-07	17:46:06	79	29926	29926	PDS_UNKNOWN_FAILURE
21-Nov-07	05:02:06	21-Nov-07	05:02:17	11	29933	29933	PDS_UNKNOWN_FAILURE
21-Nov-07	05:03:51	21-Nov-07	05:05:10	79	29933	29933	PDS_UNKNOWN_FAILURE
21-Nov-07	16:44:14	21-Nov-07	16:45:32	78	29940	29940	PDS_UNKNOWN_FAILURE
21-Nov-07	17:12:12	21-Nov-07	17:12:23	11	29940	29940	PDS_UNKNOWN_FAILURE
21-Nov-07	17:13:22	21-Nov-07	17:14:41	79	29940	29940	PDS_UNKNOWN_FAILURE
22-Nov-07	03:15:54	22-Nov-07	03:18:52	178	29946	29946	PDS_UNKNOWN_FAILURE
22-Nov-07	04:30:29	22-Nov-07	04:30:40	11	29947	29947	PDS_UNKNOWN_FAILURE
22-Nov-07	04:32:14	22-Nov-07	04:33:33	79	29947	29947	PDS_UNKNOWN_FAILURE
22-Nov-07	16:13:09	22-Nov-07	16:14:27	78	29954	29954	PDS_UNKNOWN_FAILURE
22-Nov-07	18:20:23	22-Nov-07	18:20:34	11	29955	29955	PDS_UNKNOWN_FAILURE
22-Nov-07	18:22:09	22-Nov-07	18:23:28	79	29955	29955	PDS_UNKNOWN_FAILURE
23-Nov-07	04:32:27	23-Nov-07	04:35:25	178	29961	29961	PDS_UNKNOWN_FAILURE
23-Nov-07	15:42:07	23-Nov-07	15:43:25	78	29968	29968	PDS_UNKNOWN_FAILURE
23-Nov-07	17:48:46	23-Nov-07	17:48:57	11	29969	29969	PDS_UNKNOWN_FAILURE
23-Nov-07	17:50:32	23-Nov-07	17:51:50	78	29969	29969	PDS_UNKNOWN_FAILURE
24-Nov-07	05:07:50	24-Nov-07	05:08:01	11	29976	29976	PDS_UNKNOWN_FAILURE
24-Nov-07	05:09:36	24-Nov-07	05:10:54	78	29976	29976	PDS_UNKNOWN_FAILURE
24-Nov-07	15:10:08	24-Nov-07	15:11:26	78	29982	29982	PDS_UNKNOWN_FAILURE
24-Nov-07	17:17:09	24-Nov-07	17:17:20	11	29983	29983	PDS_UNKNOWN_FAILURE
24-Nov-07	17:18:54	24-Nov-07	17:20:13	79	29983	29983	PDS_UNKNOWN_FAILURE
25-Nov-07	02:48:43	25-Nov-07	02:51:41	178	29989	29989	PDS_UNKNOWN_FAILURE
25-Nov-07	04:36:13	25-Nov-07	04:36:24	11	29990	29990	PDS_UNKNOWN_FAILURE
25-Nov-07	04:37:58	25-Nov-07	04:39:17	79	29990	29990	PDS_UNKNOWN_FAILURE
25-Nov-07	16:19:03	25-Nov-07	16:20:21	78	29997	29997	PDS_UNKNOWN_FAILURE
25-Nov-07	18:26:07	25-Nov-07	18:26:19	12	29998	29998	PDS_UNKNOWN_FAILURE
25-Nov-07	18:27:53	25-Nov-07	18:29:12	79	29998	29998	PDS_UNKNOWN_FAILURE
26-Nov-07	04:05:18	26-Nov-07	04:05:30	12	30004	30004	PDS_UNKNOWN_FAILURE
26-Nov-07	04:06:29	26-Nov-07	04:07:47	78	30004	30004	PDS_UNKNOWN_FAILURE
26-Nov-07	15:47:42	26-Nov-07	15:49:00	78	30011	30011	PDS_UNKNOWN_FAILURE
26-Nov-07	17:54:31	26-Nov-07	17:54:41	10	30012	30012	PDS_UNKNOWN_FAILURE
26-Nov-07	17:56:16	26-Nov-07	17:57:35	79	30012	30012	PDS_UNKNOWN_FAILURE
27-Nov-07	05:13:35	27-Nov-07	05:13:45	10	30019	30019	PDS_UNKNOWN_FAILURE
27-Nov-07	05:15:20	27-Nov-07	05:16:39	79	30019	30019	PDS_UNKNOWN_FAILURE
27-Nov-07	15:16:02	27-Nov-07	15:17:20	78	30025	30025	PDS_UNKNOWN_FAILURE
27-Nov-07	17:22:53	27-Nov-07	17:23:04	11	30026	30026	PDS_UNKNOWN_FAILURE
27-Nov-07	17:24:39	27-Nov-07	17:25:57	78	30026	30026	PDS_UNKNOWN_FAILURE
27-Nov-07	17:25:57	27-Nov-07	17:25:58	1	30026	30026	PDS_UNKNOWN_FAILURE

28-Nov-07	04:41:57	28-Nov-07	04:42:08	11	30033	30033	PDS_UNKNOWN_FAILURE
28-Nov-07	04:43:43	28-Nov-07	04:45:02	79	30033	30033	PDS_UNKNOWN_FAILURE
28-Nov-07	13:19:10	28-Nov-07	14:58:08	5938	30038	30039	PDS_UNKNOWN_FAILURE
28-Nov-07	16:24:57	28-Nov-07	16:26:15	78	30040	30040	PDS_UNKNOWN_FAILURE
28-Nov-07	18:31:51	28-Nov-07	18:32:03	12	30041	30041	PDS_UNKNOWN_FAILURE
28-Nov-07	18:33:06	28-Nov-07	18:34:25	79	30041	30041	PDS_UNKNOWN_FAILURE
29-Nov-07	04:10:20	29-Nov-07	04:10:31	11	30047	30047	PDS_UNKNOWN_FAILURE
29-Nov-07	04:12:06	29-Nov-07	04:13:24	78	30047	30047	PDS_UNKNOWN_FAILURE
29-Nov-07	15:50:34	29-Nov-07	15:50:36	2	30054	30054	PDS_UNKNOWN_FAILURE
29-Nov-07	15:53:17	29-Nov-07	15:54:35	78	30054	30054	PDS_UNKNOWN_FAILURE
29-Nov-07	18:00:15	29-Nov-07	18:00:26	11	30055	30055	PDS_UNKNOWN_FAILURE
29-Nov-07	18:02:00	29-Nov-07	18:03:19	79	30055	30055	PDS_UNKNOWN_FAILURE
30-Nov-07	05:19:19	30-Nov-07	05:19:30	11	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	05:21:04	30-Nov-07	05:22:23	79	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	05:29:01	30-Nov-07	05:31:59	178	30062	30062	PDS_UNKNOWN_FAILURE
30-Nov-07	15:21:57	30-Nov-07	15:23:15	78	30068	30068	PDS_UNKNOWN_FAILURE
30-Nov-07	17:28:37	30-Nov-07	17:28:49	12	30069	30069	PDS_UNKNOWN_FAILURE
30-Nov-07	17:30:23	30-Nov-07	17:31:42	79	30069	30069	PDS_UNKNOWN_FAILURE
01-Dec-07	02:51:12	01-Dec-07	02:54:10	178	30074	30074	PDS_UNKNOWN_FAILURE
01-Dec-07	04:47:42	01-Dec-07	04:47:53	11	30076	30076	PDS_UNKNOWN_FAILURE
01-Dec-07	04:49:27	01-Dec-07	04:50:46	79	30076	30076	PDS_UNKNOWN_FAILURE
01-Dec-07	16:30:52	01-Dec-07	16:32:10	78	30083	30083	PDS_UNKNOWN_FAILURE
02-Dec-07	04:16:05	02-Dec-07	04:16:16	11	30090	30090	PDS_UNKNOWN_FAILURE
02-Dec-07	04:17:50	02-Dec-07	04:19:09	79	30090	30090	PDS_UNKNOWN_FAILURE
02-Dec-07	15:58:53	02-Dec-07	16:00:10	77	30097	30097	PDS_UNKNOWN_FAILURE
02-Dec-07	18:06:00	02-Dec-07	18:06:11	11	30098	30098	PDS_UNKNOWN_FAILURE
02-Dec-07	18:07:45	02-Dec-07	18:09:04	79	30098	30098	PDS_UNKNOWN_FAILURE
03-Dec-07	05:25:02	03-Dec-07	05:25:12	10	30105	30105	PDS_UNKNOWN_FAILURE
03-Dec-07	05:26:11	03-Dec-07	05:27:30	79	30105	30105	PDS_UNKNOWN_FAILURE
03-Dec-07	15:27:51	03-Dec-07	15:29:09	78	30111	30111	PDS_UNKNOWN_FAILURE
03-Dec-07	17:34:23	03-Dec-07	17:34:33	10	30112	30112	PDS_UNKNOWN_FAILURE
03-Dec-07	17:36:08	03-Dec-07	17:37:27	79	30112	30112	PDS_UNKNOWN_FAILURE

APPENDIX 3: LEVEL 2 STATIC AUXILIARY DATA FILES

AUX_DEM_AXVIEC20031201_000000_20031201_000000_20200101_000000
AUX_ATT_AXVIEC20020924_131534_20020703_120000_20781231_235959
AUX_LSM_AXVIEC20020123_141228_20020101_000000_20200101_000000
MWR_LSF_AXVIEC20020313_172218_20020101_000000_20200101_000000
MWR_CHD_AXVIEC20021111_131410_20020101_000000_20200101_000000
MWR_LSF_AXVIEC20020313_172218_20020101_000000_20200101_000000

MWR_SLT_AXVIEC20050426_120000_20020101_000000_20200101_000000
RA2_IFA_AXVIEC20050216_125529_20020101_000000_20200101_000000
RA2_IFB_AXVIEC20050216_125738_20020101_000000_20200101_000000
RA2_CHD_AXVIEC20051017_093900_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_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_AXVIEC20051003_170000_20020101_000000_20200101_000000
RA2_SSB_AXVIEC20051129_111810_20020101_000000_20200101_000000
RA2_TLD_AXVIEC20031208_151137_20020101_000000_20200101_000000
RA2_TLG_AXVIEC20040310_110000_20020101_000000_20200101_000000

APPENDIX 4: SIGMA0 ABSOLUTE CALIBRATION

Table 18: Transponder measurement results up to cycle 61

Absolute Orbit nb	Date of Measurement	Location / Rel. track	RA-2 resolution	Transponder Bias [dB]	ECMWF Wet Tropo. Corr. [dB]
10389	24-feb-04	Rome / 315	Low	1,552	0,120
10511	04-mar-04	Valmontone / 437	Low	1,542	0,102
10618	11-mar-04	Fiuggi / 43	Low	1,447	0,135
10783	23-mar-04	Maccarese / 208	Low	1,540	0,142
10890	30-mar-04	Rome / 315	Low	1,442	0,152
11119	15-apr-04	Fiuggi / 43	High	0,963	0,122
11513	13-mag-04	Valmontone / 437	Low	1,353	0,133
11620	20-mag-04	Fiuggi / 43	Low	1,427	0,139
11892	08-giu-04	Rome / 315	Low	1,504	0,154
12014	17-giu-04	Valmontone / 437	Low	1,448	0,348
12121	24-giu-04	Fiuggi / 43	Low	1,576	0,149
14290	23-nov-04	Maccarese / 208	Low	1,43	0,164
14397	30-nov-04	Rome / 315	Low	1,11	0,142
14519	9-dic-04	Valmontone / 437	Low	1,26	0,248
14791	28-dic-04	Maccarese / 208	High	0,97	0,134
14898	4-gen-05	Rome / 315	High	0,95	0,114

15020	13-gen-05	Valmontone / 437	High	0,88	0,118
15127	20-gen-05	Fiuggi / 43	High	1,01	0,108
15292	1-feb-05	Maccarese / 208	High	0,95	0,132
15399	8-feb-05	Rome / 315	High	1,05	0,124
15521	17-feb-05	Valmontone / 437	High	0,94	0,115
15793	8-mar-05	Maccarese / 208	High	0,93	0,116
15900	15-mar-05	Rome / 315	High	0,93	0,128
16022	24-mar-05	Valmontone / 437	High	0,94	0,154
16294	12-apr-05	Maccarese / 208	High	0,97	0,140
16401	19-apr-05	Rome / 315	High	0,99	0,134
16523	28-apr-05	Valmontone / 437	High	0,97	0,114
16795	17-may-05	Maccarese / 208	High	0,84	0,168
16902	24-may-05	Rome / 315	High	1,00	0,152
17403	28-jun-05	Rome / 315	High	1,13	0,16
17525	7-jul-05	Valmontone / 437	High	1,04	0,13
17904	02-aug-05	Rome / 315	High	1,02	0,188
18026	11-aug-05	Valmontone / 437	High	0,93	0,154
18405	06-sep-05	Rome / 315	High	1,06	0,16
18634	22-Sep-05	Fiuggi/43	High	1,00	0,152
18799	04-Oct-05	Maccarese/208	High	0,85	0,164
18906	11-Oct-05	Perm site Rome / 315	Low	1,46	0,156
19407	15-Nov-05	Perm site Rome / 315	High	1,09	0,19
20409	24-Jan-06	Perm site Rome / 315	High	1,38	0,110
20910	28-Feb-06	Perm site Rome / 315	High	0,98	0,124
21912	9-May-06	Perm site Rome / 315	High	1,0	0,138
23916	26-Sep-06	Perm site Rome / 315	High	1,05	0,172
24417	31-Oct-06	Perm site Rome / 315	High	1,08	0,146
24918	05-Dec-06	Perm site Rome / 315	High	1,00	0,156
25419	09-Jan-2007	Perm site Rome / 315	High	0,97	0,148
25929	13-Feb-2007	Perm site Rome / 315	High	1,07	0,118
26922	24-Apr-2007	Perm site Rome / 315	High	1,17	0,154
27423	29-May-2007	Perm site Rome / 315	High	1,04	0,168
29928	20-Nov-2007	Perm site Rome / 315	High	1,04	0,139

APPENDIX 5: S-BAND ANOMALY

Table 13: List of L2 FGD Files affected by S-Band anomaly during the current cycle
No files affected by S Band Anomaly on cycle 63

File name	Start date	Start time	Stop date	Sto

APPENDIX 6: IE SITES COORDINATES

ZONE_ID="CapraiaA"
RECORD polygon_pt: LONG=+009.934000<deg> LAT=+042.970000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+009.863000<deg> LAT=+042.970000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+009.863000<deg> LAT=+043.166000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+009.934000<deg> LAT=+043.166000<deg>
ENDRECORD
ZONE_ID="Toulon_D"
RECORD polygon_pt: LONG=+005.500000<deg> LAT=+043.070000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+005.473000<deg> LAT=+043.070000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+005.473000<deg> LAT=+043.160000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+005.500000<deg> LAT=+043.160000<deg>
ENDRECORD
ZONE_ID="Vostok_x"
RECORD polygon_pt: LONG=+106.500000<deg> LAT=-078.000000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+105.500000<deg> LAT=-078.000000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+105.500000<deg> LAT=-077.500000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+106.500000<deg> LAT=-077.500000<deg>
ENDRECORD
ZONE_ID="Dome_x__"
RECORD polygon_pt: LONG=+124.000000<deg> LAT=-075.250000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+122.000000<deg> LAT=-075.250000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+122.000000<deg> LAT=-074.750000<deg>
ENDRECORD
RECORD polygon_pt: LONG=+124.000000<deg> LAT=-074.750000<deg>
ENDRECORD