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Title : **IDEAS+ – SMOS Public Monthly Report - December 2016**

Abstract : This document provides a summary of the status and performance of SMOS over the course of the reporting month.

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AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	DATE	DCI No	REASON
1	19 January 2017	N/A	First release

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1. EXECUTIVE SUMMARY

This is the routine Soil Moisture and Ocean Salinity (**SMOS**) Monthly Public Report containing a summary of the instrument health, product quality status and updates to SMOS processing and AUX files during December 2016.

Since 19th December 2016 auxiliary dataset from the NOAA Interactive Multisensor Snow and Ice Mapping System (IMS) is used by the SMOS soil moisture level 2 processor to represent the snow cover extent. The NOAA IMS, based on data acquired by various sensors, provides a better representation of the snow cover compared to previously snow density information from ECMWF forecast.

The instrument health during December was found to be nominal. There were eight un-availabilities reported during the reporting period that translate into time intervals with data loss or degraded data. The list of unavailabilities is included in the section 3.2.

The data quality during December 2016 was found to be nominal, with the exceptions listed in section 4.5. These degraded periods have been induced either by instrument anomalies or unavailability of dynamic auxiliary files.

2. INTRODUCTION

2.1 Structure of the Document

After this introduction, the document is divided into a number of major sections that are briefly described below:

1   Executive summary

The executive summary covers the main findings from the report.

2   Introduction

A list of referenced documents and definitions of terms are available.

3   Instrument status

This section covers the instrument health and unavailabilities from this reporting period.

4   Data Summary

This section covers reprocessing, updates to processors and aux files as well as a data coverage summary.

5   Long Term Analysis

Long-term analysis of the instrument calibration and data quality are provided in this section.

2.2 Definitions of Terms

The following terms have been used in this report with the meanings shown.

Term	Definition
CMN	Control and Monitoring Node, responsible for commanding the receivers, reading their physical temperatures and telemetry and the generation of the synchronization signal (local oscillator tone) among receivers.
CCU	Correlator and Control unit, instrument computer on-board
DPGS	Data Processing Ground Segment
ESL	Expert Science Laboratory
IC4EC	Internal Calibration for External calibration. Calibration sequences for the instrument monitoring and calibration of science data acquired in external target pointing.
IDEAS+	Instrument Data quality Evaluation and Analysis Service, reporting to the ESA Data Quality and Algorithms

Management Office (EOP-GQ), responsible for quality of data provided to users including the data calibration and validation, the data processing algorithms, and the routine instrument and processing chain performances.

IPF	Instrument Processor Facility
L2SM	Level 2 Soil Moisture
MM	Mass Memory
OCM	Orbit Correction Manoeuvre
PMS	Power Measurement System
RFI	Radio Frequency Interference
N/A	Not applicable

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3. INSTRUMENT STATUS

3.1 Instrument health

The current instrument status is that all the **instrument** subsystems are working correctly. The current configuration of the instrument is that the arm A and the arm B are working in nominal side and arm C is in the redundant side.

Table 3-1   History of instrument problems and mode changes

Start	Stop	Description
11 January 2010 12:07z Orbit 1013	N/A	Arm A changes from redundant to nominal side. That operation is to avoid the malfunction of one of the redundant CMNs of the arm.
12 January 2011 09:15z Orbit 6278	N/A	Arm B changes from redundant to nominal side. That operation is to avoid the malfunction of one of the redundant CMNs of the arm.

3.2 Instrument unavailabilities and anomalies

The unavailabilities and anomalies listed in Table 3-2 occurred during the reporting period. A full list of unavailabilities can be found in the Mission Status section on the SMOS Earthnet website accessible here

During these unavailabilities and anomalies the instrument may have either not collected data or may have collected corrupt data which may not have been processed to higher levels. Table 4-5, Table 4-6 and Table 4-7 provide details of the data which has been affected by gaps and quality degradation respectively.

Table 3-2   SMOS unavailability list

Start Time (UTC)	Stop Time (UTC)	Unavailability Report Reference	Planned	Description
07/12/2016 09:19z	07/12/2016 09:29z	FOS-2519	No	CMN Unlock C3
07/12/2016 23:46z	08/12/2016 00:03z	FOS-2518	Yes	OCM
16/12/2016 18:42z	16/12/2016 19:26z	FOS-2536	No	MM Latch-Up on P0

18/12/2016 04:15z	18/12/2016 04:15z	FOS-2537	No	MM Latch-Up on P9
19/12/2016 15:55z	19/12/2016 16:04z	FOS-2538	Yes	MM Latch-Up Recovery
20/12/2016 09:44z	20/12/2016 09:54z	FOS-2541	No	CMN Unlock C3
26/12/2016 13:51z	20/12/2016 14:01z	FOS-2545	No	CMN Unlock B2
27/12/2016 19:32z	27/12/2016 19:32z	FOS-2548	No	MM Latch-Up on P9

4. DATA SUMMARY

4.1 Reprocessing activities

The information regarding to data reprocessing activities (REPR data type) during the reporting period are:

1) The SMOS mission reprocessing for sea surface salinity L2OS v661 was launched on 2016-07-28 at 14:16 UTC and finished the 6th of October. The dataset has been validated by the Expert Support Laboratories (ESLs) and results were presented at the Quality Working Group in December 2016. The dataset did not achieve the requested quality, therefore it is not disseminated to the end user. A new reprocessing campaign is scheduled in January 2017 by using a new version v622 for the level 2 sea surface salinity processor.

The information regarding to the data regeneration activities (OPER data type) during the reporting period are:

1) None.

The information regarding to past version 62x data reprocessing activities (REPR data type) are:

1) Level 2 sea surface salinity and soil moisture reprocessing finished the 31st December 2015. The reprocessed dataset has been delivered to the user on 4 March 2016. Sensing time of the reprocessed data goes from 12th January 2010 to 14th July 2015. For more details see the SMOS news here. The SMOS users are strongly encouraged to consult the level 2 read-me-first notes before using the SMOS data. The level 2 read-me-first note for sea surface salinity product is available here, the level 2 read-me-first note for soil moisture product is available here.

2) The second SMOS mission reprocessing for L1 v62x finished the 25th June 2015. Sensing time of the reprocessed data goes from 12th January 2010 to 05th May 2015. Data set is available for the SMOS user community since 25th June 2015 (see the SMOS news here). The SMOS data users are strongly encouraged to consult the level 1 read-me-first note before using the SMOS data. The level 1 read-me-first note is available here: https://earth.esa.int/documents/10174/1854503/SMOS_L1OPv620_release_note

The information regarding to the past version V62x data regeneration activities (OPER data type) are:

1) Dataset sensed from 20160414T172533 to 20160419T100347 was degraded due to the usage of an out of date long calibration. Period has been regenerated with the proper calibration up to L2.

2) CCU reset on the 25th of November 2015 caused a delay in the data production. As consequence, the calibration CSTD1A files where not processed in the correct order from 20151125T033228 to 20151127T082215. All these affected CSTD1A files have been regenerated.

3) CCU reset on the 25th of November 2015 caused a delay in the production. As consequence, CSTD1A files where not processed in the correct order. This impacted science up to L2 from 20151126T054441 to 20151126T140819. The period has been regenerated from L1 to L2.

4) A hardware anomaly in DPGS systems introduced a large delay in the production on 05th May 2016. As a consequence, some calibration CSTD1A files where incorrectly consolidated when the production was recovered. This introduced some LO gaps, which impacted the quality of the data severely (no local oscillator calibration) from 20160505T170715z until 20160506T113201z. All the affected data were successfully regenerated from L0 up to L2.

5) On December 2015, the next periods were regenerated from L1C to L2 due to VTEC_P delay: the period from 20151206T005504 to 20151206T041830 and the period from 20150719T005448 to 20150720T024908.

6) On 15th of August 2015 a hardware anomaly caused a TLM_MIRA1A order to fail due to timeout. Therefore, a gap in science and in calibration (CSTD1A) was introduced. The next data types and periods has been regenerated: TLM_MIRA1A at 20150815T031323, CSTD1A files with times between 20150815T003625 and 20150815T214626, affected science (MIR_SC_F1A, MIR_SC_F1B, MIR_SCLF1C, MIR_SCSF1C, MIR_BWLF1C and MIR_BWSF1C) between 20150815T023400 and 20150815T050753.

7) Due to an anomaly in the NIR calibration on the 3rd of June 2015, the next data types has been regenerated from 2015-06-03 06:43z to 2015-06-12 08:14z: MIR_SC_F1A, MIR_SC_F1B, MIR_SCLF1C, MIR_SCSF1C, MIR_BWLF1C and MIR_BWSF1C.

8) A hardware anomaly in DPGS systems introduced a large delay in the production. As a consequence some CSTD1A orders were dropped due time-out. This introduced bad-consolidated calibration in the system, with some LO gaps, which has impacted the quality of the data severely (no local oscillator calibration). Data from 20150713T194909z until 20150714T032238z is affected. All data were regenerated successfully from L0 up to L1C; L2 data was reprocessed and now available as REPR data type.

9) Period from 29 May 2015 to 31 May 2015 have been regenerated since one of the DPGS processing nodes (PWF-5) induced several science and calibration gaps for the reported period. L2 data was reprocessed and now available as REPR data type

The information regarding the past version V5xx data regeneration and reprocessing activities (OPER and REPR data type) are available in the monthly report of April 2015.

4.2 Processing changes

4.2.1 Processor updates

No processor updates have been conducted during the reporting period.

4.2.2 Processor Status

At the end of the reporting period, the Processing Facility is using the following processors:

Table 4-1   Instrument Processors status

Processor	Version	Deployment date

L1OP	620 (L1a/L1c/NIRCAL)	05/05/2015
	621 (L1b/CAL_1A)	
L2OS	622	05/05/2015
L2SM	620	05/05/2015

Table 4-2   Pre- and Post-processors status

Processor	Version	Deployment date
ECMWFP	318	07/11/2013
VTECGN	320	18/05/2016
LAI pre-processor (currently not used)	307	18/02/2010
OSCOTT	624	05/05/2015
L2 Post-processors	510	05/05/2015
SNOWP	102	28/10/2016

4.2.3 Schema updates

No schema changes have been conducted during the reporting period.

4.2.4 Schema status

At the end of the reporting period, the schema version of the datablock of the products generated and distributed through SMOS dissemination service is:

Table 4-3   Schema version status

Product type	Version
MIR_SC_F1B	400
MIR_SCSF1C	400
MIR_SCLF1C	400
MIR_BWSF1C	400
MIR_BWLF1C	400
MIR_SMUDP2	400

MIR_OSUDP2	400
AUX_ECMWF_	300

The schema packages are available from the SMOS Global Mapping Tool (GMT) webpage:

https://earth.esa.int/web/guest/software-tools/-/asset_publisher/P2xs/content/gmt-smos-global-mapping-tool

Further information about the product format is available in the level 1 and level 2 Product specification documents available here

4.2.5 Aux file updates

The following quasi-static AUX files were disseminated to the processing stations this reporting period. The status of the quasi-static AUX files at the end of the reporting period is in the section 7.

SM_OPER_AUX_BULL_B_20161002T000000_20161101T235959_120_001_3
Start sensing time at L1 processor: N/A

Justification: Bulletin Update including values from October 2016 and the prediction for November 2016. Its usage is intended for reprocessing.

SM_OPER_AUX_BULL_B_20161002T000000_20500101T000000_120_001_3

Start sensing time at L1 processor: 2016-12-07 06:09:09z

Justification: Bulletin Update including values from October 2016 and the prediction for November 2016. Its usage is intended for the nominal production.

SM_OPER_AUX_BULL_B_20161002T000000_20500101T000000_120_002_3

Start sensing time at L1 processor: 2016-12-28 09:12:11z

Justification: Bulletin Update including values from October 2016 and the prediction for November 2016. Its usage is intended for the nominal production. This file introduces the leap second for 31st December 2016.

4.3 Calibration Events Summary

The following table summarizes the major calibration activities conducted during the reporting period. The Local Oscillator calibration is not included in the table since occurs periodically every 10 minutes. The short calibrations are acquired weekly since 2011-03-24 and they are currently used in the nominal processing chain.

Table 4-4 Calibration summary

Date	Start Time	Stop Time	Calibration	Comments

01/12/2016	06:43:00z	06:44:44z	Short	Nominal
08/12/2016	15:34:00z	18:07:19z	Long	Nominal
14/12/2016	12:58:52z	14:21:06z	NIR-Warm	Nominal Brightness temperature: 3.8403 K RMS: 0.3046 K Moon Elevation: -2.1822 Sun Elevation: 9.948172 Right Ascension: 175.92 Declination: -16.31
15/12/2016	07:38:00z	07:39:44z	Short	Nominal
22/12/2016	16:27:00z	16:28:44z	Short	Nominal
28/12/2016	15:33:10z	16:55:24z	NIR-Warm	Nominal Brightness temperature: 3.9879 K RMS: 0.3663 K Moon Elevation: 14.4128 Sun Elevation: 9.944467 Right Ascension: 190.31 Declination: -19.32
29/12/2016	06:53:00z	06:54:44z	Short	Nominal

4.4 Data Coverage Summary

Where instrument unavailabilities or anomalies have occurred during this reporting period, gaps in data coverage may have occurred. A list of the gaps due to a permanent data loss is given in Table 4-5 by product level. On the other hand, a list of gaps due to operational problems is given in Table 4-6. The latter gaps may be recovered when the problem is fixed.

The science data gaps due to the execution of calibration activities are not listed in this section.

Table 4-5   Data loss summary

Start	Finish	Data Level	Comments
07/12/2016 23:46z	08/12/2016 00:03z	All Products	OCM (FOS-2518)[1]
16/12/2016 18:42z	16/12/2016 19:26z	All Products	MM Latch-Up on P0 (FOS-2536)
19/12/2016 15:55z	19/12/2016 16:04z	All Products	MM Latch-Up Recovery (FOS-2538)

1: Data acquired during the manoeuvre is flagged as external pointing and not available as nominal data.

Table 4-6   Operational gaps summary

Start	Finish	Data Level	Comments
N/A	N/A	N/A	N/A

4.5 Summary of degraded data

In December 2016, SMOS data was affected by the following instrument and processing anomalies which have had a detrimental effect on the data quality.

Table 4-7   Summary of degraded data

Start	Finish	Affected products	Problem Description
07/12/2016 09:19z	07/12/2016 09:29z	L1a and above products	CMN Unlock C3
20/12/2016 09:44z	20/12/2016 09:54z	L1a and above products	CMN Unlock C3
26/12/2016 13:51z	20/12/2016 14:01z	L1a and above products	CMN Unlock B2

4.6 Product Quality Disclaimers

The following product disclaimers affects the data generated in the reporting period:

Table 4-8   Summary of product quality disclaimers

Date	Product level	
From: beginning of the mission To: 1st September 2016	L1 L2	Due to a software anomaly in the Level 0 processor, the *Cycle, orbit relative and orbit absolute* fields in all the product headers are incorrectly set. Those values are annotated in the headers of all the higher level products. The anomaly was fixed on 1st September with the deployment in the processing facility of a new version (v308) of the L0 processor.
From: 18th of August 2016 (16:36z)	L1	Brightness temperature generated with calibration occurred on 2nd July instead of calibration occurred on 18th August. The impact of wrongly consolidated calibrated visibilities

To: 20thSeptember 2016 (08:26z)		(UAVD1A) is negligible. In relation to the impact in the brightness temperature of the degraded PMS gain and offset (CRSD1A) the analysis is still on-going; so far, the impact seems to be small (TBC).

5. LONG-TERM ANALYSIS

5.1 Calibration Analysis

The calibration parameters are under monitoring. During the reporting period, there have been three Warm-NIR calibrations events: on the 14th and 28th of December 2016.

The NIR calibration events have been monitored and the noise injection levels of the NIR diodes are stable and inside the range defined in the routine calibration plan.

The evolution of the noise temperature of the reference noise diodes Tna and Tnr computed with processor baseline V62x since the beginning of the mission is shown from Figure 1 to Figure 4. The evolution of the temperature parameters, which are related to the internal diode stability, are stable in particular for the NIR CA which is the only one used for the level 1 data calibration. The small deviation in the NIR calibration on 3rd June 2015 was due to a Radio Frequency Interference (RFI) that has corrupted the measurement. This calibration should not be used for the scientific processing of the data.

Figure 5 and Figure 6 present the evolution of the NIR Observed brightness temperature (BT) since the beginning of the mission for the V620x baseline. Small variation of few Kelvin, in the observed BT are due to slightly different region of the Sky sensed during the calibration manoeuvre. This parameter is used only for monitoring purpose.

The seasonal evolution of the calibration parameters: Tna and Tnr present in the previous processor baseline V5xx (see for an example the monthly report for April 2015) had been largely mitigated by the new calibration algorithm which decouple the variation of the antenna losses and the drift of the reference diode. This approach allows to compensate each drift separately improving the diode stability monitoring and increasing the accuracy of the consequent calibration correction. Further improvements in the calibration stability were achieved by implementing the "warm NIR calibration". since 15th of October 2014. During "warm NIR calibration" the Noise Injection Radiometer (NIR) calibration is performed with a Sun elevation of 10 degrees above the antenna plane in order to maintain a stable thermal environment of the instrument through the calibration sequence. The impact on the final brightness temperature is a more stable long term measurement.

The leakage and cross-coupling factors of the NIR channels shown in Figure 7 and Figure 8 remain small and no problems can be observed apart from a peak in the phase of the NIR-AB cross-coupling term on 11 April 2012. That peak corresponds to an anomaly in the NIR-AB that did not have impact on the data.

Figure 1 Tna evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the H-channel since the beginning of the mission. Thresholds in dashed lines
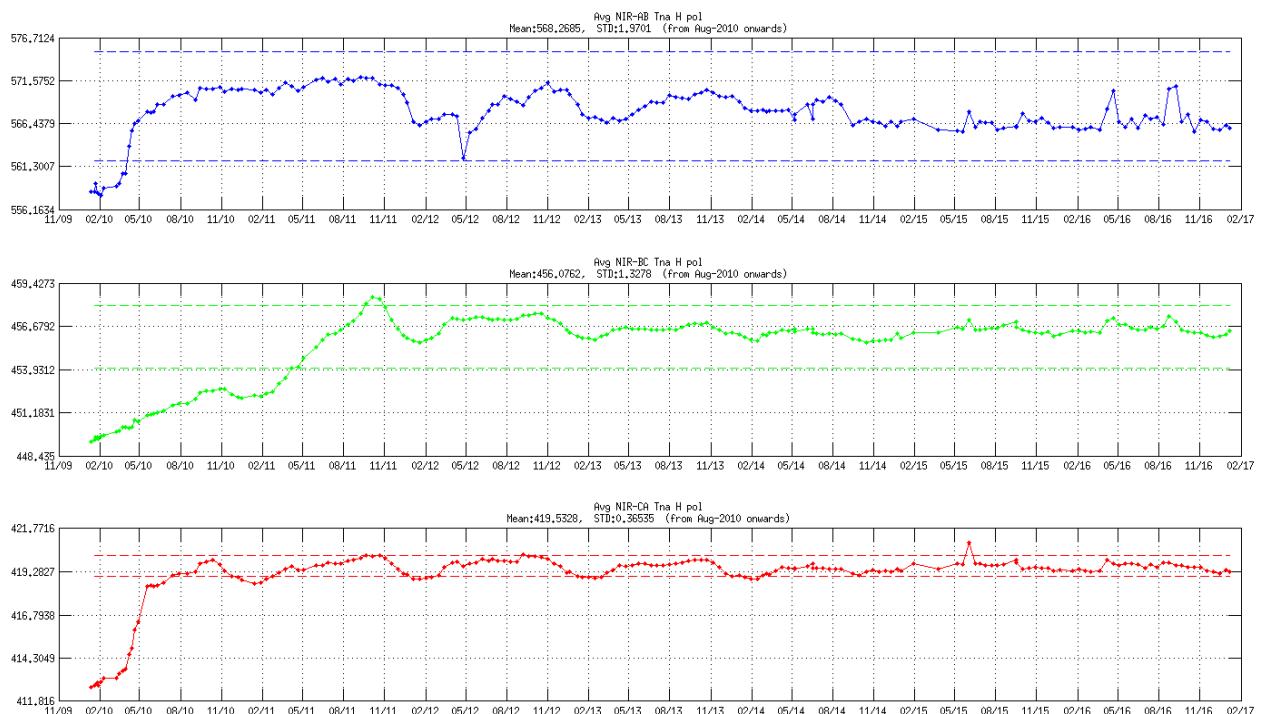

Figure 2 Tna evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the V-channel since the beginning of the mission. Thresholds in dashed lines
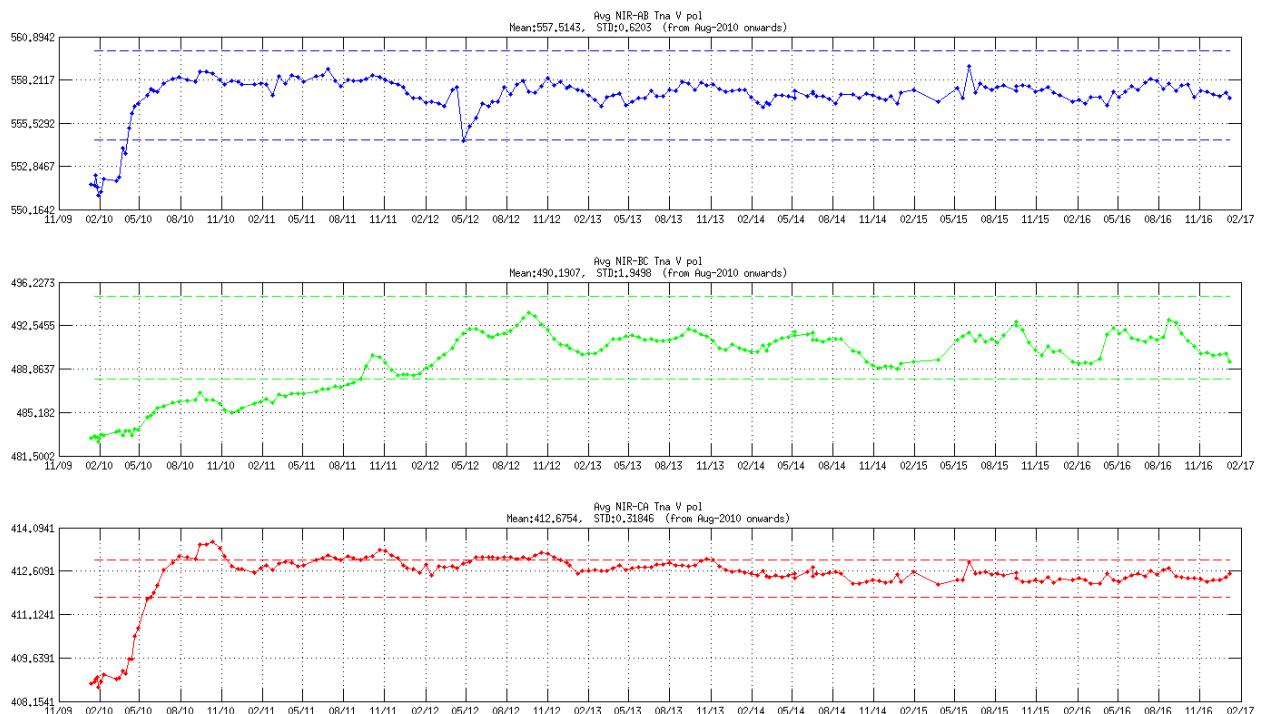
Figure 3 Tnr evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the H-channel since the beginning of the mission.
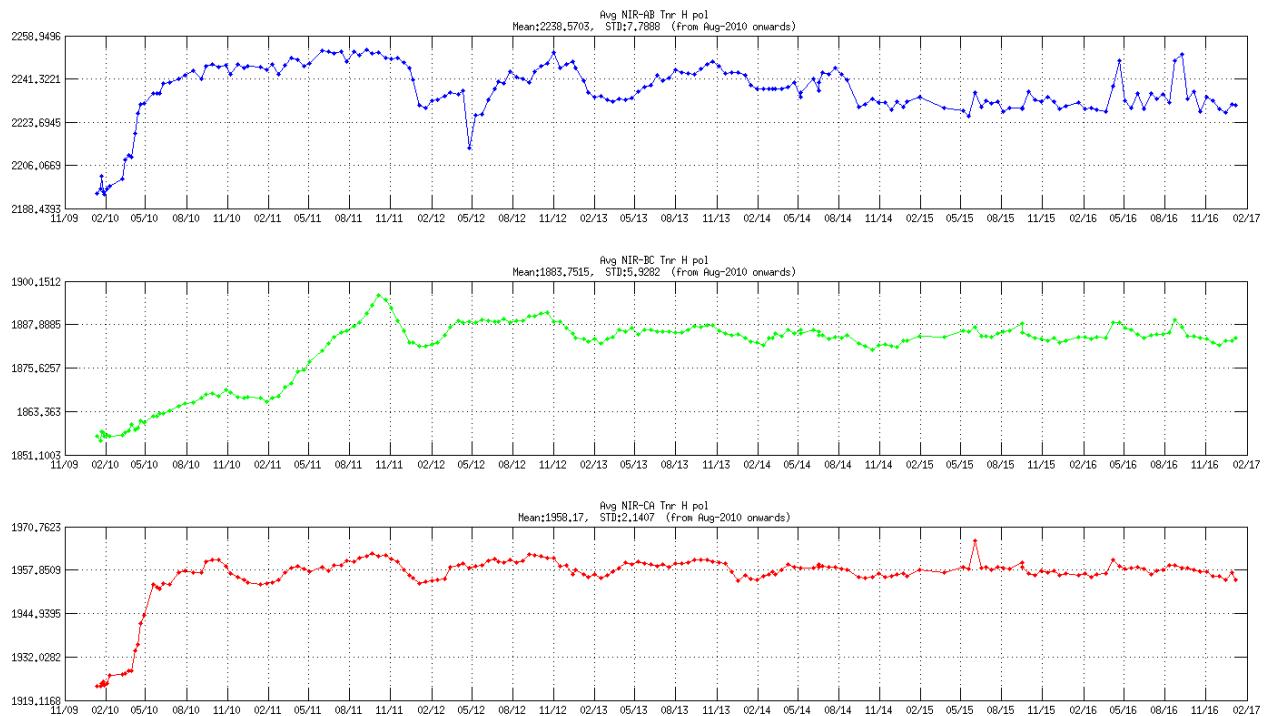

Figure 4 Tnr evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the V-channel since the beginning of the mission.
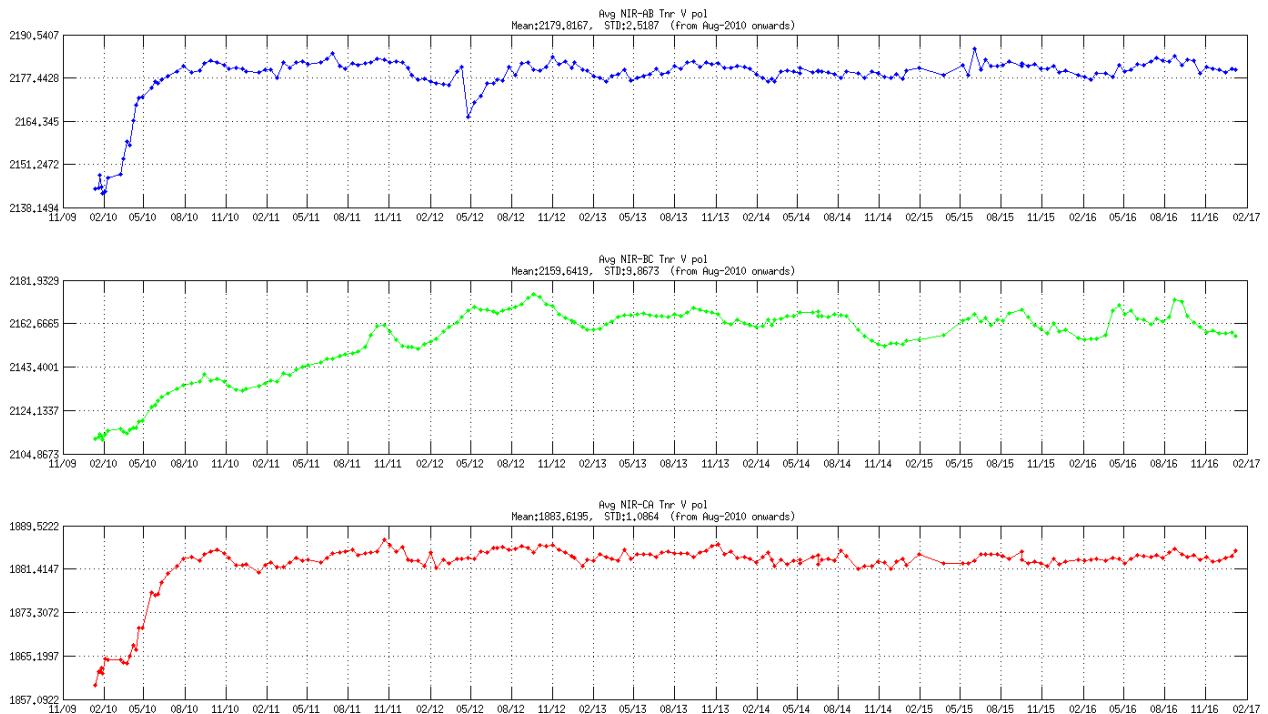
Figure 5 NIR Observed BT evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the H-channel since the beginning of the mission. Thresholds in dashed lines
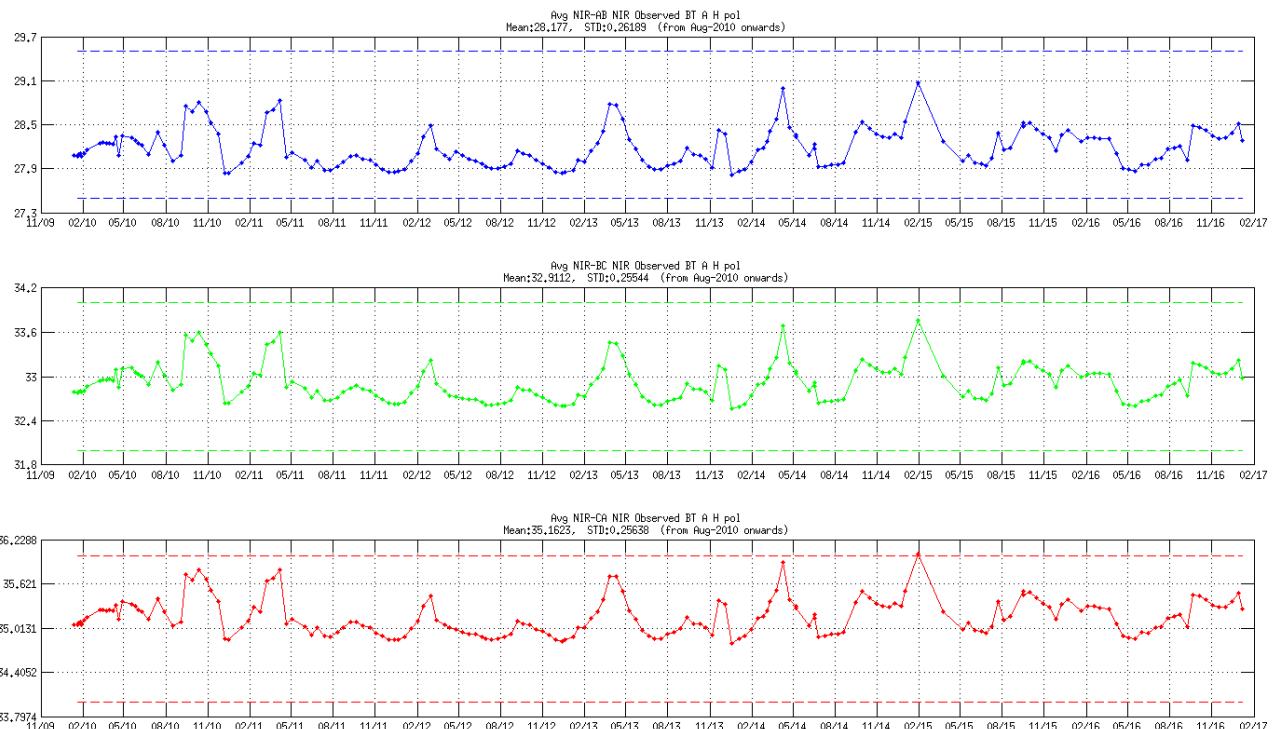
Figure 6 NIR Observed BT evolution of NIR AB (blue), NIR BC (green) and NIR CA (red) in the V-channel since the beginning of the mission. Thresholds in dashed lines
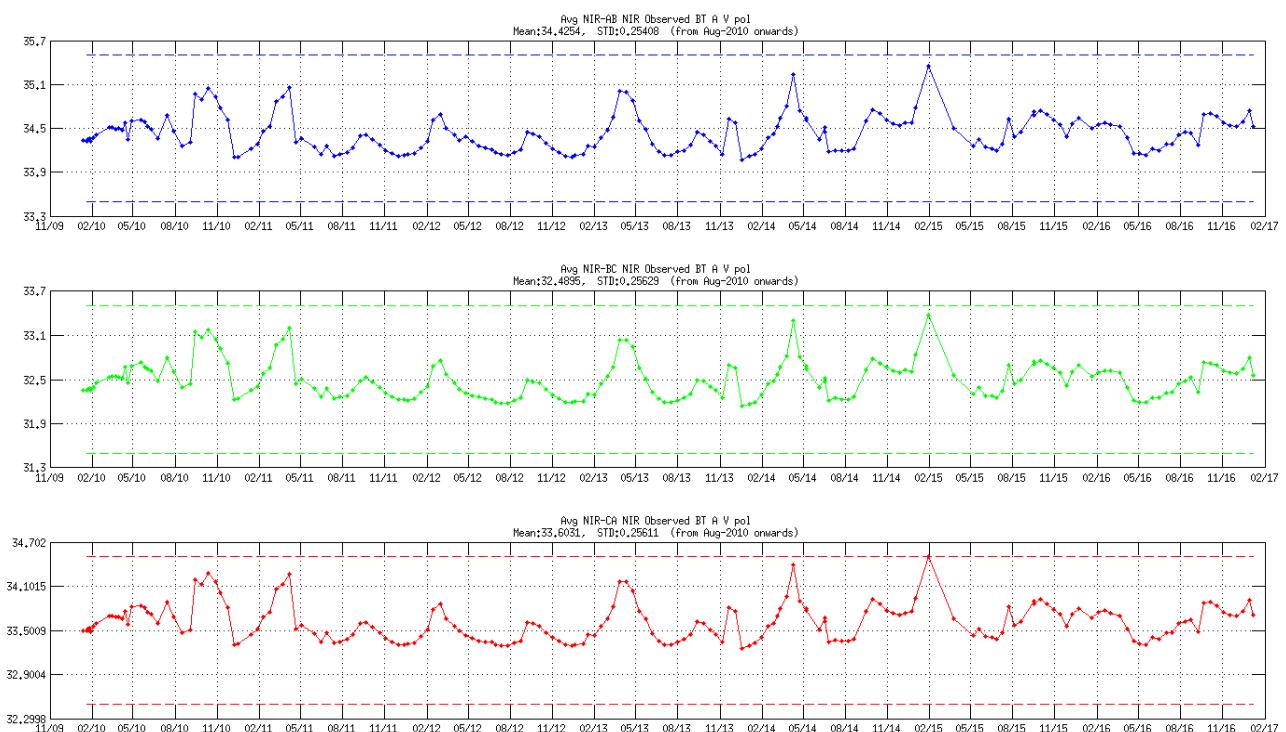
Figure 7 Cross-coupling evolution in amplitude and phase of NIR AB (blue), NIR BC (green) and NIR CA (red) since the beginning of the mission
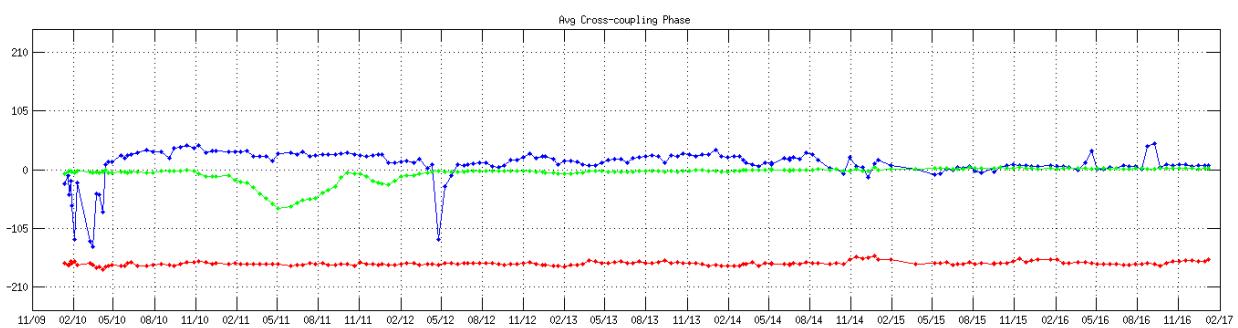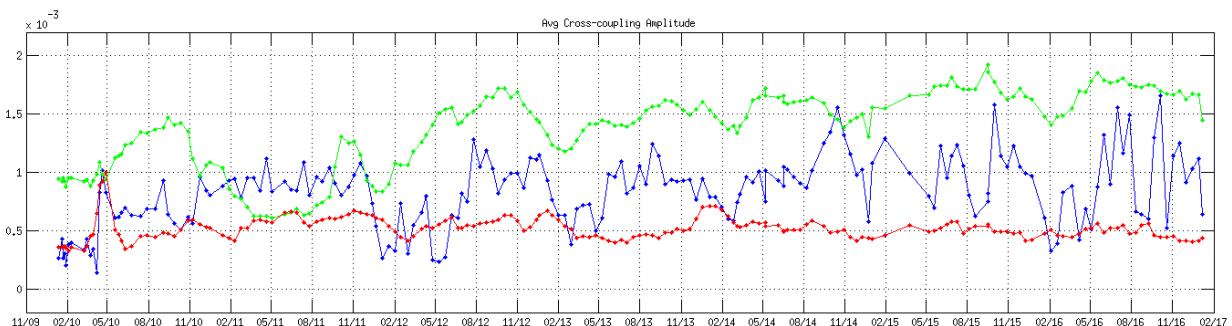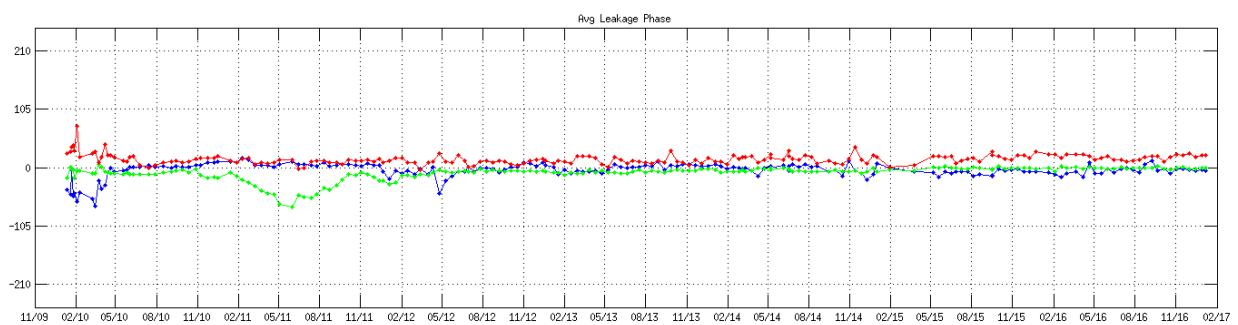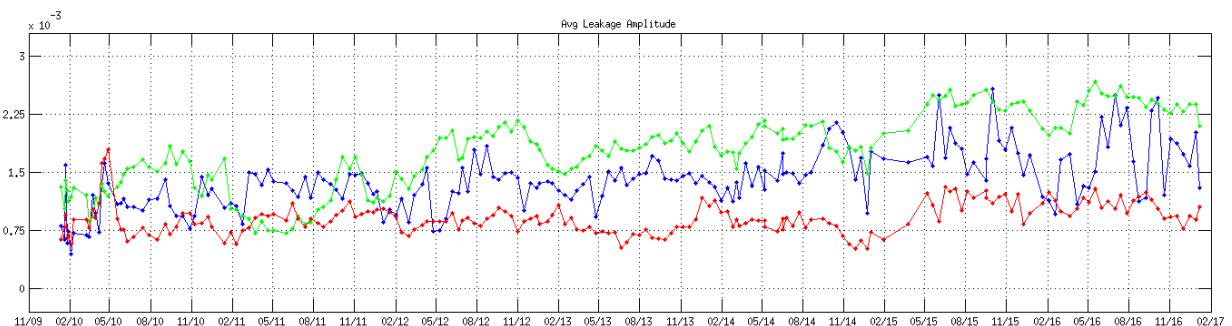
Figure 8 Leakage factor evolution in amplitude and phase of NIR AB (blue), NIR BC (green) and NIR CA (red) since the beginning of the mission

The LICEF calibration status is updated by long (every 8 weeks) and short (weekly) on-board calibration activities. No long calibration has been executed during the reporting period.

LICEF PMS gain is derived during the long calibration activity and the Figure 9 to Figure 20 show the evolution (V62x algorithm baseline) of the deviations of the PMS gain with respect to its average over time. Note that PMS gain depends on the physical temperature of the receivers, PMS calibration is performed at slightly different physical temperature due to calibration time (season effect) and position of the receiver (LICEF) in the instrument (arms and central hub). In order to compare the calibration results the gains and offsets obtained during the calibration are normalised to 21 degrees Celsius temperature by using the receiver PMS gain and offset temperature sensitivity parameter (one value for each LICEF).

Apart from receiver (LICEF) LCF_A_18, LCF_C_11, LCF_C_19, which have shown a clear evolution from the main trend (see Figure 12, 19, 20) the others PMS gains are stable. The seasonal PMS gain variation present in some LICEFs is mainly due to the PMS gain temperature sensitivity parameters which needs refinement for some LICEFs.

The LCF_A_10 PMS gain evolution in the period January-March 2016 as been further analysed. The evolution in the PMS gain computed at 21C is mainly due to the usage of the temperature sensitivity parameter for that LICEF rather than a change in the receiver itself due to the slightly temperature increase occurred on 10th January 2016. The computation of the PMS gain at 21C with a more refined temperature sensitivity parameter does not show such evolution.

The usage of refined temperature sensitivity parameters for all the LICEFs is under evaluation by the calibration team and it might be introduced in the next version of the level 1 processor to further improve the level 1 data calibration.

Figure 21 to Figure 32 show the evolution of the PMS offsets (V62x algorithm baseline) derived during the short calibration activity.

Figure 33 shows the evolution of the average over all the baselines of the Fringe Washing Function (FWF) amplitude in the origin derived during the long calibration. The amplitude of the FWF at the origin does not show any drift and their values are inside the ranges defined in the routine calibration plan.

**Figure 9 Evolution of the Δ PMS Gain of the LICEFS in CMN H1**
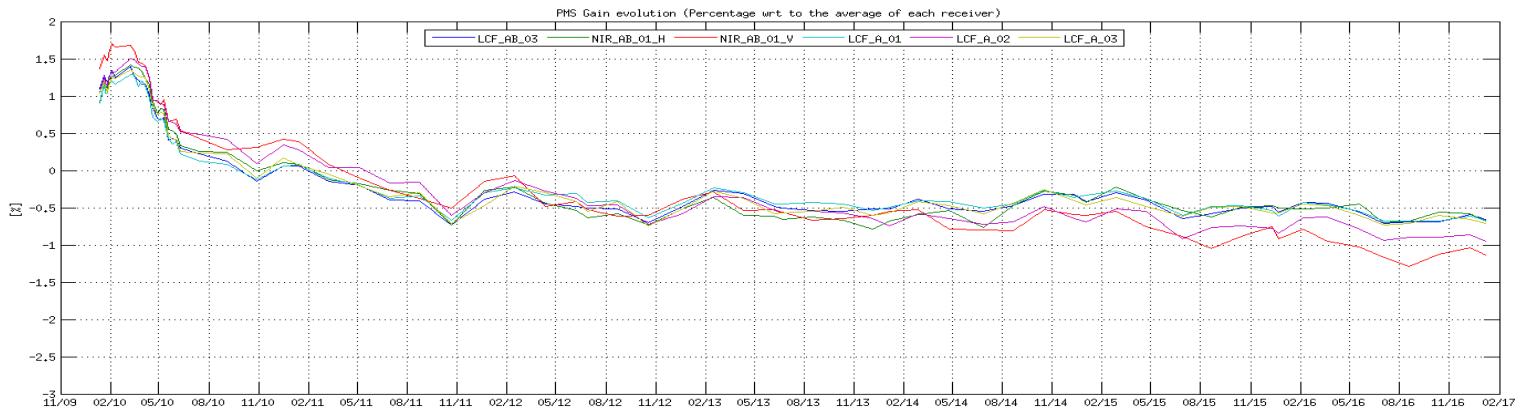
**Figure 10 Evolution of the Δ PMS Gain of the LICEFS in CMN A1**
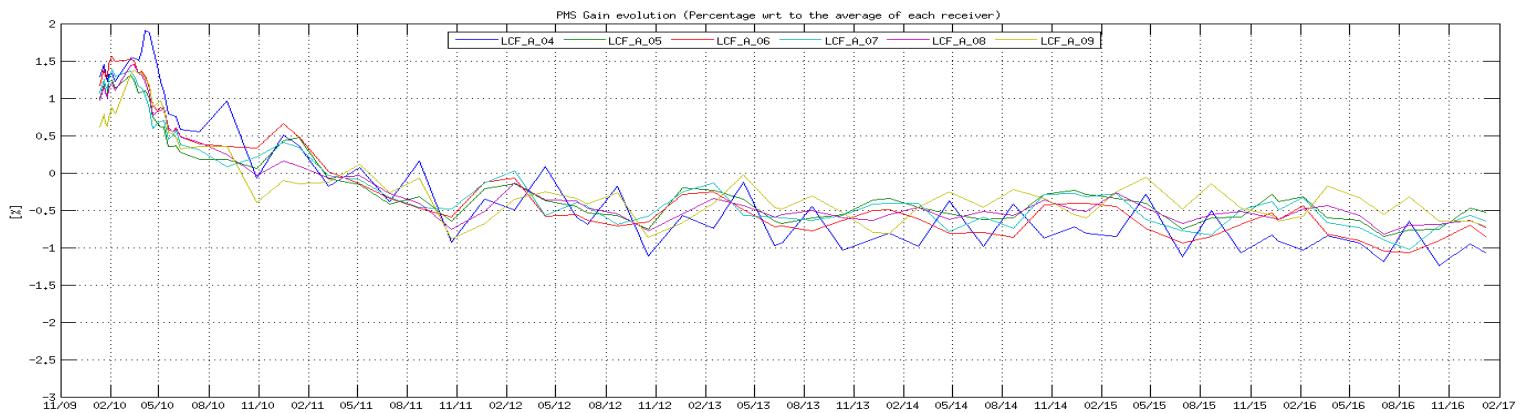
**Figure 11 Evolution of the Δ PMS Gain of the LICEFS in CMN A2**
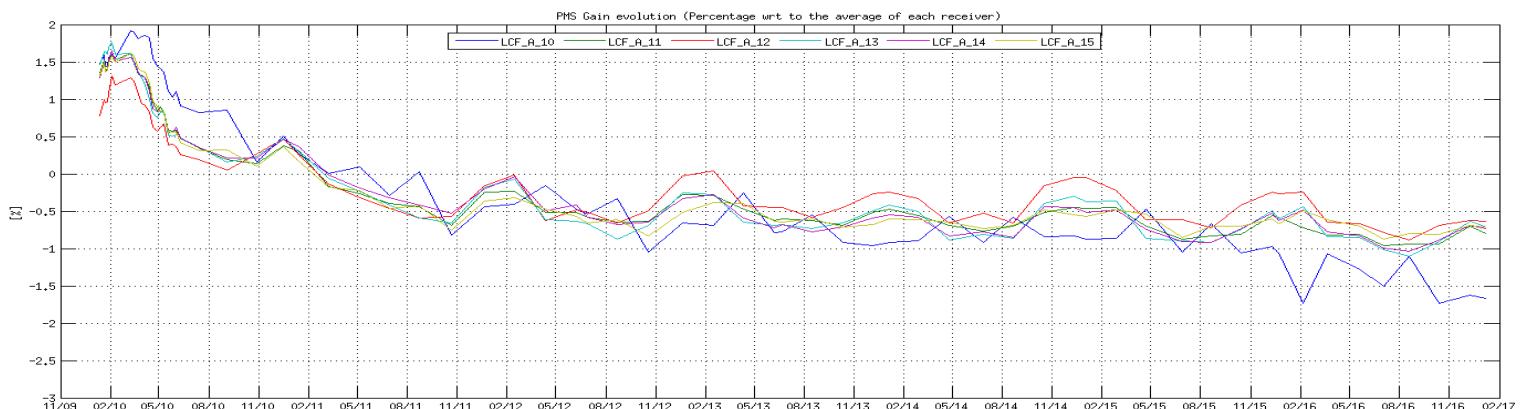
**Figure 12 Evolution of the Δ PMS Gain of the LICEFS in CMN A3**
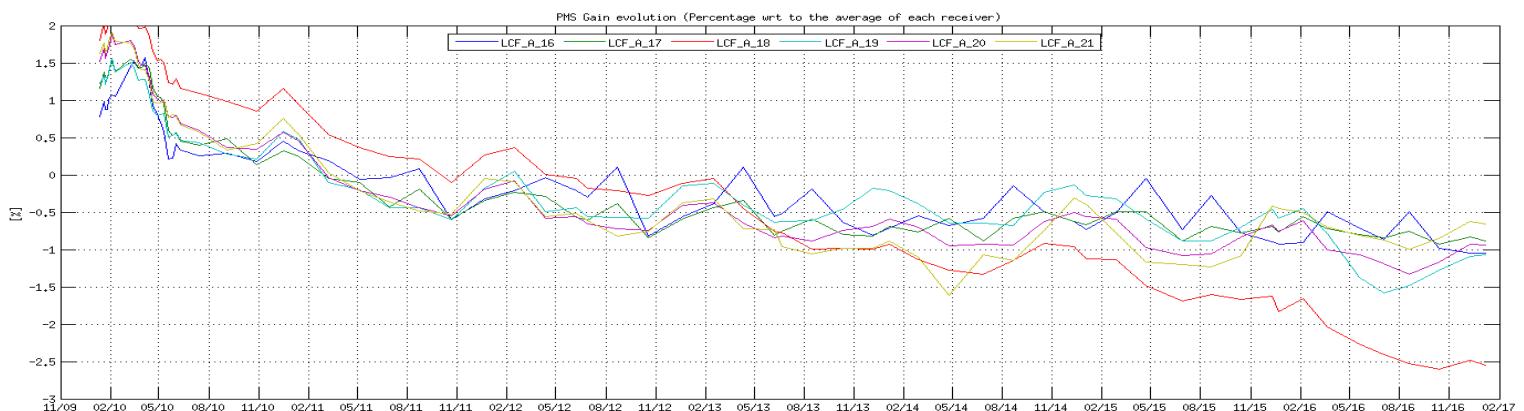
**Figure 13 Evolution of the Δ PMS Gain of the LICEFS in CMN H2**
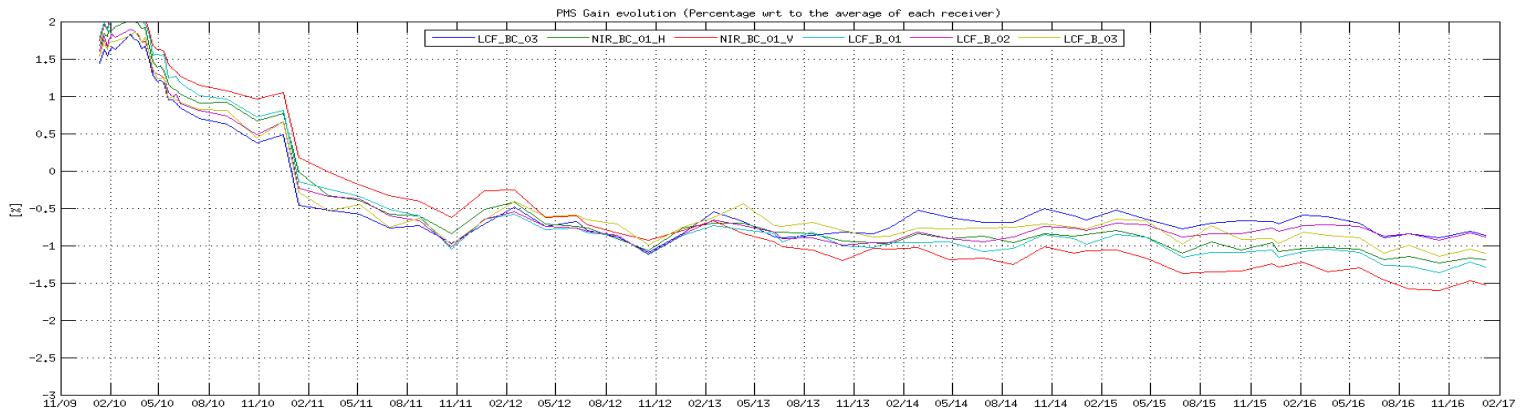
**Figure 14 Evolution of the Δ PMS Gain of the LICEFS in CMN B1**
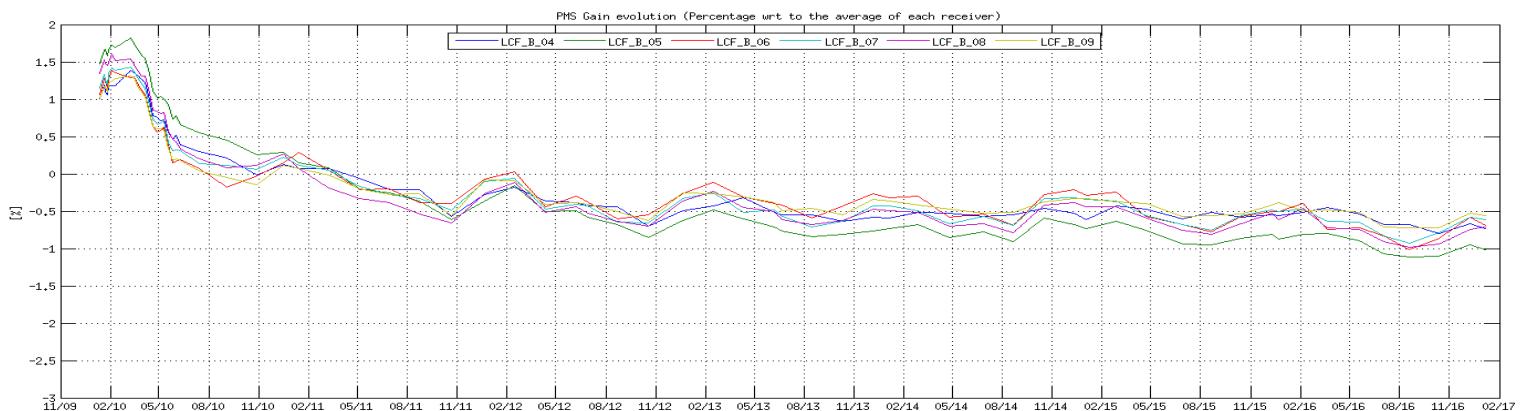
**Figure 15 Evolution of the Δ PMS Gain of the LICEFS in CMN B2**
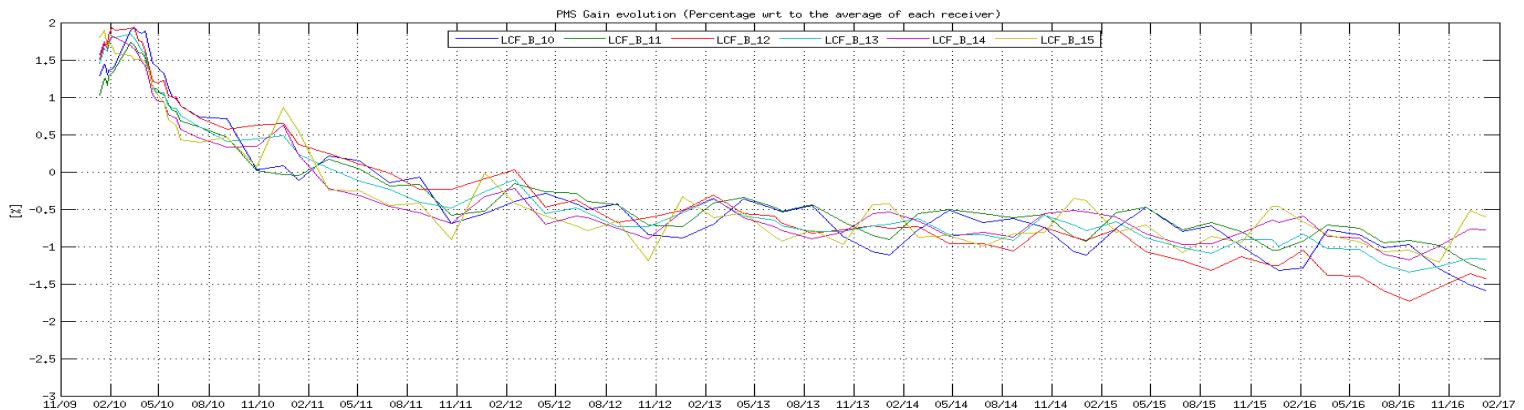
Figure 16 Evolution of the Δ PMS Gain of the LICEFS in CMN B3
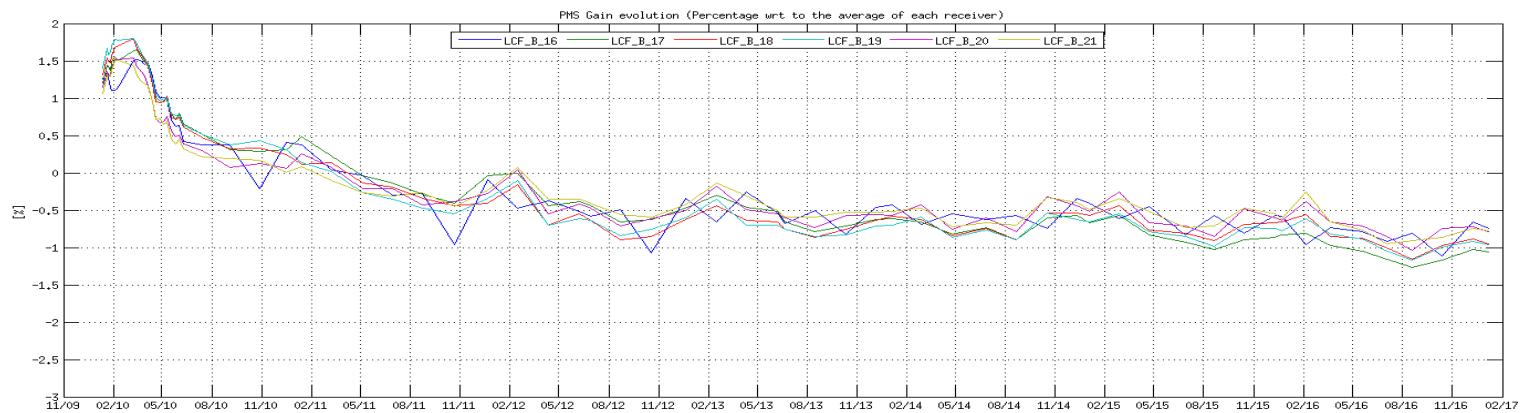
Figure 17 Evolution of the Δ PMS Gain of the LICEFS in CMN H3
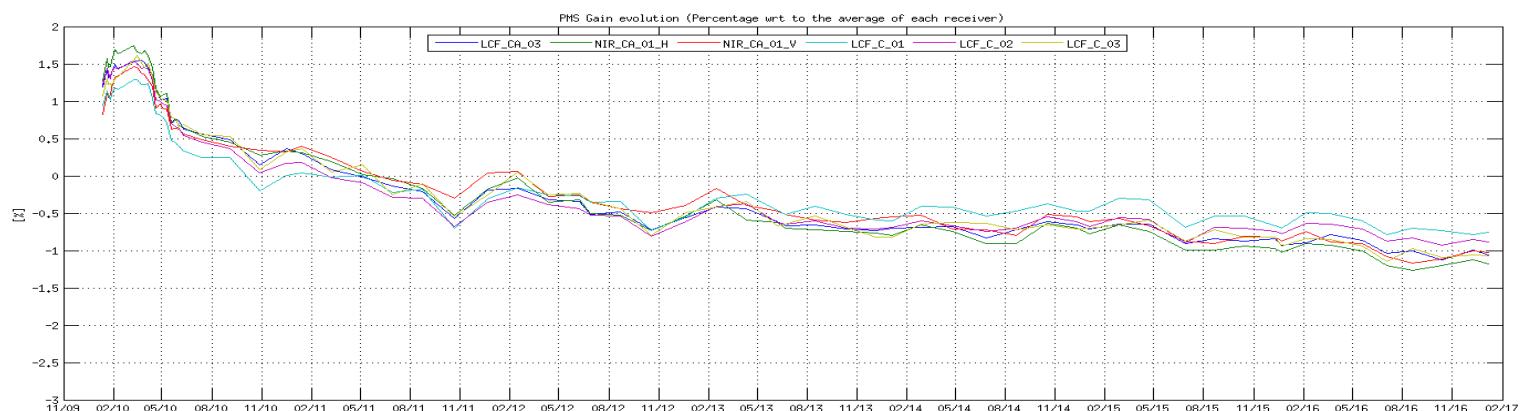
Figure 18 Evolution of the Δ PMS Gain of the LICEFS in CMN C1
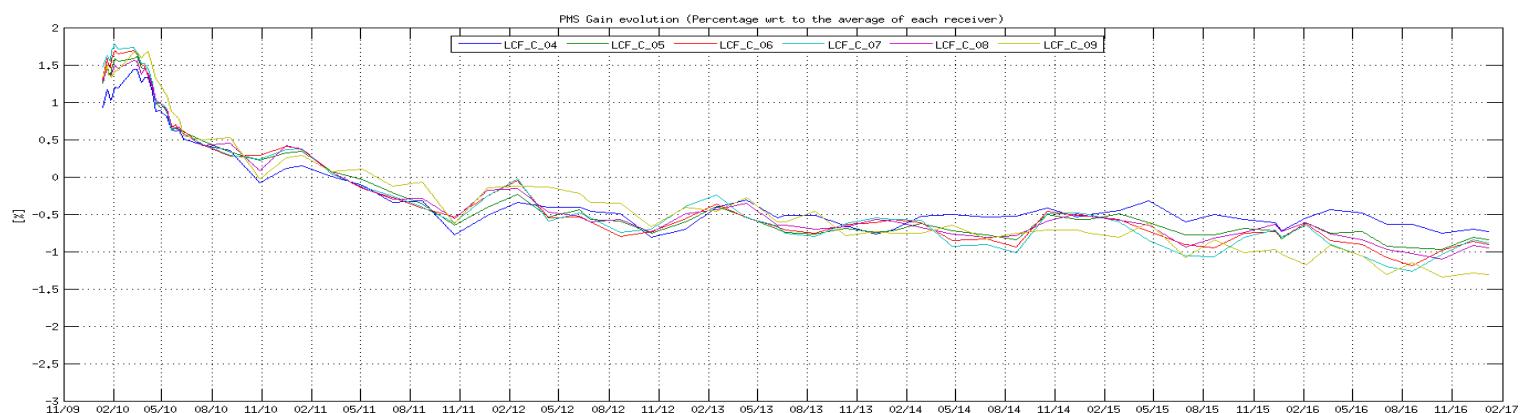
**Figure 19 Evolution of the Δ PMS Gain of the LICEFS in CMN C2**
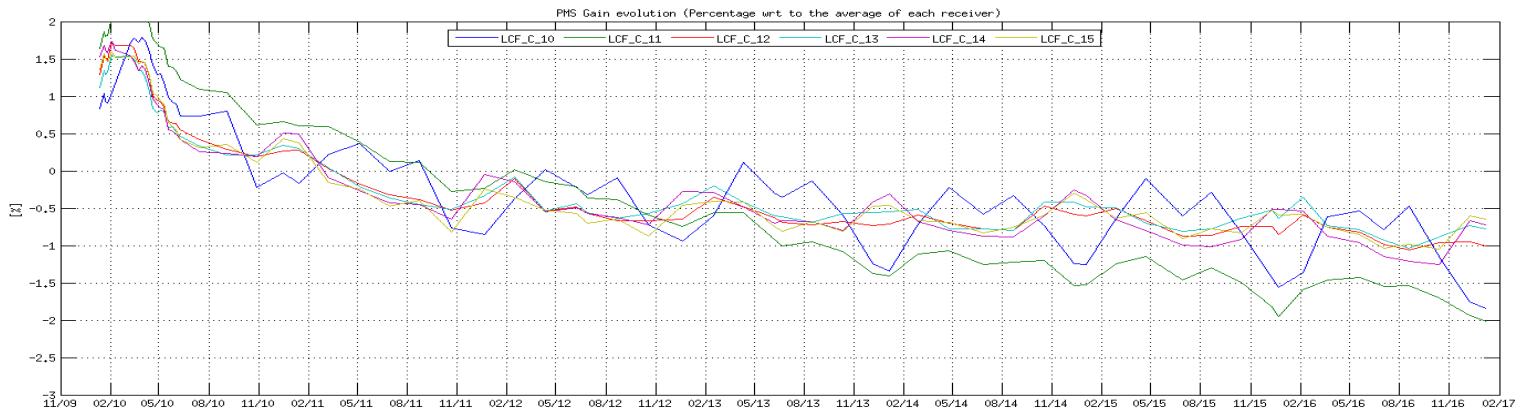
**Figure 20 Evolution of the Δ PMS Gain of the LICEFS in CMN C3**
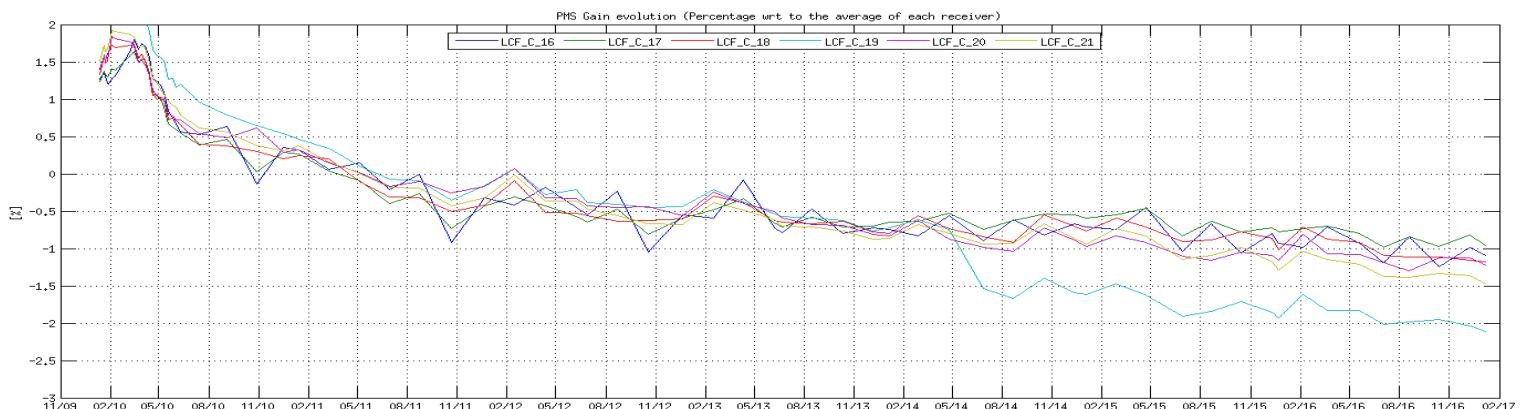
**Figure 21 Evolution of the Δ PMS Offset of the LICEFS in CMN H1**
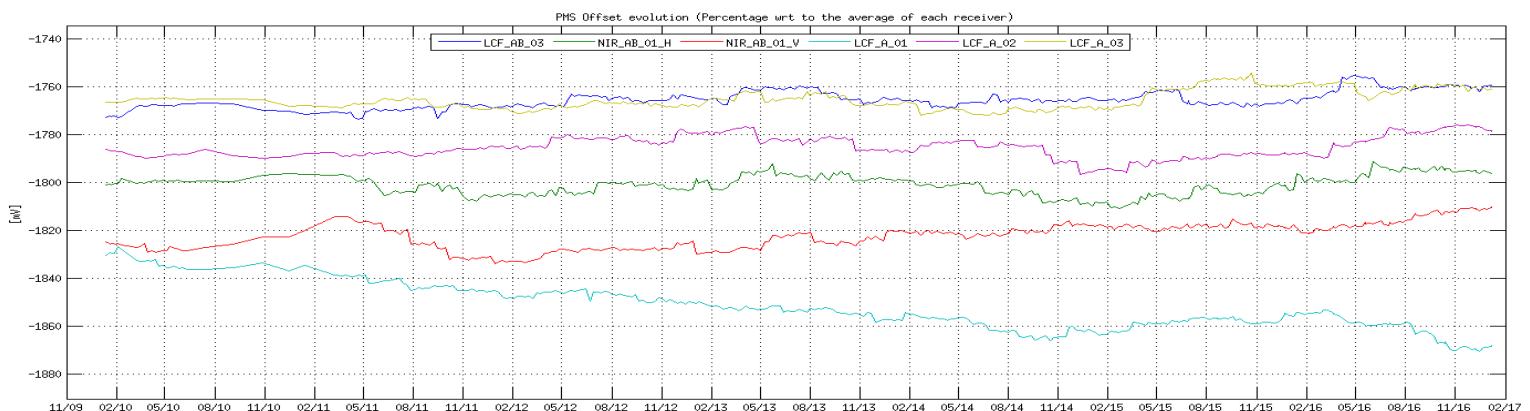
**Figure 22 Evolution of the Δ PMS Offset of the LICEFS in CMN A1**
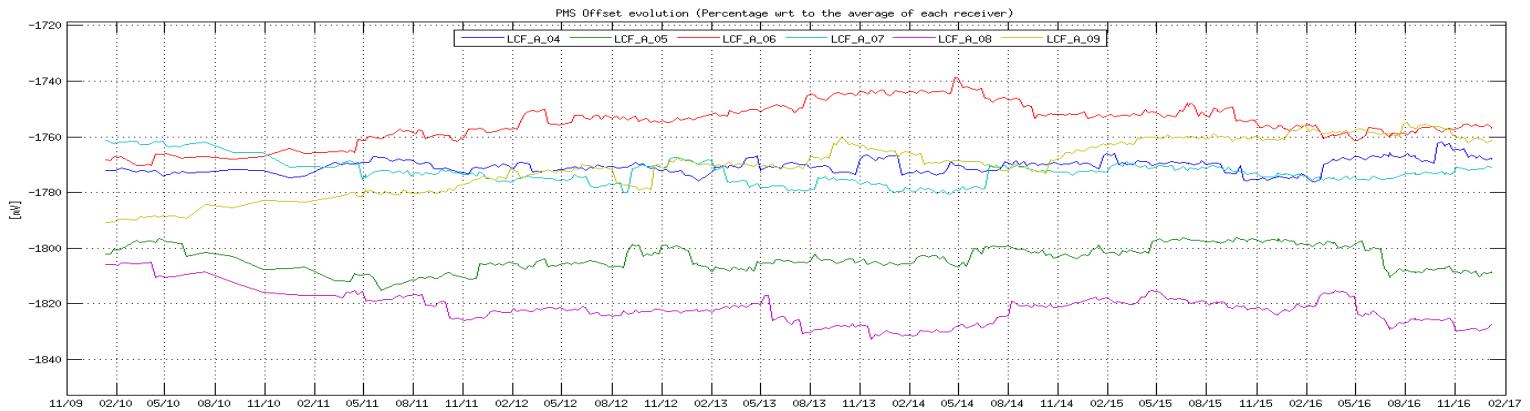
Figure 23 Evolution of the Δ PMS Offset of the LICEFS in CMN A2
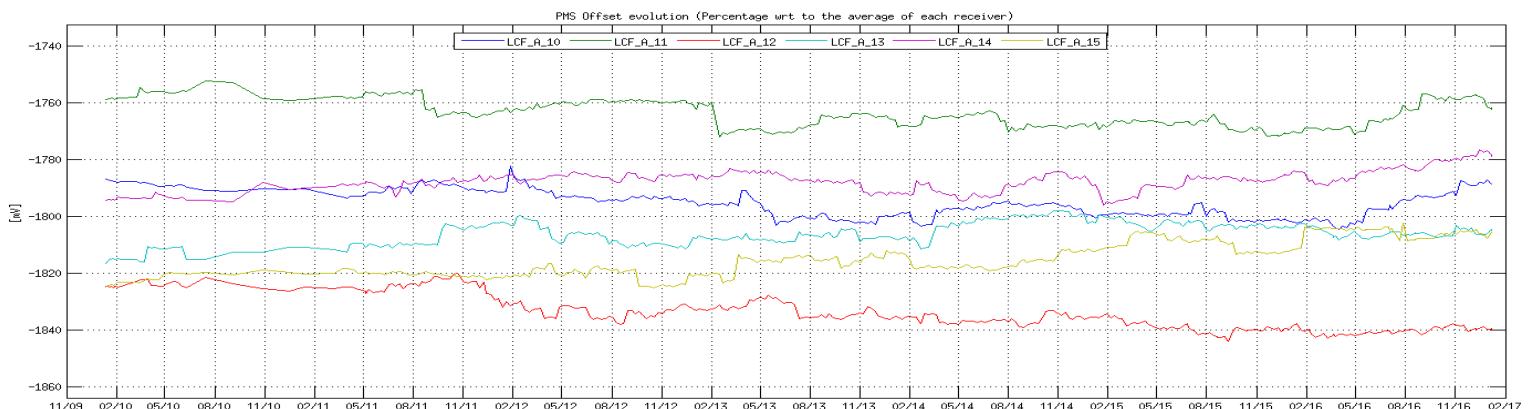
**Figure 24 Evolution of the Δ PMS Offset of the LICEFS in CMN A3**
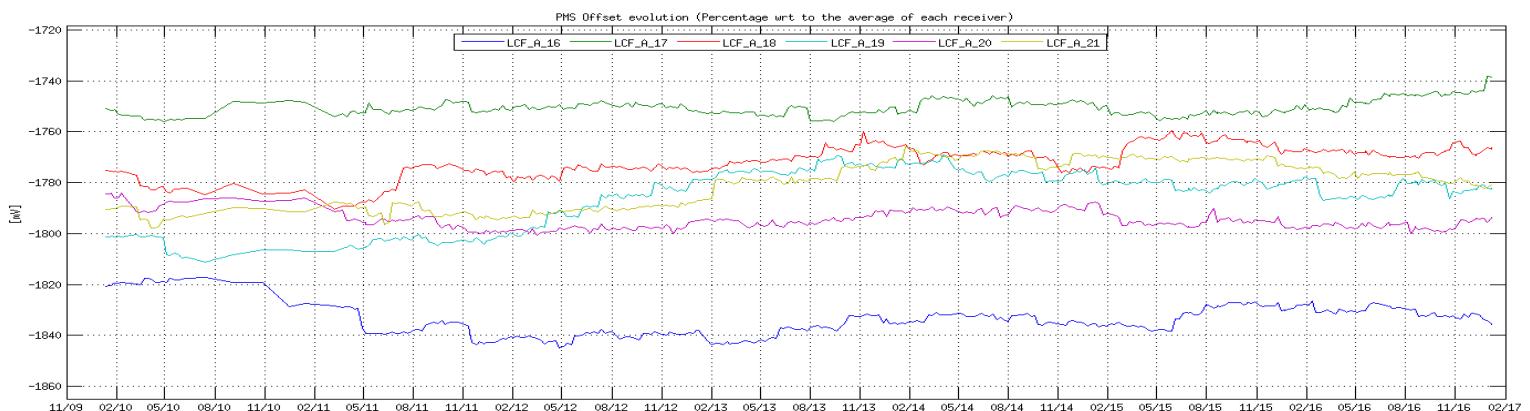
Figure 25 Evolution of the Δ PMS Offset of the LICEFS in CMN H2
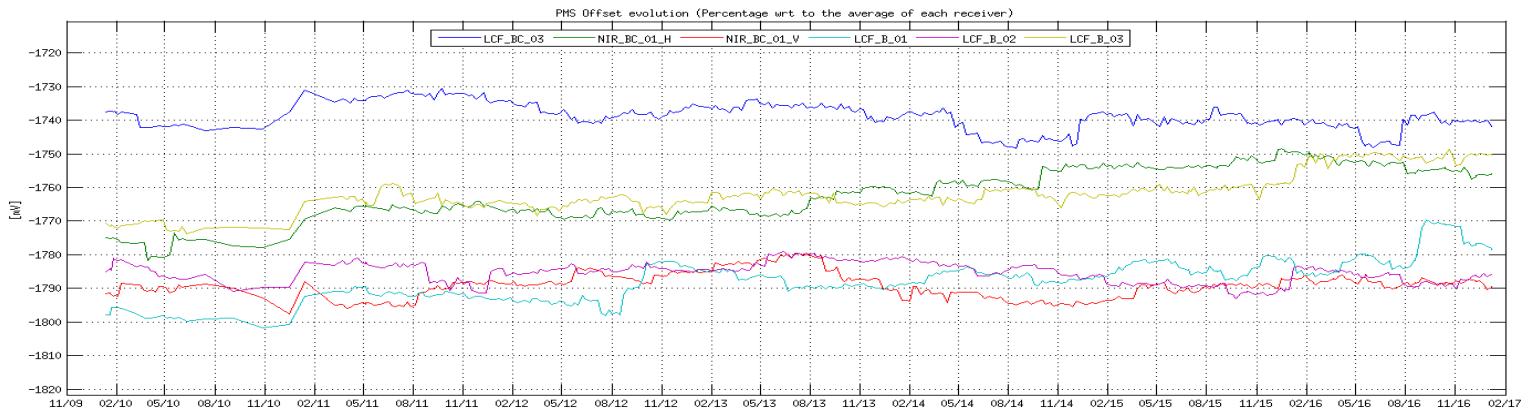
Figure 26 Evolution of the Δ PMS Offset of the LICEFS in CMN B1
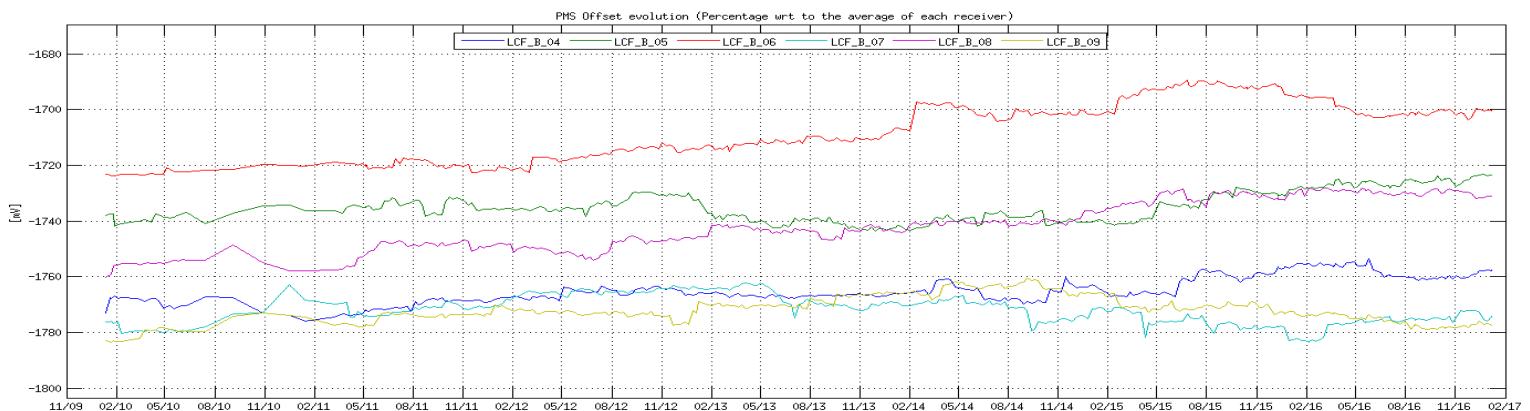
Figure 27 Evolution of the Δ PMS Offset of the LICEFS in CMN B2
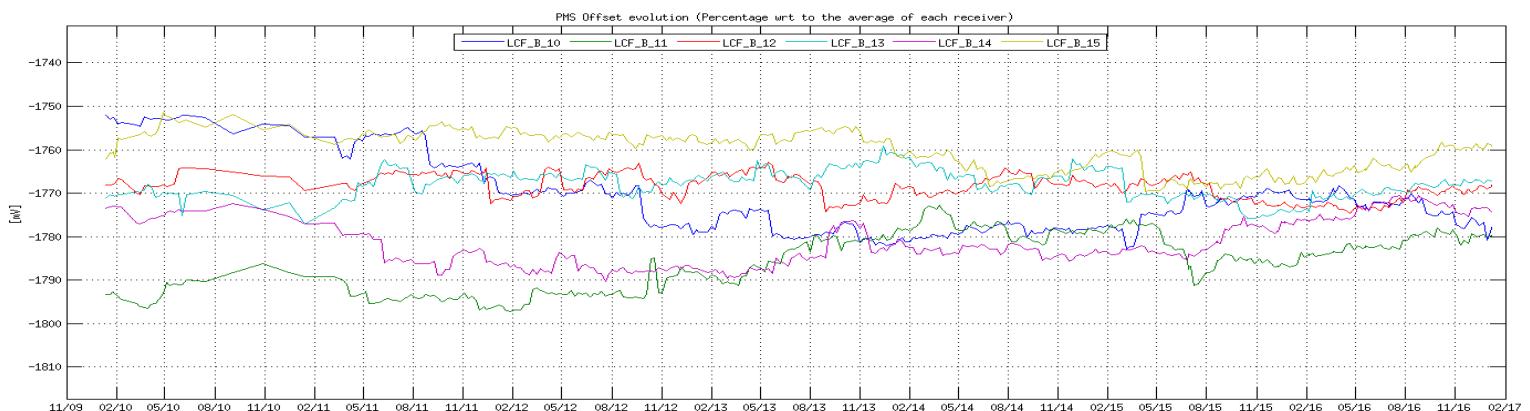
Figure 28 Evolution of the Δ PMS Offset of the LICEFS in CMN B3
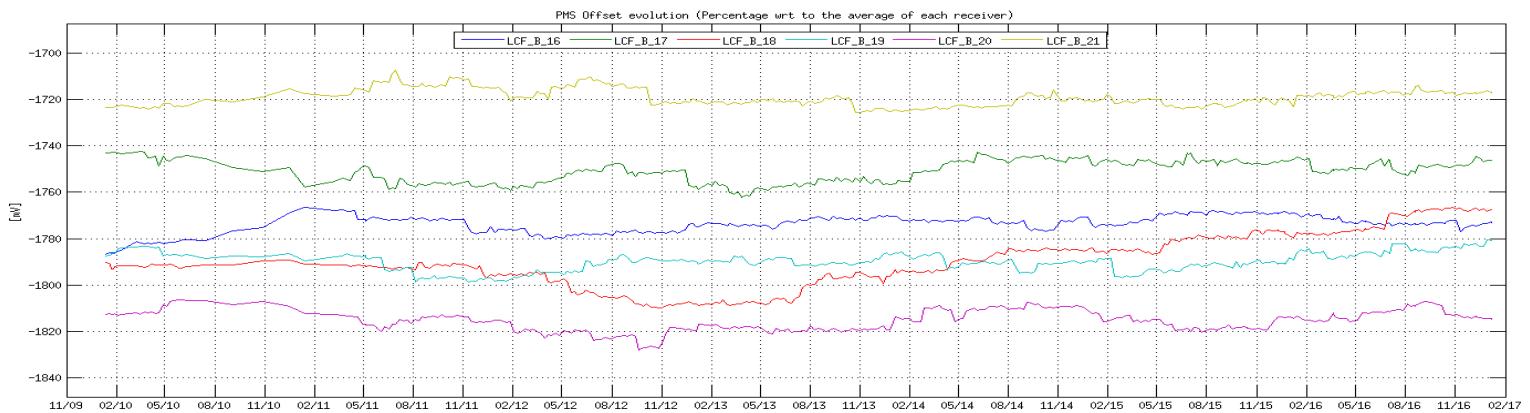
Figure 29 Evolution of the Δ PMS Offset of the LICEFS in CMN H3
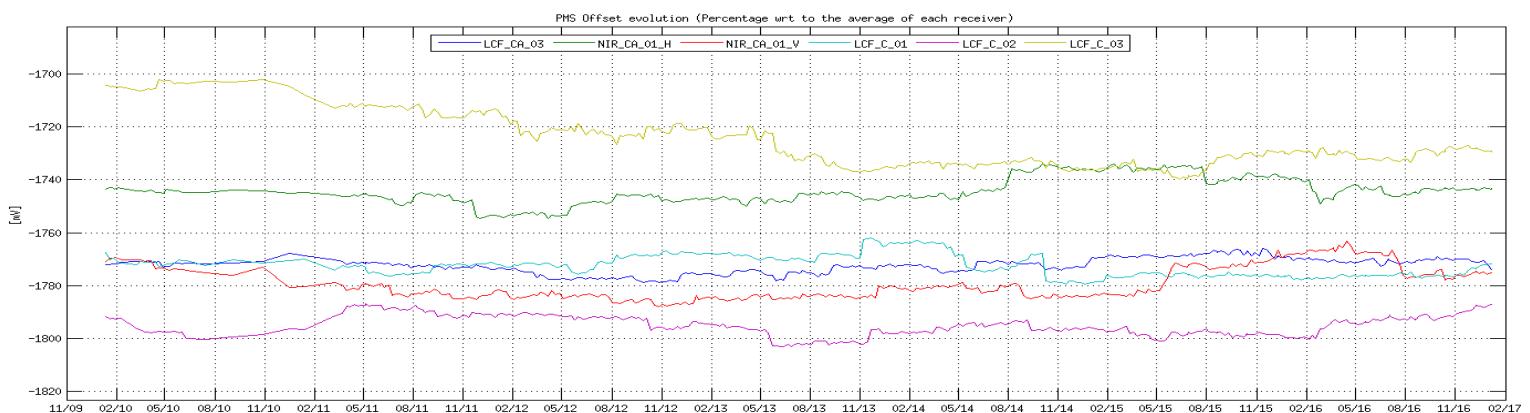
Figure 30 Evolution of the Δ PMS Offset of the LICEFS in CMN C1
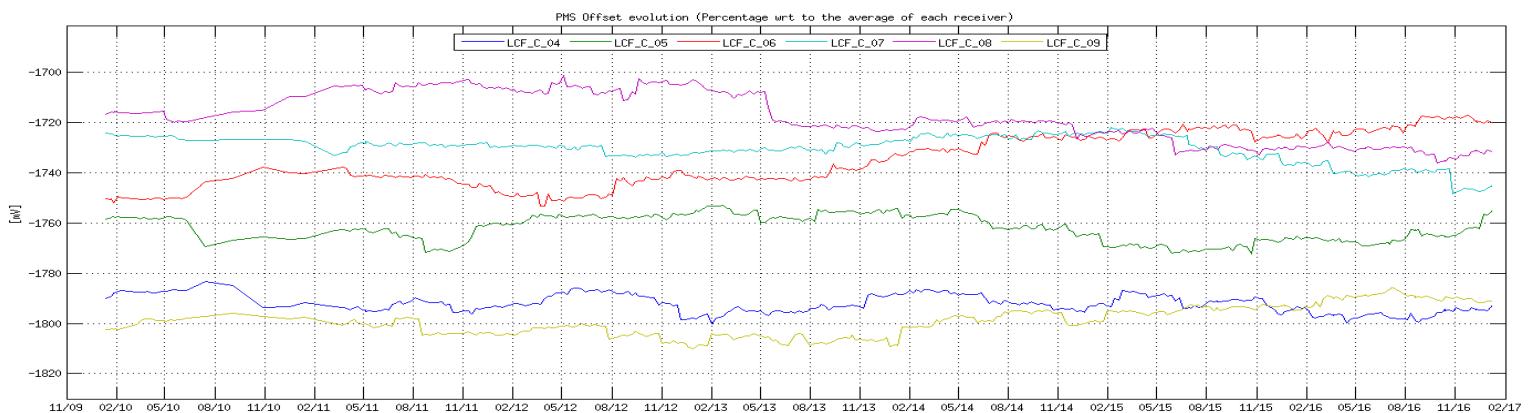
Figure 31 Evolution of the Δ PMS Offset of the LICEFS in CMN C2
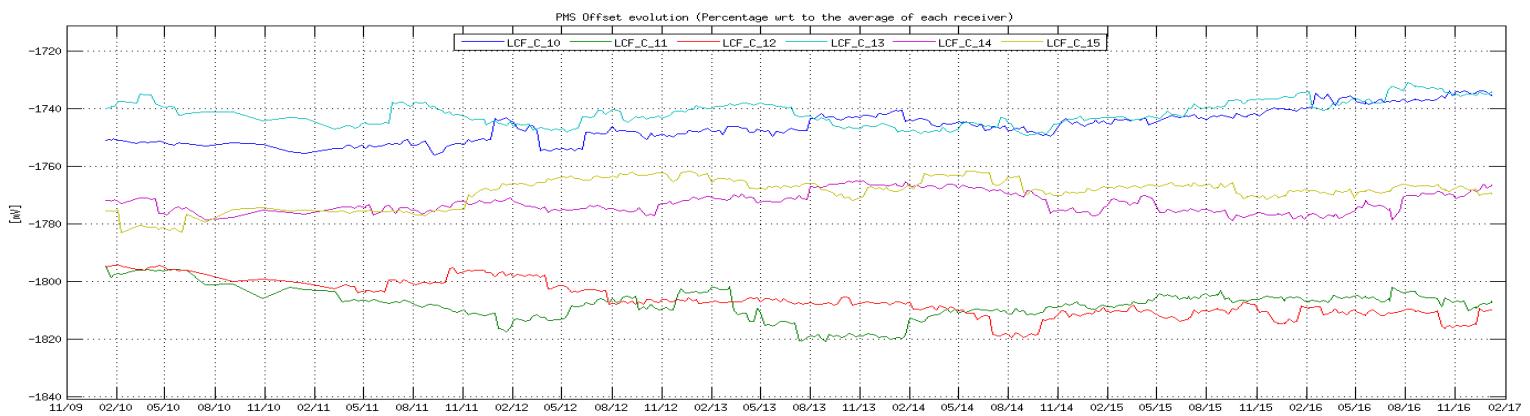
**Figure 32 Evolution of the Δ PMS Offset of the LICEFS in CMN C3**
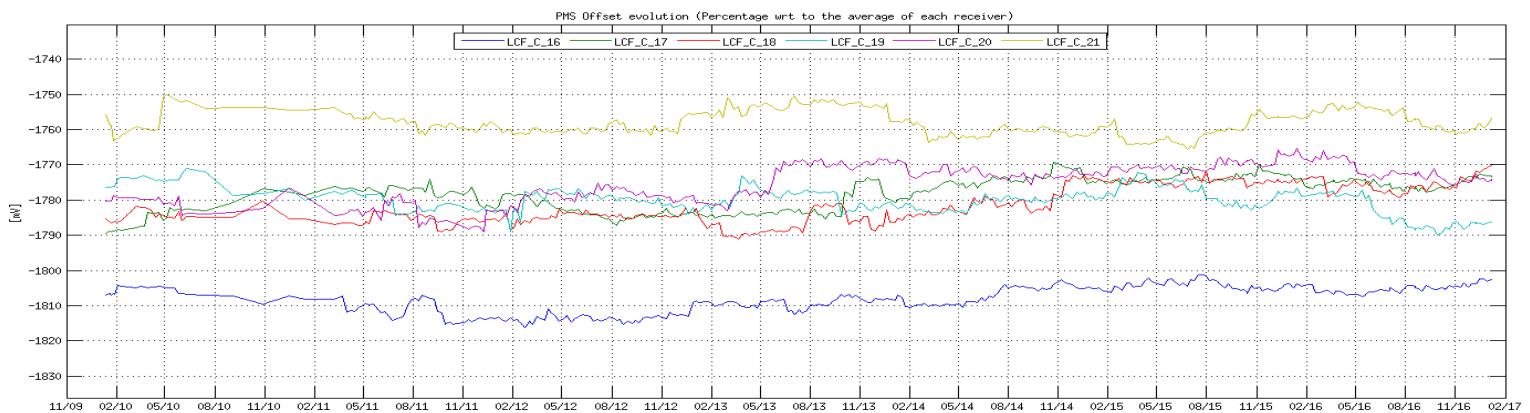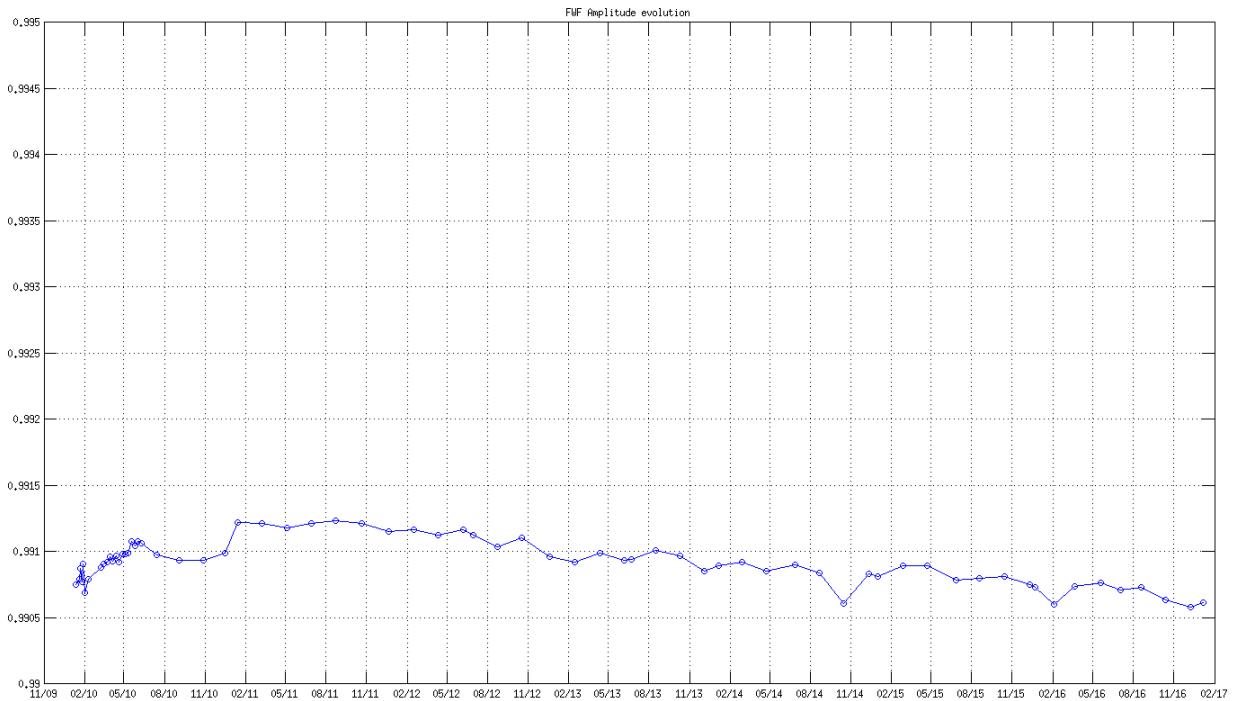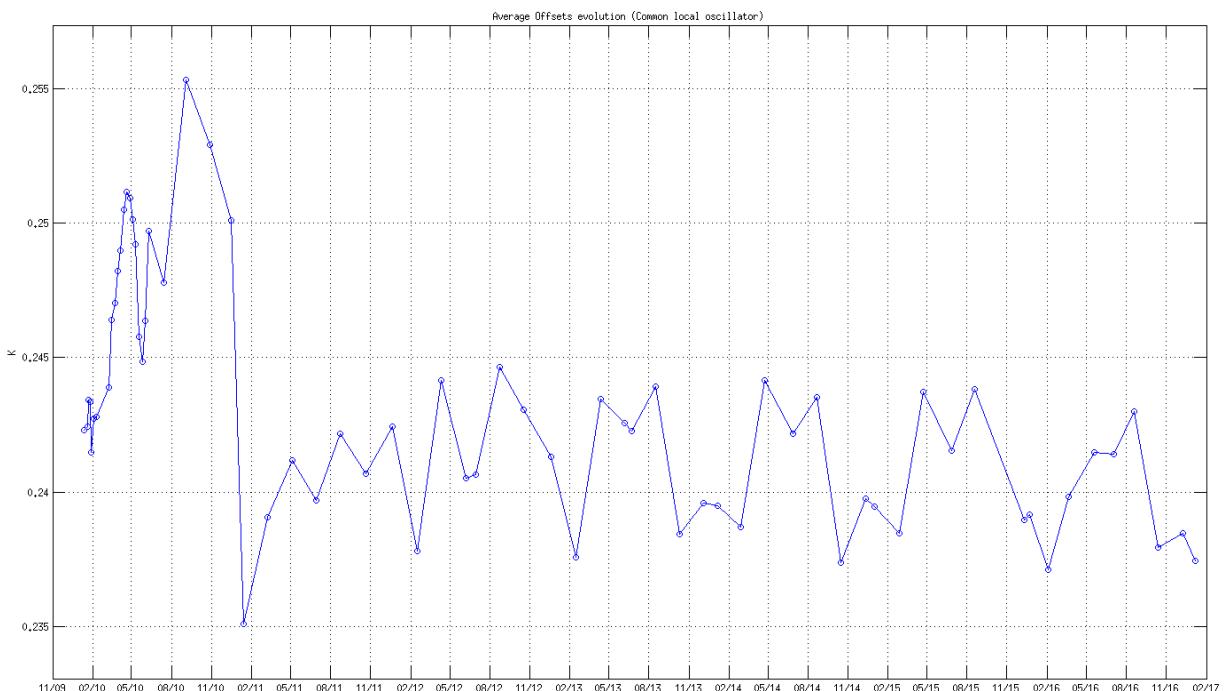
Figure 33 Evolution of the average of the FWF Amplitude at the origin

The evolution of the average of the correlator offsets does not show any significant drift. Also, the correlation offsets between receivers that do not share local oscillator remains much smaller than the correlation offsets between receivers sharing local oscillator. This result is expected since any residual correlated signal arriving to a pair of receivers, arrives through the local oscillator signal.

Figure 34 Evolution of the average of the Correlator offsets for the baselines which share local oscillator
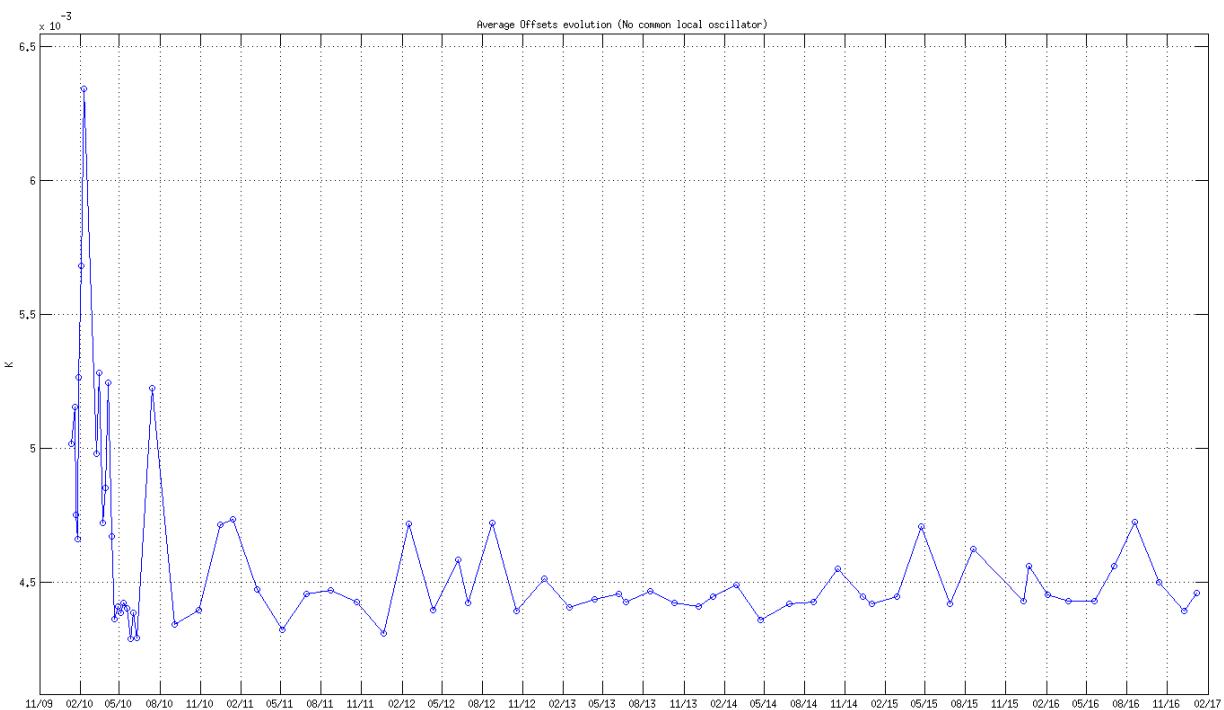
Figure 35 Evolution of the average of the Correlator offsets for the baselines which do not share local oscillator

5.2 Brightness Temperatures Trends over Dome-C Point (Antarctic)

The result of the monitoring of the evolution of the SMOS brightness temperature over Dome-C is shown in the Figure 36 (X and Y polarization at antenna frame for all the incidence angles) and in Figure 37, Figure 38 (H and V polarization at surface level for 42.0 degrees incidence angle for different areas of the Field Of View). The values are averaged every 18 days to reduce the noise and the value for July 2010 is subtracted and used as relative reference. In figure 37 are also shown in situ measurement (dome-C) from the DOMEX experiment averaged on the same period of the SMOS data.

The evolution of the brightness temperature trend over Dome-C does not show any significant drift except for the beginning of 2015 in H polarization. This drift was due to a change on surface geophysical condition: accumulation of snow since November 2014 and rapidly evolution of snow density on 22 March 2015 when a strong wind has changed the surface condition. This event has impacted the emissivity of the ice that was confirmed by on-site L-band measurement (Dome-x experiment) and from the Aquarius data set.

The brightness temperature V polarization measurements are quite stable since the beginning of the mission. The brightness temperature H polarization measurements are less stable and impacted by geophysical condition at surface level.

**Figure 36: Dome-C X and Y polarization trends (all incidence angles)**
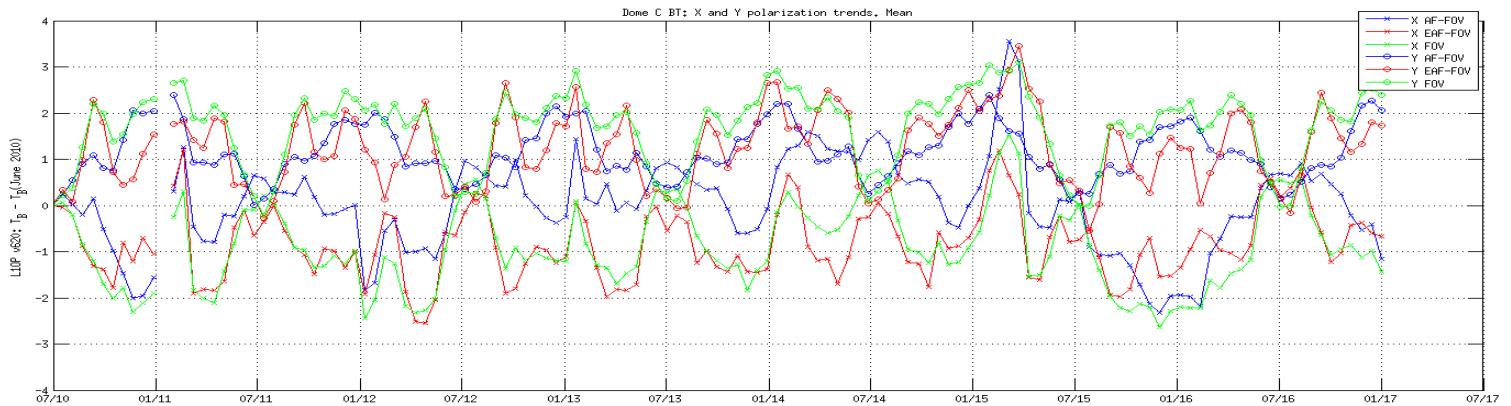
Figure 37: Dome-C H and V polarization trends in Alias Free zone (incidence angle 42°)
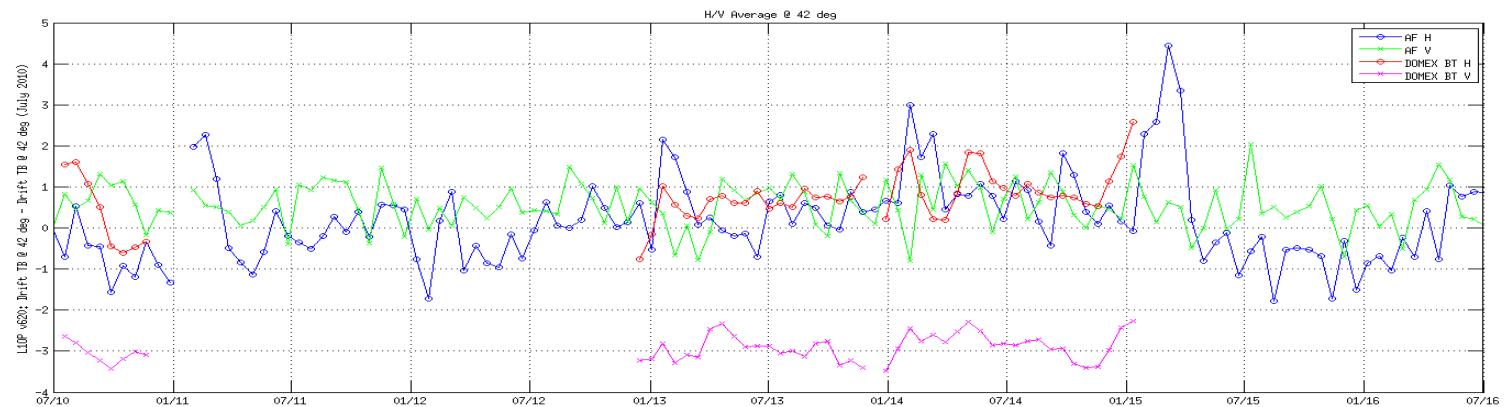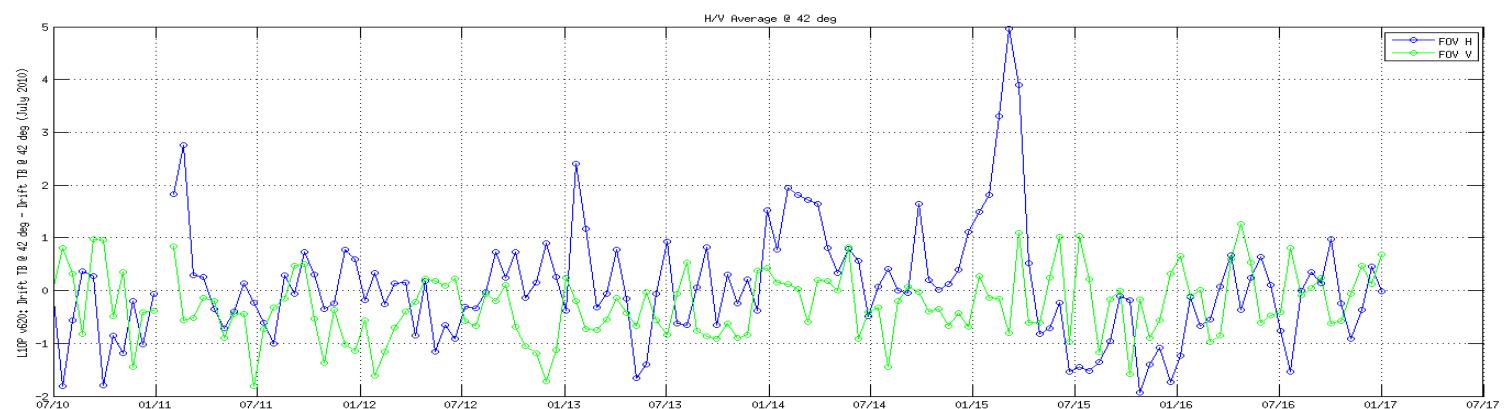

Figure 38: Dome-C H and V polarization trends in Extended Alias Free zone (incidence angle 42°)

5.3 L2OS Ocean Target Transformation (OTT) Orchestration Analysis

The OTT correction is used by the L2OS processor for sea surface salinity retrieval. The correction is computed roughly on a daily basis by accumulating previous SMOS L1C measurements. The proper usage of the OTT correction is monitored and results are present in Figure-39. Figure-39 shows the OTT delay defined as the delta time between the L2OS science product sensing time and the OTT correction validity time. As the validity time of the OTT correction depends on the dataset used to compute the correction, this OTT delay represents a quality indicator for the selection of the best OTT correction (i.e. the better correction is achieved by using an OTT with validity time closer to the L2OS sensing time).

Nominal OTT delay interval goes from 4 to 8 days of delay. The most of the OTT delays fall in the middle of such values, 5-6 days. OTT delays outside the nominal interval reveals anomalies either in the data selection policy or problems in accumulating L1C dataset (i.e. data rejection due to bad quality).

For the current SMOS L2OS v622 dataset, the next anomaly periods affecting the OTT delay (i.e. delay above 8 days) have been found:

1) From 12/01/2010 to 31/072010: SMOS commissioning phase where the accumulation of L1C data for the OTT correction required a larger time period due to the alternative operation of the MIRAS instrument between Dual polarization and Full polarization mode.

2) From 21/12/2010 to 08/01/2011: Electrical Stability Test and Temperature Reading anomalies with consequent unavailability of L1C data and increased OTT delay

3) From 02/02/2016 to 14/02/2016 and from 10/11/2016 to 23/11/2016 OTT delays due to L1C rejected data for OTT correction. Data rejection was due to the increase of the receiver temperature above 27 degC for the LICEF A10.
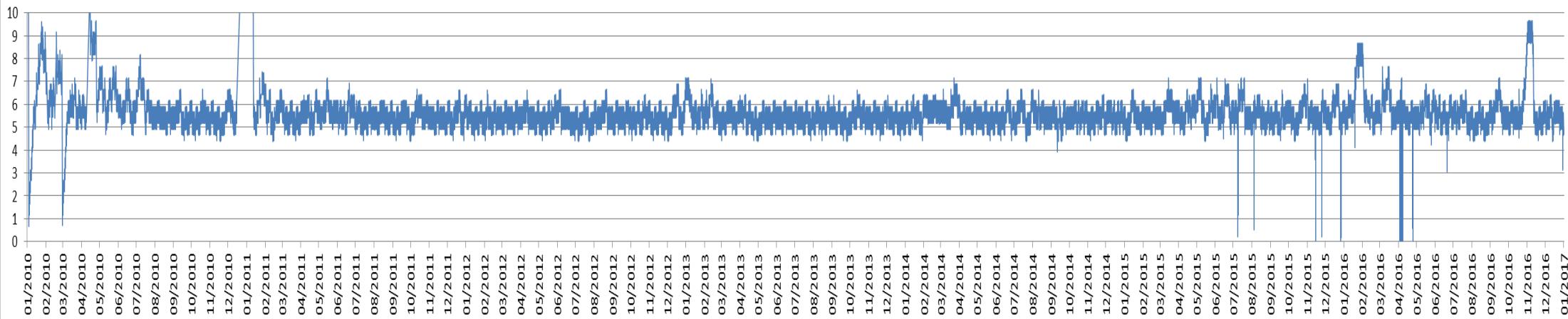
Figure 39: OTT delay per semi-orbit (start time delta between each L2OS product and the OTT correction file)

6. PRODUCT QUALITY ANALYSIS

Level 1 data quality for December has found to be nominal except in the time intervals listed in the section 4.5. Weekly maps for ascending and descending passes for the Stokes 1, Stokes 3 and Stokes 4 in videos format can be found at:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/data-quality-7059

All the artificial patterns in the maps can be explained by the presence of RFIs.

Level 2 Soil Moisture data quality for December has found to be nominal. Weekly maps for ascending and descending passes for the soil moisture in videos format can be found at:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/data-quality-7059

Since 19th December 2016 auxiliary dataset from the NOAA Interactive Multisensor Snow and Ice Mapping System (IMS) is used by the SMOS soil moisture level 2 processor to represent the snow cover extent. The NOAA IMS, based on data acquired by various sensors, provides a better representation of the snow cover compared to previously snow density information from ECMWF forecast. Globally the impact in terms of soil moisture is not significant.

The L2 Sea Surface Salinity data quality is nominal in the reporting period. Weekly maps for ascending and descending passes for good retrieved sea surface salinity in videos format can be found at:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/data-quality-7059

The lack of good retrieval at descending passes during the winter season is due to thermal effect on the instrument. In the winter season there is a stronger temperature gradient in the antennae surface that is only partially taken into account in the current calibration schema. As result the brightness temperature are somehow degraded for ocean application. This calibration issue is under investigation by the calibration team.

Lack of retrieval is also present in the period January – February 2016 due to the increase of the LICEF A10 receiver temperature which has exceed for some short period the threshold values of 27 degC.

For more details on soil moisture and sea surface salinity retrieval algorithms and caveats in data usage see the L2 Algorithm Theoretical Baseline Documents and the read-me-first note available here:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/content/-/asset_publisher/t5Py/content/data-processors-7632

7. ADF CONFIGURATION AT THE END OF THE REPORTING PERIOD

ADF File Type	Operational ADF Version (DPGS Baseline)	Updated
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AUX_APDS__	SM_OPER_AUX_APDS___20050101T000000_20500101T000000_300_004_3.EEF	No
AUX_ATMOS_	SM_OPER_AUX_ATMOS__20050101T000000_20500101T000000_001_010_3.EEF	No
AUX_BFP___	SM_OPER_AUX_BFP____20050101T000000_20500101T000000_340_004_3.EEF	No
AUX_BNDLST	SM_OPER_AUX_BNDLST_20050101T000000_20500101T000000_300_001_3	No
AUX_BSCAT_	SM_OPER_AUX_BSCAT__20050101T000000_20500101T000000_300_003_3	No
AUX_BULL_B	**SM_OPER_AUX_BULL_B_20161002T000000_20500101T000000_120_001_3** **SM_OPER_AUX_BULL_B_20161002T000000_20500101T000000_120_002_3**	**Yes**
AUX_BWGHT_	SM_OPER_AUX_BWGHT__20050101T000000_20500101T000000_340_006_3.EEF	No
AUX_CNFFAR	SM_OPER_AUX_CNFFAR_20050101T000000_20500101T000000_100_002_3.EEF	No
AUX_CNFL0P	SM_OPER_AUX_CNFL0P_20050101T000000_20500101T000000_001_005_3.EEF	No
AUX_CNFL1P	SM_OPER_AUX_CNFL1P_20110206T010100_20500101T000000_620_051_3.EEF	No
AUX_CNFNRT	SM_OPER_AUX_CNFNRT_20050101T000000_20500101T000000_620_010_3.EEF	No
AUX_CNFOSD	SM_OPER_AUX_CNFOSD_20050101T000000_20500101T000000_001_024_3.EEF	No
AUX_CNFOSF	SM_OPER_AUX_CNFOSF_20050101T000000_20500101T000000_001_026_3.EEF	No
AUX_CNFSMD	SM_OPER_AUX_CNFSMD_20050101T000000_20500101T000000_001_014_3.EEF	No
AUX_CNFSMF	SM_OPER_AUX_CNFSMF_20050101T000000_20500101T000000_001_014_3.EEF	No
AUX_DFFFRA	SM_OPER_AUX_DFFFRA_20050101T000000_20500101T000000_001_005_3	No
AUX_DFFLMX	SM_OPER_AUX_DFFLMX_20050101T000000_20500101T000000_001_006_3	No
AUX_DFFSOI	SM_OPER_AUX_DFFSOI_20050101T000000_20500101T000000_001_002_3	No
AUX_DFFXYZ	SM_OPER_AUX_DFFXYZ_20050101T000000_20500101T000000_001_003_3	No
AUX_DGG___	SM_OPER_AUX_DGG____20050101T000000_20500101T000000_300_003_3	No
AUX_DGGXYZ	SM_OPER_AUX_DGGXYZ_20050101T000000_20500101T000000_001_004_3	No
AUX_DISTAN	SM_OPER_AUX_DISTAN_20050101T000000_20500101T000000_001_011_3	No
AUX_DTBCUR	SM_OPER_AUX_DTBCUR__20120504T203936_20500101T000000_624_001_1Initialization file for the deployment of the L2OS V62x processor.	No
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AUX_ECMCDF	SM_OPER_AUX_ECMCDF_20101109T000000_20500101T000000_001_001_3.EEF SM_OPER_AUX_ECMCDF_20050101T000000_20101109T000000_001_002_3	No
AUX_FAIL__	SM_OPER_AUX_FAIL___20050101T000000_20500101T000000_300_004_3.EEF	No
AUX_FLTSEA	SM_OPER_AUX_FLTSEA_20050101T000000_20500101T000000_001_010_3.EEF	No
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AUX_GAL_OS	SM_OPER_AUX_GAL_OS_20050101T000000_20500101T000000_001_011_3	No
AUX_GAL_SM	SM_OPER_AUX_GAL_SM_20050101T000000_20500101T000000_001_003_3	No
AUX_GAL2OS	SM_OPER_AUX_GAL2OS_20050101T000000_20500101T000000_001_016_3	No
AUX_GALAXY	SM_OPER_AUX_GALAXY_20050101T000000_20500101T000000_300_004_3	No
AUX_GALNIR	SM_OPER_AUX_GALNIR_20050101T000000_20500101T000000_300_003_3	No
AUX_LANDCL	SM_OPER_AUX_LANDCL_20050101T000000_20500101T000000_001_004_3.EEF	No
AUX_LCF___	SM_OPER_AUX_LCF____20050101T000000_20500101T000000_500_016_3.EEF	No
AUX_LSMASK	SM_OPER_AUX_LSMASK_20050101T000000_20500101T000000_300_003_3	No
AUX_MASK__	SM_OPER_AUX_MASK___20050101T000000_20500101T000000_300_002_3	No
AUX_MISP__	SM_OPER_AUX_MISP___20050101T000000_20500101T000000_300_004_3.EEF	No
AUX_MN_WEF	SM_OPER_AUX_MN_WEF_20050101T000000_20500101T000000_001_002_3	No
AUX_MOONT_	SM_OPER_AUX_MOONT__20050101T000000_20500101T000000_300_002_3	No
AUX_N256__	SM_OPER_AUX_N256___20050101T000000_20500101T000000_504_002_3	No
AUX_NIR___	SM_OPER_AUX_NIR____20050101T000000_20500101T000000_500_010_3.EEF	No

AUX_NRTMSK	SM_OPER_AUX_NRTMSK_20050101T000000_20500101T000000_207_001_6	No
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AUX_OTT1F_	SM_OPER_AUX_OTT1F__20120504T203936_20500101T000000_624_001_1 Initialization file for the deployment of the L2OS V62x processor. Since level 2 OS processor V62x the new file is generated on routine basis by the level 2 post processor	No
AUX_OTT2D_	SM_OPER_AUX_OTT2D__20120504T203936_20500101T000000_624_001_1 Initialization file for the deployment of the L2OS V62x processor. Since level 2 OS processor V62x the new file is generated on routine basis by the level 2 post processor	No
AUX_OTT2F_	SM_OPER_AUX_OTT2F__20120504T203936_20500101T000000_624_001_1 Initialization file for the deployment of the L2OS V62x processor. Since level 2 OS processor V62x the new file is generated on routine basis by the level 2 post processor	No
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AUX_OTT3F_	SM_OPER_AUX_OTT3F__20120504T203936_20500101T000000_624_001_1 Initialization file for the deployment of the L2OS V62x processor. Since level 2 OS processor V62x the new file is generated on routine basis by the level 2 post processor	No
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AUX_PLM___	SM_OPER_AUX_PLM____20050101T000000_20500101T000000_600_008_3.EEF	No
AUX_PMS___	SM_OPER_AUX_PMS____20050101T000000_20500101T000000_600_011_3.EEF	No
AUX_RFI___	SM_OPER_AUX_RFI____20050101T000000_20500101T000000_300_003_3	No
AUX_RFILST	Since level 1 processor version V62x the file is generated by CATDS on monthly basis	No
AUX_RGHNS1	SM_OPER_AUX_RGHNS1_20050101T000000_20500101T000000_001_015_3	No
AUX_RGHNS2	SM_OPER_AUX_RGHNS2_20050101T000000_20500101T000000_001_013_3	No
AUX_RGHNS3	SM_OPER_AUX_RGHNS3_20050101T000000_20500101T000000_001_015_3.EEF	No
AUX_SGLINT	SM_OPER_AUX_SGLINT_20050101T000000_20500101T000000_001_011_3	No
AUX_SOIL_P	File discontinued since level 2 SM processor V62x SM_OPER_AUX_SOIL_P_20050101T000000_20500101T000000_001_002_3	No
AUX_SPAR__	SM_OPER_AUX_SPAR___20110112T091500_20500101T000000_340_012_3.EEF SM_OPER_AUX_SPAR___20100111T120700_20110112T091500_340_011_3.EEF SM_OPER_AUX_SPAR___20050101T000000_20100111T120700_340_010_3.EEF	No
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AUX_SUNT__	SM_OPER_AUX_SUNT___20050101T000000_20500101T000000_300_002_3	No
AUX_WEF___	SM_OPER_AUX_WEF____20050101T000000_20500101T000000_001_003_3	No
MPL_ORBSCT	SM_OPER_MPL_ORBSCT_20091102T031142_20500101T000000_360_001_1	No

APPENDIX A. CONFIGURATION DOCUMENT LIST

The list of internal documents used for the generation of this report is:

- Unavailability.xls

- Details_Calibrations.xls

- SMOS-CEC-VEG-IPF-REP-0609_v1.80_SMOS_Auxiliary_Data_File_List.pdf

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