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IDEAS+ Swarm Weekly Report : 01/09/2014 – 07/09/2014

Abstract : This is the **Instrument Data quality Evaluation and Analysis Service Plus** (IDEAS+) Swarm Weekly report on Swarm products quality, covering the period 01 to 07 September, 2014.

Author :

Igino Coco, on behalf of Swarm IDEAS+ Team

Approval :

Lidia Saavedra de Miguel
IDEAS+ Service Manager

Distribution : ESA/ESRIN EOP-GMQ
ESA/ESRIN EOP-GM Swarm MM
IDEAS+ Leadership Team
IDEAS+ subcontractors
ESA/ESTEC Swarm PLSO
ESA/ESOC Swarm FOS

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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	REASON
1.0	12 Sep 2014	First issue

1. INTRODUCTION

This document refers to the activities carried out in the framework of the Sensor Performance, Products and Algorithms (SPPA) Office [RD.1], and as such it reports on work related to:

- Algorithms and Processors Development, Maintenance and Evolution: these include all algorithm and software evolution and maintenance aspects for the different components, for both the Operational processors (OP) and Prototypes processors (PP) of L1 and L2 chains.
- Performance Assessment: these include all Quality Control activities (on-line and offline, systematic or on-demand), for the applicable product levels.
- System Calibration: these include the activities related to calibration, from sensor to system level. They also include aspects like cross calibration and handling of external calibration sources.
- Product validation: these include definition and maintenance of product validation plans.
- End-to-end Sensor Dataset Performance: these include activities related to the organisation and coordination of Quality Working Groups and all aspects of the Experimental platform. It also covers the product baseline, coordination and handling of external communities, and all aspects of ADF handling (both for the operational processors and for the prototypes).

This weekly report constitutes a work in progress throughout the mission life time, and new parts and complements will be added while the consolidation of knowledge on Swarm data and instruments will progress.

Section 2.1 always gives an overview of the general quality status of the mission instruments and products, while the main observations of the week are summarized in Section 2.4.

The document also includes information on data quality for the three Swarm spacecraft, inferred from automated HTML quality reports which are produced on daily basis for each product. Please contact the IDEAS+ Swarm team if interested in accessing the reports via web or FTP (all details about interfaces and folder structure available on [RD.2]). Such quality reports represent the core of the Routine Quality Control (Chapter 3). A description of the implemented quality checks is given in [RD.3], and references therein.

Basing on specific findings of the routine quality control, or on-demand from other entities (i.e. Swarm PDGS, FOS, Mission Management, Post-Launch Support Office, Expert Support Laboratories, Quality Working Groups, user community), anomalies can be triggered and preliminary characterisations and investigations of such anomalies are given in Chapter 4.The anomalies documented in the Weekly Reports are tracked in the following way:

1. If triggered by ESA Eohelp or within the Service: IDEAS+ action and ticketing system (http://requests-sppa.serco.it/RT3/index.html).

2. If triggered by IDEAS+ Swarm team or other entities:

    2a. If the observation/analysis leads to an anomaly to be addressed to the processor provider (GMV): SPR on EO ARTS (https://arts.eo.esa.int), **SWL1L2DB** project.

2.b. If the observation/analysis does not lead to an anomaly or the investigation shall be escalated to other entities (PLSO/industry, ESL, PDGS): Action tracked on EO ARTS, **SW-IDEAS** project, then addressed to the proper tracking system if needed (e.g. JIRA for ESLs, SW-CP-AR project on EO ARTS for PDGS)

Information on Level 1B Swarm products can be found in [RD.4].

1.1 Current Operational configuration of monitored data:

- Processor Version: L1BOP 3.11p2
- L0 input products baseline: 02
- L1B baseline: 03 (for definitions and description of the data baseline concept see https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/swarm/data-access/product-baseline-definition)
- Level 2 – Cat 2 baseline: 01
- Input auxiliary files baseline: CCDB 0009, ADF 0101
- MPPF-CVQ v.2.11p2

1.2 Reference documents

The following is a list of documents with a direct bearing on the content of this report. Where referenced in the text, these are identified as RD.n, where 'n' is the number in the list below:

[RD.1] Sensor Performance, Products and Algorithms (SPPA), PGSI-GSOP-EOPG-TN-05-0025. Version 2.3.

[RD.2] Swarm PDGS External DMC Interface Control Document, SW-ID-DS-GS-0001, Issue 3.2.

[RD.3] Swarm MPPF-CVQ Monitoring Baseline Document, ST-ESA-SWARM-MBD-0001, Issue 1.7.

[RD.4] Swarm Level 1B Product Definition, SW-RS-DSC-SY-0007, Issue 5.13.

[RD.5] Swarm IDEAS Configuration Management Plan, IDEAS-SER-MGT-PLN-1081 v0.14.

[RD.6] Swarm Quality Control Project Plan, IDEAS-SER-MGT-PLN-1071

[RD.7] SW_L1BOP_status_20140910_MoM

[RD.8] Planned Updates for Level 1b, SW-PL-DTU-GS-008, Rev: 1dC.

[RD.9] IDEAS+ Swarm Weekly Report: 25/08/2014 – 31/08/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20140825_20140831.pdf

2. SUMMARY OF THE OBSERVATIONS

2.1 General status of Swarm instruments and Level 1B products quality

With respect to the previous reporting period, the following updates have to be reported:

1. **Status of EFI – TII recent operations after switching in Active State.** University of Calgary did not provide evidences of further improvements with the new settings, now identical for the three S/C. The image degradation begins after 4-5 days from the power-up for S/C A and B, and after just few orbits for S/C C. A recommendation was given to put the instruments in ready state again and this has been done between 28/8 and 29/8. After ARB#3 (11/09/2014) the decisions taken have been: 1) switch-on again all the TIIs with updated gain maps and AGC settings where applicable, 2) wait for University of Calgary feedback on image quality and evaluate the possibility of running calibration modes interleaved by few days (2-3) in ready state.

2. **Status of EFI – Langmuir Probes: recent updates.** The on-board parameter which sets the ripple frequency amplitude for harmonic mode – linear electron region, has been found to be incorrect on S/C C. The main effect of this is an overestimate of the S/C potential. Now the on-board settings have been corrected but discussion is ongoing on the way to handle the already produced raw data in order to amend the issue.

2.2 Plan for operational processor updates

Currently, the L1B processor is being updated with a number of evolutions and fixing various SPRs. A full description of the details of the Prototype Processor and Operational Processor update is provided in [RD.7]. In the meanwhile (31/08), DTU has released a new version (4.10) of the main prototype processor, containing a number of minor updates in order to be aligned with the operational processor, as described in [RD.8].

With respect to the previous reporting period, the following important update has to be reported:

GMV has tested the operational processor following the recommendations by L2PS community (RINEX produced without antenna pattern corrections and carrier phase filtering) and using the test data set and information provided by C. Siemes. An assessment on the effects on the orbit calculation is expected from the Napeos team by 19th September, as well as an evaluation from L2PS of the GMV results. Following such outcomes, an ORBATT patch could be prepared in few days and possibly be put in operations by the end of September. No need for a reprocessing.

An update of [RD.8] has been requested by ESA to the ESL, and the foreseen final delivery of the Operational Processor by GMV date is therefore postponed to the second half of October.

2.3 Quality Working Group and Cal/Val Coordination

The third QWG – Cal/Val meeting is being planned for the 2-5 December 2014 at GFZ premises in Potsdam, Germany.

A number of Task forces, each dedicated to an instrument group, continuously co-ordinates the investigation of the various anomalies.

2.4 Summary of observations for Week 36 (01-07/09/2014)

During the monitored week the following events have been found and investigated:

1. **Three observations of attitude rejection** occurred on S/C A (6 attitudes rejected the 04/09) and S/C C (4 attitudes rejected on 02/09 and 50 attitudes rejected on 01/09), caused by simultaneous occurrence of Big Bright Objects on all the three camera units of the S/C, or invalid measurements. The rejections are nominal, i.e. follow the nominal rules given by processing algorithms and cannot be therefore classified as anomalies. The observations are nonetheless tracked in the IDEAS+ ARTS repository for purposes of monitoring instruments health.

2. **New occurrence of the MOD-NAV anomaly** already reported and described past week (**SWL1L2DB-9**). An error in the MOD determination is observed, this time on S/C C, 07/09/2014, that grows up to about 25 m at the end of the day. The effect seems to be cumulative and starts from about 8 p.m.

The variable under specific analysis is the $|B_{NEC}|$ - F parameter, i.e. the residual difference between the VFM and ASM measurements which is still above the accuracy for the mission requirements.

An observation has been done of few spikes in $|B_{NEC}|$ - F, especially for S/C B and C, apparently related to regions where the vector field is rapidly varying. This kind of events are under monitoring and further analysis will follow in the coming weeks.

Also the TCF calibration parameters are affected by the VFM-ASM anomaly, resulting in a slow and constant decrease of the Scales factors (for Swarm A the TCF scales decreased of about 0.001 % throughout the week): following the algorithms experts, this is expected and does not cause any worry for the time being.

3. ROUTINE QUALITY CONTROL

3.1 Gaps analysis

No telemetry gaps are reported for the period.

3.2 Orbit and Attitude Products

The following events have to be reported:

Observation ID	Description	Affected parameter	Sect. of Obs. description	Sect. of Obs. analysis
SW-IDEAS-22	OBS_ROUTINE: 01/09/2014, STR S/C C out of range.	Flags_q, quaternions, B_{NEC}	3.2.3.2	3.2.3.2
SW-IDEAS-24	OBS_ROUTINE: 04/09/2014, STR S/C A out of range.	Flags_q, quaternions, B_{NEC}	3.2.1.2	3.2.1.2
SW-IDEAS-25	OBS_ROUTINE: 02/09/2014, STR S/C C out of range.	Flags_q, quaternions, B_{NEC}	3.2.3.2	3.2.3.2
SWL1L2DB-9	New occurrence of this anomaly on S/C C, 07/09/2014	MOD position and velocity	3.2.3.1	[RD.9], Sect. 4.3
SW-IDEAS-26	OBS_ROUTINE: spikes in VFM-ASM residuals	F, B_{NEC}, B_{VFM}	3.3.3.2, 3.3.3.3	

Table 1: list of events to be reported in the monitoring for Week 36: 01/09 - 07/09/2014

The relevant parameters that have been monitored are:

- Position difference between calculated Medium Accuracy orbits (**MODx_SC_1B**) and on-board solution (**GPSxNAV_0**). Threshold values for such differences have not been assessed yet: we have just monitored the average values and maximum variations around the week, and reported in tables in the sections below, along with some example from the HTML daily reports. For the time being we evaluated an anomaly should be raised if one (or more) of the following conditions occurs:

  o The **average difference** on a given day exceeds the position accuracy requirement for the mission (1.5 m),

  o The variability around the average is quite high: **standard deviation** threshold has been arbitrarily chosen to be twice the position accuracy requirement for the mission (2-sigma = 3 m).

   o   At least 4-5 spikes are observed on a given day, exceeding +/- 50 m.

-   Visual inspection of Star Tracker characterisation flags (**STRxATT_1B**)
-   Deviation of the quaternion norm from unity (deviation threshold = +/- 10^{-9})
-   Visual inspection of Euler Angles derived from quaternions.

3.2.1 Swarm A

3.2.1.1 Position statistics

In Table 2 one can see the statistics of the differences between MOD and on-board solution positions. In the third column the maximum differences (maximum negative and maximum positive) are reported with, in parentheses, the ITRF component affected by such difference. The standard deviation is, on average, around 1.65 m.

Swarm A, 01-07/09/2014, Position difference			
Day	**Average Difference (m)**	**Maximum difference (m)**	**Notes**
01/09	0.13	+/- 8.5 (Z)	
02/09	0.19	-11, 10 (Z)	
03/09	0.17	-10 (Z), 8.3 (X)	
04/09	0.15	-17.5 (Z), 9 (Y)	
05/09	0.47	-8.5 (Z), 14.5 (Z)	Very spiky behaviour especially on Z. This increases a little bit both the mean diff and the st. dev. (1.8 m)
06/09	0.15	-10 (Z), 15 (Z)	Very spiky behaviour especially on Z. This increases a little bit the st. dev. (1.9 m)
07/09	0.07	+/- 8 (Z)	

Table 2: Swarm A, difference between MOD and on-board solution positions.

Below some plot example follows of such differences taken at the beginning of the week (01/09, Figure 1), in the middle (04/09, Figure 2) and at the end (07/09, Figure 3). The values are given in Km.
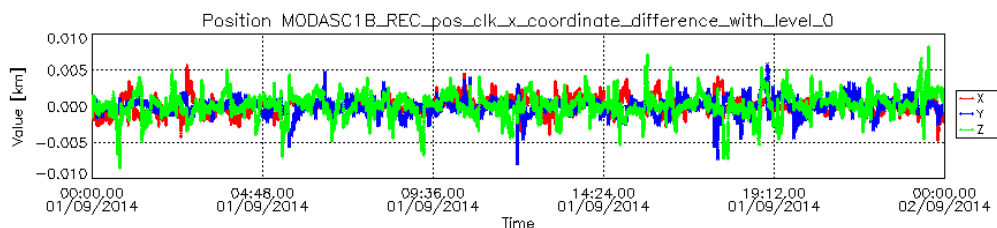
Figure 1: Difference MOD-GPSNAV, sc A, 01/09/2014
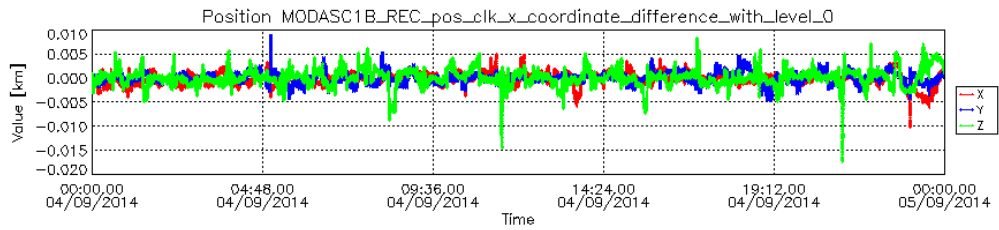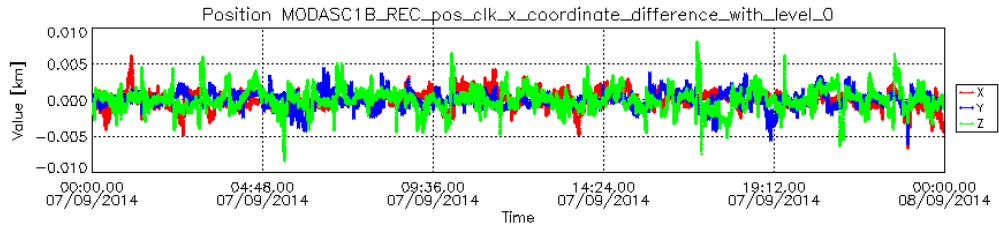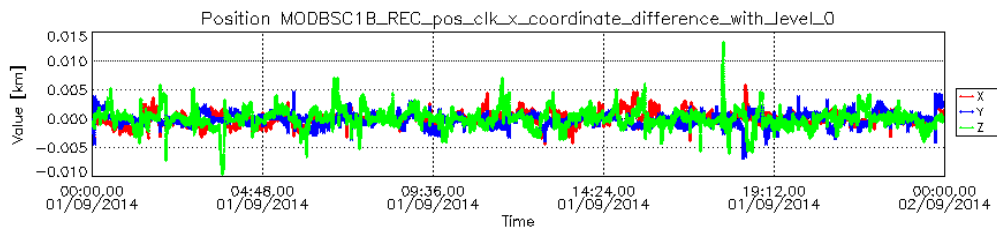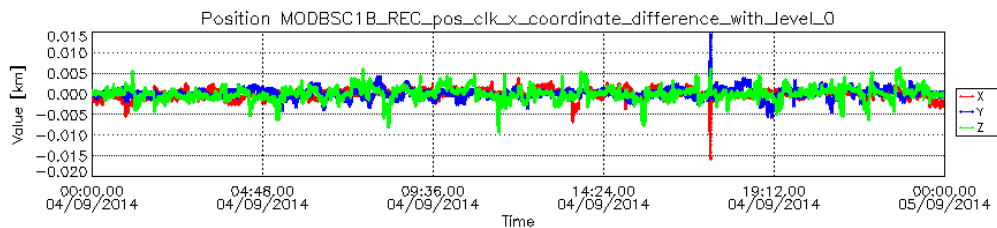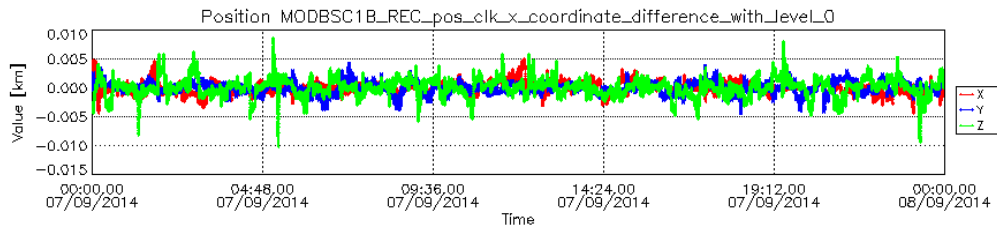
Figure 2: Difference MOD-GPSNAV, sc A, 04/09/2014

Figure 3: Difference MOD-GPSNAV, sc A, 07/09/2014

3.2.1.2 Attitude observations

- **SW-IDEAS-24**
  Affected product:
  SW_OPER_STRAATT_1B_20140904T000000_20140904T235959_0301

  6 seconds out of range (Flags_q=255, no attitude available).
  See Table 3 for details.

Start Out-of-range	Stop Out-of-range	Duration (s)	Value
04SEP2014 16:01:06	04SEP2014 16:01:11	6	255

Table 3: Attitudes out-of-range, S/C A, 31/08/2014

The cause of such rejected attitudes is the simultaneous occurrence of BBOs on the three camera units for the specified interval (see Figure 4).
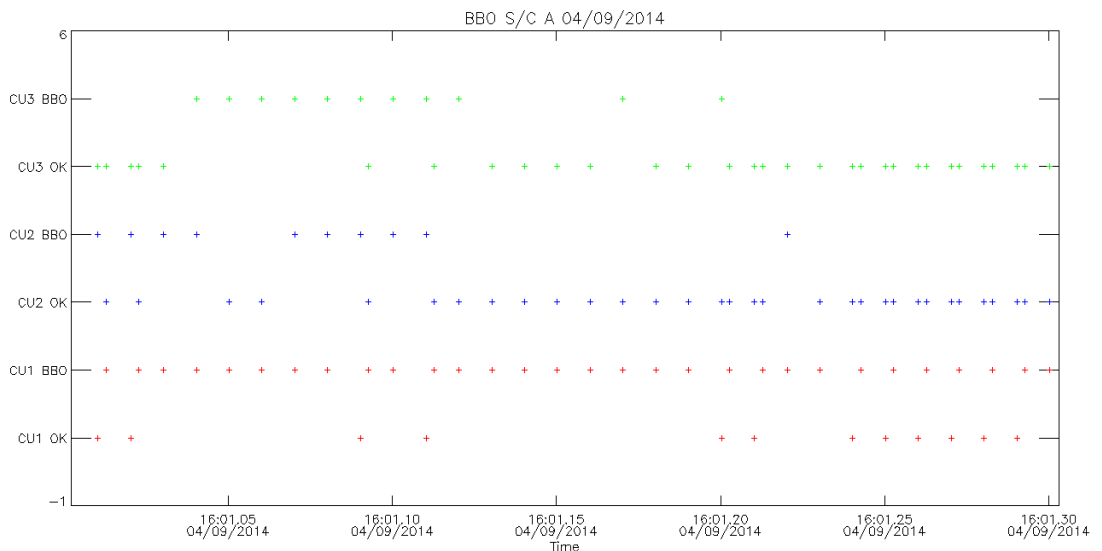
Figure 4: BBO flags for S/C A during 04/09/2014

3.2.2 Swarm B

3.2.2.1   Position Statistics

In Table 4 one can see the statistics of the differences between MOD and on-board solution positions. In the third column the maximum differences (maximum negative and maximum positive) are reported with, in parentheses, the ITRF component affected by such difference. The standard deviation is, on average, around 1.67 m.

Swarm B, 01-07/09/2014, Position difference			
Day	**Average Difference (m)**	**Maximum difference (m)**	**Notes**
01/09	0.15	-9.6 (Z), 13.2 (Z)	
02/09	0.22	-13 (Z), 9 (Z)	
03/09	0.15	-14 (Z), 8.3 (Z)	
04/09	0.15	-16 (X), 14.5 (Y)	one single big spike observed in X and Y at about 17 UT
05/09	0.35	-7.4 (Z), 28 (Y)	one single big spike observed in Z at about 6 UT
06/09	0.08	-9 (Z), 10 (Z)	Very spiky behaviour especially on Z. This increases a little bit the st. dev. (1.9 m)
07/09	0.04	-10 (Z), 8.6 (Z)	

Table 4: Swarm B, difference between MOD and on-board solution positions.

Below some plot example follows of such differences taken at the beginning of the week (01/09, Figure 5), in the middle (04/09, Figure 6), and at end of the week (07/09, Figure 7). Values are given in Km.
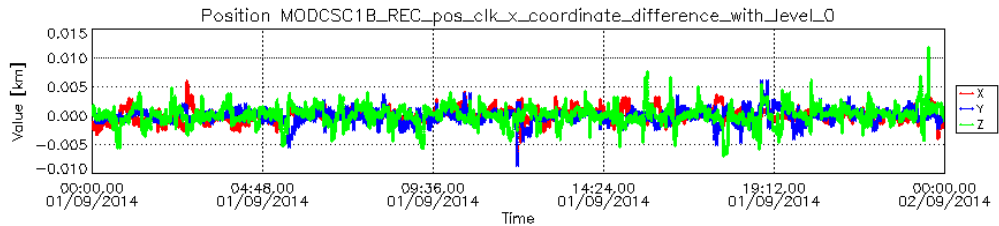

Figure 5: Difference MOD-GPSNAV, sc B, 01/09/2014

Figure 6: Difference MOD-GPSNAV, sc B, 04/09/2014

Figure 7: Difference MOD-GPSNAV, sc B, 07/09/2014

3.2.2.2   Attitude observations

Nothing to report.

3.2.3 Swarm C

3.2.3.1   Position Statistics

In Table 5 one can see the statistics of the differences between MOD and on-board solution positions. In the third column the maximum differences (maximum negative and maximum positive) are reported with, in parentheses, the ITRF component affected by such difference. The standard deviation is, on average, around 1.7 m (excluding day 07/09 from the average, as an anomaly occurred, and St. Dev. grew up to 4, see below).

Swarm C, 01-07/09/2014, Position difference			
Day	**Average Difference (m)**	**Maximum difference (m)**	**Notes**
01/09	0.12	-8.6 (Y), 12 (Z)	
02/09	0.19	-10.5 (Y), 11 (Z)	
03/09	0.17	-10 (Z), 8 (X,Z)	
04/09	0.1	-15.4 (Z), 9 (Z)	
05/09	0.5	-8 (Z), 15 (Z)	Very spiky behaviour especially on Z. This increases a little bit both the average and the st. dev. (1.8 m)
06/09	0.18	-8 (Z), 21 (Z)	one single big spike at about 18 UT on Z comp.
07/09	**0.29**	**-25 (Z), 16 (Z)**	**Anomaly already documented (SWL1L2DB-9): the difference starts to diverge from 20 UT on. St. Dev = 4**

Table 5: Swarm C, difference between MOD and on-board solution positions.

Below some plot example of such differences follows, taken at the beginning of the week (01/09, Figure 8), in the middle (04/09, Figure 9) and at the end (07/09, Figure 10). The values are given in Km. In particular, in Figure 10, one can observe the occurrence of an already documented anomaly (**SWL1L2DB-9,** [RD.9]): the difference between MOD and NAV solution starts to diverge from about 20 UT.
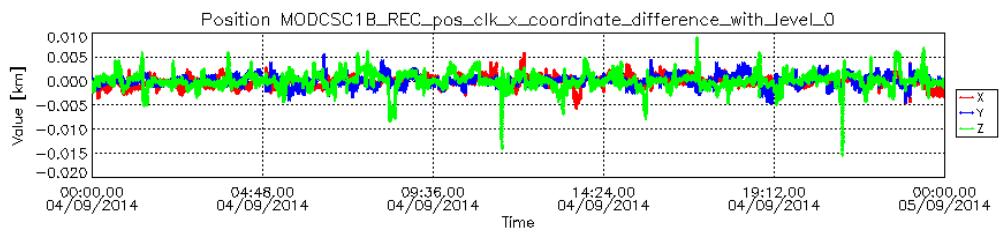

Figure 8: Difference MOD-GPSNAV, sc C, 01/09/2014

Figure 9: Difference MOD-GPSNAV, sc C, 04/09/2014
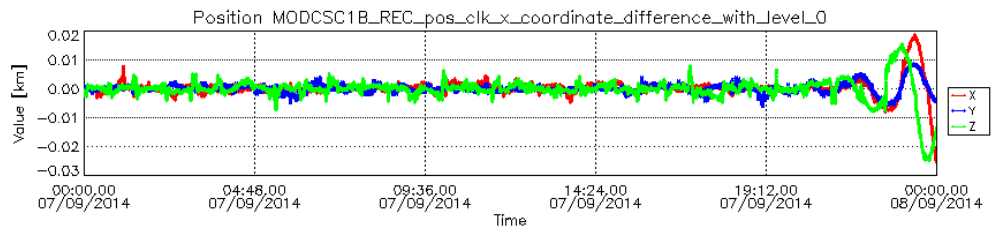
Figure 10: Difference MOD-GPSNAV, sc C, 07/09/2014

3.2.3.2   Attitude observations

-   **SW-IDEAS-22**
    Affected product:
    SW_OPER_STRCATT_1B_20140901T000000_20140901T235959_0301

    50 seconds out of range (Flags_q=255, no attitude available).
    See Table 6 for details:

Start Out-of-range	Stop Out-of-range	Duration (s)	Value
01SEP2014 00:04:37	01SEP2014 00:04:39	4	255
01SEP2014 01:38:38	01SEP2014 01:38:55	18	255
01SEP2014 03:12:35	01SEP2014 03:12:48	14	255
01SEP2014 04:46:33	01SEP2014 04:46:46	14	255

Table 6: Attitudes out-of-range, S/C C, 01/09/2014

As for Observation **SW-IDEAS-22**, we performed further analysis and verified that: 1) No telemetry gaps corresponded to such out-of-range values, 2) the non calculated attitudes are due to a combination of BBO occurrences and invalid measurements. As for the

event described within **SW-IDEAS-22, the observation is therefore not an anomaly and the attitude rejections are expected.**

- **SW-IDEAS-25**
  Affected product:
  SW_OPER_STRCATT_1B_20140902T000000_20140902T235959_0301

  4 seconds out of range (Flags_q=255, no attitude available).
  See Table 6 for details:

Start Out-of-range	Stop Out-of-range	Duration (s)	Value
02SEP2014 00:58:49	02SEP2014 00:58:52	4	255

Table 7: Attitudes out-of-range, S/C C, 02/09/2014

As for Observation **SW-IDEAS-25**, we performed further analysis and verified that: 1) No telemetry gaps corresponded to such out-of-range values, 2) the non calculated attitudes are due to a combination of BBO occurrences and invalid measurements. As for the event described within **SW-IDEAS-25, the observation is therefore not an anomaly and the attitude rejections are expected.**

3.3 Magnetic Products

The magnetic products **look nominal** during the monitored period. The effects of rejected attitudes (**SW-IDEAS-22, SW-IDEAS-24** and **SW-IDEAS-25**) are observed in magnetic data as "zero" values in the vector field time series and few isolated spikes in the ASM-VFM differences.

For the magnetic products the weekly monitoring consists in:

- Visual inspection of daily time series of magnetic field intensity F, B_{NEC} and $B_{VFM.}$ Looking for gaps (or zero values in case of **MAGx_LR_1B** products), out-of-threshold values (i.e. exceeding +/- 60000 nT), and other strange features.

- Monitoring of the **VFM-ASM known anomaly**: visual inspection of $|B_{NEC}|$ - F and recording of daily maximum variations. If +/- 5 nT are exceed on a given day, an alert is raised. Daily PSD analysis and monitoring of the spectrum peaks.

- 2nd difference analysis on F, B_{NEC} and $B_{VFM.}$ If more than 10% of data of a given day (8640 records) exceeds the threshold (100 nT/s^2) an anomaly is opened.

- TCF.VFM parameters monitoring (VFM calibration parameters): weekly series of biases, scales, non-orthogonality factors and RMS.

3.3.1 Swarm A

3.3.1.1 Magnetic time series visual inspection

Nothing relevant to report. An example of representative F time series for S/C A can be seen in Figure 11 (07/09/2014).
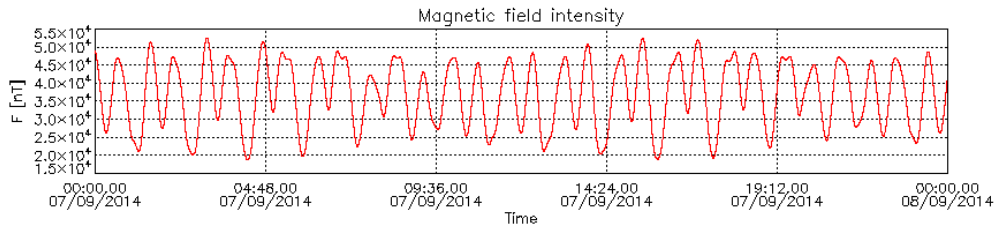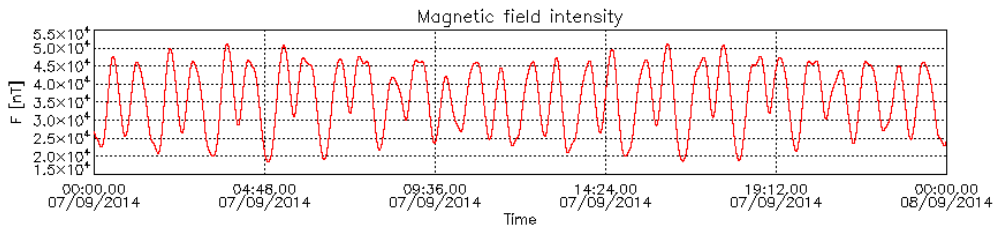

Figure 11: Time series of magnetic field intensity, F, for 07/09/2014, S/C A

3.3.1.2   VFM-ASM anomaly

The differences between the module of B_{NEC} and F did not show any relevant feature or change with respect to the previous weeks. The daily peak-to-peak difference around the week is, on average: [-3, 2.5] nT.

Below some plot example of such differences follows, taken at the beginning of the week (01/9, Figure 12), in the middle (04/09, Figure 13) and at the end (07/09, Figure 14).
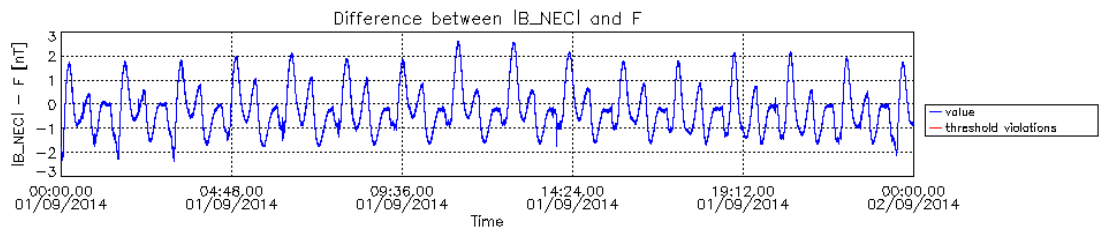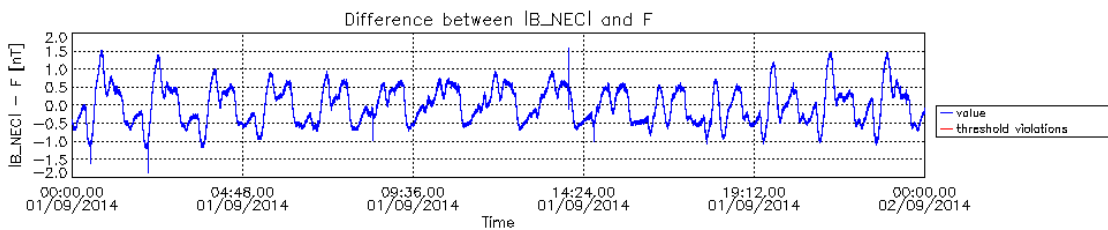

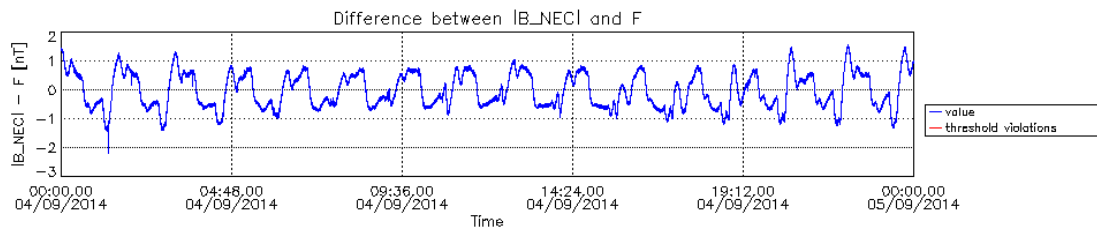**Figure 12:** $|B_{NEC}|$ - F for S/C A, 01/09/2014
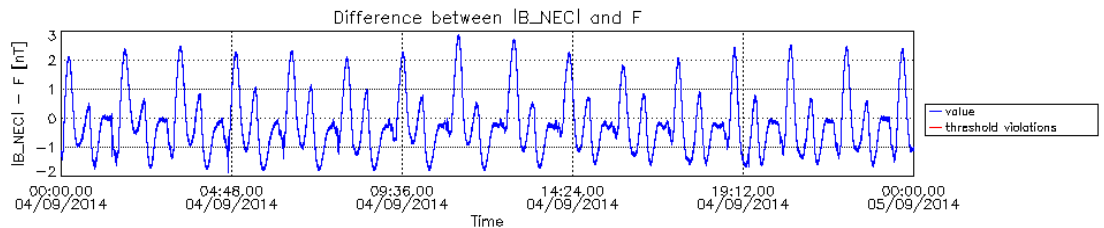
Figure 13: $|B_{NEC}|$ - F for S/C A, 04/09/2014
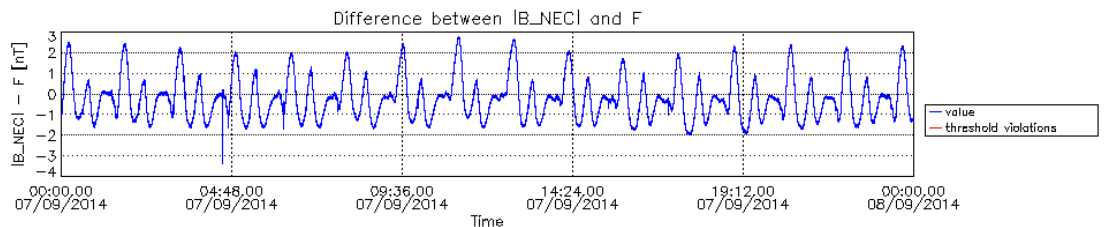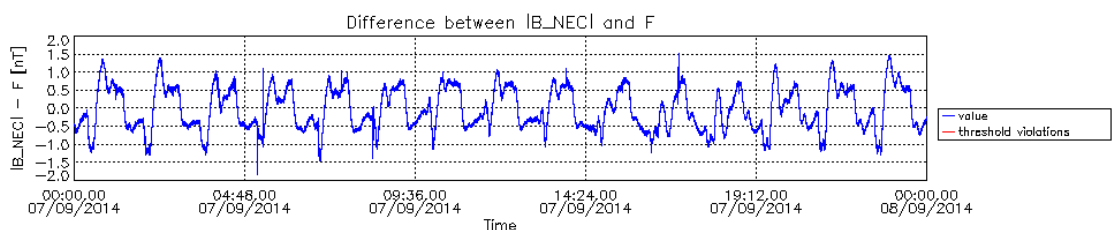

Figure 14: $|B_{NEC}|$ - F for S/C A, 07/09/2014

The Power Spectral Density (PSD) analysis does not evidence variations with respect to the previous weeks.

3.3.1.3   2nd difference analysis

Nothing relevant to report.

3.3.1.4   TCF.VFM monitoring

In the following plots one can see the three groups of TCF VFM calibration parameters for Swarm A, for the reported period: Biases (Figure 15), Scales (Figure 16) and Non-orthogonalities (Figure 17). Each group is actually a three-component vector in the compact detector coil frame. The parameters are steady and constant during the week, decreasing trend continues in the X scale components (of about 0.001%).
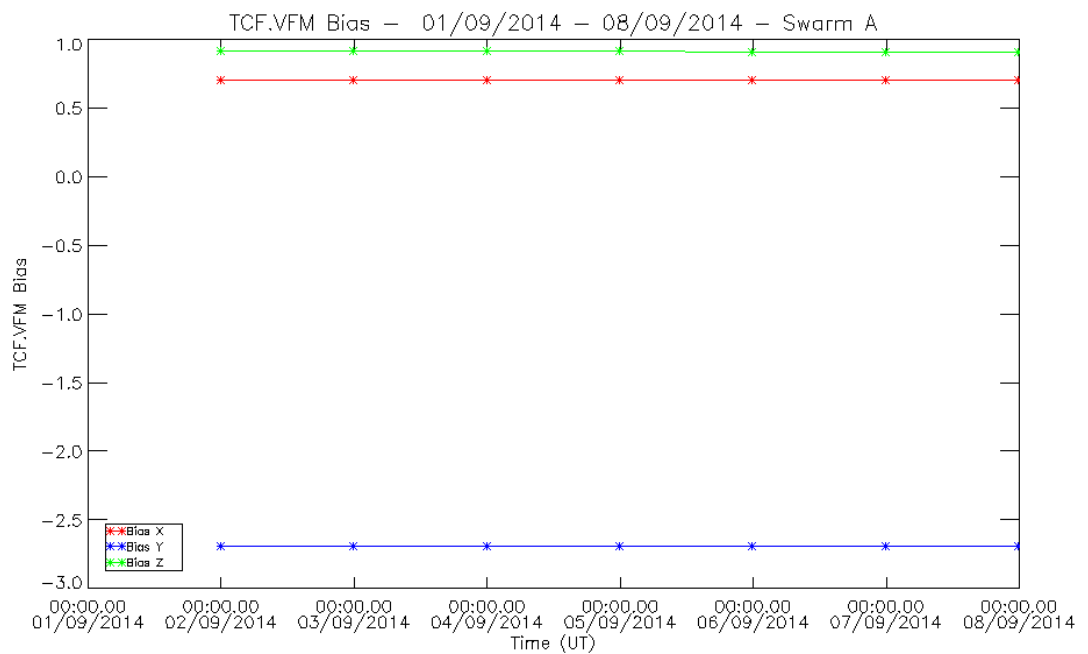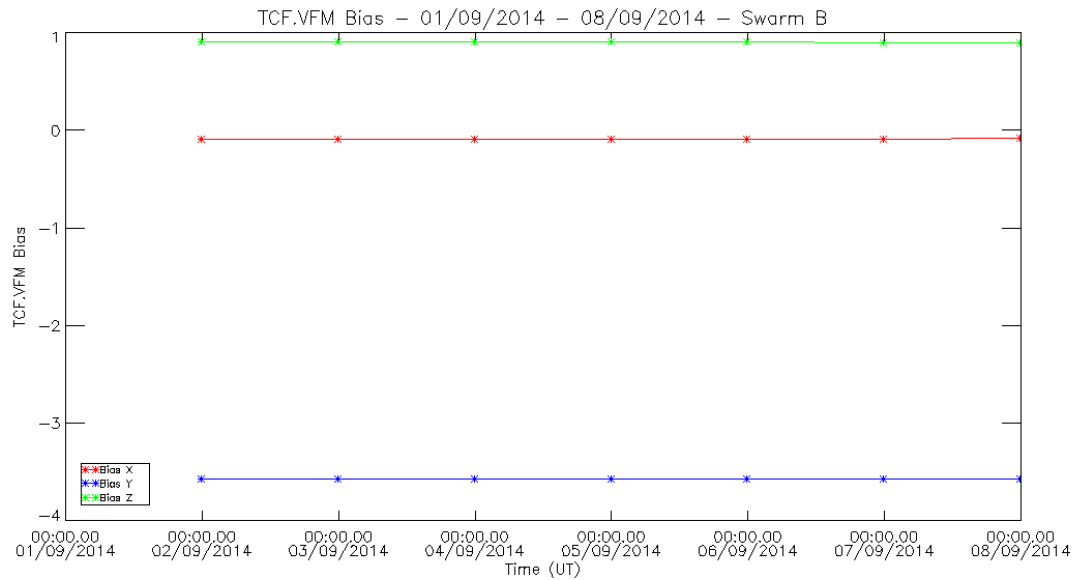

Figure 15: TCF.VFM Biases for S/C A, 01-08/09/2014.
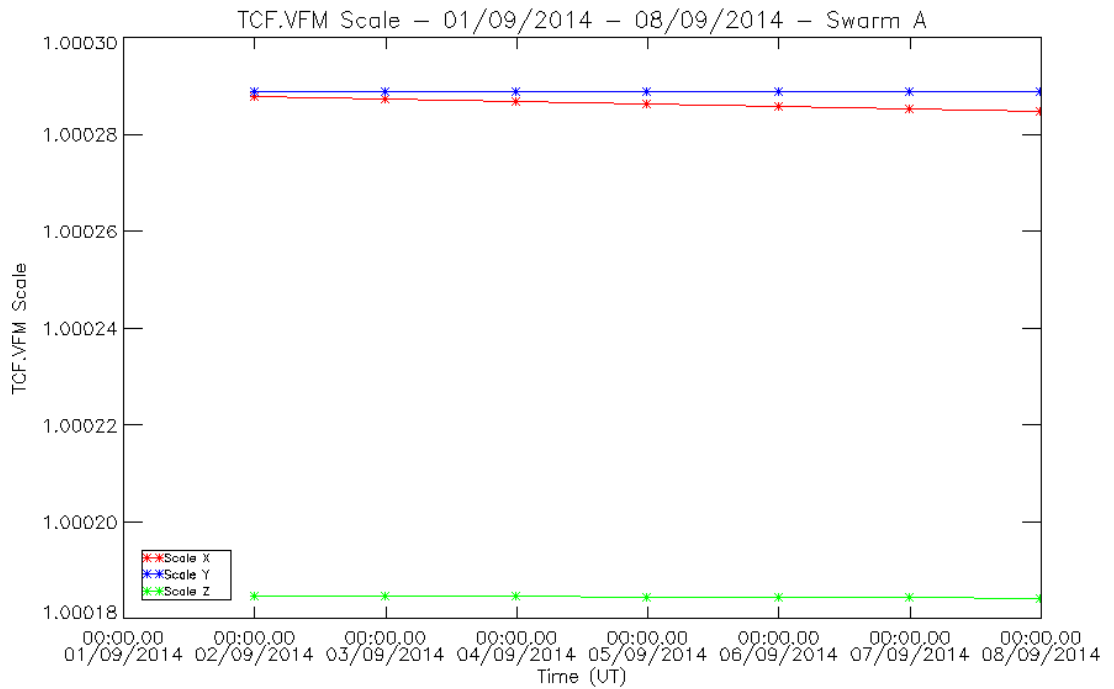
Figure 16: TCF.VFM Scales for S/C A, 01-08/09/2014.
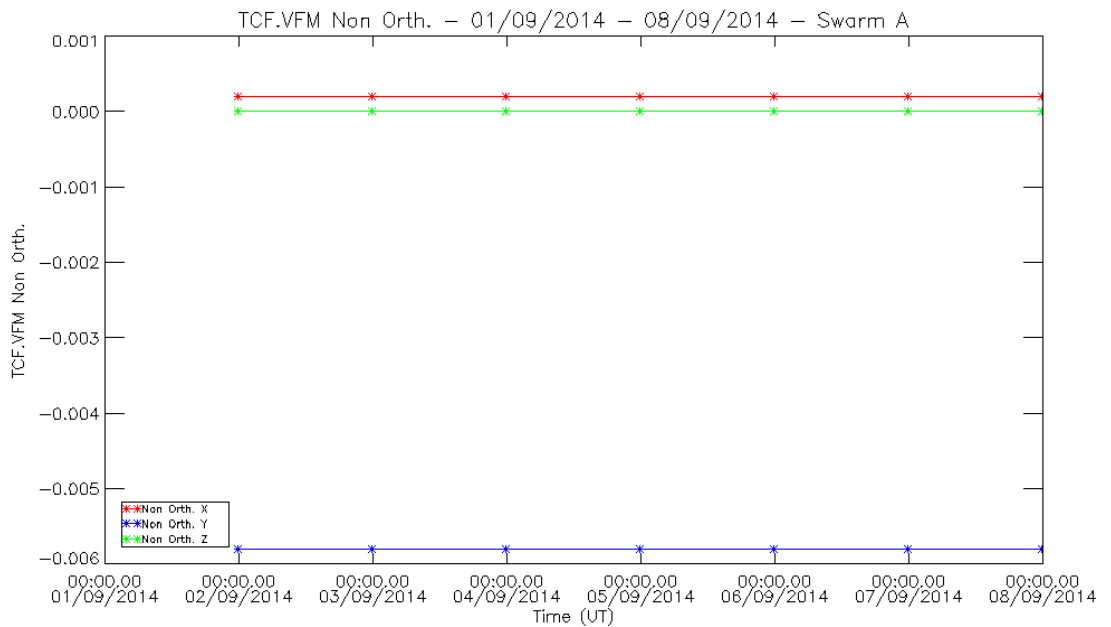
Figure 17: TCF.VFM Non-Orthogonalities for S/C A, 01-08/09/2014.

3.3.2 Swarm B

3.3.2.1 Magnetic time series visual inspection

Nothing relevant to report. An example of representative F time series for S/C B (07/09/2014) can be seen in Figure 18 below.

Figure 18: Time series of magnetic field intensity, F, for 07/09/2014, S/C B

3.3.2.2   VFM-ASM anomaly

The differences between the module of **B$_{NEC}$** and F did not show any relevant feature or change with respect to the previous weeks. The daily peak-to-peak difference around the week is, on average: [-1.5, 1.5] nT.

Below some plot example follows of such differences taken in the middle of the week (01/09, Figure 19), at the middle (04/09, Figure 20), and at the end (07/09, Figure 21).

Figure 19: |B$_{NEC}$| - F for S/C B, 01/09/2014

Figure 20: |B$_{NEC}$| – F for S/C B, 04/09/2014

Figure 21: |B$_{NEC}$| - F for S/C B, 07/09/2014

The Power Spectral Density (PSD) analysis does not evidence variations with respect to the previous weeks.

3.3.2.3   2nd difference analysis

Nothing relevant to report.

3.3.2.4   TCF.VFM monitoring

In the following plots one can see the three groups of TCF VFM calibration parameters for Swarm B, for the reported period: Biases (Figure 22), Scales (Figure 23) and Non-orthogonalities (Figure 24). Each group is actually a three-component vector in the compact detector coil frame. The parameters are steady and constant during the period.

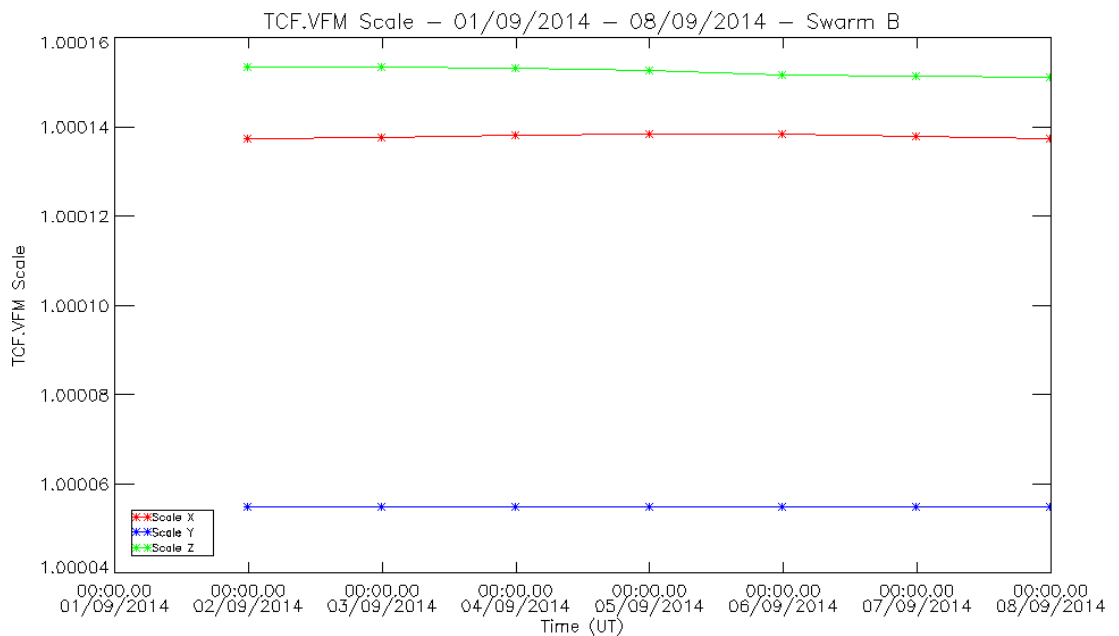**Figure 22:** TCF.VFM Biases for S/C B, 01-08/09/2014.
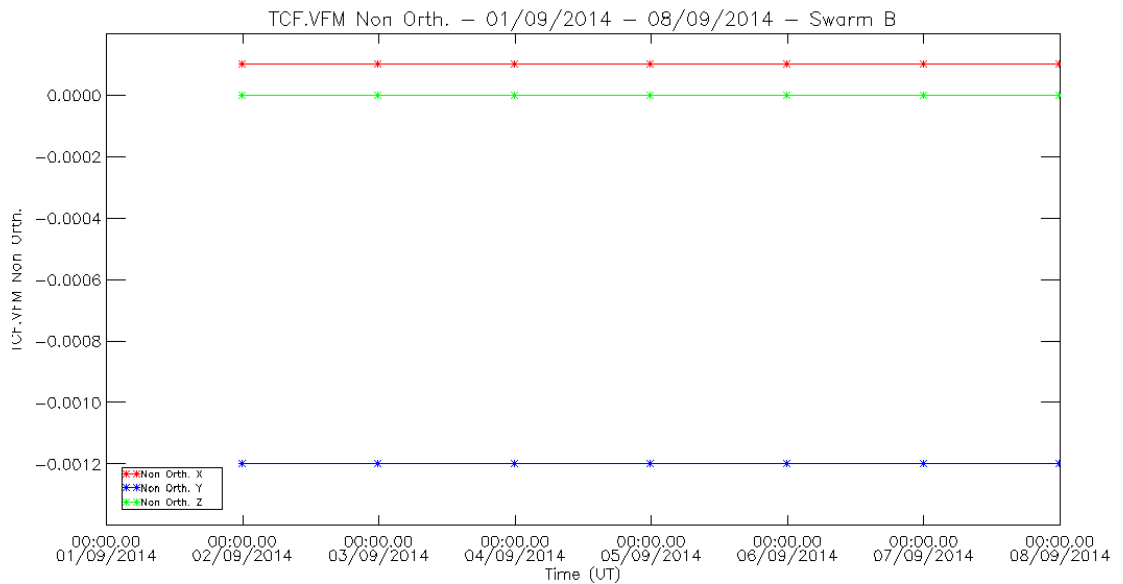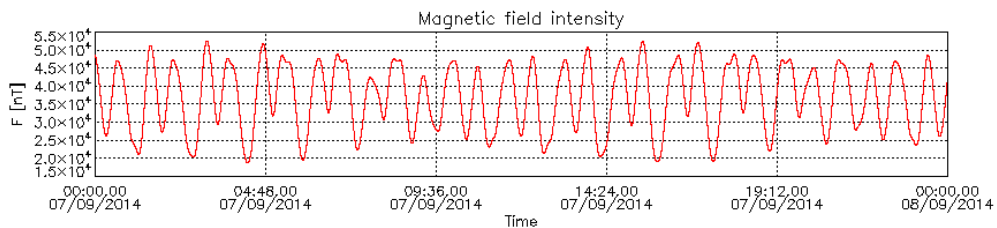

Figure 23: TCF.VFM Scales for S/C B, 01-08/09/2014.

Figure 24: TCF.VFM Non-Orthogonalities for S/C B, 01-08/09/2014.

3.3.3 Swarm C

3.3.3.1   Magnetic time series visual inspection

Nothing relevant to report. An example of representative F time series for S/C C (07/09/2014) can be seen in Figure 25 below.

Figure 25: Time series of magnetic field intensity, F, for 07/09/2014, S/C C

3.3.3.2   VFM-ASM anomaly

- **SW-IDEAS-26:** In the differences between the module of B_{NEC} and F, few spikes can be observed during the week that cannot be related to gaps in telemetry or rejected attitudes. See for example Figure 28: at about 6 UT a spike down to -5 nT can be observed in ASM-VFM difference. Additional information can be found in Section 3.3.3.3 below, further analysis will follow in the coming weeks.

The daily peak-to-peak difference around the week is, on average: [-1.5, 1.5] nT.

Below some plot example follows of such differences taken at the beginning og the week (01/09, Figure 26), at the middle (04/09, Figure 27), and at the end (07/09, Figure 28).
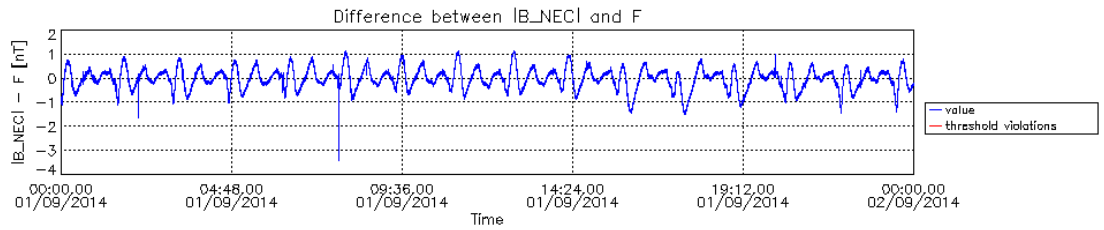
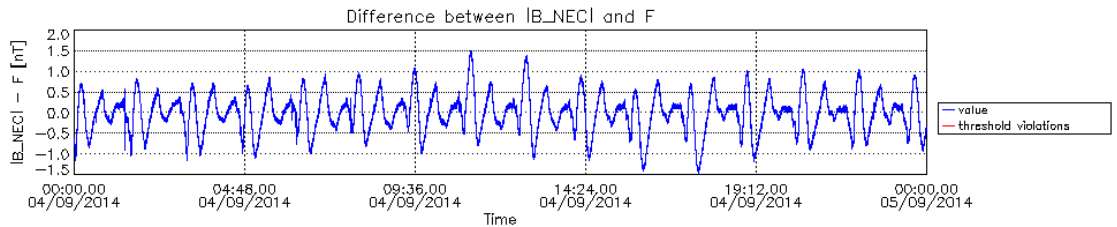**Figure 26:** $|B_{NEC}|$ - F for S/C C, 01/09/2014

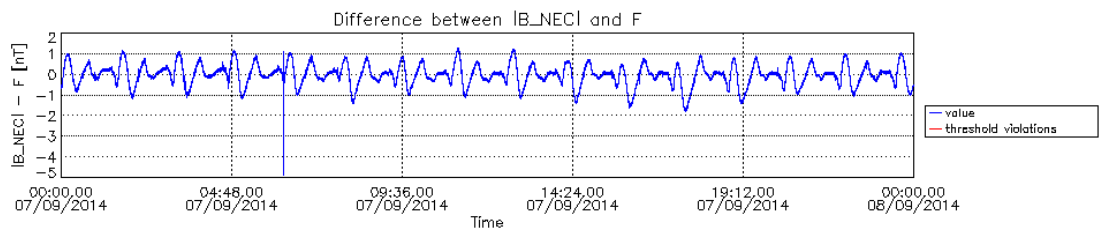**Figure 27:** $|B_{NEC}|$ - F for S/C C, 04/09/2014

Figure 28: $|B_{NEC}|$ - F for S/C C, 07/09/2014

The Power Spectral Density (PSD) analysis does not evidence variations with respect to the previous weeks.

3.3.3.3   2nd difference analysis

As a complement and preliminary analysis on the observation **SW-IDEAS-26** reported above, we show below the 2nd difference B_{VFM} plots for S/C C, 07/09/2014 (Figure 29 for X comp.; Figure 30 for Y comp.; Figure 31 for Z comp.). A big excursion can be seen, especially in the X and Z components, which is correlated with the spike observed in ASM-VFM difference (about 6:15 UT), corresponding to a latitude of about -64.
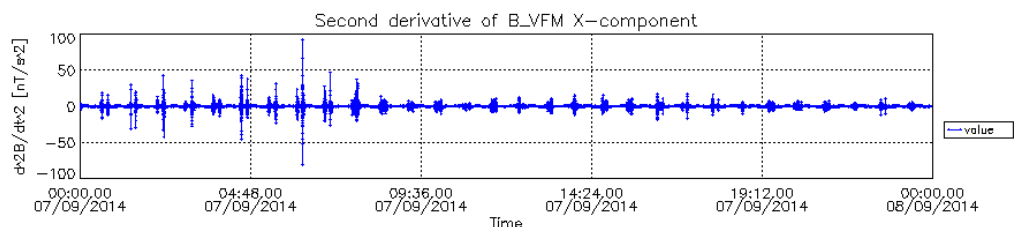

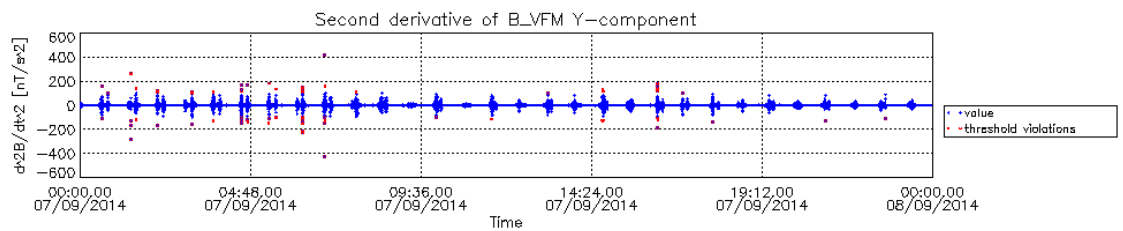**Figure 29:** 2nd derivative of B_{VFM}, X comp., S/C C, 07/09/2014.

Figure 30: 2nd derivative of B$_{VFM}$, Y comp., S/C C, 07/09/2014.
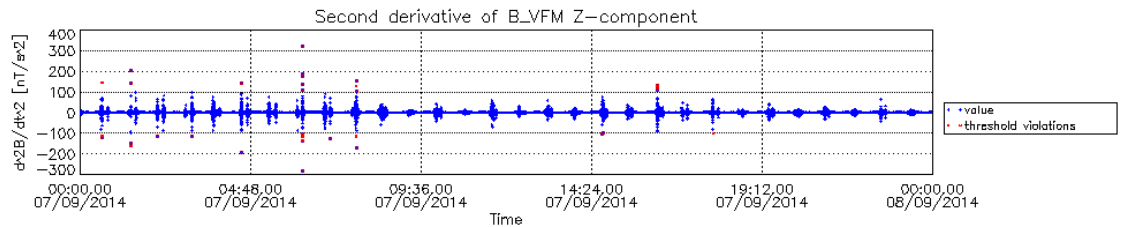

Figure 31: 2nd derivative of B$_{VFM}$, Z comp., S/C C, 07/09/2014.

3.3.3.4 TCF.VFM monitoring

In the following plots one can see the three groups of TCF VFM calibration parameters for Swarm C, during the reporting period: Biases (Figure 32), Scales (Figure 33) and Non-orthogonalities (Figure 34). Each group is actually a three-component vector in the compact detector coil frame. The parameters are steady and constant during the week, with an exception in the Z scale component, which shows a slow increase (0.001%).
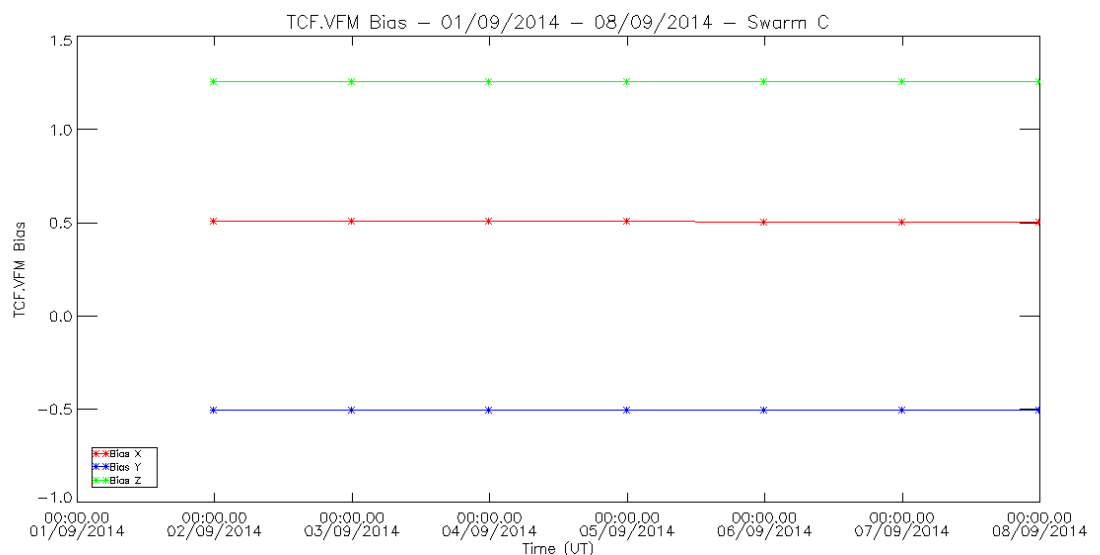

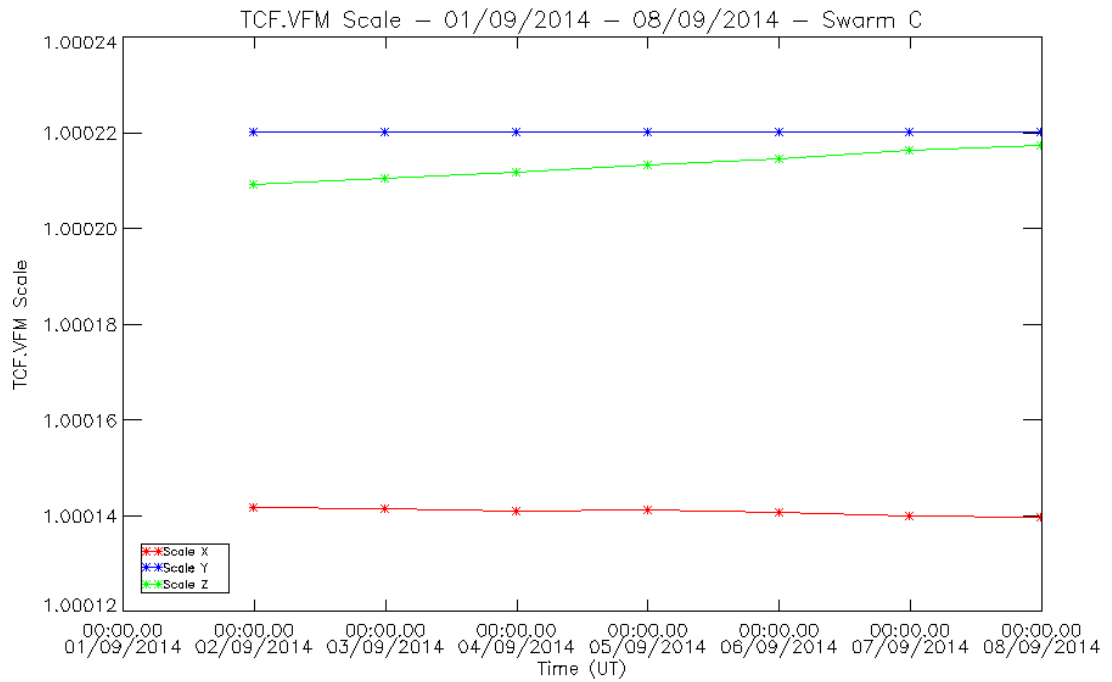**Figure 32:** TCF.VFM Biases for S/C C, 01-08/09/2014.

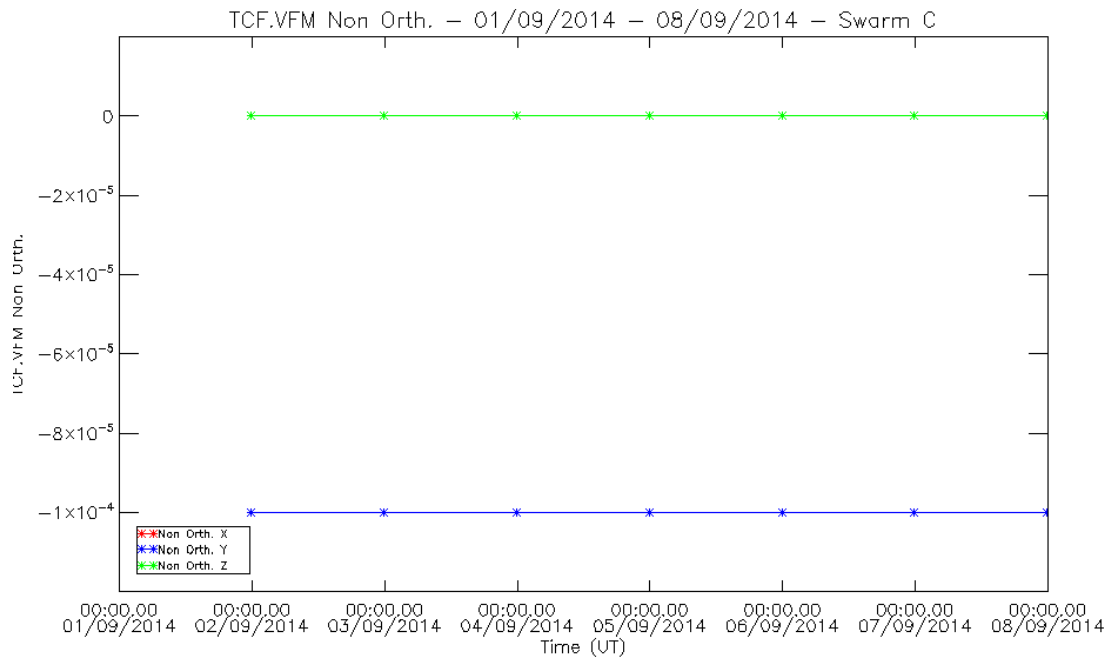**Figure 33:** TCF.VFM Scales for S/C C, 01-08/09/2014.

Figure 34: TCF.VFM Non-Orthogonalities for S/C C, 01-08/09/2014.

3.3.4 Summary of TCF behaviour for the three S/C

An important parameter which characterizes the quality of the TCF calculation is the weighted Root Mean Square (RMS) value of the residuals after the estimation. Figure 35 summarizes the RMS behaviour for all S/C during the week 01-08/09/2014.
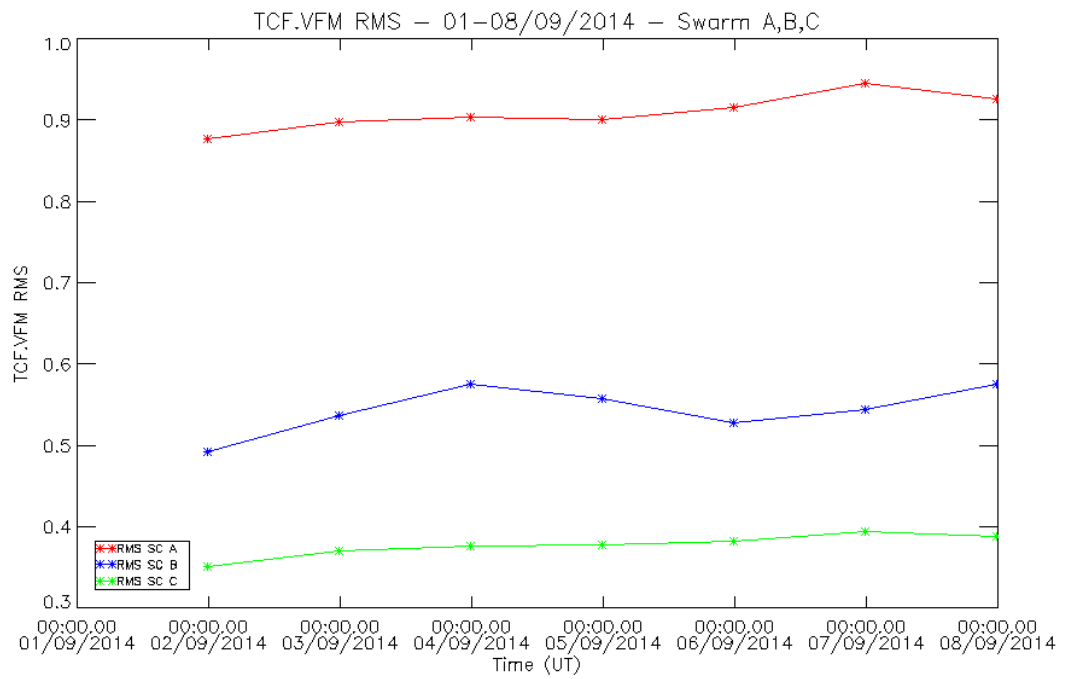
Figure 35: weighted RMS of the residuals after the TCF estimation, all S/C, August 2014.

4. ON-DEMAND ANALYSIS

Nothing to report

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