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IDEAS+ Swarm Weekly Report 2015/49: 2015/11/30 - 2015/12/06

Abstract : This is the **Instrument Data quality Evaluation and Analysis Service Plus** (IDEAS+) Swarm Weekly report on Swarm products quality, covering the period from 30 November to 06 December 2015.

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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	14 Dec 2015	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 lifetime, 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 2.2.

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, and user community), anomalies can be triggered. 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:

- Processors Version: L1BOP 3.16.p2, L2-Cat2 1.15.p3.
- L0 input products baseline: 02
- L1B baseline: MAGNET and PLASMA 04, ORBATT and ACCELE 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: EEF 01, IBI, FAC and TEC 02
- Input auxiliary files baseline: CCDB 0007 (29/10/2015), ADF 0101
- MPPF-CVQ v.2.14.01

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_20141124_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 (ref. for SWL1L2DB-9)

[RD.10] IDEAS+ Swarm Weekly Report: 29/09/2014 – 05/10/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20140929_20141005.pdf (ref. for SW-IDEAS-34)

[RD.11] IDEAS+ Swarm Weekly Report: 06/10/2014 – 12/10/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20141006_20141012.pdf (ref. for SW-IDEAS-36)

[RD.12] IDEAS+ Swarm Weekly Report: 20/10/2014 – 26/10/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20141020_20141026.pdf (ref. for SW-IDEAS-40, GPS sync loss)

[RD.13] IDEAS+ Swarm Weekly Report: 15/09/2014 – 21/09/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20140915_20140921.pdf (ref. for SW-IDEAS-27)

[RD.14] Swarm L1B 03.15 Validation Report, OSMV-OPMT-SRCO-RP-15-3385, Issue 1.3.

[RD.15] IDEAS+ Swarm Weekly Report: 23/03/2015 – 29/03/2015, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_201513_20150323_20150329.pdf.

[RD.16] SWARM Weekly Operations Report #76, SW-RP-ESC-FS-6172

[RD.17] Olsen, N., H. Luhr, C.C. Finlay, T.J. Sabaka, I. Michaelis, J. Rauberg and L. Tøffner-Clausen, The CHAOS-4 geomagnetic field model, Geophys. J. Int. 197, 815–827, 2014

[RD.18] IDEAS+-SER-IPF-PLN-2272, Swarm Level 1B Operational Processor Verification Plan, IDEAS+-SER-IPF-PLN-2272_L1BOP_316_v1.5_final.pdf

[RD.19] IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_201547_20151116_20151122.pdf

2. SUMMARY OF THE OBSERVATIONS

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

Nothing to report

2.2 Plan for operational processor updates

The Euler angles contained in the CCDB AUXxSW1_C_ CCDB file have been updated. These updated CCDB, after being double checked by Ideas+ and DTU team, have been deployed in operations on 10/12/2015. As consequence, the counter of the MAGNET (and PLASMA for consistency) products from 07/12/2015 have been incremented (i.e. from 06 to 08). For consistency, also the counter of the L2-Cat2 products has been increased. In the coming days the MAGREP regeneration of both MAGx_LR_1B and MAGx_HR_1B will start, from 18/07/2015 (day when we introduced L1BOP 3.16 into operations), also with counter 08.

2.3 Quality Working Group and Cal/Val Coordination

Following the decisions of the 5th QWG in Paris, these activities will be carried on in order to better understand the origin of the ASM-VFM residuals:

- Investigation on boom alignment error budget (from industry) that could help in developing a thermos-elastic correction approach.

- Investigation on plasma-induced stray field in order to focus on any possible current flow near the VFM (and not the ASM), because the intensity of such a current may be stronger near the VFM due to the accumulation of charged plasma particles near the STR baffles.

IPGP has delivered a test dataset obtained from the vector mode of ASM for the benefit of expert users (/Advanced folder). This dataset covers the period of the 4 x 90° yaw slew manoeuvre i.e. S/C A and S/C C, 10-18/05/2014; S/C B, 05-13/05/2015.

University of Calgary has delivered a new version of the Swarm TII Level 0 16 Hz image moments datasets, for the benefit of expert users (/Advanced folder).

IRF is about (beginning of January) to deliver three new datasets, for the benefit of expert users (/Advanced folder):

- 16 Hz Faceplate currents and derived electron density
- Single-probe derived electron temperatures and S/C potential
- Sweep mode derived electron density and temperature and S/C potential

Moreover, investigations are on-going with the help of GFZ, on the spike occurrences on the electron temperature: we have provided GFZ with HK_BUS_1A products in CDF, containing the solar panel currents, in order to investigate possible correlation of the spikes with solar illumination and/or currents activations.

2.4 Summary of observations for 2015, Week 49 (30/11 - 06/12)

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

- **ORBATT failure** processing for S/C B on 04/12; this is a due to a SW anomaly which will be resolved with the next ORBATT L1B OP release.

- **Several few seconds gaps in MAGx_CA_1B products** throughout the week. Some of them seem not to be associated to gaps in telemetry. Monitoring on-going.

- **ASM-VFM residuals threshold violation**: on S/C A starting from 04/12, the residuals become very high, exceeding the 1nT threshold on 06/12. For more details please see Section 4.

3. ROUTINE QUALITY CONTROL

3.1 Gaps analysis

- **ORBATT failure** processing for S/C B on 04/12; this is a due to a SW anomaly which will be resolved with the next ORBATT L1 IPF release
- **Several few seconds gaps in MAGx_CA_1B products** throughout the week. Some of them seem not to be associated to gaps in telemetry. Monitoring on-going.

3.2 Orbit and Attitude Products

In Table 1 are listed events that have to be reported.

Table 1: List of events related to attitude and orbit products to be reported in the monitoring for 2015, Week 49: 30/11 - 06/12.

Observation ID	Description	Affected parameter	Sect. of Obs. Description	Sect. of Obs. Analysis

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. They are reported in tables in the sections below. In addition, some example plots are given 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:
    - The **average difference** on a given day exceeds the position accuracy requirement for the mission (1.5 m),
    - 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).
    - 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 Position Statistics

In Table 2, one can see the statistics of the differences between MOD and on-board solution positions for S/C A, B and C respectively. In the third column the maximum differences (maximum negative and maximum positive) are reported. The maximum standard deviation is in the fourth column. Maxima, minima and standard deviations usually refer to the Z component that is often the most disturbed; in case another component is most affected, it will be specified in parentheses. Figure 1 shows a cumulative trend of the maximum daily standard deviation for the past 30 days of operations of the MOD-NAV difference, while Figure 2 shows the daily maximum

difference, in absolute value, of the MOD-NAV difference, always for the past 30 days of operations.

Table 2: Swarm A, B and C, difference between MOD and on-board solution positions. If not specified maximum difference and maximum standard deviation refers to the Z-axis.

Swarm A, 30/11 - 06/12, Position difference					
Day	**Average difference (m)**	**Maximum difference (m)**		**Maximum standard deviation (m)**	**Notes**
30/11	0.07	-8.1 (Y)	6.4	1.24	
01/12	0.19	-10.2	9.8	1.46	
02/12	0.08	-7.1	4.9 (Y)	1.2	
03/12	0.05	-6.2	6.7	1.17	
04/12	0.08	-8.5	7.4	1.49	
05/12	0.03	-12.6	7.3	1.39	
06/12	0.11	-7.2	8.4	1.43	
Swarm B, 30/11 - 06/12, Position difference					
Day	**Average difference (m)**	**Maximum difference (m)**		**Maximum standard deviation (m)**	**Notes**
30/11	0.08	-6.1	5.3	1.35	
01/12	0.23	-7.7	8	1.46	
02/12	0.08	-8.8 (Y)	7.7	1.36	
03/12	0.03	-6	5.6	1.17	
04/12	Data not available	Data not available	Data not available	Data not available	ORBATT failure
05/12	0.1	-7.8	6.5	1.27	
06/12	0.08	-6.9	6.9	1.44	
Swarm C, 30/11 - 06/12, Position difference					
Day	**Average difference (m)**	**Maximum difference (m)**		**Maximum standard deviation (m)**	**Notes**
30/11	0.06	-6.9 (Y)	7	1.25	
01/12	0.2	-7.3	8.3	1.44	
02/12	0.15	-7.5	6.1	1.2	
03/12	0.02	-8.1	4.9	1.17	
04/12	0.08	-7.5	7.7 (Y)	1.43	
05/12	0.07	-10.9	7.6	1.36	
06/12	0.14	-8	8.6	1.33	

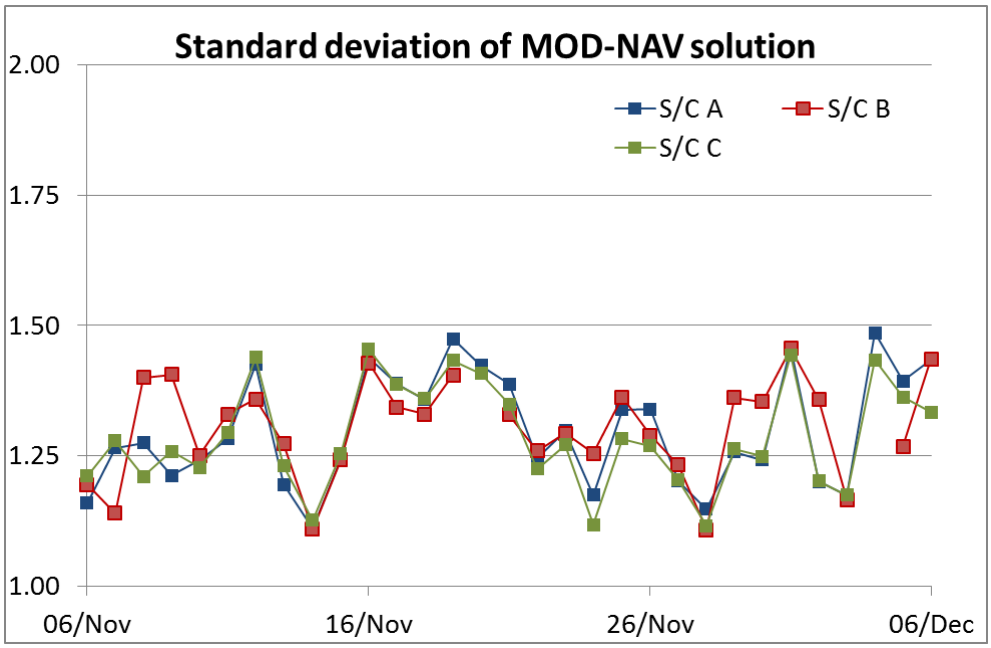

Figure 1: Plot of the standard deviation of the difference between MOD and NAV solutions for all satellites. Plot covers last month of operation.

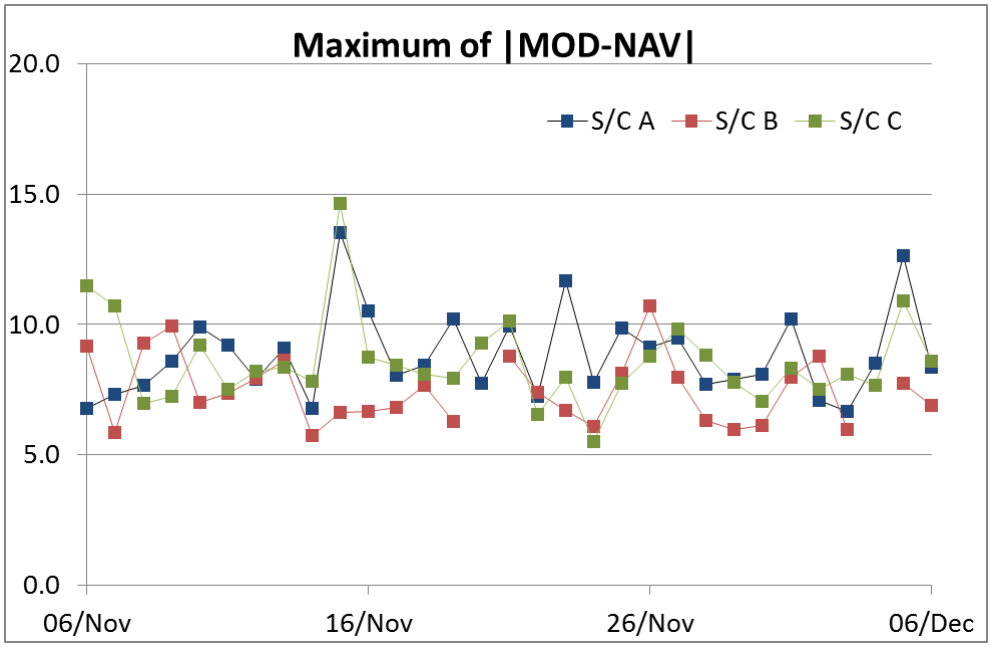

Figure 2: Plot of the maximum difference of the absolute value of the difference between MOD and NAV solutions for all satellites. Plot covers last month of operation.

3.2.1.1 Swarm A

Below is presented plot of MOD-NAV differences for S/C A, taken at the beginning of the week (30/11, Figure 3). From top to bottom, the plots show of MOD-NAV differences in ITFR reference frame: on X, Y and Z-axis respectively. The difference between both solutions is given in [m].

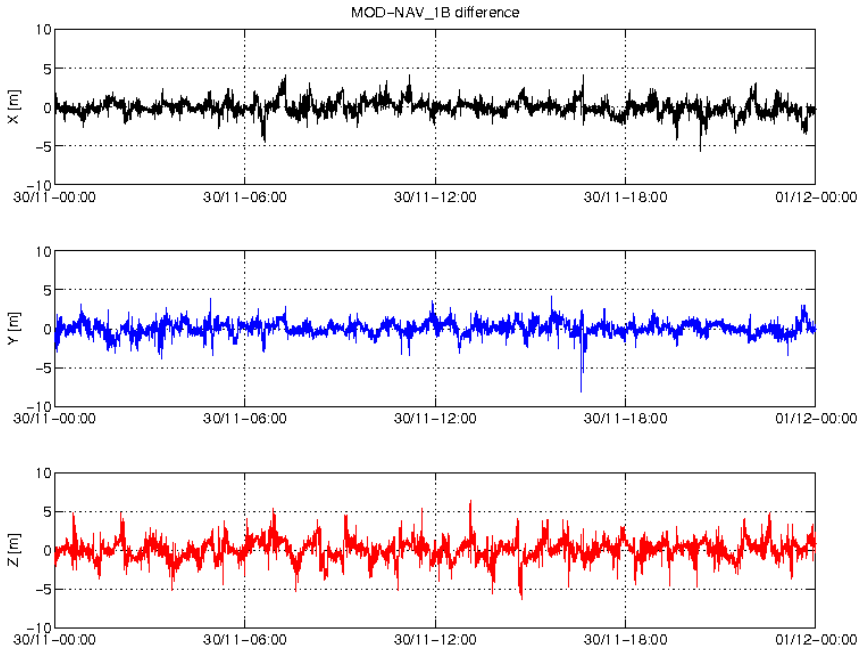

Figure 3: Difference MOD-GPSNAV, S/C A, 30/11. From top to bottom: X, Y and Z-axis

3.2.1.2 Swarm B

Below is presented plot of MOD-NAV differences for S/C B, taken at the beginning of the week (30/11, Figure 4). From top to bottom, the plots show of MOD-NAV differences in ITFR reference frame: on X, Y and Z-axis respectively. The difference between both solutions is given in [m].

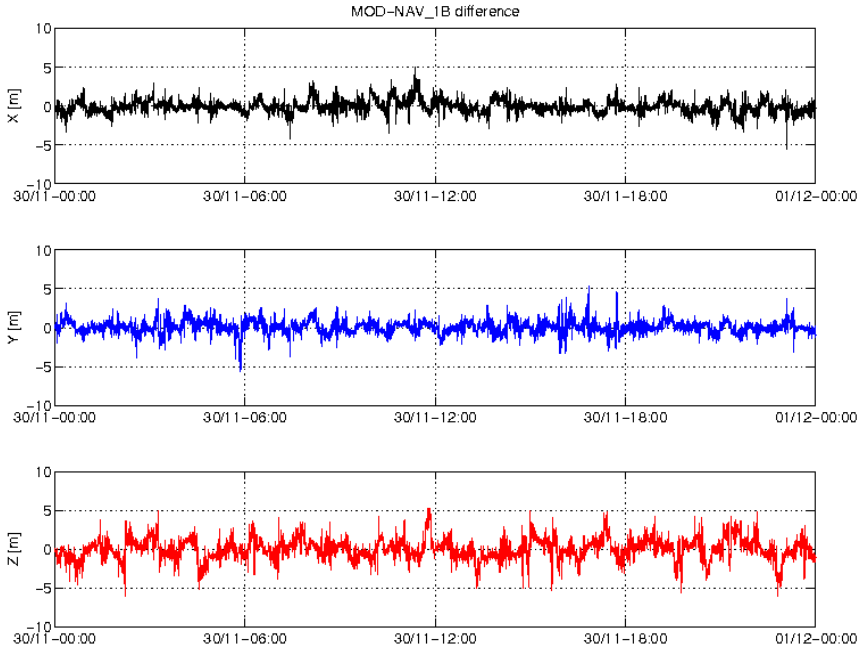

Figure 4: Difference MOD-GPSNAV, S/C B, 30/11. From top to bottom: X, Y and Z-axis

3.2.1.3 Swarm C

Below is presented plot of MOD-NAV differences for S/C C, taken at the beginning of the week (30/11, Figure 5). From top to bottom, the plots show of MOD-NAV differences in ITFR reference frame: on X, Y and Z-axis respectively. The difference between both solutions is given in [m].

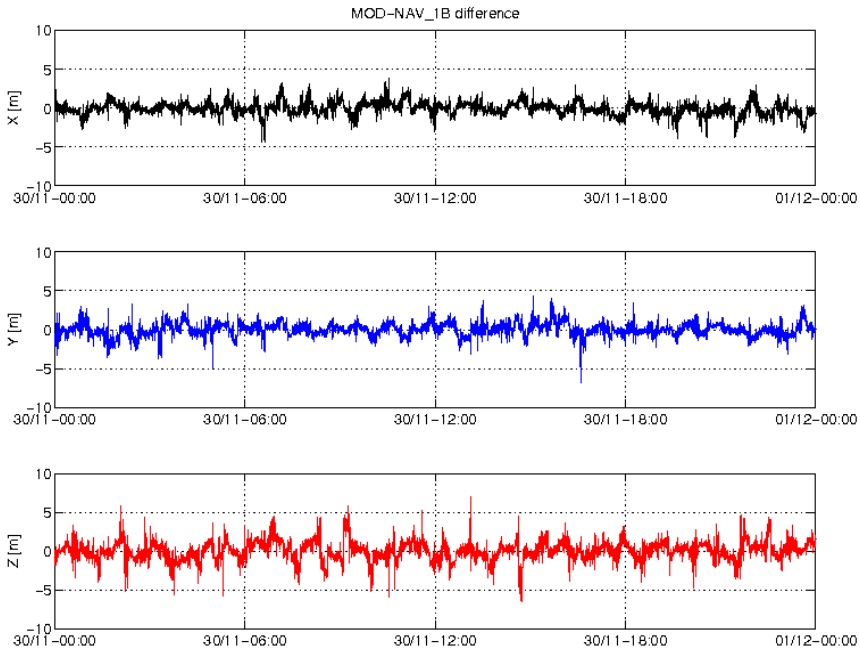

Figure 5: Difference MOD-GPSNAV, S/C C, 30/11. From top to bottom: X, Y and Z-axis

3.2.2 Attitude observations

3.2.2.1 Swarm A

Nothing to report.

3.2.2.2 Swarm B

ORBATT failure on 04/12

3.2.2.3 Swarm C

Nothing to report.

3.3 Magnetic Products

For the magnetic products, the weekly monitoring consists in:

- ASM instrument monitoring: quartz frequency and ASM temperature
- VFM instrument monitoring: temperatures
- 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 ASM-VFM known anomaly: visual inspection of $|B_{VFM}|$ - F taken from MAGx_CA_1B products and recording of daily maximum variations and standard deviations. If +/- 1 nT are exceed on a given day, an alert is raised.
- Comparison of magnetic data (B_{NEC}) with a model (Chaos4plus)

3.3.1 Magnetic Products overview

In Table 3 are listed events that have to be reported.

Table 3 List of events related to magnetic products to be reported in the monitoring for 2015, Week 49: 30/11 - 06/12.

Observation ID	Description	Affected parameter	Sect. of Obs. Description	Sect. of Obs. Analysis
SW-IDEAS-63	OBS_ROUTINE: MAGx_CA_1B gaps	MAGx_CA_1B	3.1	NA

3.3.2 VFM-ASM anomaly

General observation: on S/C A starting from 04/12, the residuals become very high, finally exceeding the 1nT threshold on 06/12. On S/C B the maximum residuals value was very close to threshold value on 01/12 and 02/12. For more details please see Section 4.

3.3.2.1 ASM-VFM difference statistics

In Table 4, one can see the statistics of the differences between magnetic field absolute value measured by ASM and by VFM. In the second and third column are reported the maximum differences, maximum negative and maximum positive respectively. The maximum standard deviation is in the fourth column.

The ASM-VFM difference is defined as follow:

$dF = |B_{VFM}| - F_{ASM}$

Figure 6 and Figure 7 shows the daily mean (circles) and standard deviation (crosses) of dF for Swarm A and Swarm B respectively.

Table 4 Swarm A and B, difference between magnetic field absolute value measured by ASM and by VFM.

Swarm A, 30/11 - 06/12, ASM-VFM difference					
Day	**Max (nT)**	**Min (nT)**	**Standard deviation (nT)**	**Mean (nT)**	**Notes**
30/11	0.6	-0.47	0.21	0.063	
01/12	0.64	-0.5	0.22	0.075	
02/12	0.85	-0.59	0.27	0.086	
03/12	0.9	-0.55	0.28	0.107	
04/12	0.98	-0.68	0.29	0.115	
05/12	1	-0.68	0.3	0.114	Threshold violation
06/12	1.01	-0.78	0.29	0.093	Threshold violation
Swarm B, 30/11 - 06/12, ASM-VFM difference					
Day	**Max (nT)**	**Min (nT)**	**Standard deviation (nT)**	**Mean (nT)**	**Notes**
30/11	0.75	-0.8	0.28	0.021	
01/12	0.83	-0.94	0.31	0.004	
02/12	0.7	-0.93	0.28	0.004	
03/12	0.65	-0.75	0.27	0.001	
04/12	Data not available	Data not available	Data not available	Data not available	ORBATT failure
05/12	0.56	-0.73	0.22	-0.018	
06/12	0.59	-0.72	0.21	-0.033	

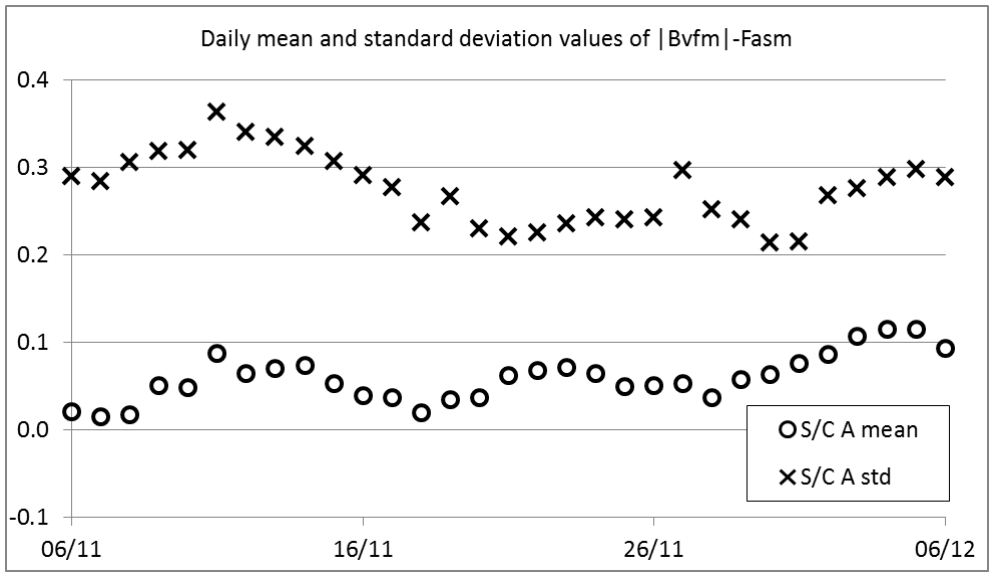

Figure 6: Daily mean and standard deviation values of ASM-VFM residuals (defined as $dF=|B_{VFM}|-F_{ASM}$) for S/C A.

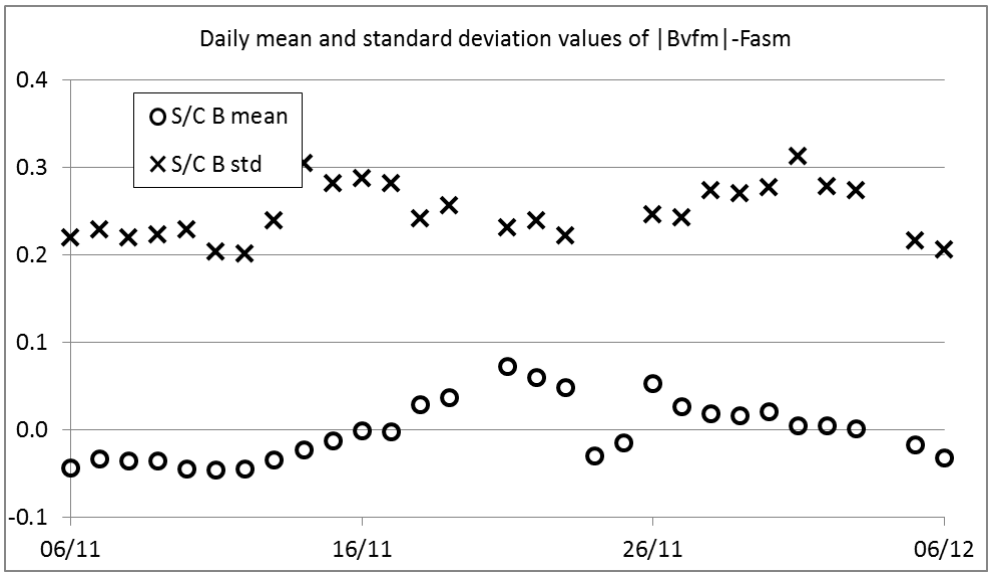

Figure 7: Daily mean and standard deviation values of ASM-VFM residuals (defined as $dF=|B_{VFM}|-F_{ASM}$) for S/C B.

3.3.2.2 Swarm A

The daily peak-to-peak difference around the week stays within [-0.8, 1] nT. Below two example plots of such differences for the days: 30/11 (Figure 8), and 06/12 (Figure 9).

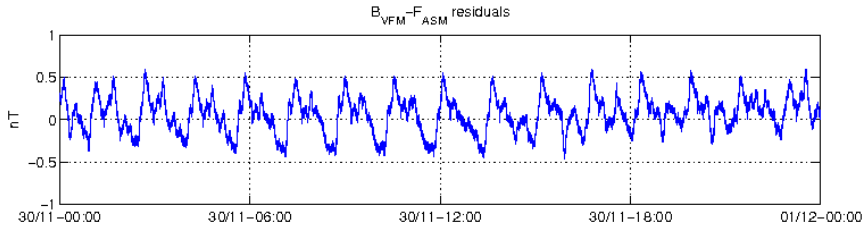

Figure 8: ASM-VFM residuals for S/C A, 30/11.

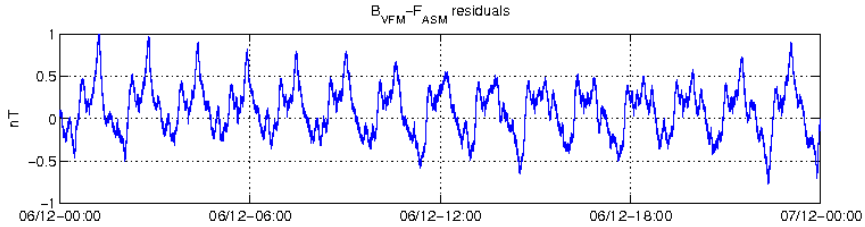

Figure 9: ASM-VFM residuals for S/C A, 06/12.

3.3.2.3 Swarm B

The daily peak-to-peak difference around the week is, on average: [-0.95, 0.85] nT. Below two example plots follows of such differences: 30/11 (Figure 10), and 06/12 (Figure 11).

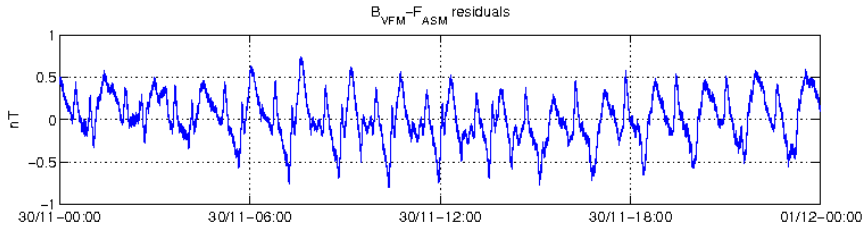

Figure 10: ASM-VFM residuals for S/C B, 30/11.

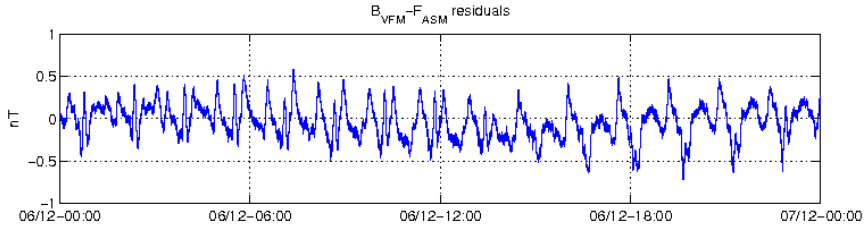

Figure 11: ASM-VFM residuals for S/C B, 06/12.

3.3.2.4 Swarm C

No data because ASM is switched off.

3.3.3 ASM Instrument parameters: quartz frequency and ASM temperature (ASMAVEC_0)

For S/C A and B, the temperature and quartz frequency behaved as expected.

3.3.4 VFM Instrument parameters: VFM temperatures (MAG_CA)

The VFM instrument parameters important for monitoring the instrument health are the VFM sensor temperatures: T_CDC, T_CSC and T_EU.

For S/C A, B and C, for reported period, the temperatures behaved as expected.

3.3.5 Magnetic time series visual inspection

3.3.5.1 Swarm A

An example of representative magnetic field time series for S/C A (06/12) can be seen in Figure 12 below.

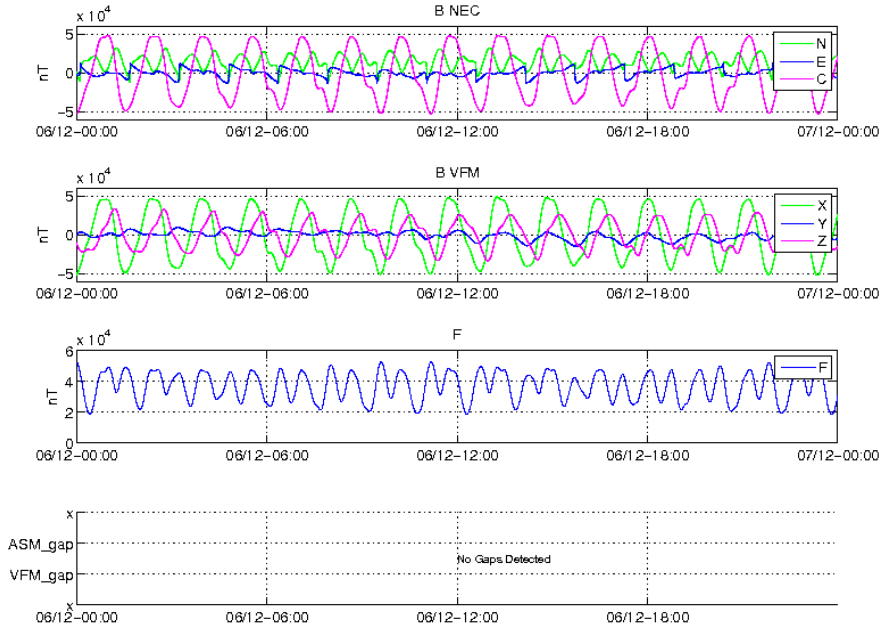

Figure 12: Time series of the geomagnetic field, for 06/12, S/C A. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the VFM reference frame, magnetic field intensity (F) from ASM, and location of gaps (if any).

3.3.5.2 Swarm B

An example of representative magnetic field time series for S/C B (06/12) can be seen in Figure 13 below.

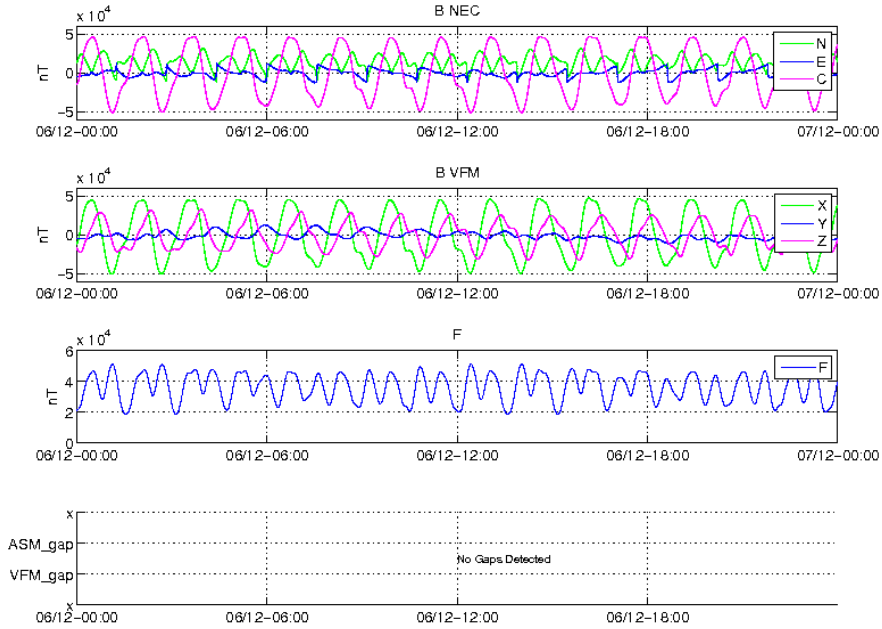

Figure 13: Time series of the geomagnetic field for 06/12, S/C B. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the VFM reference frame, magnetic field intensity (F) from ASM, and location of gaps (if any).

3.3.5.3 Swarm C

An example of magnetic field time series for S/C C (06/12) can be seen in Figure 14.

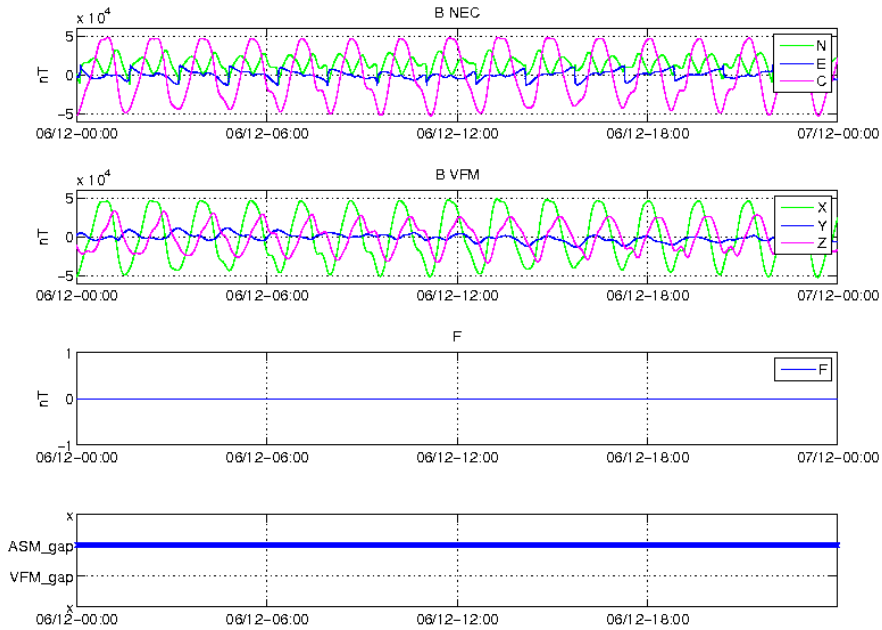

Figure 14: Time series of the geomagnetic field for 06/12, S/C C. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the

VFM reference frame, magnetic field intensity (F) from ASM (no data here because ASM is off) and location of gaps.

3.3.6 B_{NEC} vs Chaos4plus model residuals

Figure 15, Figure 17 and Figure 19 show field residuals $dB=B_{NEC} - B_{Chaos}$ (all versus co-latitude in degrees), from top to bottom: 1) Br, 2) Bθ and 3) Bφ.

As a general feature one can see the field residuals to be steady and usually below 50 nT at low and middle latitudes, up to |55| - |60| degrees; then the residual increases at high latitudes because the Chaos model does not take into account the contribution from the external field ([RD.17]).

Figure 16, Figure 18 and Figure 20 shows, from top to bottom, the time series on 30/11 of: (1-2-3) residuals of B_{NEC}-B_{CHAOS} by components, related to S/C A, B and C respectively.

The component most affected by residual spikes and variations is Bθ, i.e. the component that shows the variations of the field wrt to co-latitude. At high latitudes, the order of magnitude of the variability is about +/- 200 nT.

3.3.6.1 Swarm A

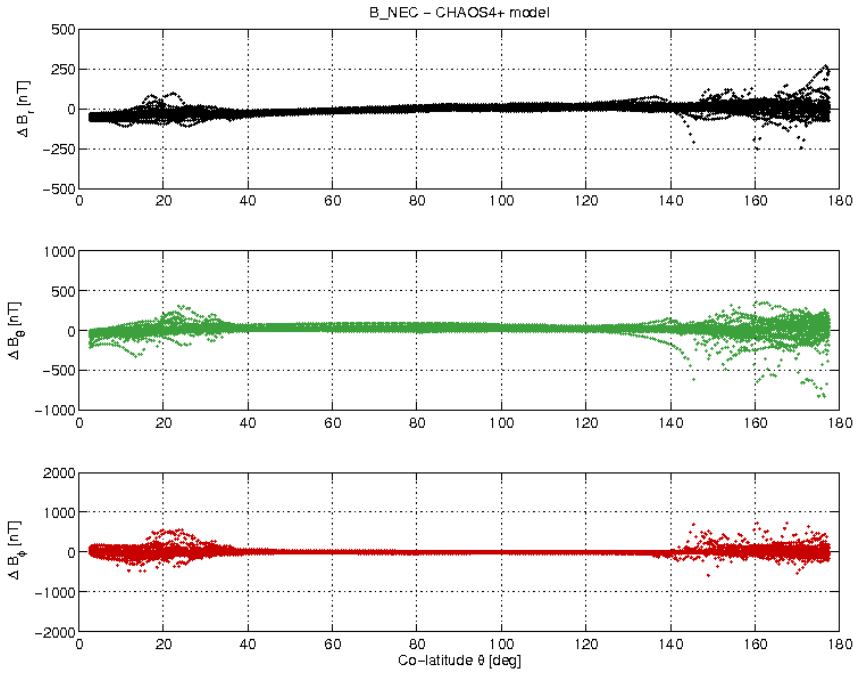

Figure 15: Swarm A day 30/11 B_NEC - B_Chaos vs colatitude.

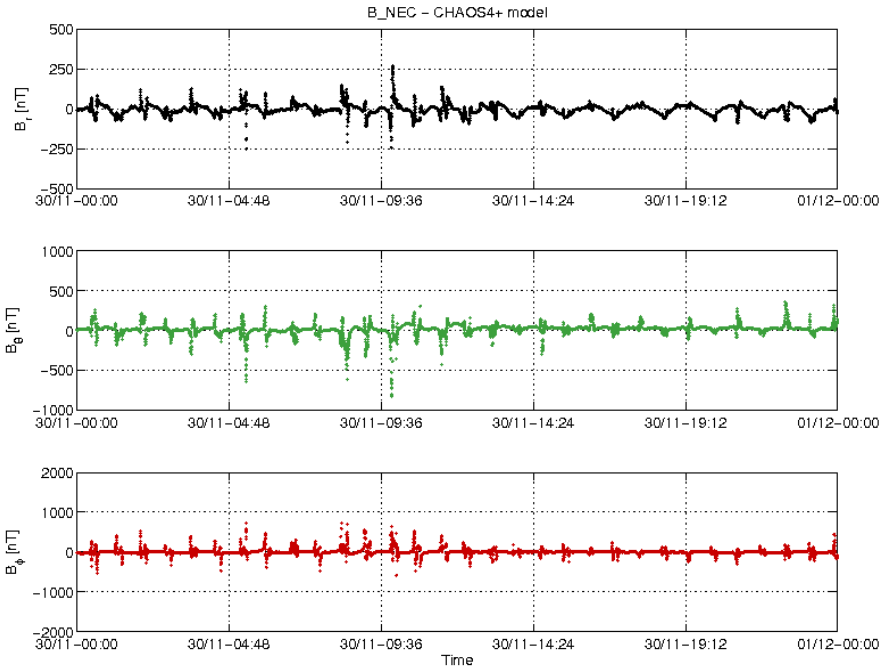

Figure 16: Swarm A day 30/11: time series of B_NEC – B_Chaos residuals.

3.3.6.2 Swarm B

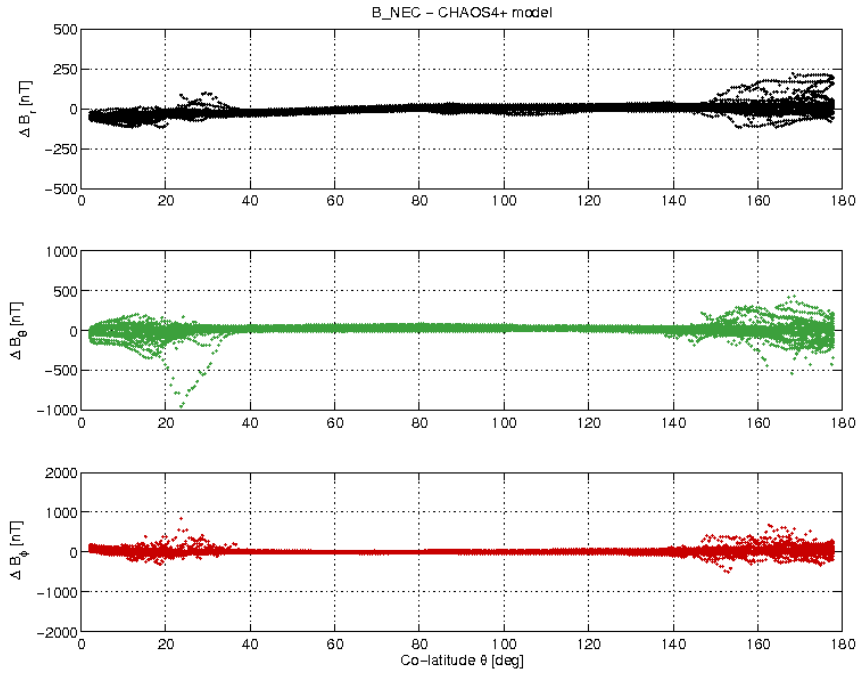

Figure 17: Swarm B day 30/11 B_NEC - B_Chaos difference vs colatitude.

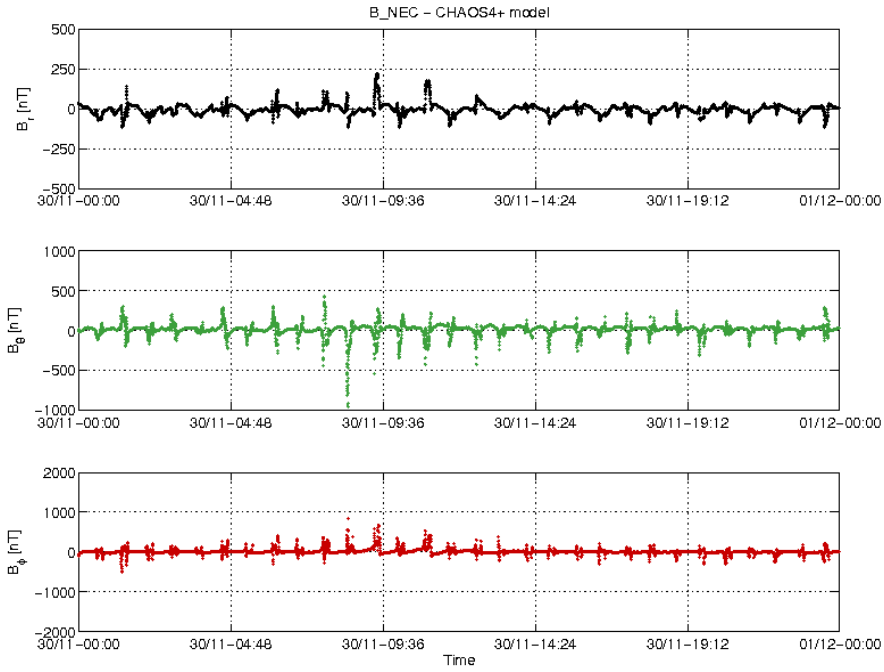

Figure 18: Swarm B day 30/11 time series of B_NEC – B_Chaos residuals.

3.3.6.3 Swarm C

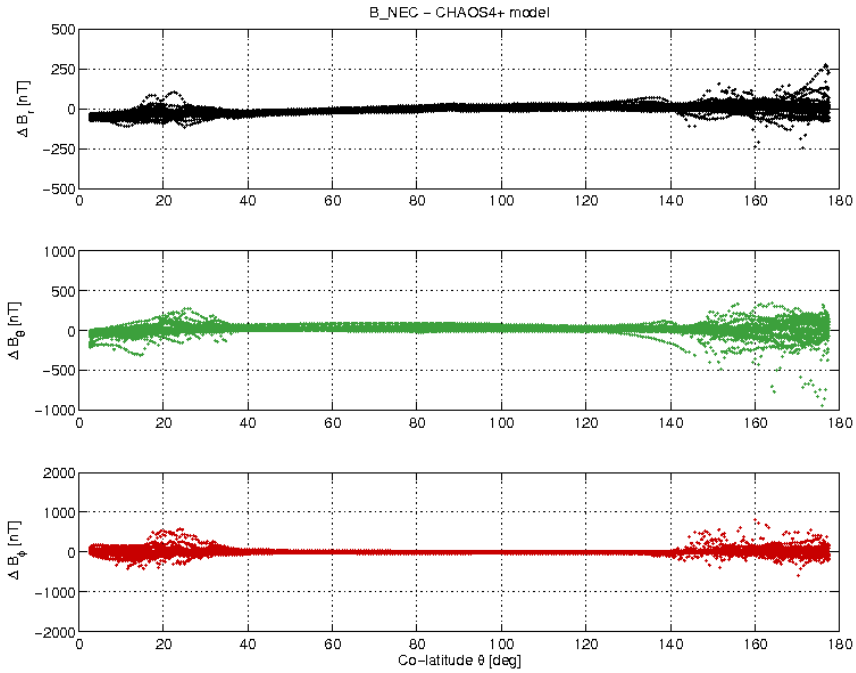

Figure 19: Swarm C day 30/11 B_NEC - B_Chaos difference vs colatitude.

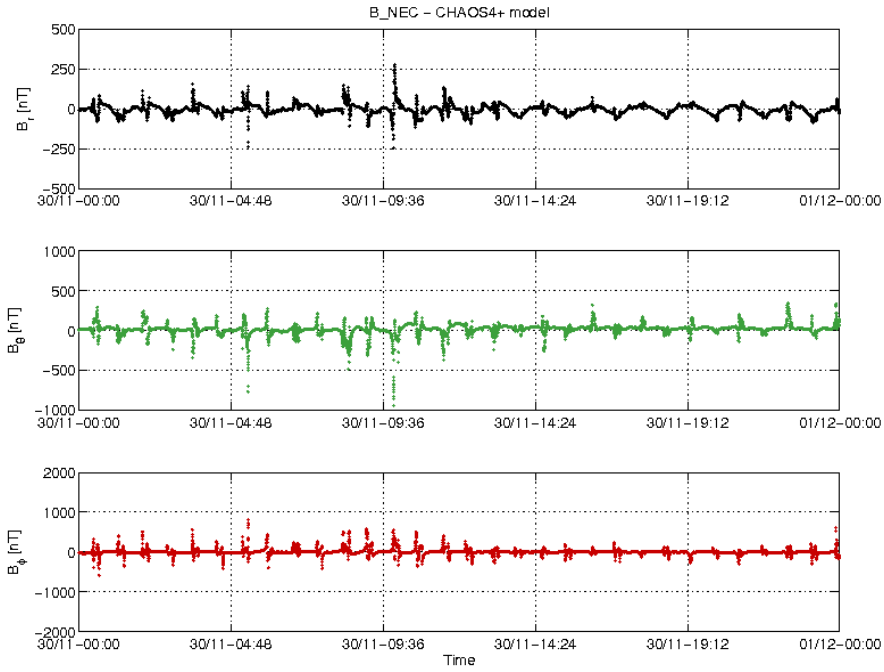

Figure 20: Swarm C day 30/11 time series of B_NEC – B_Chaos residuals.

4. ON-DEMAND ANALYSIS

4.1 Residuals B_{VFM}-F on SC A and B

During week 49 (from 30/11 to 06/12), the ASM-VFM residuals have exceeded the threshold i.e., +/-1nT on S/C A, and almost reached this threshold on S/C B. As can be seen in Figure 21 (S/C A) and Figure 24 (S/C B) these residuals are highly correlated with alpha (Azimuth) sun incident angle w.r.t spacecraft. This strong correlation of residuals and alpha angle means that an update of dB_Sun correction is needed, as confirmed by the ESLs (see also [RD.19]).

A clear correlation has been seen also between the high value of residuals and the local time as presented in Figure 22 (S/C A) and Figure 25 (S/C B). The sun disturbance model (dB_Sun) is clearly underperforming at down/dusk orbit as can be seen in Figure 23, where are shown the differences between F_{VFM} and F_{ASM} as function of LT for the day 06/12.

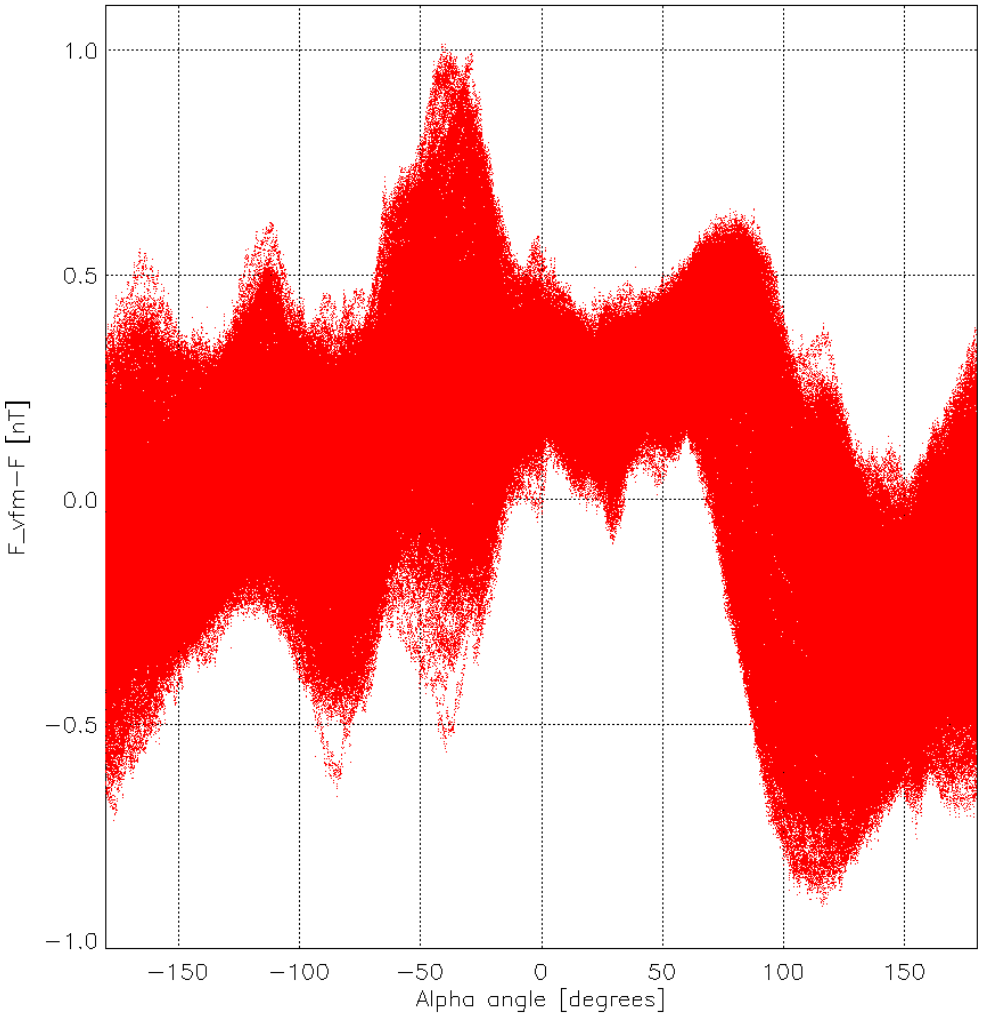

Figure 21: S/C A: Difference between F_{VFM} and F_{ASM} as function of alpha sun angle. The plot is based on one month of data [07/11-06/12].

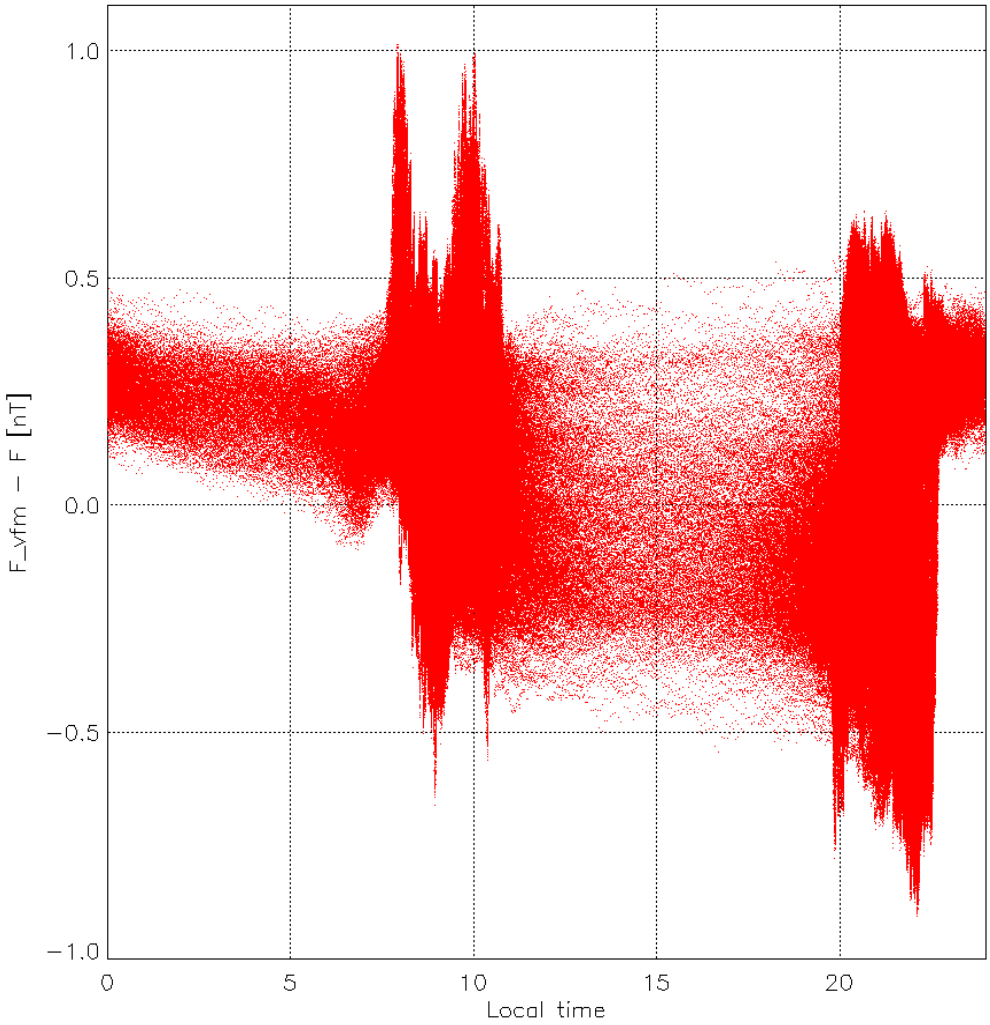

Figure 22: S/C A: Difference between F_{VFM} and F_{ASM} as function of local time. The plot is based on one month data [07/11-06/12].

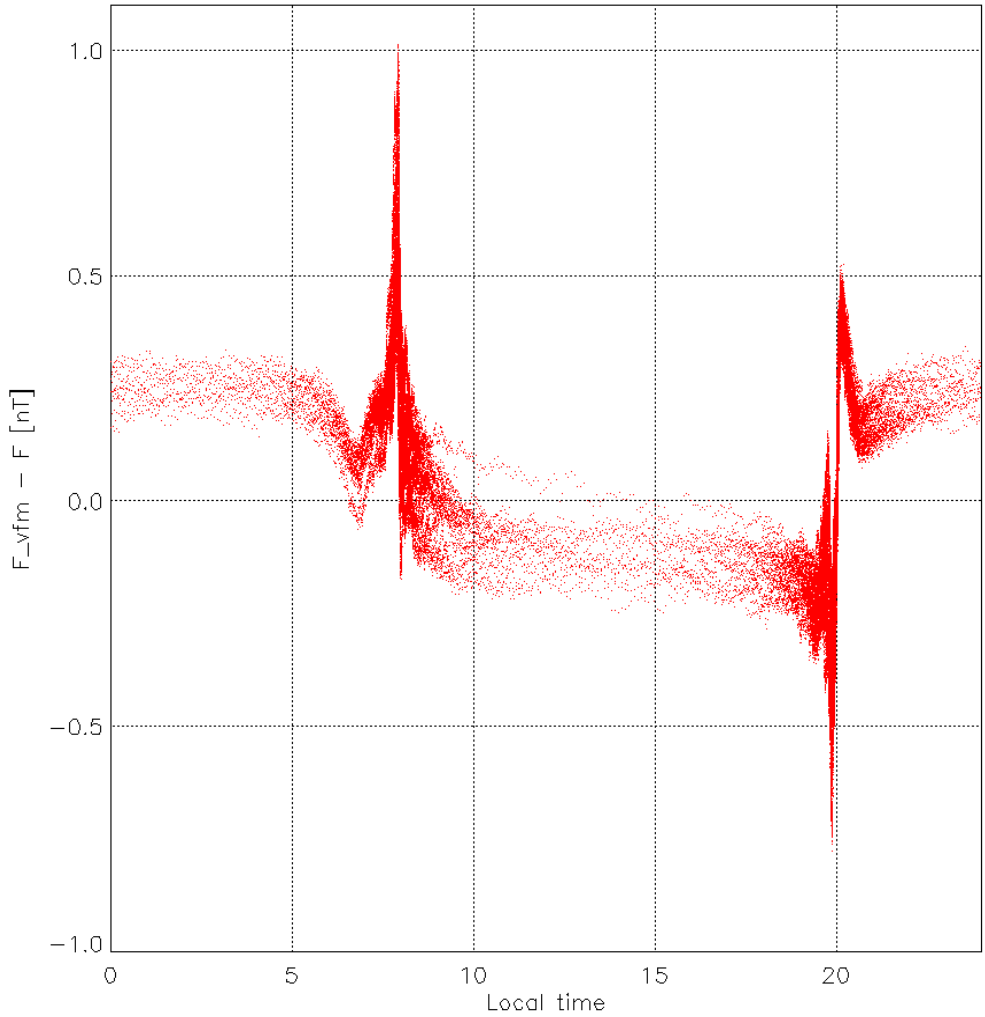

Figure 23: S/C A: Difference between F_{VFM} and F_{ASM} as function of local time. The plot is based on one day data 06/12.

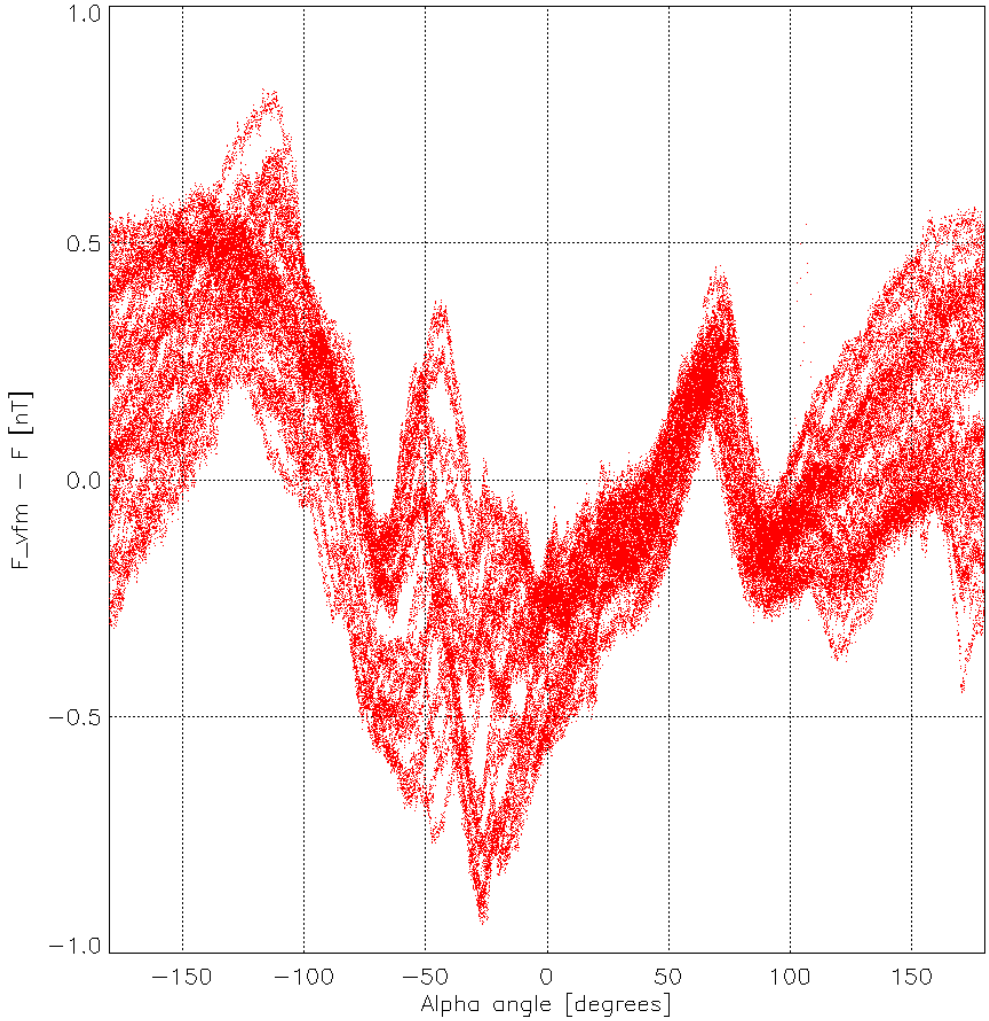

Figure 24: S/C B: Difference between F_{VFM} and F_{ASM} as function of Alpha sun angle. The plot is based on two days data 01/12 and 02/12.

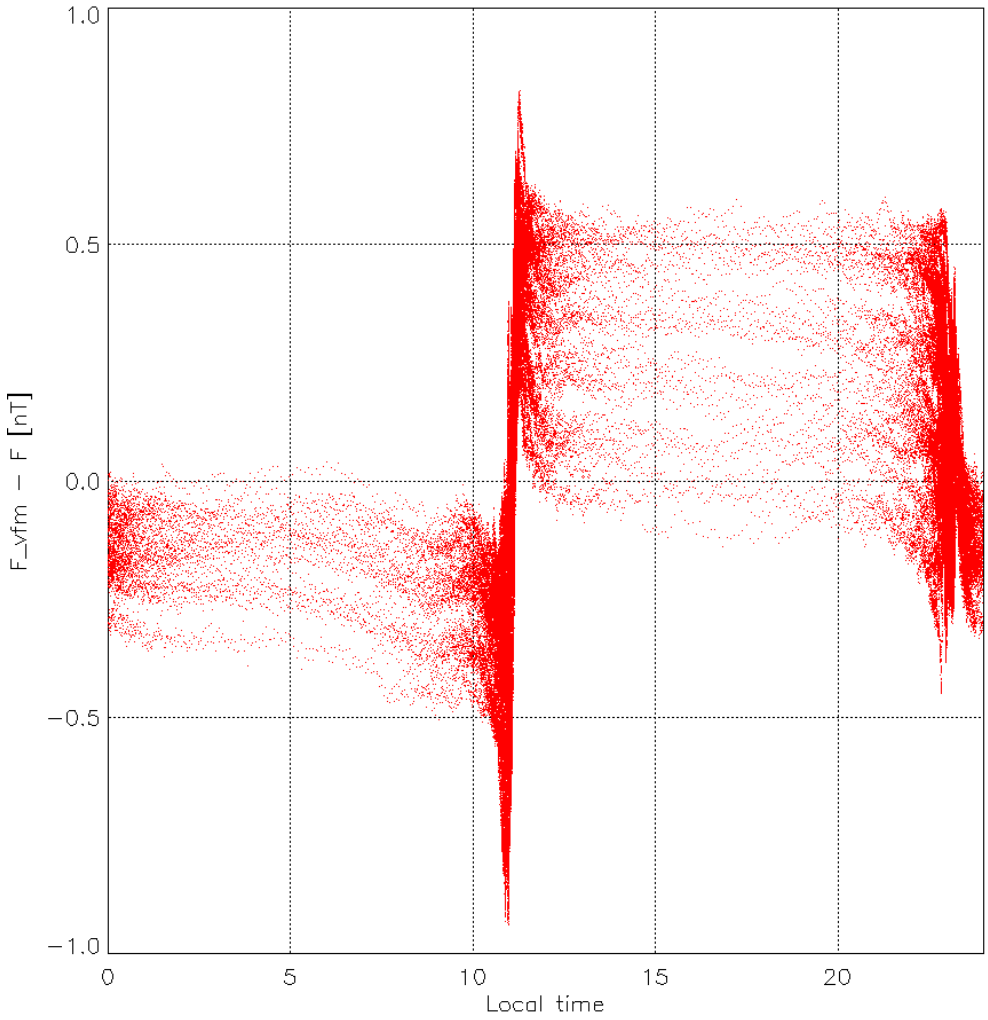

Figure 25: S/C B: Difference between F_{VFM} and F_{ASM} as function of local time. The plot is based on two days data 01/12 and 02/12.

End of Document