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IDEAS+ Swarm Weekly Report : 03/11/2014 – 09/11/2014

Abstract : This is the **Instrument Data quality Evaluation and Analysis Service Plus** (IDEAS+) Swarm Weekly report on Swarm products quality, covering the period from 03 to 09 November, 2014.

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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	13 Nov 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:

- Processors Version: L1BOP 3.11p3, L2-Cat2 1.12
- 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_20141027_MoM

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

[RD.9] IDEAS+ Swarm Weekly Report: 06/10/2014 – 12/10/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20141006_20141012.pdf

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

[RD.11] IDEAS+ Swarm Weekly Report: 20/10/2014 – 26/10/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20141020_20141026.pdf

[RD.12] IDEAS+ Swarm Weekly Report: 22/09/2014 – 28/09/2014, IDEAS+-SER-OQC-REP-2071_SPPA_SwarmWeeklyReport_20140922_20140928.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:

The Absolute Scalar Magnetometer on Swarm C, on 05/11/2014 at about 19:37 was switched off by the Failure Detection and Identification Recovery (FDIR) system due to a suspect current value in the instrument telemetry. The anomaly is currently object of in-depth study and the instrument will remain off until further notice.

Still few GPS out-of-sync events are observed, with the same characteristics of the ones already reported in the past weeks.

The burn-in procedure applied to TII on S/C C starts to be fruitful: the gain map on the horizontal sensor is flattening pretty well, on the vertical sensor more scrubbing cycles may be needed. After a final burn-in on the MCP side, we will monitor the behaviour of TII images on C for few days before to go on with the scrubbing on the phosphors.

2.2 Plan for operational processor updates

Nothing to report from the past week.

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 45 (03-09/11/2014)

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

1. **Strange features observed again in the MOD-GPSNAV solution difference:** again we often notice a marked “spiky” behaviour, with deviations from the average which are not normal spikes but lasts for several seconds if not minutes (**SW-IDEAS-34**, [RD.10]); at times, the NAV-MOD difference takes an oscillatory behaviour accompanied by an apparent loss of GPS clock calculation (**SW-IDEAS-36**, [RD.9])

2. **17 cases of GPS loss of sync occurred during the week.** The phenomenon involves mainly S/C A and C, but also one occurrence in S/C B is reported the 5st November. This causes rejection of the corresponding Level 0 packets in the Level 1B processing and consequent data gaps in STR and magnetic products (**SW-IDEAS-40**, [RD.11]).

3. **ASM-VFM residuals superimposed noise** observed throughout the week (**SW-IDEAS-27**).

4. **Magnetic production lost on S/C C from 6/11 on**, because of the ASM switch off mentioned above.

3. ROUTINE QUALITY CONTROL

3.1 Gaps analysis

SW-IDEAS-40:

The GPS sync losses already mentioned in Sect. 2.4 affect all the Level 0 products. The Sync Status is = 32 for all the intervals specified in Sect. 3.2.1.2 and 3.2.3.2, also for the ASMxVEC_0_ and VFMxNOM_0_ product types of Swarm A and C affected by such sync loss, and this causes the corresponding records to be rejected and not processed further.

In the MAGx_HR_1B product types a gap is left corresponding to the a GPS sync loss interval, while in the MAGx_LR_1B product types, in the same intervals, all the magnetic values are set to exactly zero (but properly flagged as not good).

ASM switch-off on Swarm C. This causes the following effects on the data production:

- *Day 05/11:* all the magnetic products are regularly produced, as ASM raw data are available until 19:37 UT. MAGC_CA_1B covers until the ASM switch off, then it has a data gap until the end of the day; MAGC_LR_1B covers the full 24 hours but from 19:37 on data records are padded with zeros; the other magnetic products come up nominally.

- *From Day 06/11 on:* MAGNET processor fails for Swarm C because of the lack of ASM raw inputs, and no Level 1B magnetic data is produced.

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-34	OBS_ROUTINE: large number of spiky features observed in the NAV-MOD difference	Orbits (position and velocity)	3.2.1.1	[RD.10]
SW-IDEAS-36	OBS_ROUTINE: deviations of MOD-NAV solution apparently correlated with GPS clock deterioration	Orbits (position and velocity)	3.2.2.1	[RD.9]
SW-IDEAS-40	OBS_ROUTINE: STR out of range - ANOMALOUS	STRCATT_1B STRCSCI_1A	3.2.1.2, 3.2.2.2 3.2.3.2	[RD.11]

	CASES			

Table 1: list of events related to attitude and orbit products to be reported in the monitoring for Week 45: 03 - 09/11/2014

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:
    - 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 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 maximum standard deviation is in the fourth column: it usually refers to the Z component which is always the most disturbed; in case another component is most affected, it will be specified in parentheses.

Swarm A, 03-09/11/2014, Position difference				
Day	**Average Difference (m)**	**Maximum difference (m)**	**Standard deviation (m)**	**Notes**
03/11	0.1	-15.6, 10 (X)	1.7	SW-IDEAS-34 [RD.10]
04/11	0.02	-9, 7 (Z)	1.5	
05/11	0.07	-10 (Z), 17 (X)	1.7	SW-IDEAS-34 [RD.10]
06/11	0.11	-15 (Y), 16 (X)	1.4	Big spikes corresponding to GPS sync loss events
07/11	0.14	+/- 8 (Z)	1.3	SW-IDEAS-36 [RD.9]

Swarm A, 03-09/11/2014, Position difference				
08/11	0.12	-8.7 (Z), 14 (X)	1.7	SW-IDEAS-36 [RD.9]
09/11	0.16	+/- 9 (Z)	1.5	SW-IDEAS-34 [RD.10]

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 (03/11, Figure 1), in the middle (06/11, Figure 2) and at the end (09/11, Figure 3). From top to bottom the plots show: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two. The values are given in Km.

The red circled area in Figure 1 evidences an interval affected by **SW-IDEAS-34** anomaly ([RD.10]): "spiky" features are seen which lasts several minutes.

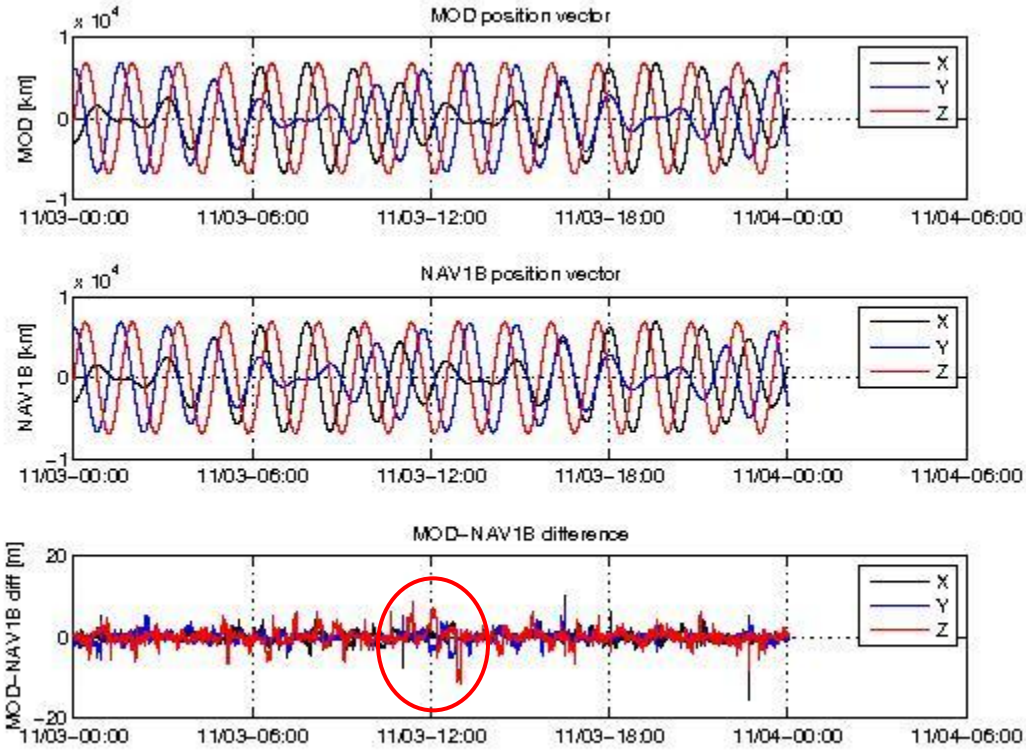

Figure 1: Difference MOD-GPSNAV, sc A, 03/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two. The red circled area marks the occurrence of **SW-IDEAS-34** [RD.10] events.

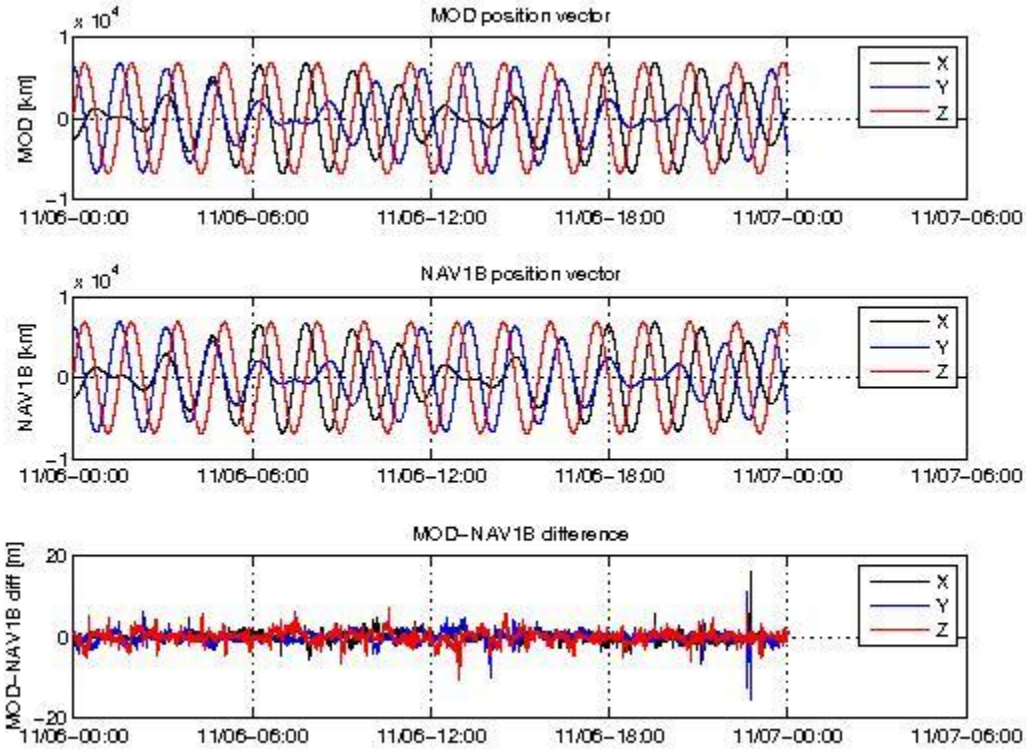

Figure 2: Difference MOD-GPSNAV, sc A, 06/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

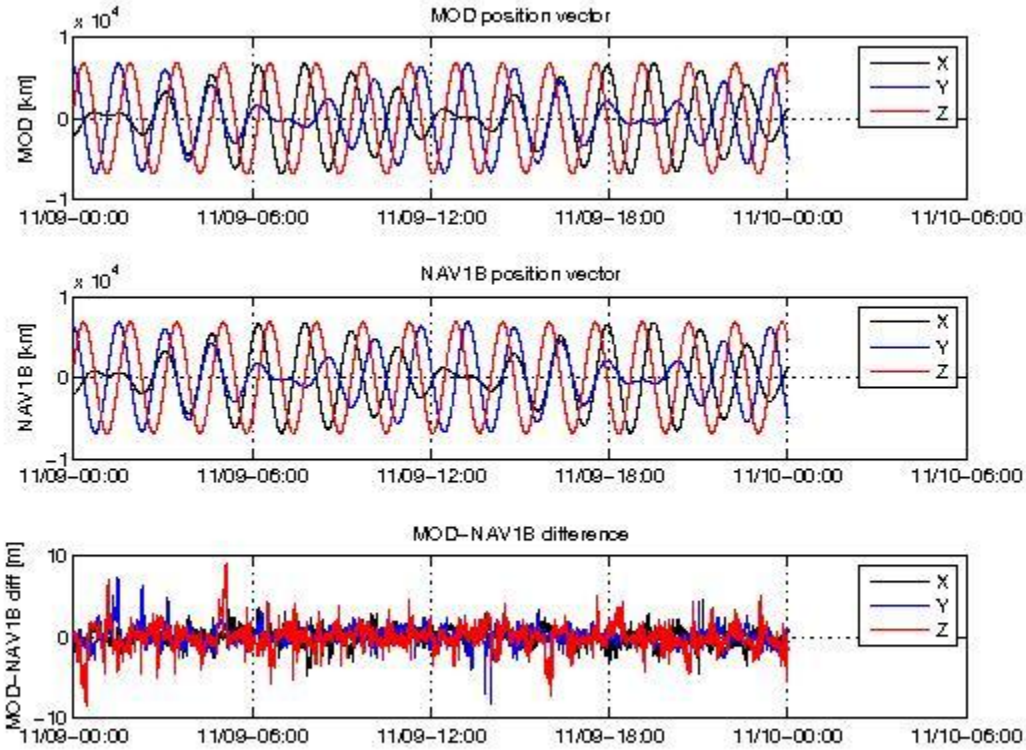

Figure 3: Difference MOD-GPSNAV, sc A, 09/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

3.2.1.2 Attitude observations

- **SW-IDEAS-40**

  During week 45 several GPS out-of-Sync were detected. As explained in [RD.11], this affects the STR data, causing rejection of packets in the Level 1A products and filling gaps with zero quaternions and Flags_q = 255 in the Level 1B products. In Table 3 below, the list of such events for S/C A is given.

Start Out-of-range	Stop Out-of-range	Duration (s)
03NOV2014 21:10:01	03NOV2014 21:12:08	67
05NOV2014 21:41:02	05NOV2014 21:41:38	36
06NOV2014 21:08:09	06NOV2014 21:08:38	29
06NOV2014 22:44:47	06NOV2014 22:45:38	51
07NOV2014 22:04:32	07NOV2014 22:05:38	66
08NOV2014 21:37:39	08NOV2014 21:38:22	43

Table 3: Attitudes out-of-range due to GPS out-of-sync, S/C A, 03 – 09/11/2014.

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 maximum standard deviation is in the fourth column: it usually refers to the Z component which is always the most disturbed; in case another component is most affected, it will be specified in parentheses.

Swarm B, 03-09/11/2014, Position difference				
Day	**Average Difference (m)**	**Maximum difference (m)**	**Standard Deviation (m)**	**Notes**
03/11	0.07	-11.5 (X), 7 (Z)	1.6	SW-IDEAS-34 [RD.10]
04/11	0.13	-8.4 (Z), 6.4 (X)	1.5	
05/11	0.12	-10.6 (Y), 9 (X)	1.5	Big spike at the end of the day corresp. to a GPS sync loss
06/11	0.08	-12.6, 10.7 (Z)	1.6	
07/11	0.04	+/- 9 (Z)	1.4	
08/11	0.16	-8.5 (Z), 9.4 (X)	1.6	SW-IDEAS-36 [RD.9]
09/11	0.17	-11.6, 12.6 (Z)	1.5	

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 (03/11, Figure 4), in the middle (06/11, Figure 5), and at end of the week (08/11, Figure 6). From top to bottom the plots show: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two. The values are given in Km.

In Figure 6 an area in circled in red evidencing an occurrence of **SW-IDEAS-36** ([RD.9]) anomaly: a quasi-periodic behaviour can be seen in the MOD-NAV solutions difference, especially in the X component, which is associated with several failures in the MOD GPS clock calculation (not shown).

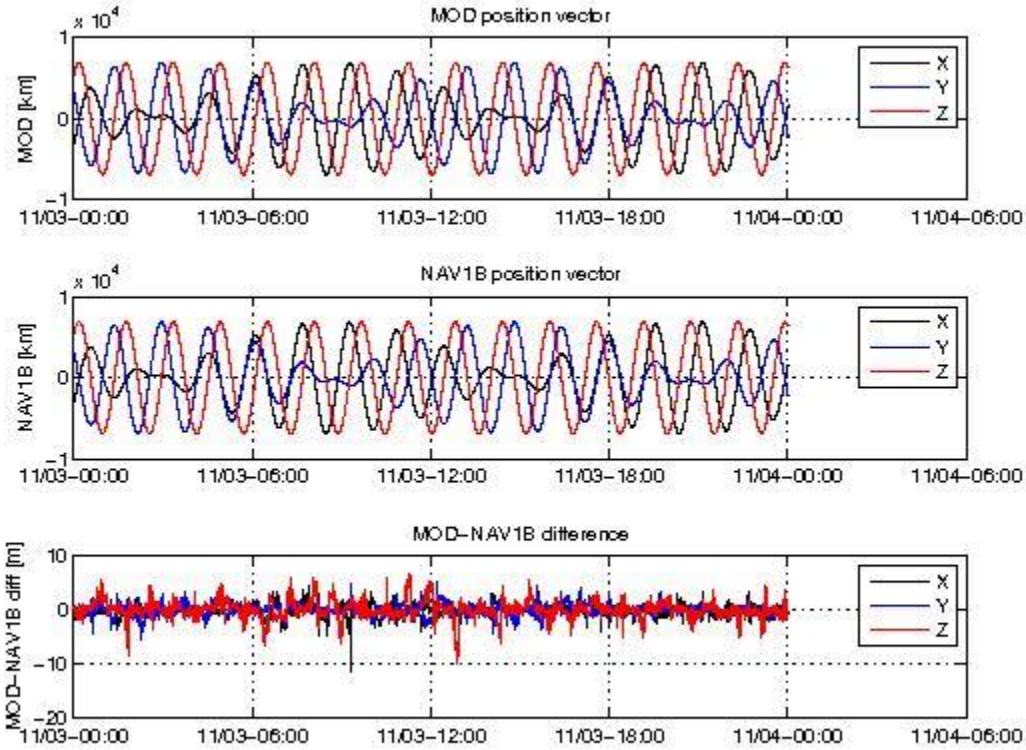

Figure 4: Difference MOD-GPSNAV, sc B, 03/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

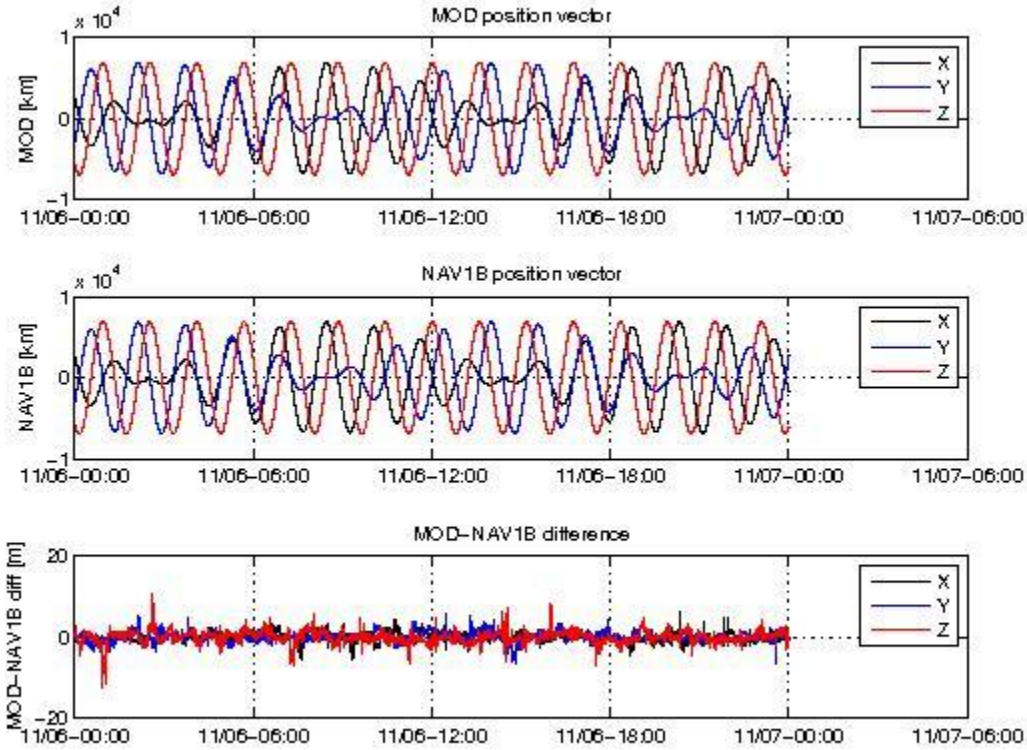

Figure 5: Difference MOD-GPSNAV, sc B, 06/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

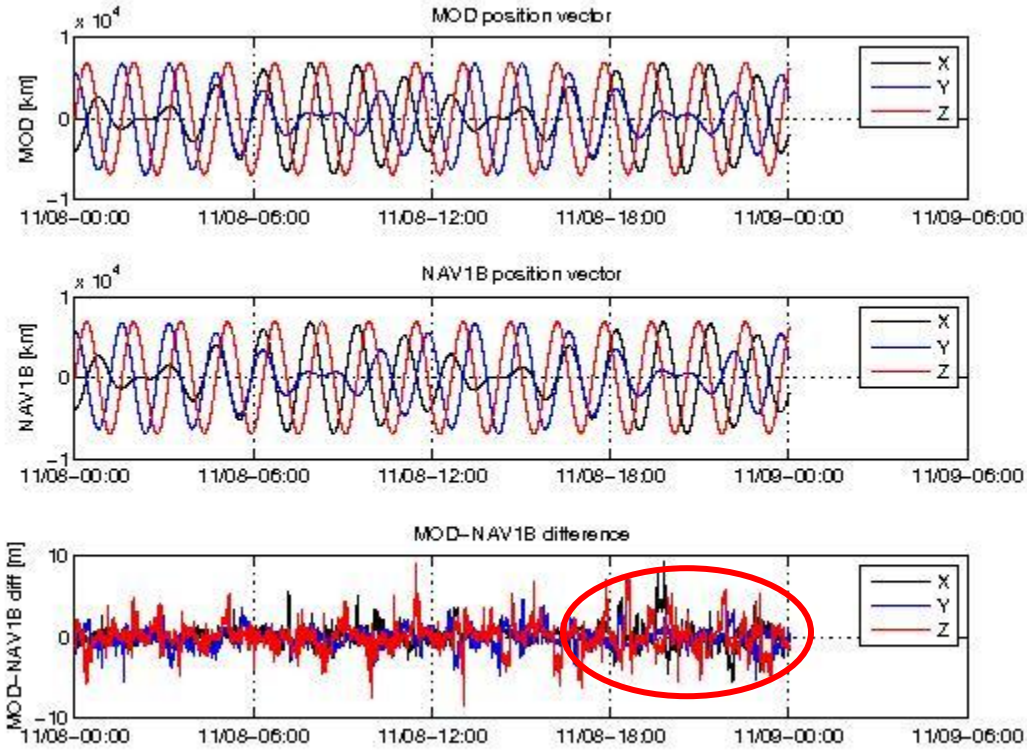

Figure 6: Difference MOD-GPSNAV, sc B, 08/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two. The red circled area highlights an interval when **SW-IDEAS-36** ([RD.9]) anomaly occurs.

3.2.2.2 Attitude observations

- **SW-IDEAS-40**

  During week 45 several GPS out-of-Sync were detected. As explained in [RD.11], this affects the STR data, causing rejection of packets in the Level 1A products and filling gaps with zero quaternions and Flags_q = 255 in the Level 1B products. In Table 5 below, the list of such events for S/C B is given.

Start Out-of-range	Stop Out-of-range	Duration (s)
05NOV2014 23:50:34	05NOV2014 23:50:38	4

Table 5: Attitudes out-of-range due to GPS out-of-sync, S/C B, 03 – 09/11/2014.

3.2.3 Swarm C

3.2.3.1 Position Statistics

In Table 6 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 maximum standard deviation is in the fourth column: it usually refers to the Z component which is always the most disturbed; in case another component is most affected, it will be specified in parentheses.

Swarm C, 03-09/11/2014, Position difference				
Day	**Average Difference (m)**	**Maximum difference (m)**	**Standard Deviation (m)**	**Notes**
03/11	0.13	-15.6 (Y), 8.6 (Z)	1.7	
04/11	0.05	-8.7, 8 (Z)	1.5	
05/11	0.12	-14 (Z), 14 (Y)	1.8	Several spikes above 10 m throughout the day
06/11	0.05	-50 (Y), 40 (X)	1.6 (Y)	Huge spike corresponding to a GPS sync loss
07/11	0.4	-162 (Y), 357 (X)	7.1 (X)	Huge spike corresponding to a GPS sync loss
08/11	0.11	+/- 13 (Y)	1.7	SW-IDEAS-36 [RD.9]
09/11	0.25	+/- 9 (Y, Z)	1.4	SW-IDEAS-34 [RD.10]

Table 6: 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 (03/11, Figure 7), in the middle (05/11, Figure 8) and at the end (09/11, Figure 9). From top to bottom the plots show: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two. The values are given in Km.

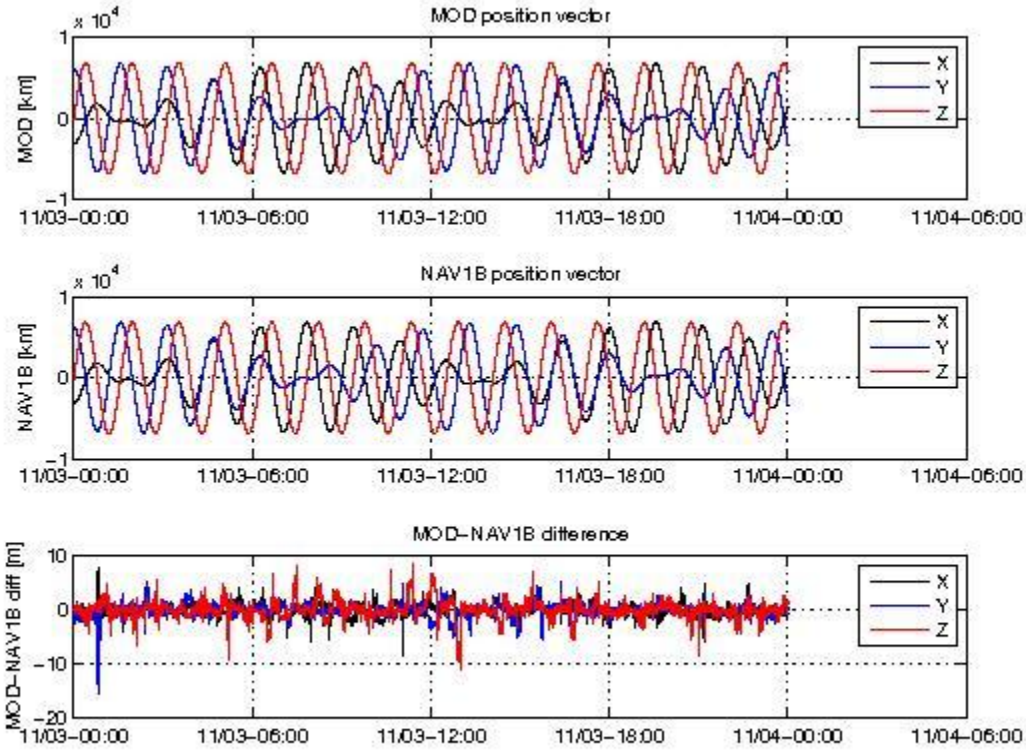

Figure 7: Difference MOD-GPSNAV, sc C, 03/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

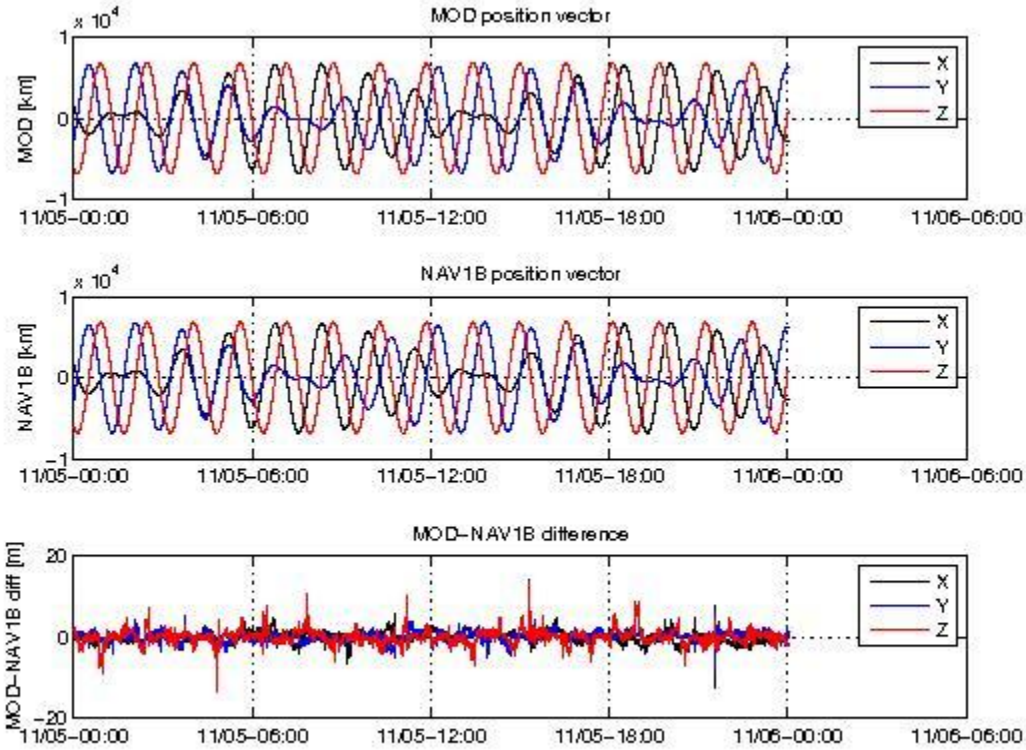

Figure 8: Difference MOD-GPSNAV, sc C, 05/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

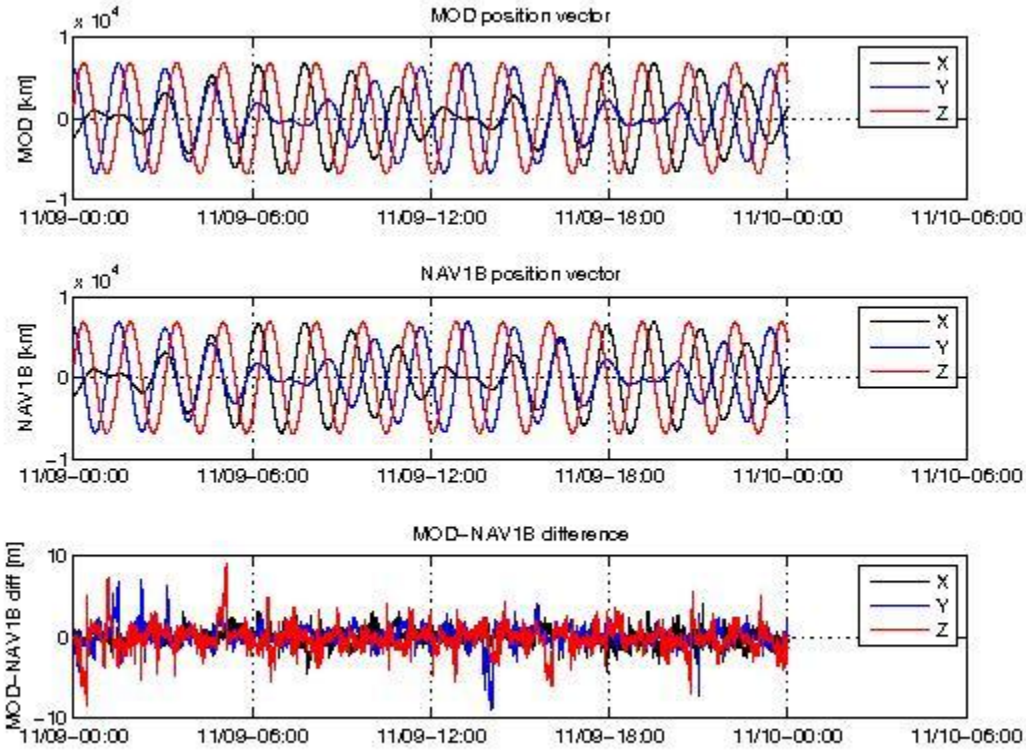

Figure 9: Difference MOD-GPSNAV, sc C, 09/11/2014. From top to bottom: the S/C position determined from the MOD calculation, the S/C position determined on-board, the difference between the two.

3.2.3.2 Attitude observations

- **SW-IDEAS-40**

During week 45 several GPS out-of-Sync were detected. As explained in [RD.11], this affects the STR data, causing rejection of packets in the Level 1A products and filling gaps with zero quaternions and Flags_q = 255 in the Level 1B products. In Table 7 below, the list of such events for S/C C is given.

Start Out-of-range	Stop Out-of-range	Duration (s)
03NOV2014 21:10:36	03NOV2014 21:11:38	62
05NOV2014 21:34:05	05NOV2014 21:34:08	4
06NOV2014 21:01:45	06NOV2014 21:02:08	23
06NOV2014 21:10:25	06NOV2014 21:10:38	13
06NOV2014 22:37:29	06NOV2014 22:38:38	69

06NOV2014 22:44:26	06NOV2014 22:45:38	62
07NOV2014 22:05:19	07NOV2014 22:05:38	20
08NOV2014 21:31:47	08NOV2014 21:32:08	21
08NOV2014 21:39:03	08NOV2014 21:39:38	35
09NOV2014 21:00:19	09NOV2014 21:00:38	20

Table 7: Attitudes out-of-range due to GPS out-of-sync, S/C C, 03 – 09/11/2014.

3.3 Magnetic Products

For the magnetic products the weekly monitoring consists in:

- Visual inspection of daily time series of magnetic field intensity F, $\mathbf{B_{NEC}}$ and $\mathbf{B_{VFM}}$. 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.

- TCF.VFM parameters monitoring (VFM calibration parameters): series of biases, scales, non-orthogonality factors and RMS. **This check is performed on monthly basis.**

SW-IDEAS-27 (monitoring of the anomaly): During week 45 we do observe events of noise increase in the ASM-VFM residuals. The noise level in the spectral region [0.03 – 0.06] Hz often exceeds the average PSD usually observed for more “quiet” days almost every time.

3.3.1 Swarm A

3.3.1.1 Magnetic time series visual inspection

An example of representative magnetic field time series for S/C A can be seen in Figure 10 (09/11/2014).

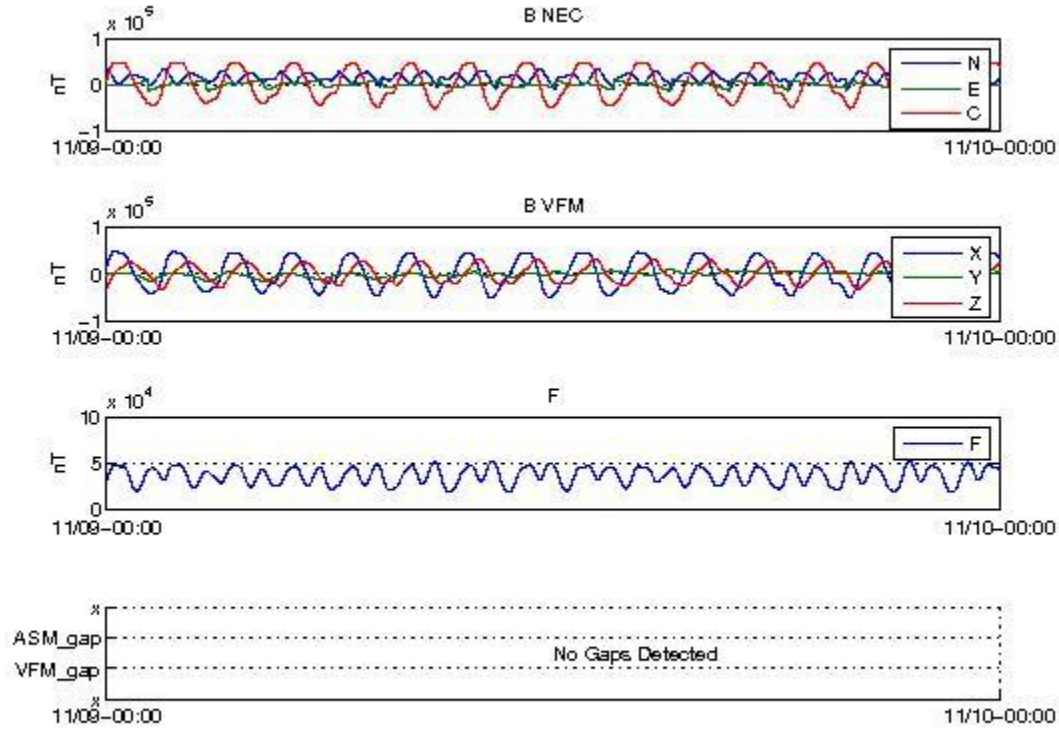

Figure 10: Time series of the geomagnetic field, for 09/11/2014, S/C A. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the VFM reference frame, magnetic field intensity (F) from ASM, and location of gaps (if any).

3.3.1.2 VFM-ASM anomaly

The daily peak-to-peak difference around the week is, on average: [-2.5, 2.5] nT, with occasional spikes up to 12 nT.

Below some plot example of such differences follows, taken at the beginning of the week (03/11, Figure 11) and at the end (09/11, Figure 12). From top to bottom the plots show: The VFM module, the ASM module, the difference ASM-VFM.

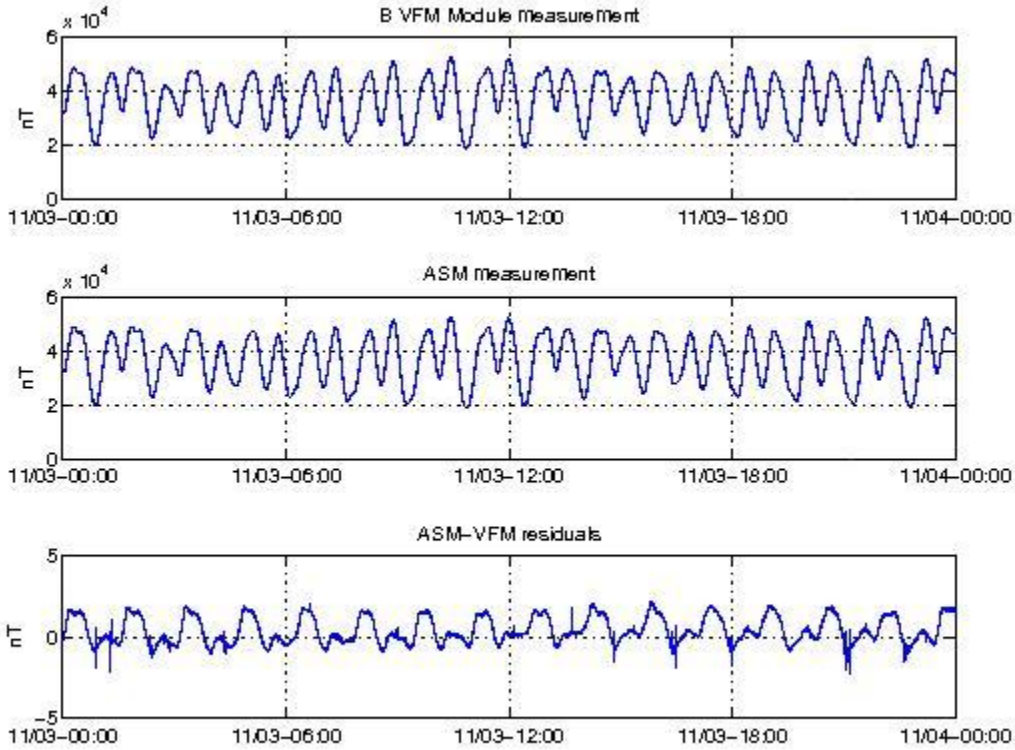

Figure 11: VFM module, ASM module and ASM-VFM residuals for S/C A, 03/11/2014.

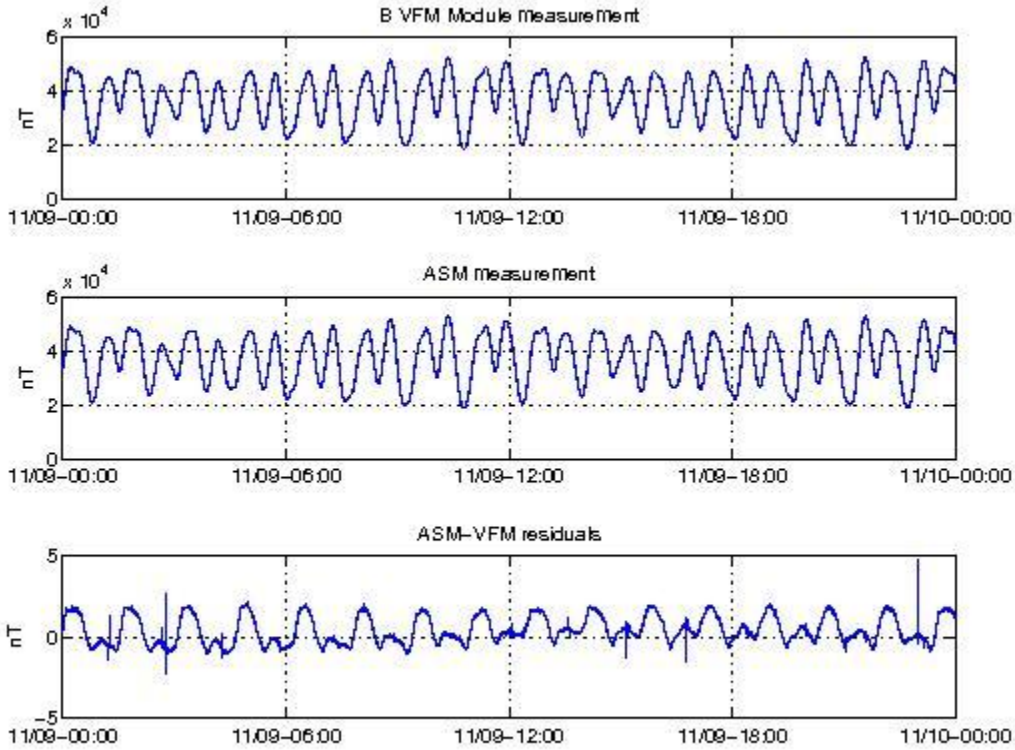

Figure 12: VFM module, ASM module and ASM-VFM residuals for S/C A, 09/11/2014.

3.3.1.3 TCF.VFM monitoring

The TCF.VFM analysis will be included in the last report of the month.

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 (09/11/2014) can be seen in Figure 13 below.

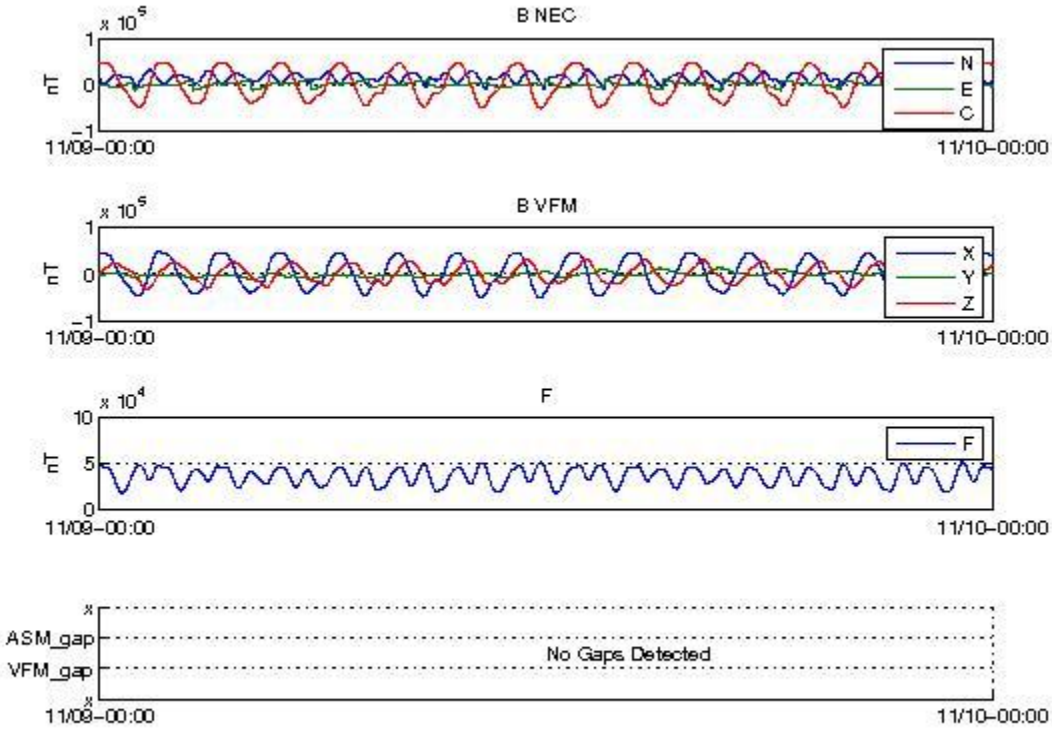

Figure 13: Time series of the geomagnetic field for 09/11/2014, S/C B. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the VFM reference frame, magnetic field intensity (F) from ASM, and location of gaps (if any).

3.3.2.2 VFM-ASM anomaly

The daily peak-to-peak difference around the week is, on average: [-1.8, 1.8] nT, with isolated spikes (gradients) that reaches up to 6 nT.

Below some plot example follows of such differences taken at the beginning of the week (03/11, Figure 14), and at the end of the week (09/11, Figure 15). From top to bottom the plots show: The VFM module, the ASM module, the difference ASM-VFM.

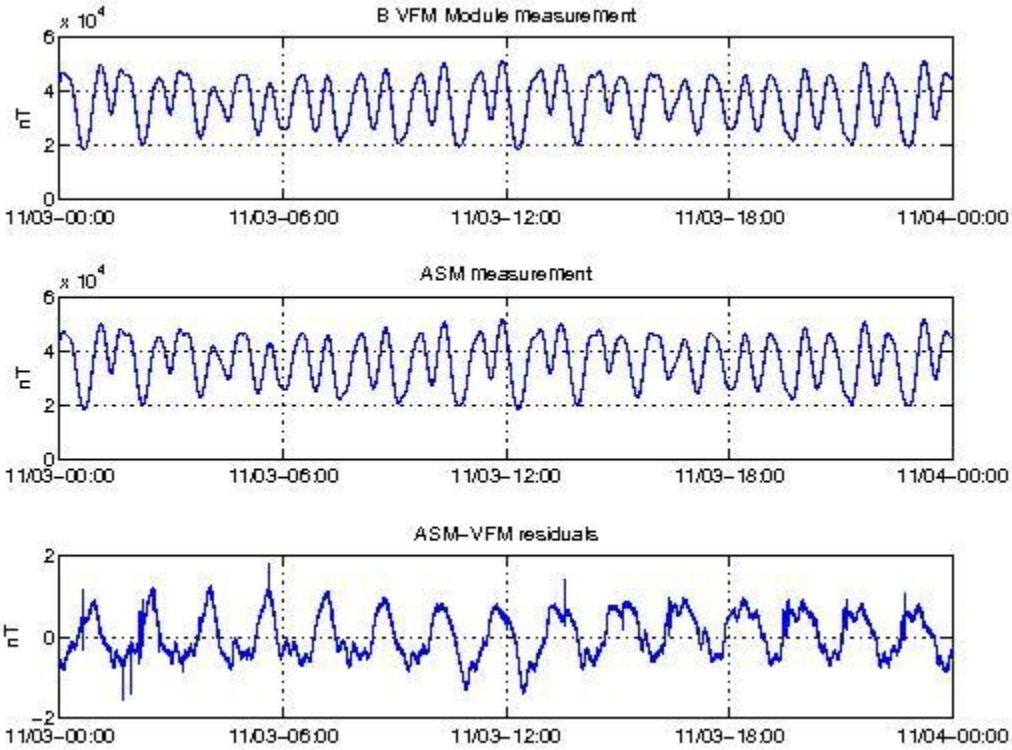

Figure 14: VFM module, ASM module and ASM-VFM residuals for S/C B, 03/11/2014

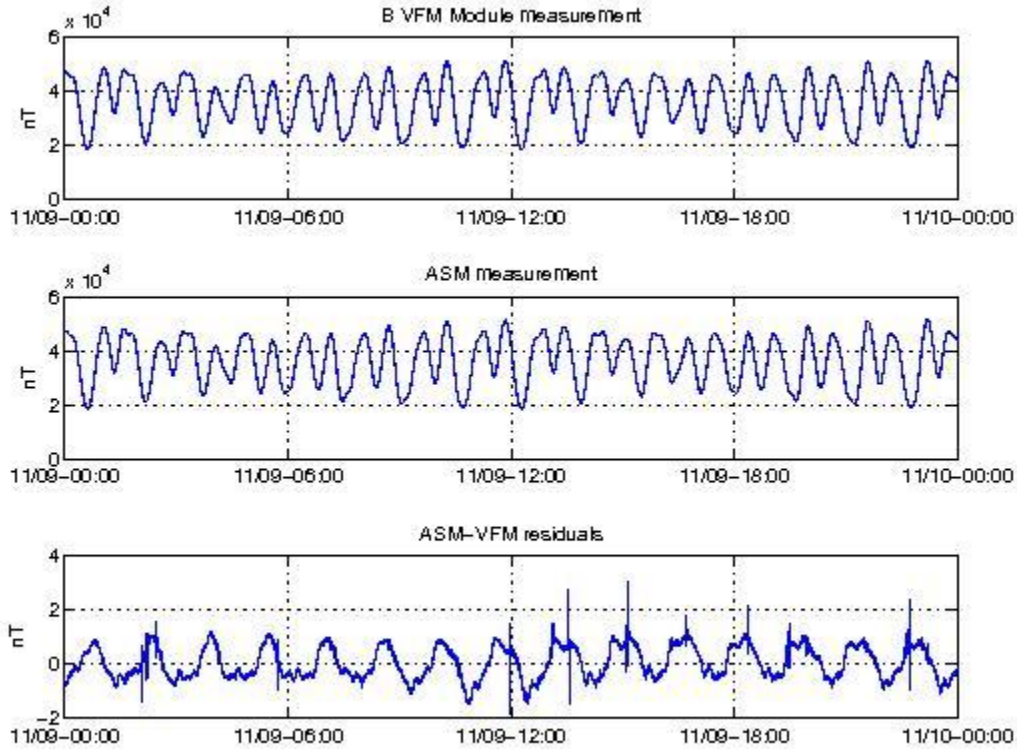

Figure 15: VFM module, ASM module and ASM-VFM residuals for S/C B, 09/11/2014.

3.3.2.3 TCF.VFM monitoring

The TCF.VFM analysis will be included in the last report of the month.

3.3.3 Swarm C

3.3.3.1 Magnetic time series visual inspection

As already stated in Sect. 2.4, an unexpected ASM switch-off occurred on 05/11, causing the MAGNET failure for the following days. The F and B time series for S/C C on 05/11/2014 can be seen in Figure 16 below. The values F fall to zero at the moment of the ASM switch-off (19:37 UT).

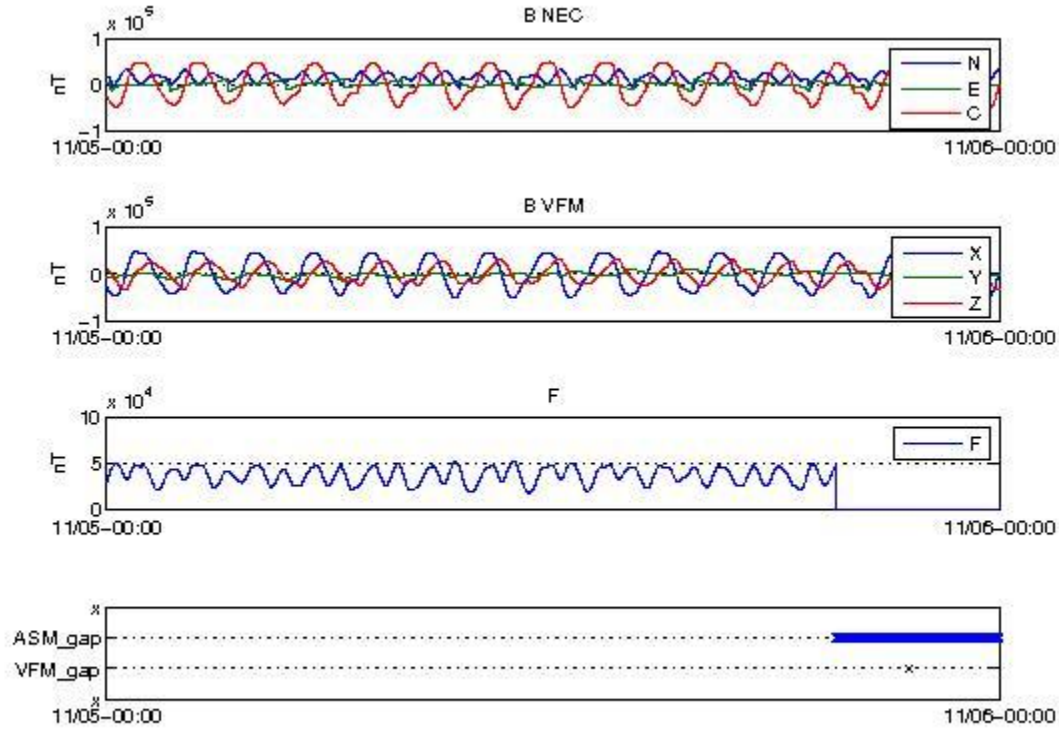

Figure 16: Time series of magnetic field intensity, F, for 05/11/2014, S/C C. From top to bottom: magnetic field components in NEC reference frame, magnetic field components in the VFM reference frame, magnetic field intensity (F) from ASM, and location of gaps.

3.3.3.2 VFM-ASM anomaly

Below an example is shown of the ASM-VFM difference taken at the beginning of the week (04/11, Figure 17), the day before the ASM switch-off. From top to bottom the plots show: The VFM module, the ASM module, the difference ASM-VFM. Spiky features and gradients are very common during this period.

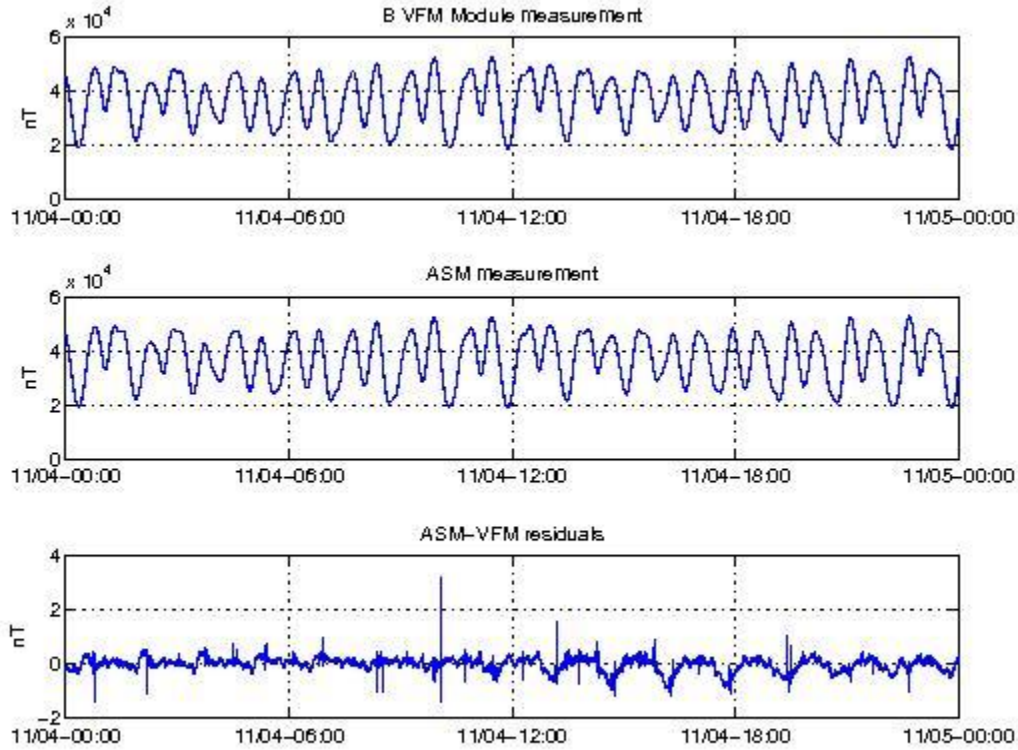

Figure 17: VFM module, ASM module and ASM-VFM residuals for S/C C, 04/11/2014.

3.3.3.3 TCF.VFM monitoring

The TCF.VFM analysis will be included in the last report of the month.

3.3.4 Summary of TCF behaviour for the three S/C

The TCF.VFM analysis will be included in the last report of the month.

4. ON-DEMAND ANALYSIS

Nothing to report.

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