



11 Mar 2024 (report covers data release for 1-30 Sept 2021)

Report Version	3	L2 ground processing software version:	V2.26.1
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Data Summary

**V2 updates 2024:**

After an investigation by ESA, Airbus and Imperial, the unexplained spacecraft interference has been confirmed not to impact the science quality of the OBS data. Cleaning of data around thruster firings requires use of the contaminated IBS data so users should beware of data during these periods, which can be identified by the thruster flag. These now re-released periods have also been quality flagged to level 2, due to the effect on the IBS data, as IBS-OBS is also an important tool in offset determination. This SC interference had historically resulted in the data not being released for these periods. The MAG team is now working to re-release these previously retracted periods, please see the Appendix for the periods now released.

There was a large CME in the previously unreleased portion of this data on the 25<sup>th</sup> of September, and the data for the 22<sup>nd</sup> was also released (the offsets were determined to be acceptable for this period).

**V1:**

MAG was on for the period 1-15 September and 20-31 September 2021. This report covers the period 1-30 September 2021.

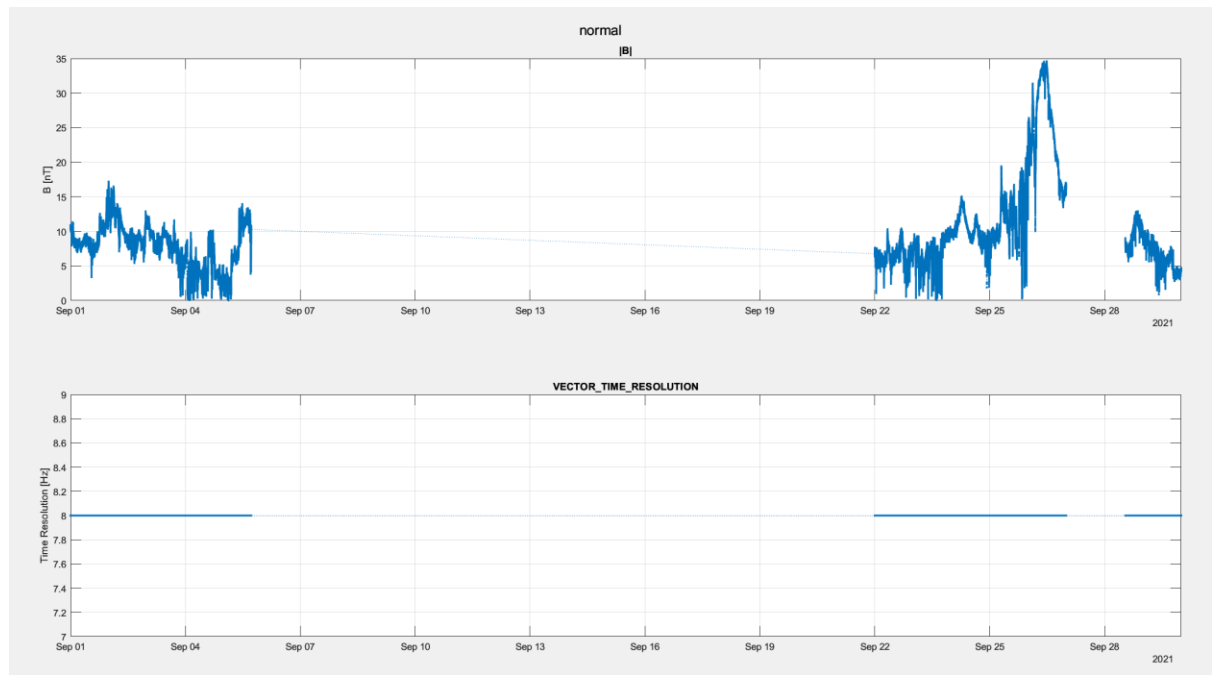
However the data set for this period is not complete:

- On the 16<sup>th</sup> of August, MAG was turned off due to a spacecraft FDIR event. MAG turned on again on the 20<sup>th</sup> of September at 17:39.
- The MAG 1minute averaged data stream has been produced from NM for the period 1-5 Sept and 23-30 Sept and from the LL for the period 5-15 Sept. It is quality level 2 when derived from the LL data .
- Following the switch on the MAG offsets are significantly disturbed, and so the data is not released for 20-22 Sept.
- MAG was not in science mode from 26 Sept at 23:57 to 28 Sept at 13:02, thus no data in this period is available.
- 26 Sept cannot be released because the data have been all converted to NaNs due to spacecraft interference.

**Spacecraft noise** was observed particularly in IBS data for several periods (there was significant noise for a total of 31 hours in the period 23-30 Sept). This noise is very clear in IBS, the source has not been identified. We can see evidence for it being there in OBS as well, and have not got algorithms to clean this from the data. The magnetic field data have been converted to NaNs when the noise in the data was particularly high. The full period of missing data is listed in the appendix of this report. If you have particular need for any data during these periods, please contact the MAG team and we see if the data maybe suitable for release for certain applications.

The spacecraft started the month at 0.78AU and ended it at 0.63AU.

## Normal Mode



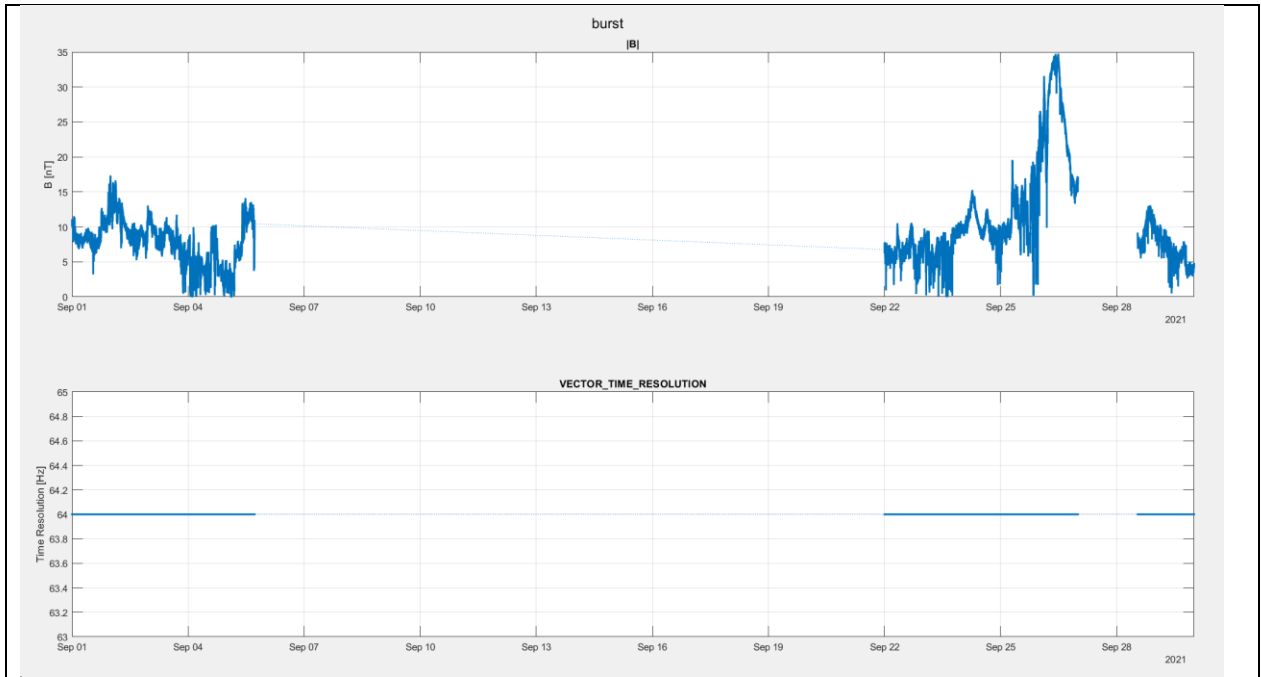
MAG was on with 8Hz cadence normal mode data returned, for exceptions see below.

Operations	20-30 September	Cruise phase throughout period, normal data returned
Operational Events of Note	16 September: MAG turns off 20 September at 17:39: MAG turns back on 26 at 23:57 - 28 at 13:02 September: MAG not in science mode, data not available.	

**Data Gaps greater than one minute:**

None, apart from when MAG was off and not in science mode.

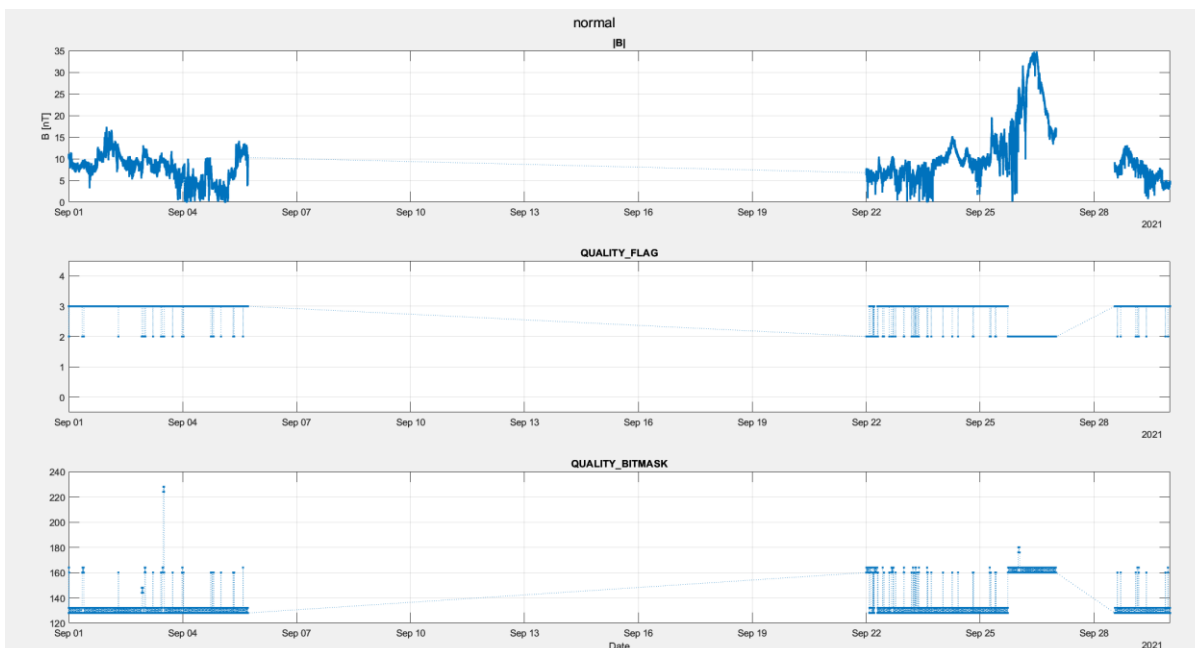
## Burst Mode



Coverage continuous. Data at 64 Hz cadence.

Coverage	From	To	Coverage
	20/09 from 17:39	30/09	24 hours 64 Hz per day

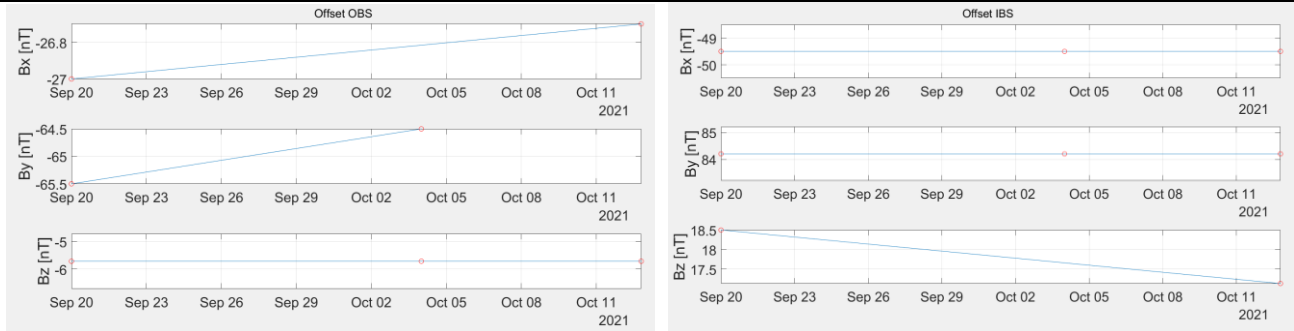
## Quality bitmask



### Quality bit mask events

SC events which disturb the field	<ol style="list-style-type: none"> <li>1. Thruster firings</li> <li>2. Solar array lubrications (solar array is moved 15 degrees, then returned to original position)</li> <li>3. Solar array movements (solar array angle is changed, and then remains at new angle due to sun-SC distance thermal constraints)</li> <li>4. High gain antenna movements</li> </ol>	
SC related issues	Time	Reason
	20/09/21 14:33	HGA elevation from -93 to -116 deg
	27/09/21 00:04	Battery top up event

## Offset



### 23-30 September:

When MAG turned ON on the 20th of September OBS offset drastically changed: the step change between pre and post switching is ~12nT in Bx and ~30nT in By, Bz is stable. OBS Bx offset linearly changed between the 20th of September and the 12<sup>th</sup> of October (SA movement), OBS By offset linearly changed starting on 20th of September but on the 4<sup>th</sup> of October the linear trend changed and continued during October and November. The reason for these trends is the slow offset recovery to normal level after the jump caused by the reboot.

These offsets have been quantified and removed from the L2 data.

Offset #	Date	OBSX	OBSY	OBSZ	IBSX	IBSY	IBSZ	Comment
164	17/08/2021 17:54	-15.1	-35.5	-5.65	-49.2	84.9	16.5	Post SA current event
165	01/09/2021 09:00	-15.1	-35.5	-5.65	-49.2	84.7	17	Pre HGA azimuth from 105 to 102 deg
166	01/09/2021 09:00	-14.9	-35.3	-5.5	-49	84.7	18	Post HGA azimuth from 105 to 102 deg
166	16/09/2021 00:00	-14.9	-35.3	-5.5	-49	84.7	18	MAG turn OFF
190	20/09/2021 00:00	-27	-65.5	-5.72	-49.5	84.2	18.5	Post reboot
191	04/10/2021 00:00		-64.5	-5.72	-49.5	84.2		Change of linear trend in OBS
192	12/10/2021 19:09	-26.7		-5.72	-49.5	84.2	17.13	Pre SA movement

## SC Interference Re-Release

After an investigation by ESA, Airbus and Imperial, the unexplained spacecraft interference (SC interference) has been confirmed not to impact the science quality of the OBS data, so this is no longer being removed from these periods. Cleaning of data around thruster firings requires use of the contaminated IBS data so users should beware of data during these periods, which can be identified by the thruster flag. These now re-released periods have also been quality flagged to level 2, due to the effect on the IBS data, as IBS-OBS is also an important tool in offset determination.

## Appendix

## Appendix – Periods now released

StartTime	EndTime	Comment
25/09/2021 17:30	27/09/2021 00:00	SC interference

## Appendix B: Released files

Filename
solo_L2_mag-rtn-burst_20210901_V02.cdf
solo_L2_mag-rtn-burst_20210902_V02.cdf
solo_L2_mag-rtn-burst_20210903_V02.cdf
solo_L2_mag-rtn-burst_20210904_V02.cdf
solo_L2_mag-rtn-burst_20210905_V02.cdf
solo_L2_mag-rtn-burst_20210922_V01.cdf
solo_L2_mag-rtn-burst_20210923_V03.cdf
solo_L2_mag-rtn-burst_20210924_V03.cdf
solo_L2_mag-rtn-burst_20210925_V03.cdf
solo_L2_mag-rtn-burst_20210926_V01.cdf
solo_L2_mag-rtn-burst_20210928_V03.cdf
solo_L2_mag-rtn-burst_20210929_V03.cdf
solo_L2_mag-rtn-burst_20210930_V03.cdf
solo_L2_mag-rtn-normal-1-minute_20210901_V02.cdf
solo_L2_mag-rtn-normal-1-minute_20210902_V02.cdf
solo_L2_mag-rtn-normal-1-minute_20210903_V02.cdf
solo_L2_mag-rtn-normal-1-minute_20210904_V02.cdf
solo_L2_mag-rtn-normal-1-minute_20210905_V02.cdf
solo_L2_mag-rtn-normal-1-minute_20210922_V01.cdf
solo_L2_mag-rtn-normal-1-minute_20210923_V03.cdf
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solo_L2_mag-rtn-normal-1-minute_20210928_V03.cdf
solo_L2_mag-rtn-normal-1-minute_20210929_V03.cdf
solo_L2_mag-rtn-normal-1-minute_20210930_V03.cdf
solo_L2_mag-rtn-normal_20210901_V02.cdf

solo_L2_mag-rtn-normal_20210902_V02.cdf
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solo_L2_mag-srf-normal_20210902_V02.cdf
solo_L2_mag-srf-normal_20210903_V02.cdf
solo_L2_mag-srf-normal_20210904_V02.cdf
solo_L2_mag-srf-normal_20210905_V02.cdf
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solo_L2_mag-srf-normal_20210930_V03.cdf