Imperial College London

MAG Data Release Report 2103

17 Jan 2024 (report covers data release for 1-31 Mar 2021)

Report Version	2	L2 ground processing software version:	V2.26.1
MAG PI	Tim Horbury t.horbury@imperial.ac.uk		
MAG IM	Helen O'Brien h.obrien@imperial.ac.uk		
Report Prepared by	Jean Morris j.morris23@imperial.ac.uk		

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.

V1:
MAG was on for the period 1-31 March, in burst mode throughout.

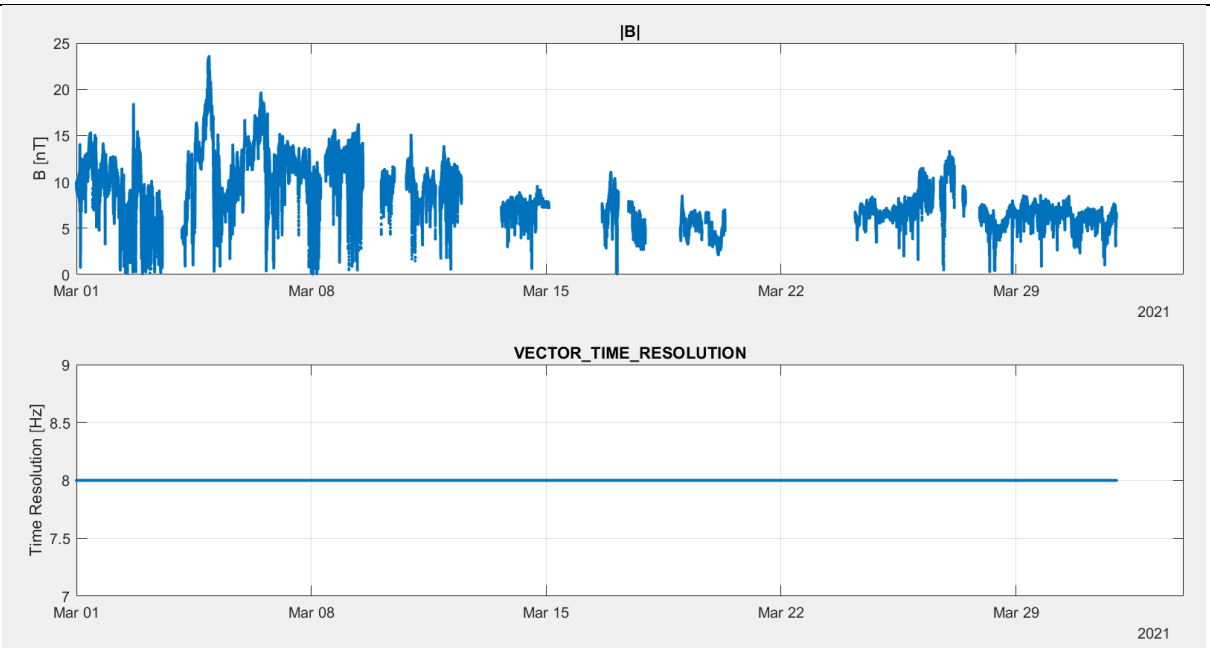
In March there were events such as the solar arrays and high gain antenna movements, which generated **offset changes** in the inboard and outboard sensors.

On **1st March**, there was a solar array current event. This kind of event has not been fully understood yet, but it affected the offset at the inboard sensor and at the outboard sensor.

Spacecraft noise was observed particularly in IBS data for several periods (there was significant noise for a total of 277 hours during March). 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 following days have not been released because the data have been all converted to NaNs:
9-18-21-22-23 March 2021.

The spacecraft started March at 0.55 AU and ended it at 0.75AU.

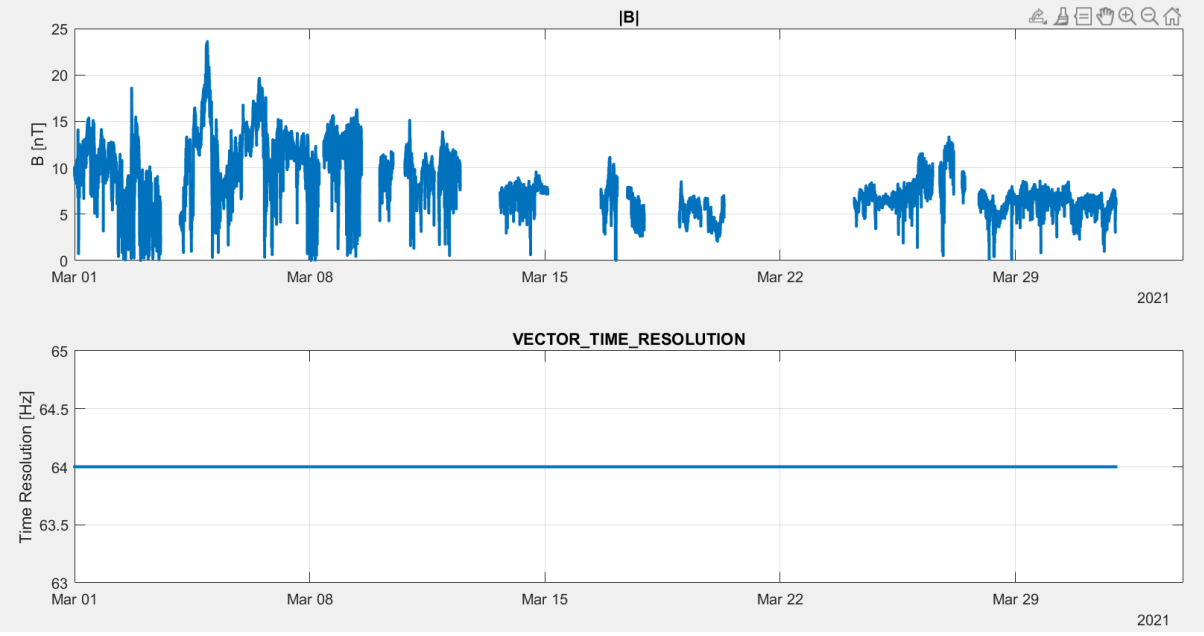
Normal Mode



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

Operations	1-31 Mar	Cruise phase throughout period
Operational Events of Note	None	

Burst Mode



Coverage continuous. Data at 64 Hz cadence.

	From	To	Coverage

Coverage	1/03	31/03	24 hours 64 Hz

Quality bitmask

Quality bit mask events	
SC events which disturb the field	1. Thruster firings 2. Solar array lubrications (solar array is moved 15 degrees, then returned to original position) 3. Solar array movements (solar array angle is changed, and then remains at new angle due to sun-SC distance thermal constraints) 4. High gain antenna movements
SC related issues	See table below; The HGA azimuth and elevation linearly changed throughout the month. The period between 28/02/2021 at 10:36 (SA movement) and 01/03/2021 at 00:45 (SA current event) has been flagged to quality level 2 because it was impossible to determine accurate offset and heater profile valid between these two events. The same for the period between 31/03/2021 at 00:00 and 02/04/2021 at 00:00. For the same reason, the MAG heater profiles for the 1st and 31st of March could not be accurately determined, thus signals having the same periodicity as the MAG heater switching can be noticed in the data: please, check the quality bitmask, bit 3, for the MAG heater ON times. An unknown event on 06/03/2021 at 10:00 affects IBS offset.

Time	Event
01/03/2021 00:45	SA current event
23/03/2021 16:32	SA movement from 60 to 56 deg
31/03/2021 13:07	SA movement from 56 to 30 deg

Offset

1-31 Mar:
Both IBS and OBS offsets have been modified by the solar array current events and movements. A change unrelated to any known SC event has been detected on 6 March.
These offsets have been quantified and removed from the L2 data.
Empty boxes indicate a linear trend has been applied in the offset between the values and times indicated ahead and after the empty boxes.

Offset	Date	OBSX	OBSY	OBSZ	IBSX	IBSY	IBSZ	Comment
138	28/02/2021 10:36	-15.6	-40.4	-6	-49	84.5	15.3	SA movement from 70 to 60 deg
139	01/03/2021 00:46	-15.6	-39.5	-6	-50.2	86.1	13.1	SA current event, start linear trend in OBS Y and IBS Y
140	06/03/2021 10:00	-15.6		-6	-50.2		13.1	Start linear trend in Bz IBS
141	24/03/2021 01:00	-15.6		-6	-50.2		14	Start linear trend after SA movement from 60 to 56 deg
142	24/03/2021 15:00	-15.6		-6	-49.7		13.5	End linear trend after SA movement from 60 to 56 deg
143	31/03/2021 13:07	-15.6	-39.2	-6	-49.7	85.8	13.5	Pre SA movement from 56 to 30 deg, end linear trend OBS Y and IBS Y
144	31/03/2021 13:12	-15.6	-39	-5.8	-48.6	85.1	13.5	Post SA movement from 56 to 30 deg. Start linear trend in IBS Z
145	12/04/2021 00:05	-15.6	-39	-5.8	-48.6	85.1		Pre SA current event
146	12/04/2021 03:07	-15.6	-39	-5.8	-48.9	85.1	14.3	Post SA current event, end linear trend in IBS Z
146	05/05/2021 15:00	-15.6	-39	-5.8	-49.3	85.1	14.3	Final offset

Appendix

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 – Periods now released

StartTime	EndTime	Comment
03/03/2021 13:30	04/03/2021 03:30	Noise from SC mainly in By
05/03/2021 14:45	05/03/2021 15:30	Noise from SC mainly in By
05/03/2021 17:30	05/03/2021 17:45	Noise from SC mainly in By
05/03/2021 18:10	05/03/2021 18:45	Noise from SC mainly in By
06/03/2021 00:45	06/03/2021 02:15	Noise from SC mainly in By
06/03/2021 15:00	06/03/2021 15:30	Noise from SC mainly in By
08/03/2021 06:45	08/03/2021 10:00	Noise from SC mainly in By
09/03/2021 00:00	10/03/2021 02:00	Noise from SC mainly in By
10/03/2021 11:30	10/03/2021 20:00	Noise from SC mainly in By
11/03/2021 04:30	11/03/2021 05:45	Noise from SC mainly in By
11/03/2021 17:00	11/03/2021 20:00	Noise from SC mainly in By
12/03/2021 11:30	13/03/2021 16:00	Noise from SC mainly in By
14/03/2021 03:30	14/03/2021 04:30	Noise from SC mainly in By
14/03/2021 17:45	14/03/2021 18:30	Noise from SC mainly in By
15/03/2021 02:00	16/03/2021 16:00	Noise from SC mainly in By
17/03/2021 03:45	17/03/2021 11:00	Noise from SC mainly in By
17/03/2021 23:00	18/03/2021 23:59	Noise from SC mainly in By
19/03/2021 15:30	19/03/2021 18:00	Noise from SC mainly in By
20/03/2021 03:30	20/03/2021 03:45	Noise from SC mainly in By
20/03/2021 08:00	24/03/2021 05:00	Noise from SC mainly in By
26/03/2021 13:00	26/03/2021 18:00	Noise from SC mainly in By
27/03/2021 04:00	27/03/2021 10:00	Noise from SC mainly in By
27/03/2021 12:00	27/03/2021 22:00	Noise from SC mainly in By

Appendix – Files released

Filename
solo_L2_mag-rtn-burst_20210301_V03.cdf
solo_L2_mag-rtn-burst_20210302_V03.cdf
solo_L2_mag-rtn-burst_20210303_V03.cdf
solo_L2_mag-rtn-burst_20210304_V03.cdf
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solo_L2_mag-rtn-burst_20210306_V03.cdf
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