R O S E T T A

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Impact of Wheel-Offloading (WOL) on Magnetic Field Data

Mission Phase: EXT1
Time: Jan 2016 - Apr 2016

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1 Introduction

The Rosetta Orbiter-Magnetometer is part of the Rosetta Plasma Consortium (RPC). The instrument consists of two identical fluxgate sensors mounted on a 1.5 m long boom outside the spacecraft and an electronics box placed inside the orbiter. The inner sensor is called IB sensor, the outer one OB sensor. Both sensors recorded the magnetic field in three components between March 2004 and September 2016.

The observation time during the Comet phase in 2014 - 2016 is split up in mission phases, starting with the pre-landing phase (PRL) followed by so called comet escort phases (ESC1 to ESC4) and the extended mission phases (EXT1 to EXT3). Table 1 contains the time course of all mission phases.

Table 1: Overview of mission phases.

Mission Phase	Duration
PRL	Aug 2014 - Nov 2014
ESC1	Nov 2014 - Mar 2015
ESC2	Mar 2015 - Jun 2015
ESC3	Jun 2015 - Oct 2015
ESC4	Oct 2015 - Jan 2016
EXT1	Jan 2016 - Apr 2016
EXT2	Apr 2016 - Jun 2016
EXT3	Jun 2016 - Sep 2016

A first look at the RPC-MAG data revealed that operational spacecraft activities have a significant impact on measured magnetic field data. It turned out that some spacecraft operations are often related to special magnetic field signatures, which occur during the entire mission duration.

This document gives an overview on how Wheel-Off-Loading (WOL) influences RPC-MAG measurements during the EXT1 phase between January 2016 and April 2016. For this reason the effects of disturbances on magnetic field measurements are classified into four different types. Afterwards, the four defined classes of disturbance are used to flag the magnetic time series.

2 Impact of disturbance by Wheel-Off-Loading

A temporal comparison between the magnetic field time series and the command execution history-file data (command ZAC20188) has shown, that the WOL potentially disturbs magnetic field data in four different ways. In general, disturbance by WOL primarily affects the y-component (sc-coordinates) of the magnetic field, although spikes right after switch-on can be observed on all components. Possible WOL impacts are

- **Visible:** Approximately 5 sec after the execution of command ZAC20188 a steep decrease in the y-component of the magnetic field occurs. After approximately another 190 sec the field jumps back with a steep slope. The step height is in both cases 3 nT. Figures (1)-(3) show typical examples for a fully visible WOL disturbance. **Flag: disturbance completely visible**
- **Start not visible:** Approximately 195 sec after the execution of command ZAC20188 a steep increase in the y-component of the magnetic field occurs. The step height is 3 nT. Figure (4) (top) shows a typical example for a WOL disturbance with no visible beginning. **Flag: start not visible**
- **End not visible:** Approximately 5 sec after the execution of command ZAC20188 a steep decrease in the y-component of the magnetic field occurs. The step height is 3 nT. Figure (4) (center) shows a typical example for a WOL disturbance with no visible end. **Flag: end not visible**
- **Not visible:** No impact of disturbance recognised by eye. Figure (4) (botton) shows a typical example for a WOL without having an impact on the magnetic field. **Flag: not visible**

So far, it has not been possible to examine the impact of WOL on the magnetic field with an automatic search routine, all data were therefore examined manually.

The duration of the WOL varies for every event. The end of the disturbance is not logged anywhere in the HK files, therefore the end of WOL has to be always determined by eye.

3 Summary

During the EXT1 phase 205 WOL commands were executed of which

- 70 are completely visible (**Flag: disturbance completely visible**),

Figure 1: Examples of a WOL disturbance recorded on 23.01.2016 during the EXT1 phase with the OB sensor. Top: The x-axis shows time, the y-axis shows all three magnetic field components. Bottom: y-component of the magnetic field. The white box marks the duration of the WOL disturbance.

- 1 event is not recorded due to data gaps,
- 123 are not visible (**Flag: not visible**),
- 9 events have no visible end (**Flag: end not visible**) and
- 2 events have no visible beginning (**Flag: start not visible**).

All WOL events are listed below. The first columns contain start and end times of the disturbance, followed by the x-, y- and z-component of the magnetic field during the start and end, respectively. The last column contains annotations, which are one of the above defined flags. The table is also available as a txt-file called WOL_ EXT1.txt.

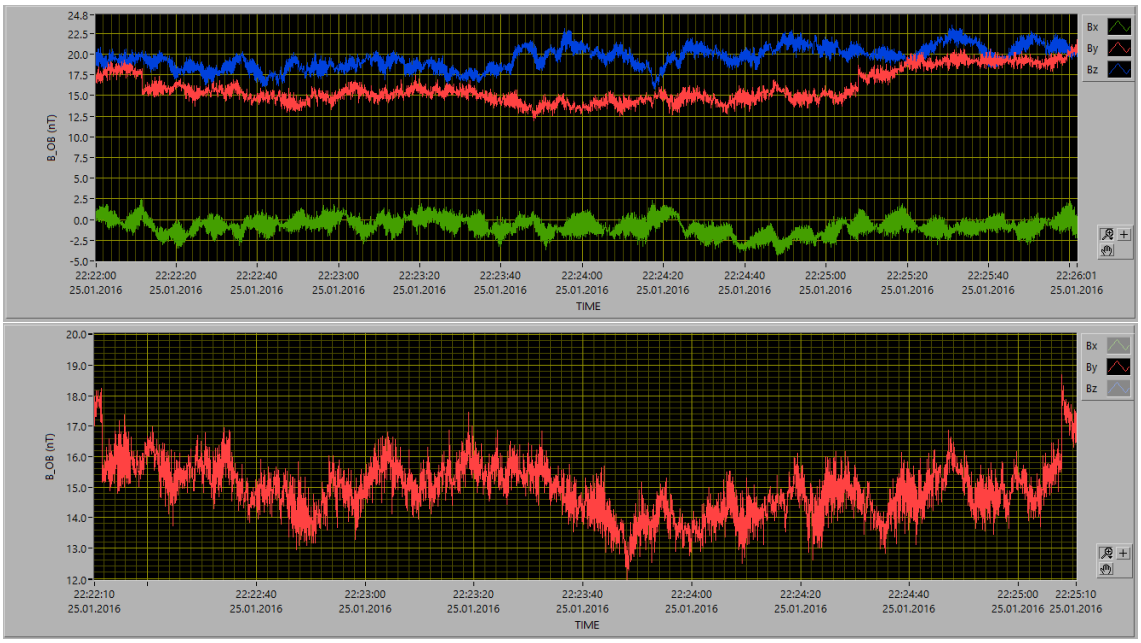

Figure 2: Examples of a WOL disturbance recorded on 25.01.2016 during the EXT1 phase with the OB sensor. Top: The x-axis shows time, the y-axis shows all three magnetic field components. Bottom: Y-component of the magnetic field. The white box marks the duration of the WOL disturbance.

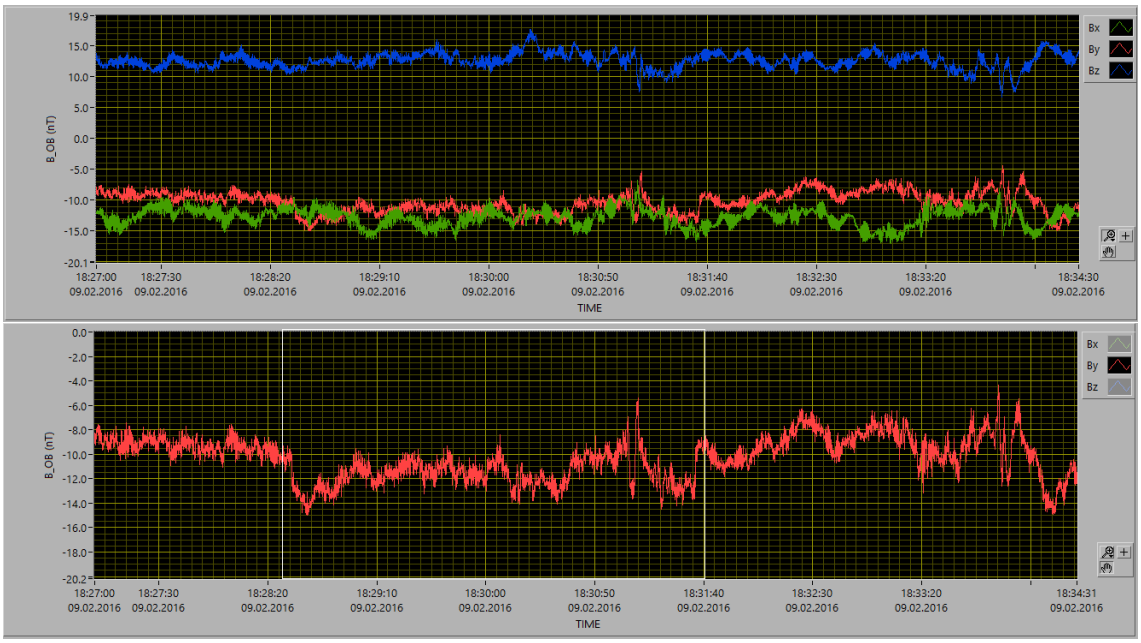

Figure 3: Examples of a WOL disturbance recorded on 09.02.2016 during the EXT1 phase with the OB sensor. Top: The x-axis shows time, the y-axis shows all three magnetic field components. Bottom: y-component of the magnetic field. The white box marks the duration of the disturbance.

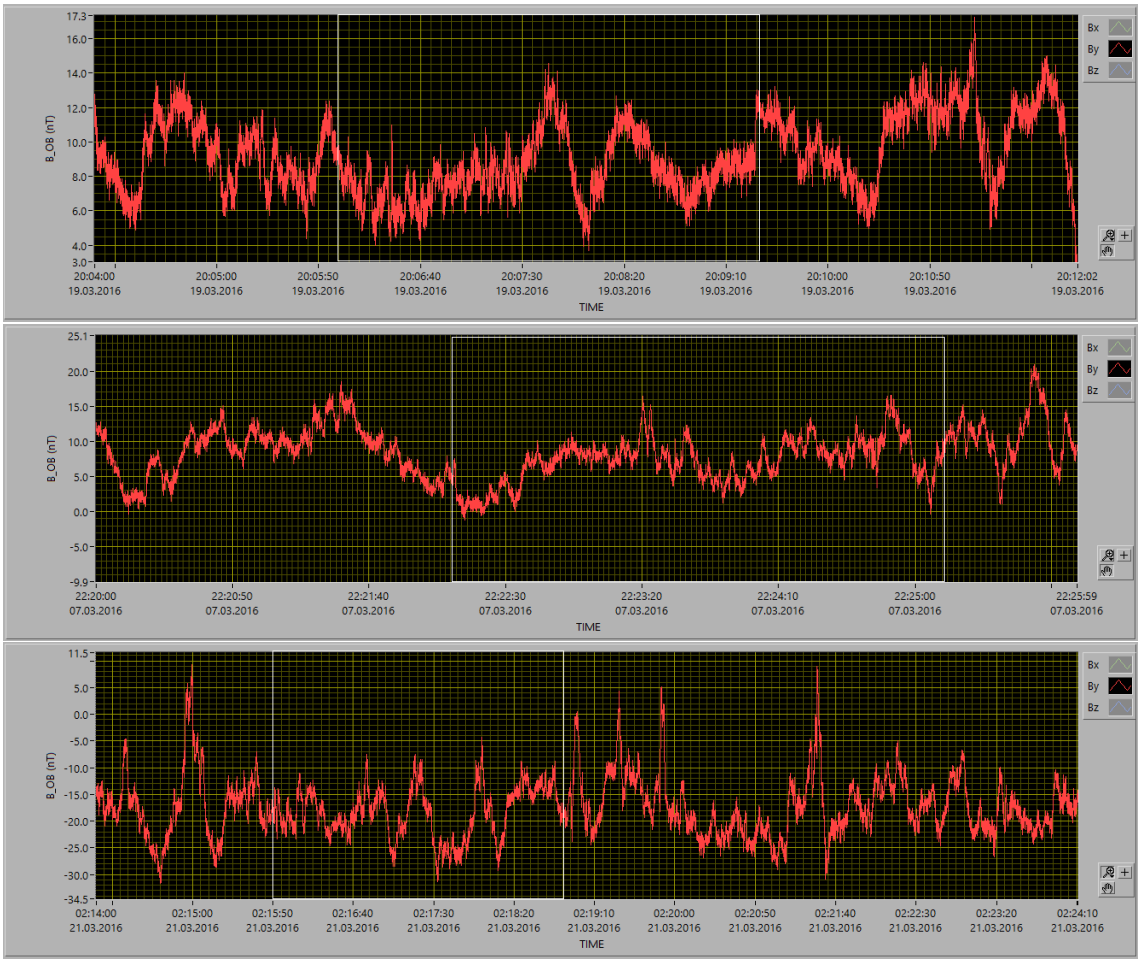

Figure 4: Top: Example of a WOL interference without a visible decreasing of 3 nT in the y-component during switch-on. The event is recorded on 19.03.2016 during the EXT1 phase with the OB sensor. Center: Example of a WOL interference without a visible increasing of 3 nT in the y-component during the switch-off. The event is recorded on 07.03.2016 during the EXT1 phase with the OB sensor. Bottom: Example of a WOL execution without visible impact on the y-component of the magnetic field. The event is recorded on 21.02.2016 during the EXT1 phase with the OB sensor. In all panels the x-axis shows time and the y-axis shows y-components of the magnetic field. Note that the scaling varies from panel to panel. White boxes mark WOL operating times

Start (day/UTC)	End (day/UTC)	ΔB (nT)						Annotation
2016-01-13T10:12:55.0	2016-01-13T10:15:54.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-13T20:25:43.0	2016-01-13T20:25:43.0	0	0	0	0	0	0	not visible
2016-01-14T06:38:37.0	2016-01-14T06:41:16.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-14T16:51:26.0	2016-01-14T16:51:26.0	0	0	0	0	0	0	not visible
2016-01-15T03:04:17.0	2016-01-15T03:04:17.0	0	0	0	0	0	0	not visible
2016-01-15T13:17:09.0	2016-01-15T13:17:09.0	0	0	0	0	0	0	not visible
2016-01-15T23:30:00.0	2016-01-15T23:30:00.0	0	0	0	0	0	0	not visible
2016-01-16T10:03:09.0	2016-01-16T10:03:09.0	0	0	0	0	0	0	not visible
2016-01-16T20:06:19.0	2016-01-16T20:06:19.0	0	0	0	0	0	0	not visible
2016-01-17T06:09:28.0	2016-01-17T06:09:28.0	0	0	0	0	0	0	not visible
2016-01-17T16:12:38.0	2016-01-17T16:12:38.0	0	0	0	0	0	0	not visible
2016-01-18T02:15:51.0	2016-01-18T02:15:47.0	0	0	-3	0	0	0	end not visible
2016-01-18T12:18:57.0	2016-01-18T12:18:57.0	0	0	0	0	0	0	not visible
2016-01-18T22:22:06.0	2016-01-18T22:22:06.0	0	0	0	0	0	0	not visible
2016-01-19T08:25:16.0	2016-01-19T08:25:16.0	0	0	0	0	0	0	not visible
2016-01-19T18:28:25.0	2016-01-19T18:28:25.0	0	0	0	0	0	0	not visible
2016-01-19T23:30:00.0	2016-01-19T23:30:00.0	0	0	0	0	0	0	not visible
2016-01-20T10:12:55.0	2016-01-20T10:15:55.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-20T20:25:43.0	2016-01-20T20:25:43.0	0	0	0	0	0	0	not visible
2016-01-21T06:38:34.0	2016-01-21T06:38:34.0	0	0	0	0	0	0	not visible
2016-01-21T16:51:26.0	2016-01-21T16:51:26.0	0	0	0	0	0	0	not visible
2016-01-22T03:04:21.0	2016-01-22T03:04:17.0	0	0	-3	0	0	0	end not visible
2016-01-22T13:17:12.0	2016-01-22T13:20:15.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-22T23:30:00.0	2016-01-22T23:30:00.0	0	0	0	0	0	0	not visible
2016-01-23T10:03:12.0	2016-01-23T10:06:27.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-23T20:06:23.0	2016-01-23T20:09:39.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-24T06:09:32.0	2016-01-24T06:12:31.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-24T16:12:42.0	2016-01-24T16:15:31.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-25T02:15:47.0	2016-01-25T02:15:47.0	0	0			0	0	not visible
2016-01-25T12:18:57.0	2016-01-25T12:18:57.0	0	0			0	0	not visible
2016-01-25T22:22:11.0	2016-01-25T22:25:20.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-26T08:25:16.0	2016-01-26T08:25:16.0	0	0	0	0	0	0	not visible
2016-01-26T18:28:25.0	2016-01-26T18:31:08.0	0	0	0	-3	0	0	start not visible
2016-01-26T23:30:00.0	2016-01-26T23:30:00.0	0	0	0	0	0	0	not visible
2016-01-27T10:12:55.0	2016-01-27T10:15:56.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-27T20:25:46.0	2016-01-27T20:25:43.0	0	0	-3	0	0	0	end not visible
2016-01-28T06:38:34.0	2016-01-28T06:38:34.0	0	0	0	0	0	0	not visible
2016-01-28T16:51:26.0	2016-01-28T16:51:26.0	0	0	0	0	0	0	not visible
2016-01-29T03:04:17.0	2016-01-29T03:04:17.0	0	0	0	0	0	0	not visible
2016-01-29T13:17:09.0	2016-01-29T13:17:09.0	0	0	0	0	0	0	not visible
2016-01-29T23:30:00.0	2016-01-29T23:30:00.0	0	0	0	0	0	0	not visible
2016-01-30T10:03:09.0	2016-01-30T10:03:09.0	0	0	0	0	0	0	not visible
2016-01-30T20:06:19.0	2016-01-30T20:06:19.0	0	0	0	0	0	0	not visible
2016-01-31T06:09:31.0	2016-01-31T06:21:36.0	0	0	-3	+3	0	0	disturbance completely visible
2016-01-31T16:12:38.0	2016-01-31T16:12:38.0	0	0	0	0	0	0	not visible
2016-02-01T02:15:47.0	2016-02-01T02:15:47.0	0	0	0	0	0	0	not visible
2016-02-01T12:18:57.0	2016-02-01T12:18:57.0	0	0	0	0	0	0	not visible
2016-02-01T22:22:06.0	2016-02-01T22:22:06.0	0	0	0	0	0	0	not visible

2016-02-02T08:25:16.0	2016-02-02T08:25:16.0	0	0	0	0	0	0	not visible
2016-02-02T18:28:25.0	2016-02-02T18:28:25.0	0	0	0	0	0	0	not visible
2016-02-02T23:30:00.0	2016-02-02T23:30:00.0	0	0	0	0	0	0	not visible
2016-02-03T10:12:51.0	2016-02-03T10:12:51.0	0	0	0	0	0	0	not visible
2016-02-03T20:25:48.0	2016-02-03T20:25:46.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-04T06:38:34.0	2016-02-04T06:38:34.0	0	0	0	0	0	0	not visible
2016-02-04T16:51:26.0	2016-02-04T16:51:26.0	0	0	0	0	0	0	not visible
2016-02-05T03:04:21.0	2016-02-05T03:04:17.0	0	0	-3	0	0	0	end not visible
2016-02-05T13:17:09.0	2016-02-05T13:17:09.0	0	0	0	0	0	0	not visible
2016-02-05T23:30:00.0	2016-02-05T23:30:00.0	0	0	0	0	0	0	not visible
2016-02-06T10:03:09.0	2016-02-06T10:03:09.0	0	0	0	0	0	0	not visible
2016-02-06T20:06:21.0	2016-02-06T20:09:24.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-07T06:09:28.0	2016-02-07T06:09:28.0	0	0	0	0	0	0	not visible
2016-02-07T16:12:43.0	2016-02-07T16:15:46.0	0	0	0	0	0	0	not visible
2016-02-08T02:15:47.0	2016-02-08T02:15:47.0	0	0	0	0	0	0	not visible
2016-02-08T12:18:57.0	2016-02-08T12:18:57.0	0	0	0	0	0	0	not visible
2016-02-08T22:22:06.0	2016-02-08T22:22:06.0	0	0	0	0	0	0	not visible
2016-02-09T08:25:17.0	2016-02-09T08:28:57.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-09T18:28:29.0	2016-02-09T18:31:38.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-09T23:30:00.0	2016-02-09T23:30:00.0	0	0	0	0	0	0	not visible
2016-02-10T10:12:51.0	2016-02-10T10:12:51.0	0	0	0	0	0	0	not visible
2016-02-10T20:25:43.0	2016-02-10T20:25:43.0	0	0	0	0	0	0	not visible
2016-02-11T06:38:34.0	2016-02-11T06:38:34.0	0	0	0	0	0	0	not visible
2016-02-11T16:51:30.0	2016-02-11T16:54:29.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-12T03:04:20.0	2016-02-12T03:07:22.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-12T13:17:12.0	2016-02-12T13:20:13.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-12T23:30:04.0	2016-02-12T23:33:30.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-13T10:03:09.0	2016-02-13T10:03:09.0	0	0	0	0	0	0	not visible
2016-02-13T20:06:22.0	2016-02-13T20:09:50.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-14T06:09:32.0	2016-02-14T06:12:30.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-14T16:12:38.0	2016-02-14T16:12:38.0	0	0	0	0	0	0	not visible
2016-02-15T02:15:47.0	2016-02-15T02:15:47.0	0	0	0	0	0	0	not visible
2016-02-15T12:18:57.0	2016-02-15T12:18:57.0	0	0	0	0	0	0	not visible
2016-02-15T22:22:06.0	2016-02-15T22:22:06.0	0	0	0	0	0	0	not visible
2016-02-16T08:25:16.0	2016-02-16T08:25:16.0	0	0	0	0	0	0	not visible
2016-02-16T18:28:25.0	2016-02-16T18:28:25.0	0	0	0	0	0	0	not visible
2016-02-16T23:30:03.0	2016-02-16T23:33:11.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-17T10:12:55.0	2016-02-17T10:16:05.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-17T20:25:43.0	2016-02-17T20:25:43.0	0	0	0	0	0	0	not visible
2016-02-18T06:38:34.0	2016-02-18T06:38:34.0	0	0	0	0	0	0	not visible
2016-02-18T16:51:30.0	2016-02-18T16:54:31.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-19T03:04:17.0	2016-02-19T03:04:17.0	0	0	0	0	0	0	not visible
2016-02-19T13:17:09.0	2016-02-19T13:17:09.0	0	0	0	0	0	0	not visible
2016-02-19T23:30:00.0	2016-02-19T23:30:00.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-20T10:03:14.0	2016-02-20T10:03:09.0	0	0	-3	0	0	0	end not visible
2016-02-20T20:06:22.0	2016-02-20T20:06:19.0	0	0	.3	0	0	0	end not visible
2016-02-21T06:09:32.0	2016-02-21T06:12:33.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-21T16:12:38.0	2016-02-21T16:12:38.0	0	0	0	0	0	0	not visible
2016-02-22T02:15:47.0	2016-02-22T02:15:47.0	0	0	0	0	0	0	not visible

2016-02-22T12:19:01.0	2016-02-22T12:18:50.0	0	0	-3	0	0	0	end not visible
2016-02-22T22:22:10.0	2016-02-22T22:22:12.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-23T08:25:16.0	2016-02-23T08:25:16.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-23T18:28:28.0	2016-02-23T18:28:27.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-23T23:30:00.0	2016-02-23T23:30:00.0	0	0	0	0	0	0	not visible
2016-02-24T10:12:51.0	2016-02-24T10:12:51.0	0	0	0	0	0	0	not visible
2016-02-24T20:25:43.0	2016-02-24T20:25:43.0	0	0	0	0	0	0	not visible
2016-02-25T06:38:34.0	2016-02-25T06:38:34.0	0	0	0	0	0	0	not visible
2016-02-25T16:51:26.0	2016-02-25T16:51:26.0	0	0	0	0	0	0	not visible
2016-02-26T03:04:22.0	2016-02-26T03:04:17.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-26T13:17:09.0	2016-02-26T13:17:09.0	0	0			0	0	not visible
2016-02-26T23:30:04.0	2016-02-26T23:33:15.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-27T10:03:09.0	2016-02-27T10:03:09.0	0	0	0	0	0	0	not visible
2016-02-27T20:06:24.0	2016-02-27T20:09:24.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-28T06:09:31.0	2016-02-28T06:12:40.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-28T16:12:38.0	2016-02-28T16:12:38.0	0	0			0	0	not visible
2016-02-29T02:16:00.0	2016-02-29T02:18:52.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-29T12:19:01.0	2016-02-29T12:22:10.0	0	0	-3	+3	0	0	disturbance completely visible
2016-02-29T22:22:06.0	2016-02-29T22:22:06.0	0	0	0	0	0	0	not visible
2016-03-01T08:25:16.0	2016-02-29T22:22:06.0	0	0	0	0	0	0	not visible
2016-03-01T18:28:25.0	2016-03-01T18:28:25.0	0	0	0	0	0	0	not visible
2016-03-01T23:30:00.0	2016-03-01T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-02T10:12:51.0	2016-03-02T10:12:51.0	0	0	0	0	0	0	not visible
2016-03-02T20:25:46.0	2016-03-02T20:28:54.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-03T06:38:39.0	2016-03-03T06:41:38.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-03T16:51:26.0	2016-03-03T16:51:26.0	0	0	0	0	0	0	not visible
2016-03-04T03:04:17.0	2016-03-04T03:04:17.0	0	0	0	0	0	0	not visible
2016-03-04T13:17:09.0	2016-03-04T13:17:09.0	0	0	0	0	0	0	not visible
2016-03-04T23:30:00.0	2016-03-04T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-05T20:06:19.0	2016-03-05T20:06:19.0	0	0	0	0	0	0	not visible
2016-03-06T06:09:28.0	2016-03-06T06:09:28.0	0	0	0	0	0	0	not visible
2016-03-06T16:12:38.0	2016-03-06T16:12:38.0	0	0	0	0	0	0	not visible
2016-03-07T02:15:47.0	2016-03-07T02:15:47.0	0	0	0	0	0	0	not visible
2016-03-07T12:18:57.0	2016-03-07T12:18:57.0	0	0	0	0	0	0	not visible
2016-03-07T22:22:10.0	2016-03-07T22:22:06.0	0	0	-3	0	0	0	end not visible
2016-03-08T08:25:20.0	2016-03-08T08:28:30.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-08T18:28:29.0	2016-03-08T18:31:10.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-08T23:30:00.0	2016-03-08T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-09T10:12:51.0	2016-03-09T10:12:51.0	0	0	0	0	0	0	not visible
2016-03-09T20:25:43.0	2016-03-09T20:25:43.0	0	0	0	0	0	0	not visible
2016-03-10T06:38:39.0	2016-03-10T06:41:40.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-10T16:51:26.0	2016-03-10T16:51:26.0	0	0	0	0	0	0	not visible
2016-03-11T03:04:22.0	2016-03-11T03:07:22.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-11T13:17:14.0	2016-03-11T13:20:14.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-11T23:30:00.0	2016-03-11T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-12T10:03:09.0	2016-03-12T10:03:09.0	0	0	0	0	0	0	not visible
2016-03-12T20:06:19.0	2016-03-12T20:06:19.0	0	0	0	0	0	0	not visible
2016-03-13T06:09:28.0	2016-03-13T06:09:28.0	0	0	0	0	0	0	not visible
2016-03-13T16:12:44.0	2016-03-13T16:15:47.0	0	0	0	0	0	0	not visible

2016-03-14T02:15:47.0	2016-03-14T02:15:47.0	0	0	0	0	0	0	not visible
2016-03-14T12:18:57.0	2016-03-14T12:18:57.0	0	0	0	0	0	0	not visible
2016-03-14T22:22:12.0	2016-03-14T22:25:13.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-15T08:25:21.0	2016-03-15T08:28:21.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-15T18:28:25.0	2016-03-15T18:28:25.0	0	0	0	0	0	0	not visible
2016-03-15T23:30:00.0	2016-03-15T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-16T10:12:51.0	2016-03-16T10:12:51.0	0	0	0	0	0	0	not visible
2016-03-16T20:25:43.0	2016-03-16T20:25:43.0	0	0	0	0	0	0	not visible
2016-03-17T06:38:40.0	2016-03-17T06:31:40.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-17T16:51:26.0	2016-03-17T16:51:26.0	0	0	0	0	0	0	no data
2016-03-18T03:04:17.0	2016-03-18T03:04:17.0	0	0	0	0	0	0	not visible
2016-03-18T13:17:09.0	2016-03-18T13:17:09.0	0	0	0	0	0	0	not visible
2016-03-18T23:30:00.0	2016-03-18T23:30:00.0	0	0	0	0	0	0	not visible
2016-03-19T10:03:09.0	2016-03-19T10:03:09.0	0	0	0	0	0	0	not visible
2016-03-19T20:06:19.0	2016-03-19T20:09:25.0	0	0	0	+3	0	0	start not visible
2016-03-20T06:09:32.0	2016-03-20T06:12:33.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-20T16:12:38.0	2016-03-20T16:12:38.0	0	0	0	0	0	0	not visible
2016-03-21T02:15:47.0	2016-03-21T02:15:47.0	0	0	0	0	0	0	not visible
2016-03-21T12:18:57.0	2016-03-21T12:18:57.0	0	0	0	0	0	0	not visible
2016-03-21T22:22:06.0	2016-03-21T22:22:06.0	0	0	0	0	0	0	not visible
2016-03-22T08:25:16.0	2016-03-22T08:25:16.0	0	0	0	0	0	0	not visible
2016-03-22T18:28:25.0	2016-03-22T18:28:25.0	0	0	0	0	0	0	not visible
2016-03-22T23:30:10.0	2016-03-22T23:33:12.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-23T10:12:51.0	2016-03-23T10:12:51.0	0	0	0	0	0	0	not visible
2016-03-23T20:25:43.0	2016-03-23T20:25:43.0	0	0	0	0	0	0	not visible
2016-03-24T06:38:34.0	2016-03-24T06:38:34.0	0	0	0	0	0	0	not visible
2016-03-24T16:51:26.0	2016-03-24T16:51:26.0	0	0	0	0	0	0	not visible
2016-03-25T03:04:20.0	2016-03-25T03:04:21.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-25T13:17:12.0	2016-03-25T13:20:10.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-25T23:30:01.0	2016-03-25T23:33:06.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-26T09:46:30.0	2016-03-26T09:49:32.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-26T19:32:47.0	2016-03-26T19:35:50.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-27T05:19:05.0	2016-03-27T05:19:05.0	0	0	0	0	0	0	not visible
2016-03-27T13:05:27.0	2016-03-27T13:05:27.0	0	0	0	0	0	0	not visible
2016-03-28T00:51:49.0	2016-03-28T00:51:49.0	0	0	0	0	0	0	not visible
2016-03-28T10:38:11.0	2016-03-28T10:38:11.0	0	0	0	0	0	0	not visible
2016-03-28T20:24:33.0	2016-03-28T20:24:33.0	0	0	0	0	0	0	not visible
2016-03-29T06:10:55.0	2016-03-29T06:10:55.0	0	0	0	0	0	0	not visible
2016-03-29T15:57:16.0	2016-03-29T15:57:16.0	0	0	0	0	0	0	not visible
2016-03-30T01:43:42.0	2016-03-30T01:46:41.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-30T11:30:04.0	2016-03-30T11:33:04.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-30T22:12:55.0	2016-03-30T22:15:57.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-31T08:25:47.0	2016-03-31T08:28:49.0	0	0	-3	+3	0	0	disturbance completely visible
2016-03-31T18:38:34.0	2016-03-31T18:38:34.0	0	0	0	0	0	0	not visible
2016-04-01T02:35:05.0	2016-04-01T02:35:00.0	0	0	-3	0	0	0	end not visible
2016-04-01T15:04:21.0	2016-04-01T15:07:22.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-02T01:17:12.0	2016-04-02T01:20:20.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-02T11:30:05.0	2016-04-02T11:33:07.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-02T21:49:28.0	2016-04-02T21:52:36.0	0	0	-3	+3	0	0	disturbance completely visible

2016-04-03T07:38:51.0	2016-04-03T07:41:49.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-03T17:28:17.0	2016-04-03T17:31:19.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-04T02:17:45.0	2016-04-04T02:20:42.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-04T13:07:08.0	2016-04-04T13:10:20.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-04T22:56:32.0	2016-04-04T22:59:28.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-05T08:45:58.0	2016-04-05T08:48:57.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-05T18:35:22.0	2016-04-05T18:38:20.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-05T23:30:04.0	2016-04-05T23:33:08.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-06T10:12:54.0	2016-04-06T10:15:58.0	0	0	-3	+3	0	0	disturbance completely visible
2016-04-06T20:25:48.0	2016-04-06T20:28:52.0	0	0	-3	+3	0	0	disturbance completely visible