

**R O S E T T A**

**FLIGHT REPORTS**

**of RPC-MAG**

**RO-IGEP-TR-0008**

**Issue: 5      Revision: 0**

**January 25, 2010**

**Report of the**

**COMMISSIONING PART 2**

**Time period: May 05. - 10., 2004**

Andrea Diedrich  
Karl-Heinz Glassmeier  
Ingo Richter

Institut für Geophysik und extraterrestrische Physik  
Technische Universität Braunschweig  
Mendelssohnstraße 3, 38106 Braunschweig  
Germany

# ROSETTA

IGEP Institut für Geophysik u. extraterr. Physik  
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## 1 Summary

The second commissioning phase for RPC-MAG was executed in the time period May 05. – 10., 2004. All the performed steps were successful. MAG worked as expected.

Both, the OB and the IB sensor were checked as primary sensor. All voltages were stable and in the expected range.

The sensor temperatures varied in a range of ( $-115^{\circ}\text{C}$  –  $-80^{\circ}\text{C}$ ), because the sensors were obviously in the shadow.

In summary MAG is operating well and we are looking forward for the first scientific relevant measurements.

The next sections give a brief description of the executed activities and show the obtained data. Housekeeping data ( Temperature of the OB & IB sensor, Filter Stages A & B, Filter configuration register, Reference voltage, negative and positive 5V supply voltage, and the coarse HK sampled magnetic field data of the OB sensor ) are presented as well as magnetic field science data of the OB and IB sensor in the activated modes. Magnetic field data are plotted in instrument coordinates if not otherwise stated. They are calibrated according to the results of the ground calibration and the new generated temperature model using flight data from March until September 2004. Sensitivity, Misalignment, and Temperature effects are taken into account. The s/c residual field is not subtracted.

The dynamic spectra show some clear lines which are varying with the time. A detailed investigation showed, that these lines have their origin in the reaction wheels of the ROSETTA S/C. As they are rotating with different speeds they generate different disturbance frequencies. The signatures of the reaction wheels are folded down in the measurement range of the magnetometers. A detailed investigation of this phenomenon is given in RO-IGEP-TR0012.

From time to time there are also horizontal lines in the dynamic spectrum to be seen. These lines represent constant frequencies and are caused by the LAP instrument. This behavior was investigated and proofed during the PC10 campaign in November 2010. See RO-IGEP-TR0030 for further details.

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## 2 May 07, 2004:

### 2.1 Actions

MAG was switched on immediately after PIU via OBCP and set to HK mode and later at 23:38 to SID 5. All commands passed smoothly and the instrument followed in the expected way.

### 2.2 Plots of Calibrated Data using the new Temperature Model

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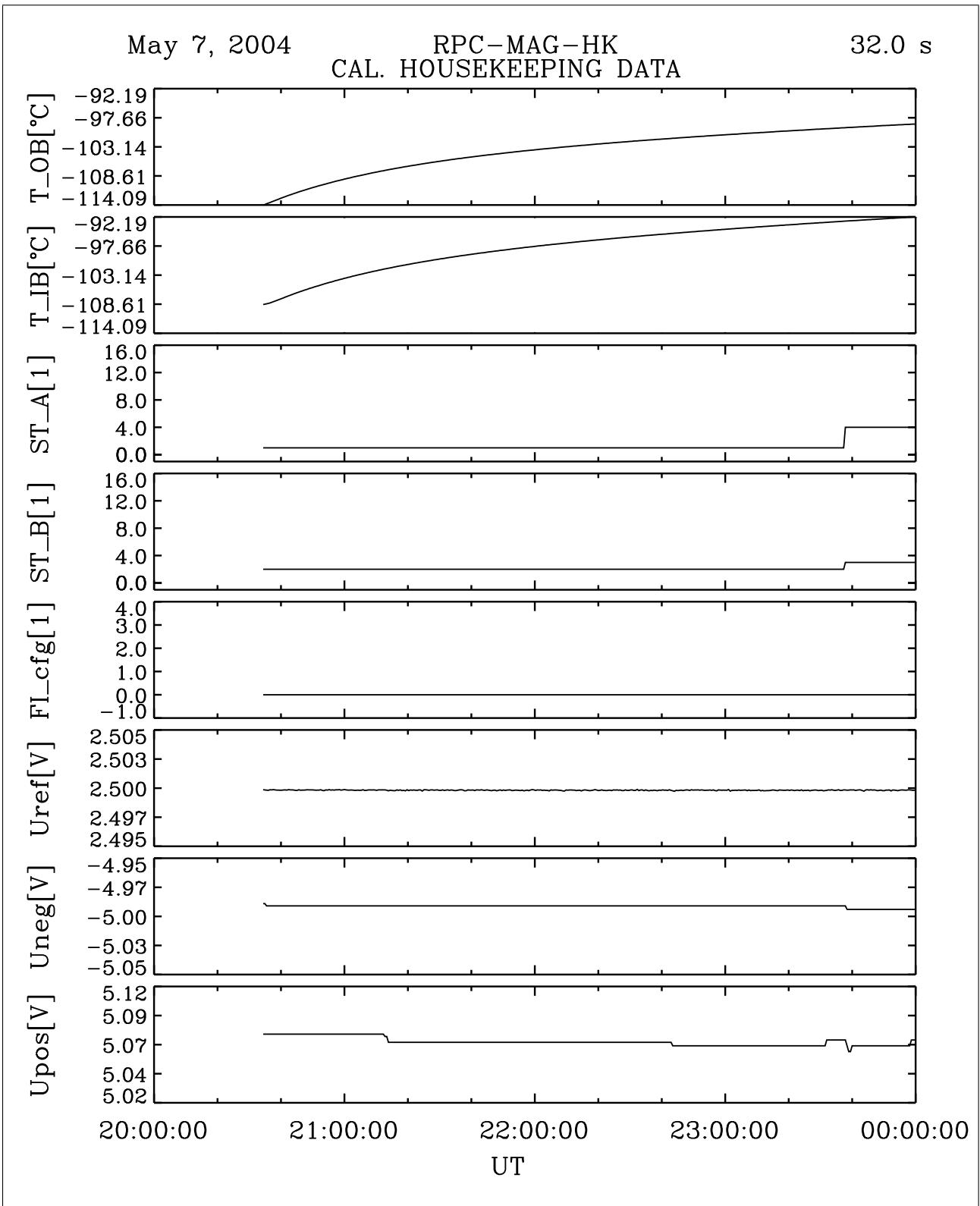


Figure 1: File: RPCMAG040507T2033.CLA.HK.P2000\_2400

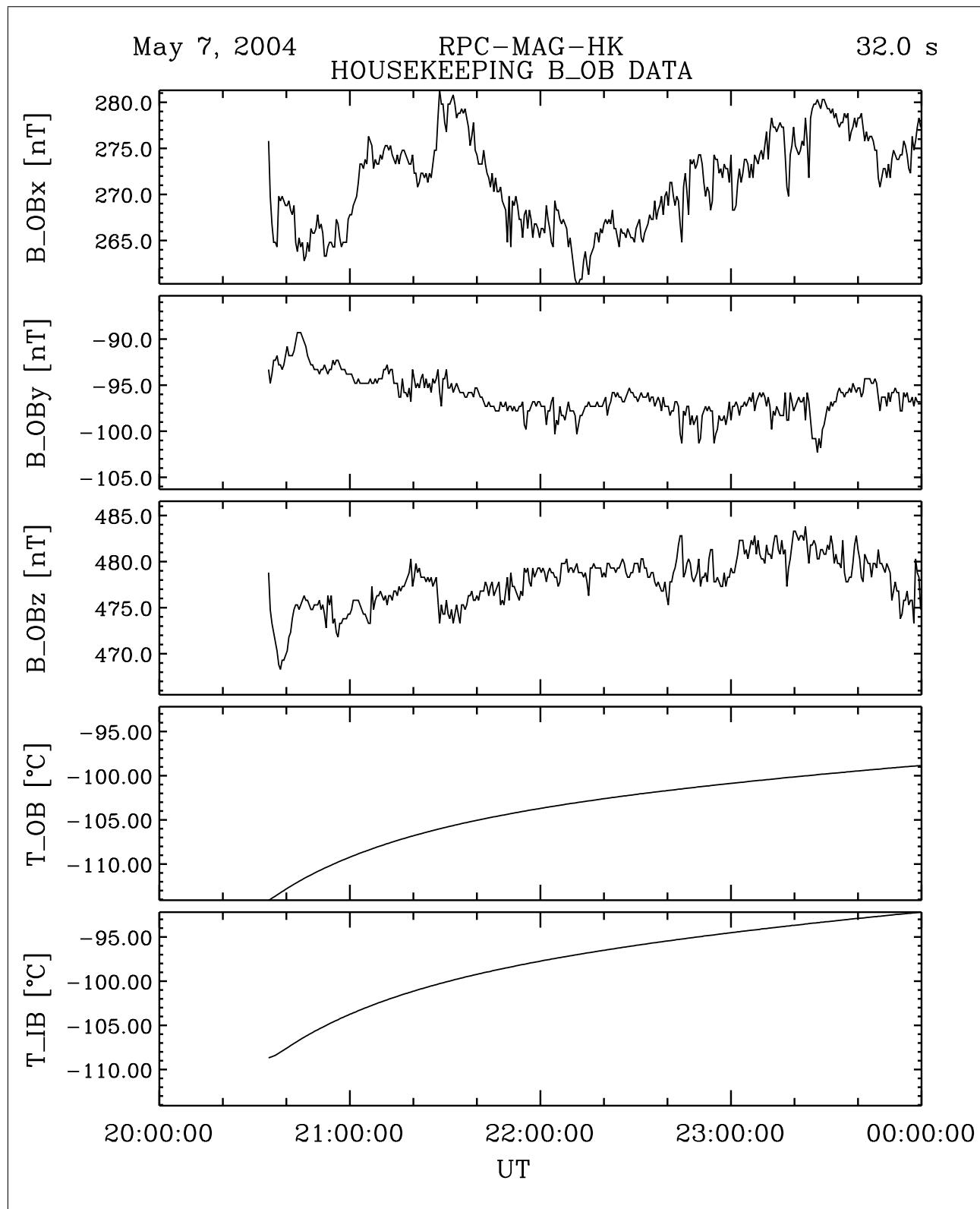


Figure 2: File: RPCMAG040507T2033\_CLA.HK\_B\_P2000\_2400

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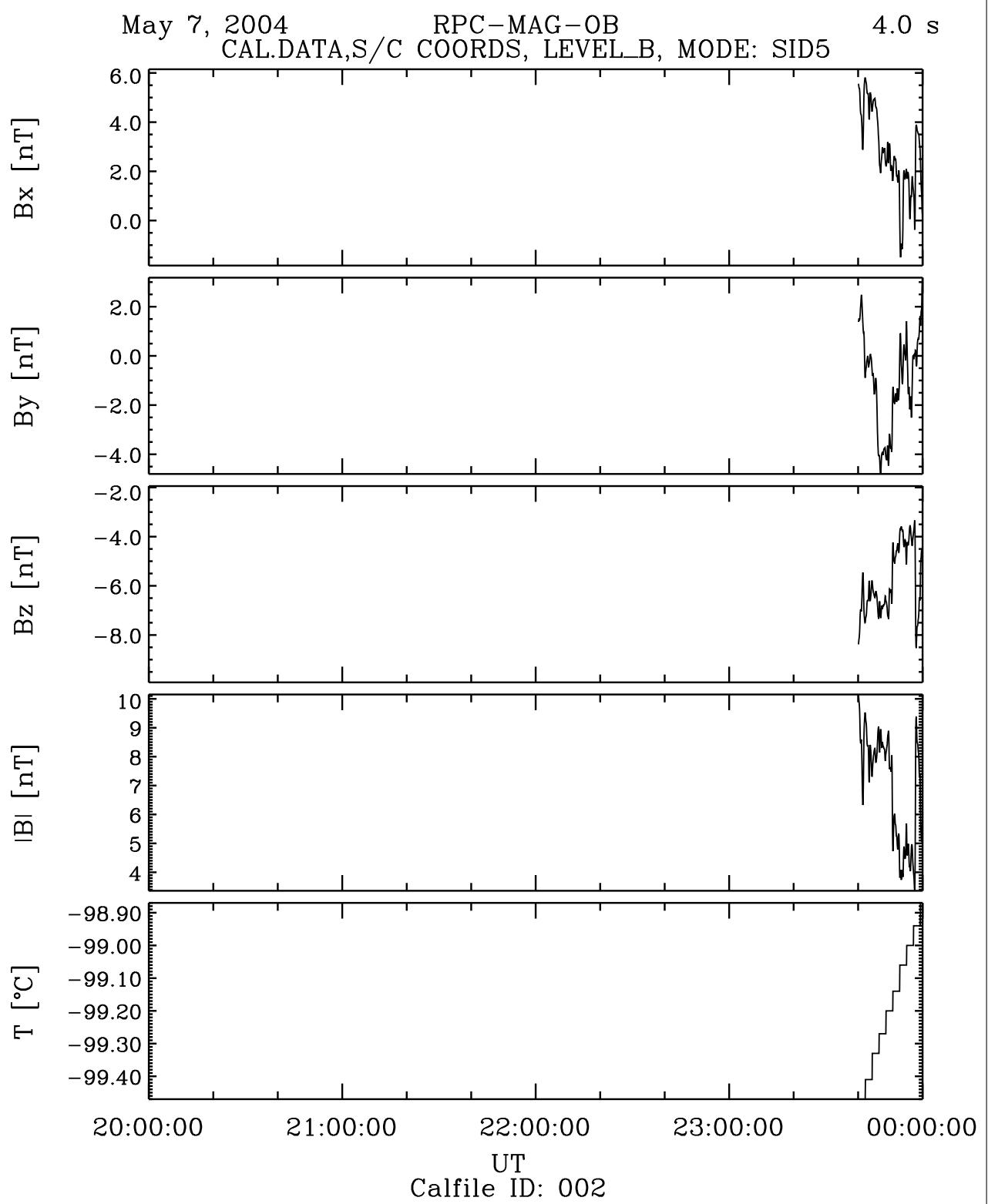


Figure 3: File: RPCMAG040507T2339\_CLB\_OB\_M5\_T2000\_2400\_002

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May 7, 2004                    RPC-MAG-IB  
CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID5            128.1 s

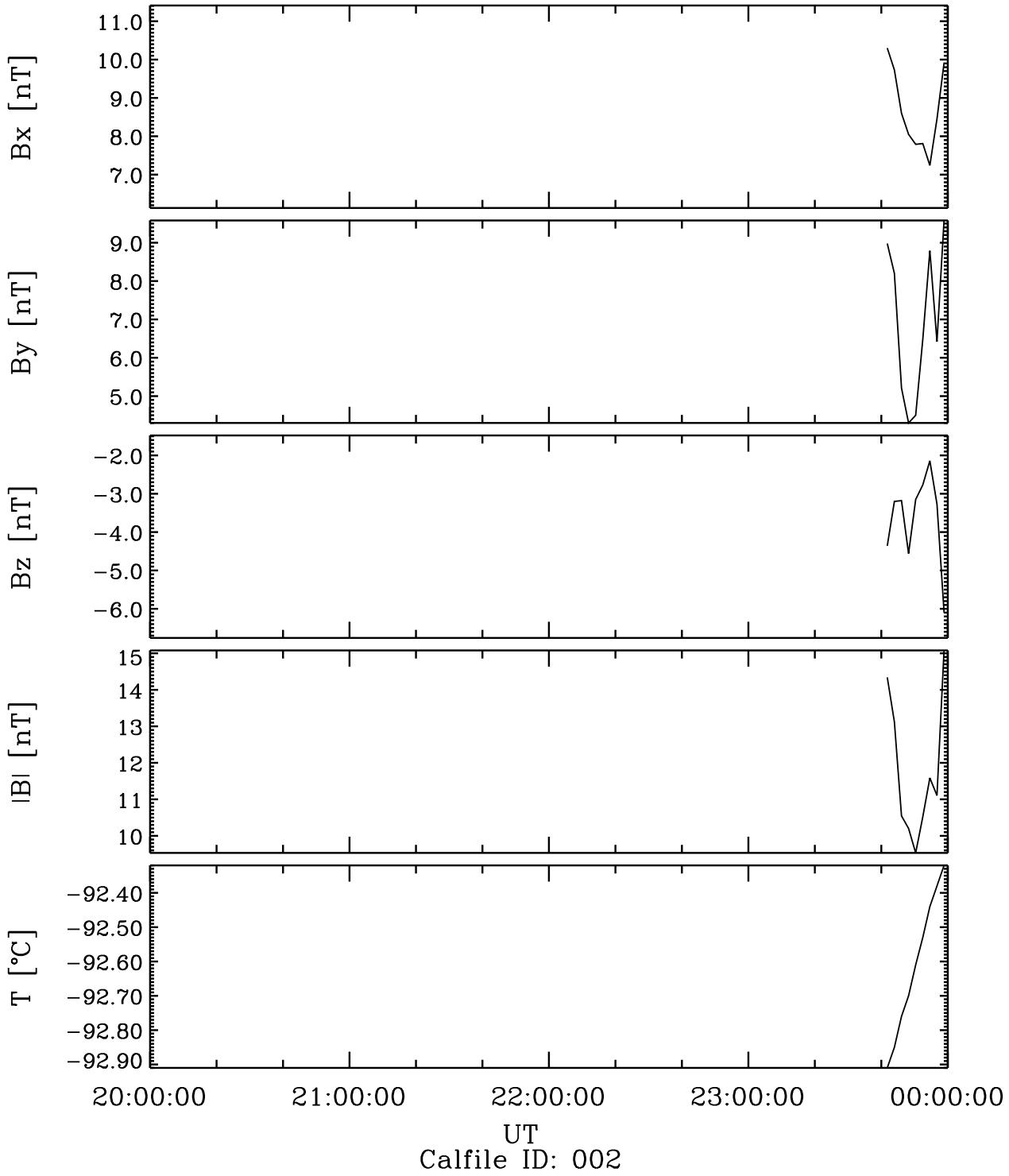


Figure 4: File: RPCMAG040507T2339\_CLB\_IB\_M5\_T2000\_2400\_002

## 2.3 Plots of ROSETTA's Reaction Wheels Speeds

The following plots show the time series of the revolutions of the 4 reaction wheels. Two kinds of data are shown:

- The original reaction wheel data as they are stored in the DDS.
- The theoretical response of the wheels impact seen by an instrument sampling with different frequencies. Here the response in the at 20 Hz, 1 Hz and 0.25 Hz sampling frequency is plotted.

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Revolutions of the four Rosetta Reaction Wheels  
May 7, 2004

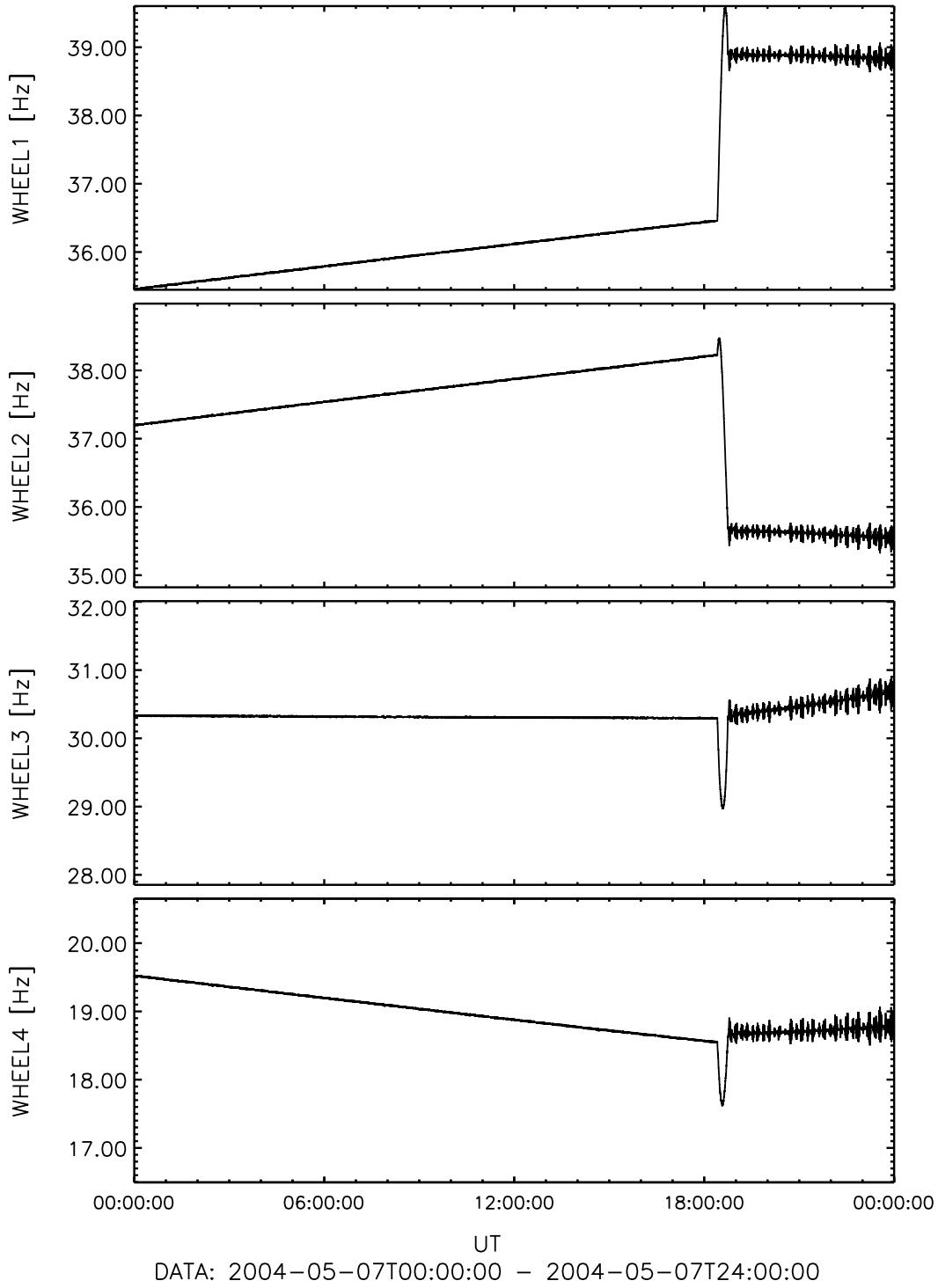


Figure 5: File: wheels\_Hz2004-05-07T00-00

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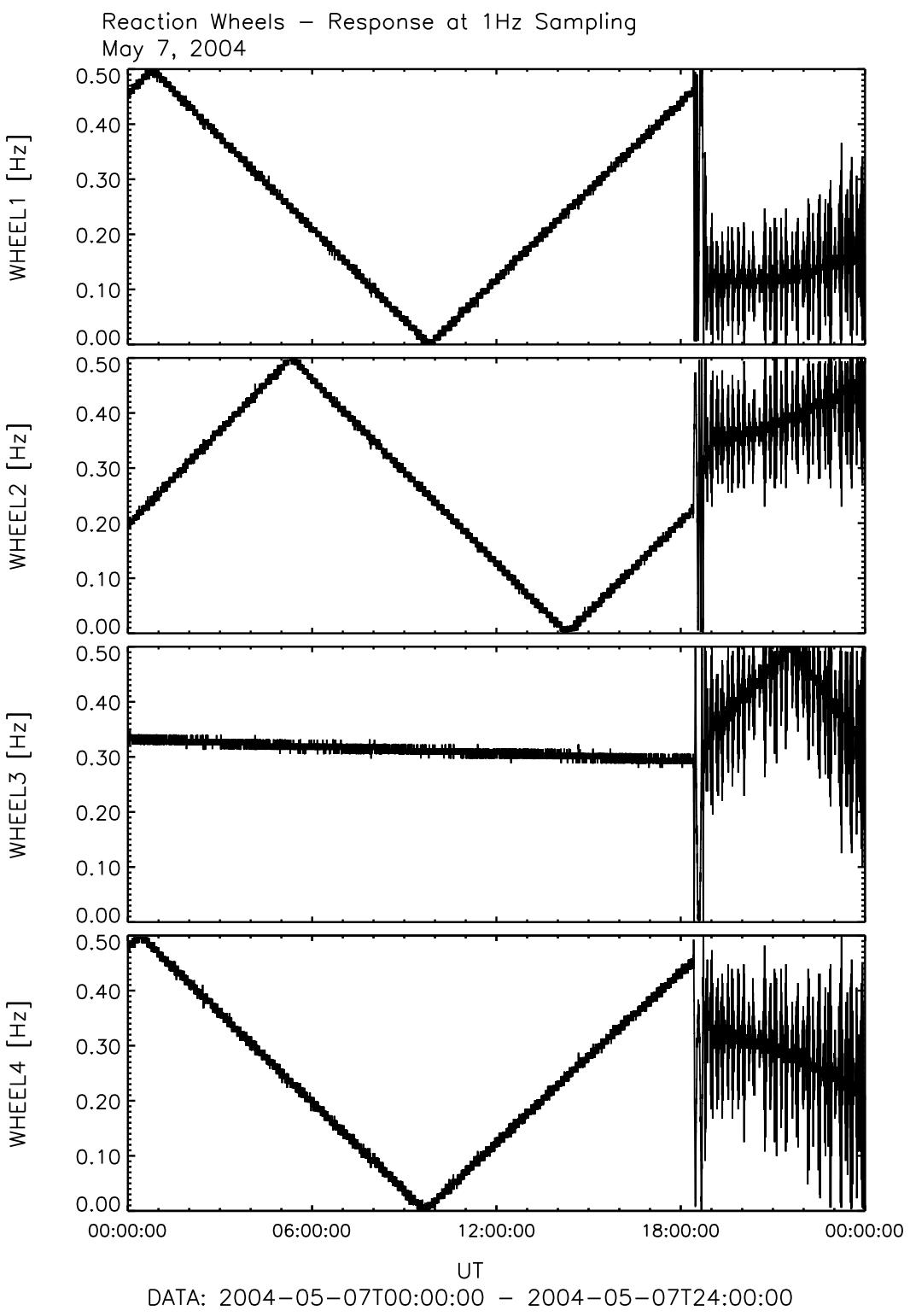


Figure 6: File: wheels\_1Hz\_Sampling2004-05-07T00-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 7, 2004

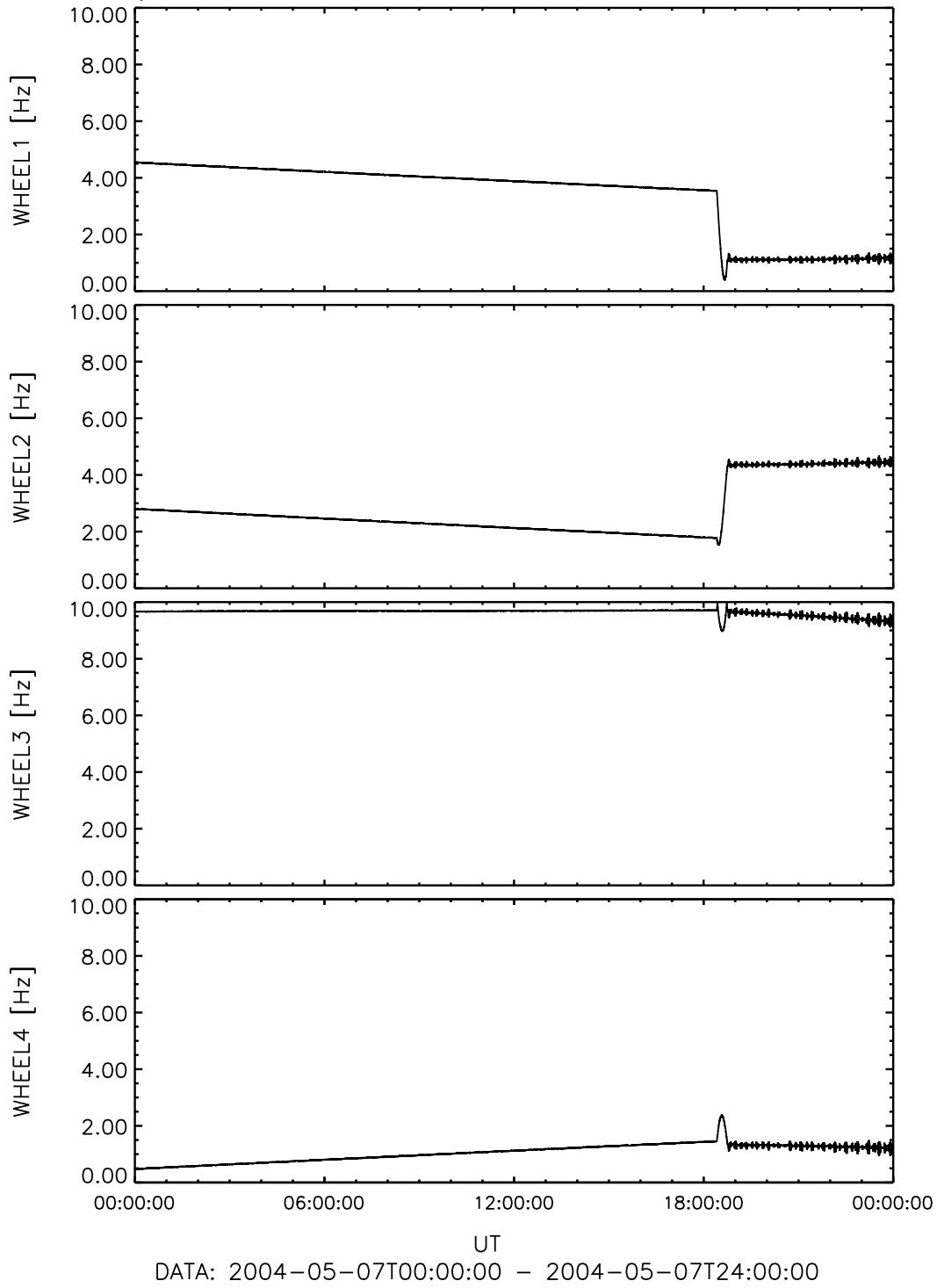


Figure 7: File: wheels\_20Hz\_Sampling2004-05-07T00-00

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Reaction Wheels – Response at 0.25 Hz Sampling  
May 7, 2004

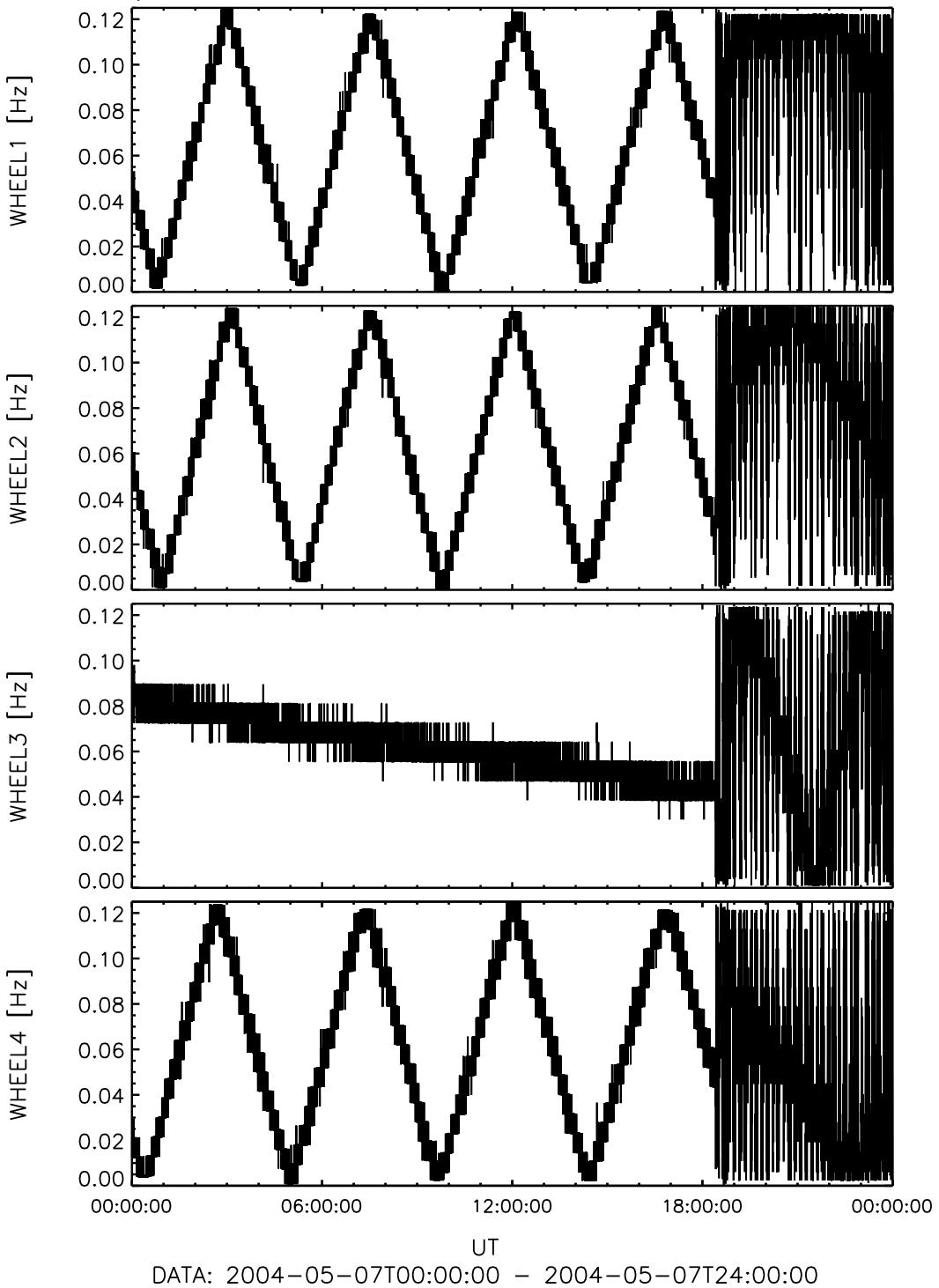


Figure 8: File: wheels\_025Hz\_Sampling2004-05-07T00-00

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Reaction Wheels – Response at 0.25 Hz Sampling  
May 7, 2004

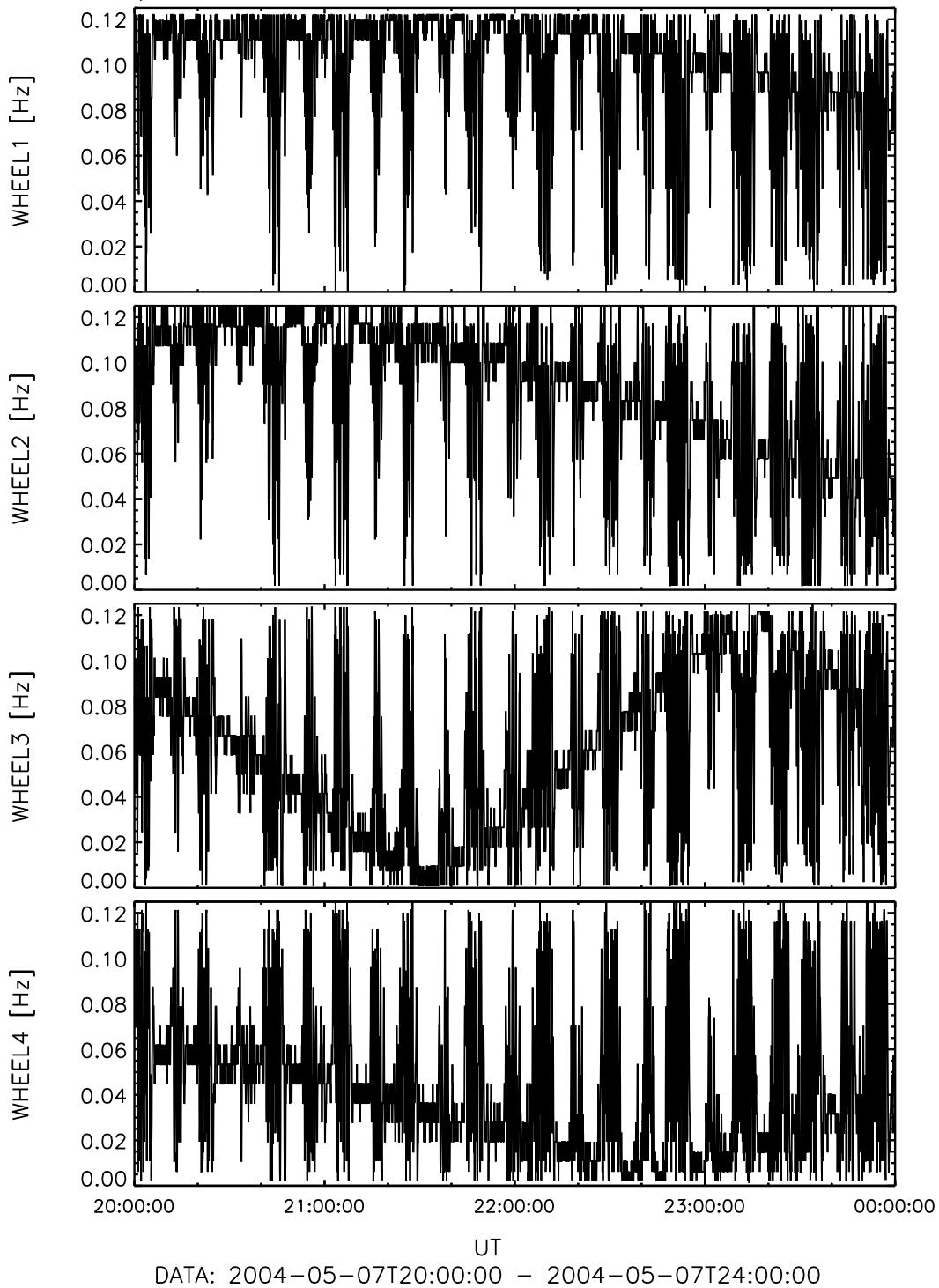


Figure 9: File: wheels\_025Hz\_Sampling2004-05-07T20-00

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### 3 May 08, 2004:

#### 3.1 Actions

MAG was successfully set to SID4 at 01:50. Data were sent until 02:15 (LOS). These data show variations of maximum 4 nT in the modulus. The temperature was stable at 95° C. The other data were stored in SSMM and downlinked later.

All the day the instrument gathered data during the Out of path period. During the day the Instrument was switched successfully to to all SIDs.

Time	Stage A, Stage B, Filter cfg	Stage 1, Stage 2, Stage3	Mode
00:00 – 01:50	4 3 0	4 3 0	SID5
– 08:49	2 0 0	2 0 0	SID4
– 11:18	0 0 0	0 0 0	SID3
– 13:47	1 2 0	1 2 0	SID2
– 18:23	4 3 1	4 3 3	SID1
– 21:34	0 0 0	0 0 0	SID3
– 22:03	4 3 1	4 3 3	SID1
– 22:05	1 2 0	1 2 0	SID2
– 22:31	4 3 1	4 3 3	SID1
– 24:00	0 0 0	0 0 0	SID3

The spectral investigation of the data reveals a peak at about 1 Hz (ref. Figure ?? and Figure ??). This frequency peak occurs e.g. in the time interval 09:00 – 10:00 and at 02:00, but disappears in the interval 19:00 – 21:00. However, in this time interval a peak at 3 Hz appears.

#### 3.2 Plots of Calibrated Data using the new Temperature Model

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RPC-MAG-HK  
 CAL. HOUSEKEEPING DATA

32.0 s

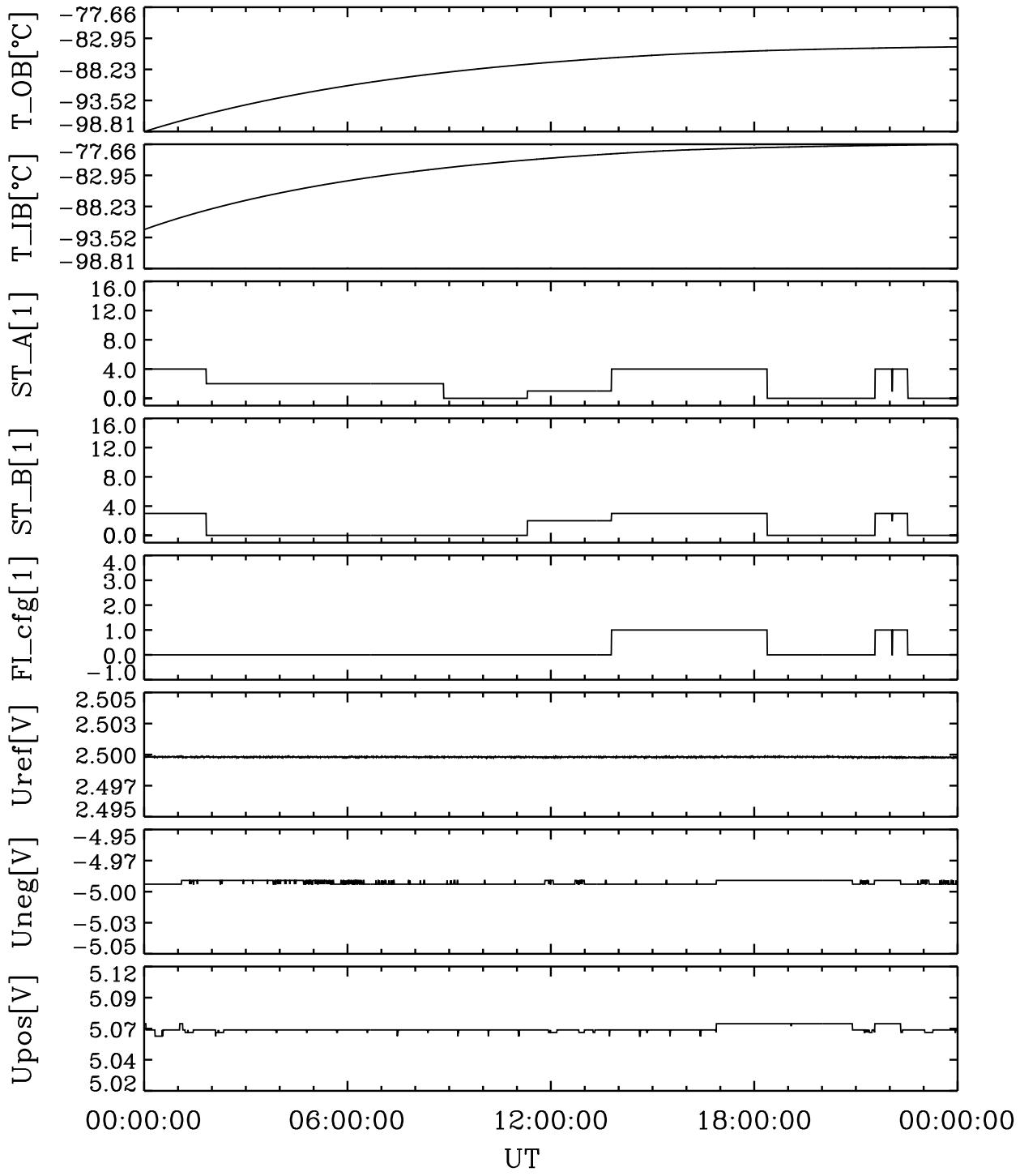


Figure 10: File: RPCMAG040508T0000\_CLA\_HK\_P0000\_2400

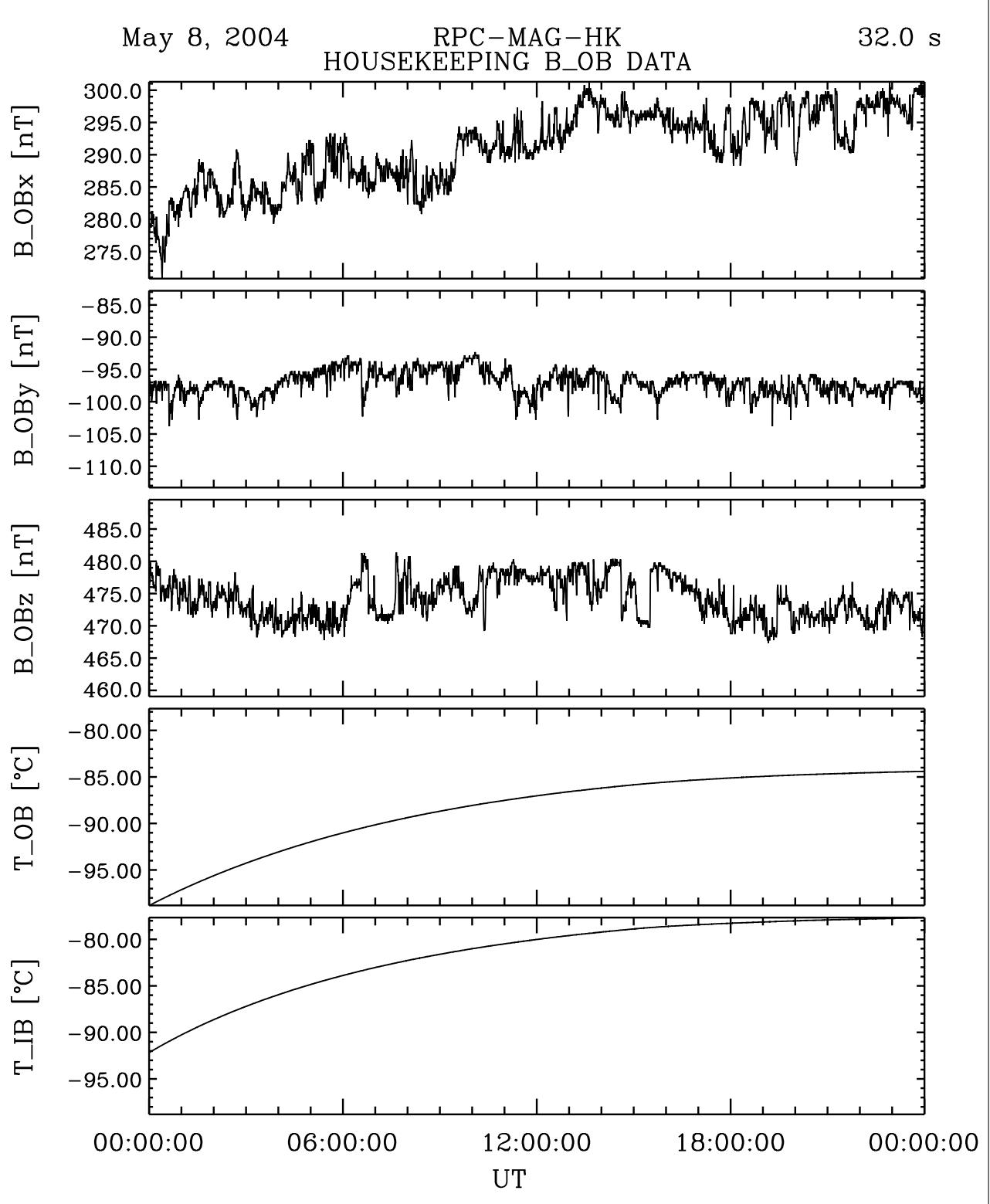


Figure 11: File: RPCMAG040508T0000\_CLA\_HK\_B\_P0000\_2400

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CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID5                    4.0 s

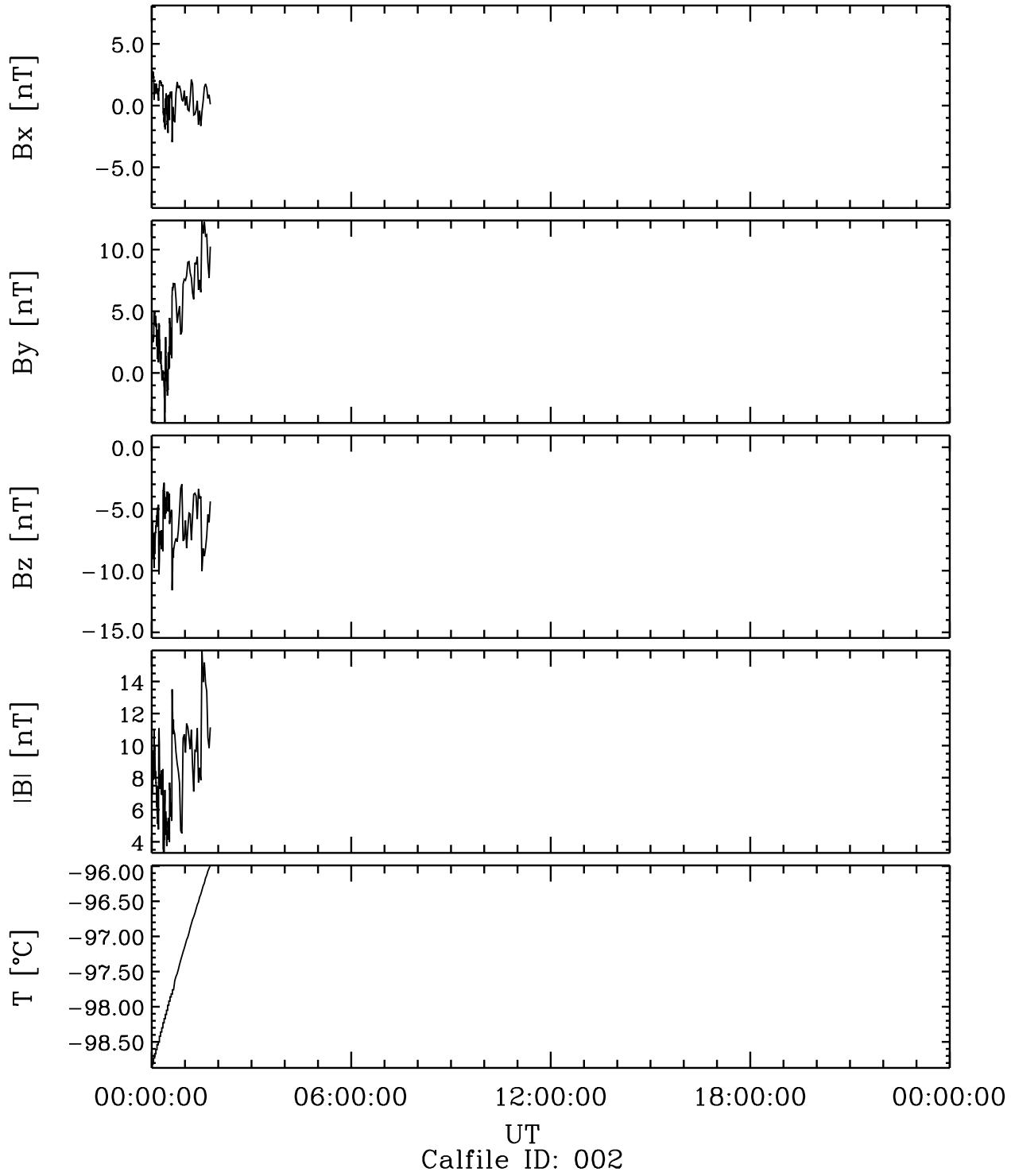


Figure 12: File: RPCMAG040508T0000\_CLB\_OB\_M5\_T0000\_2400\_002

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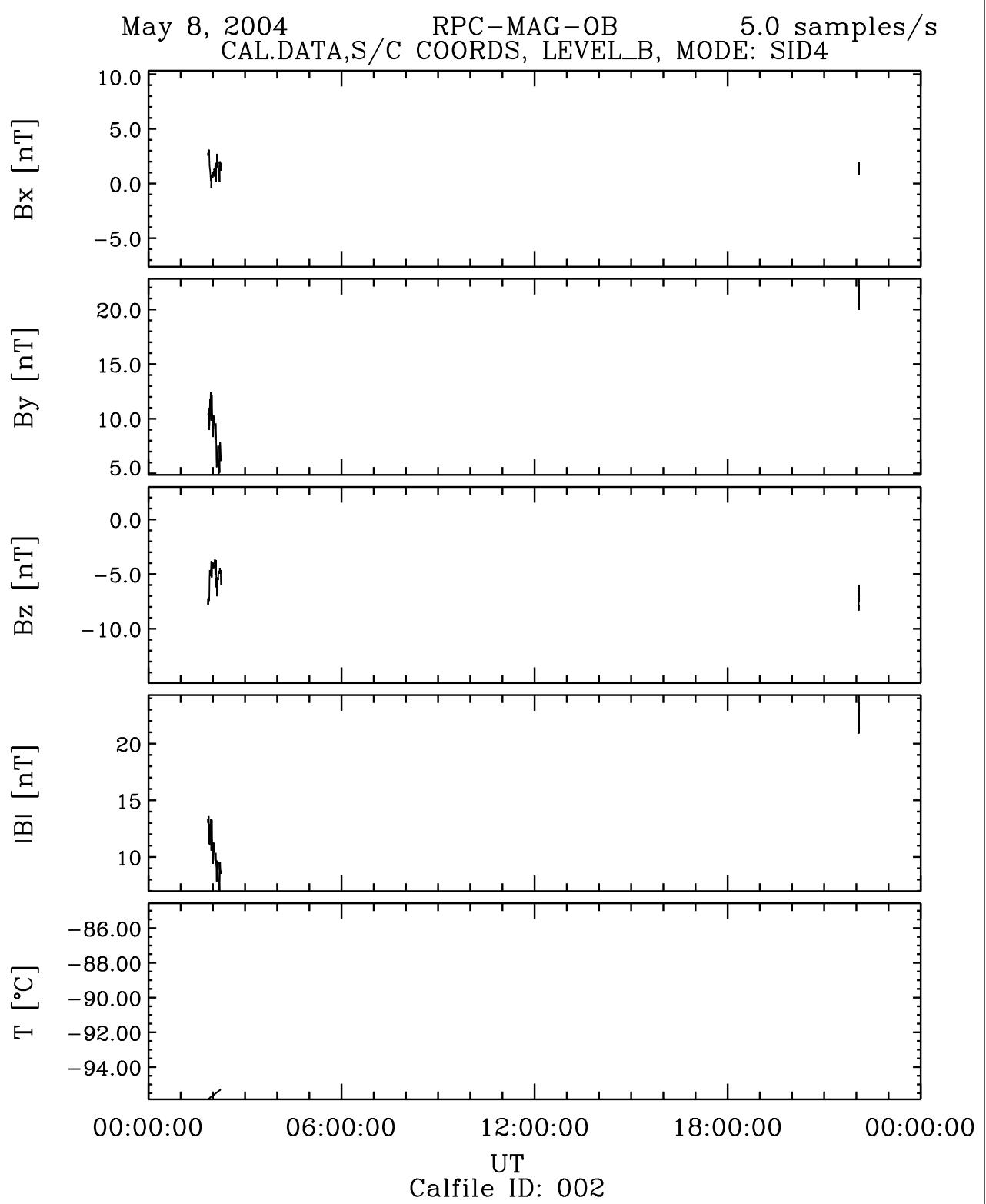


Figure 13: File: RPCMAG040508T0150\_CLB\_OB\_M4\_T0000\_2400\_002

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May 8, 2004                    RPC-MAG-OB                    20.0 samples/s  
CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID3

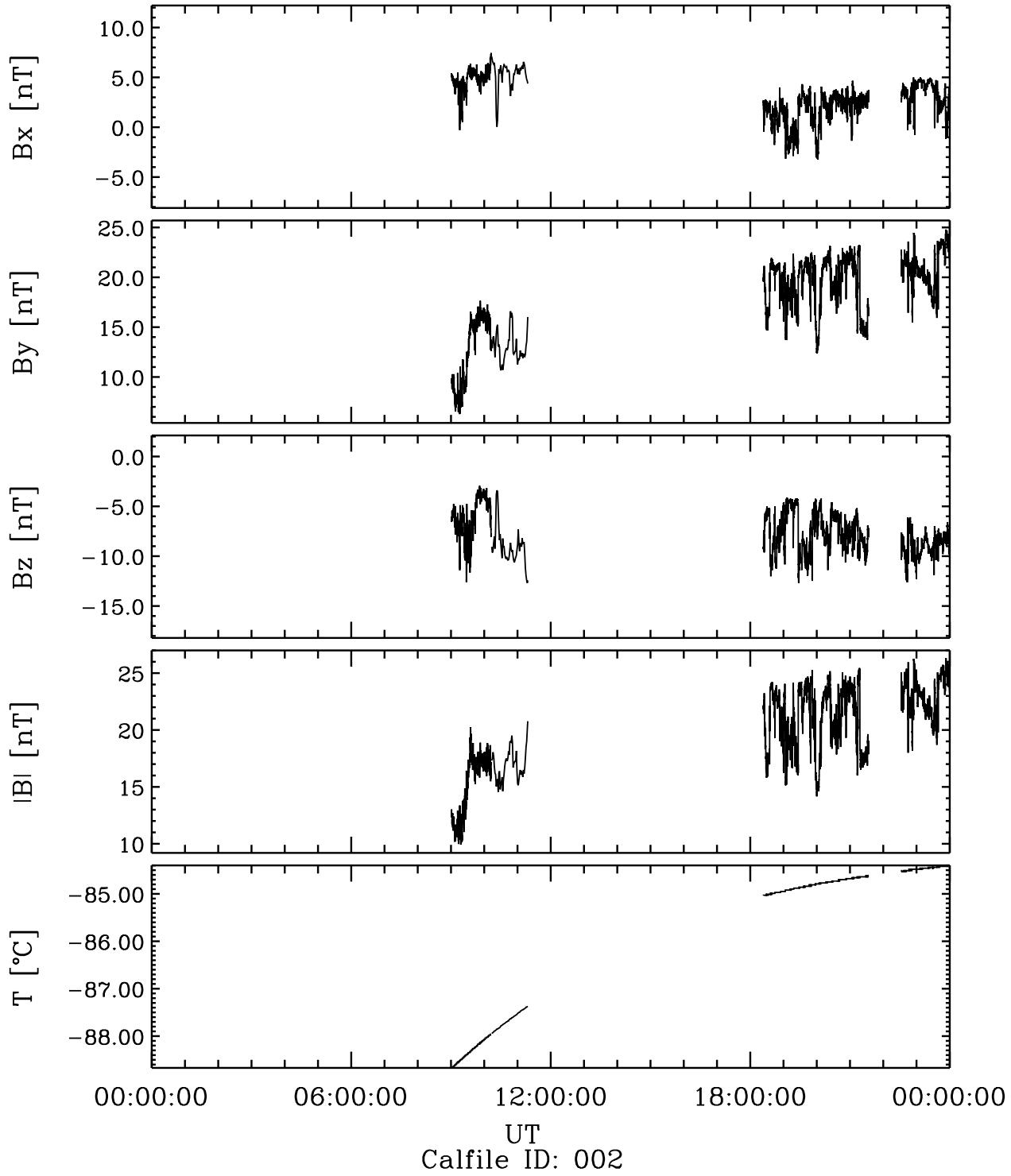


Figure 14: File: RPCMAG040508T0900\_CLB\_OB\_M3\_T0000\_2400\_002

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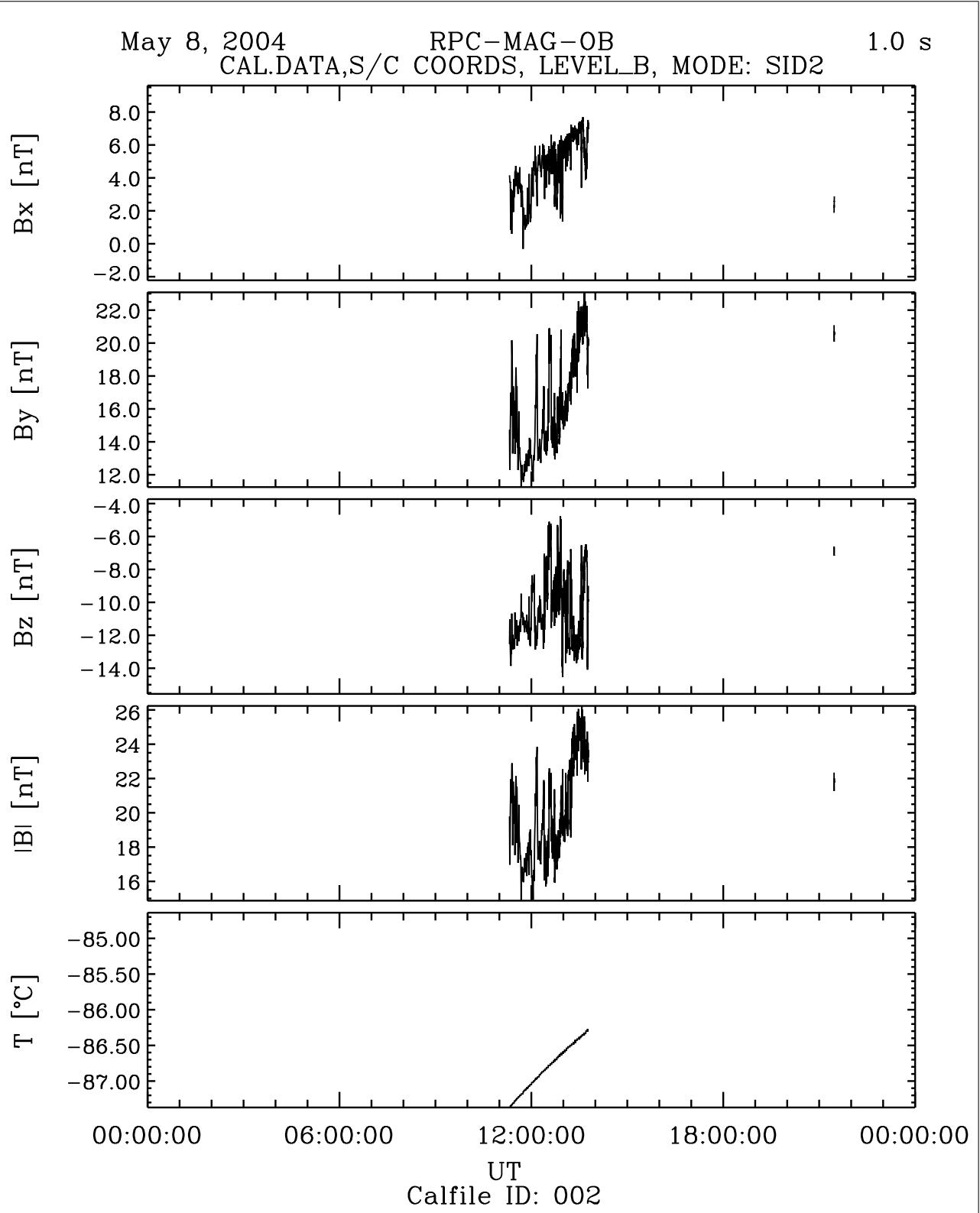


Figure 15: File: RPCMAG040508T1118\_CLB\_OB\_M2\_T0000\_2400\_002

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May 8, 2004                    RPC-MAG-OB  
CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID1                    32.0 s

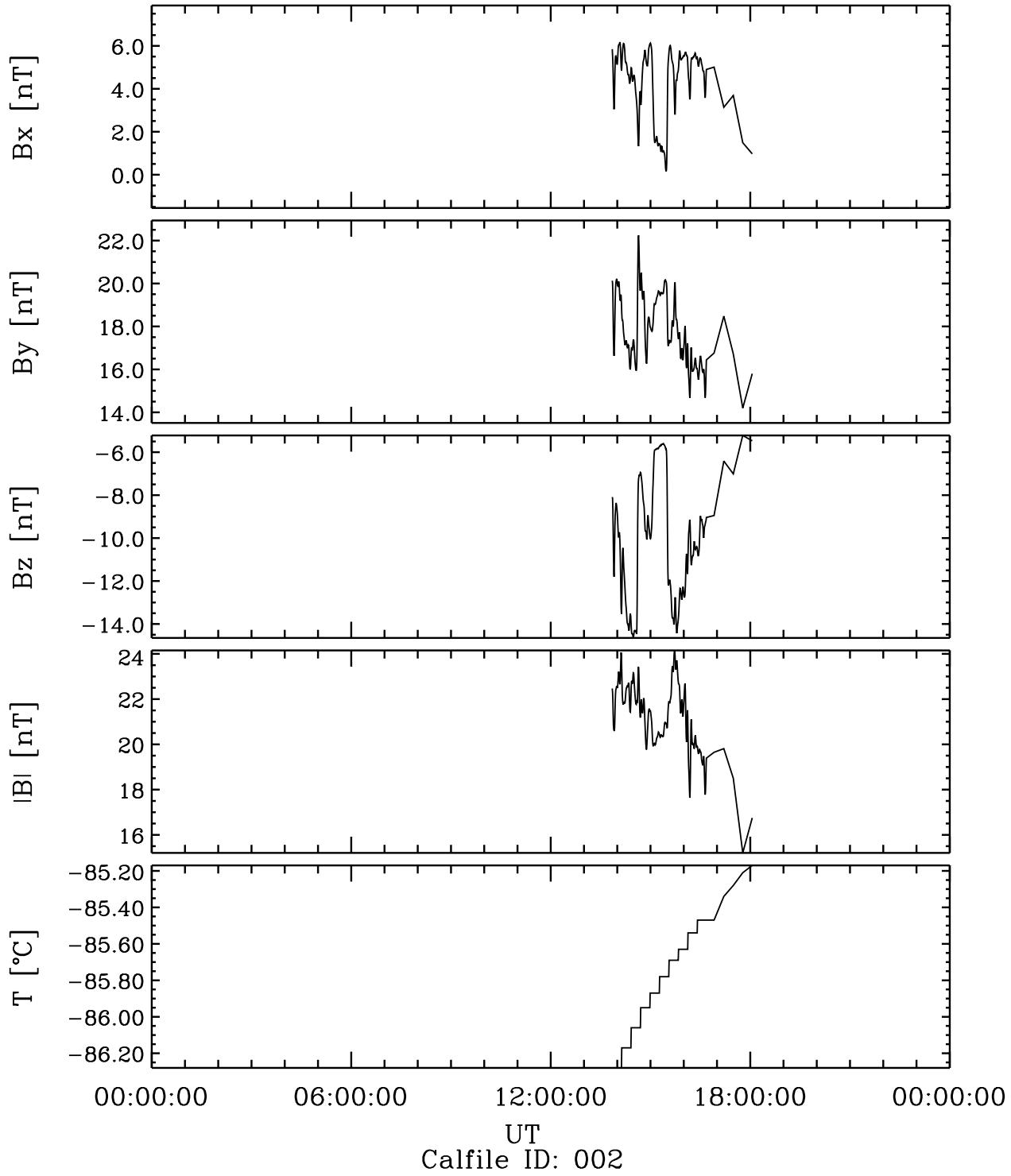


Figure 16: File: RPCMAG040508T1347\_CLB\_OB\_M1\_T0000\_2400\_002

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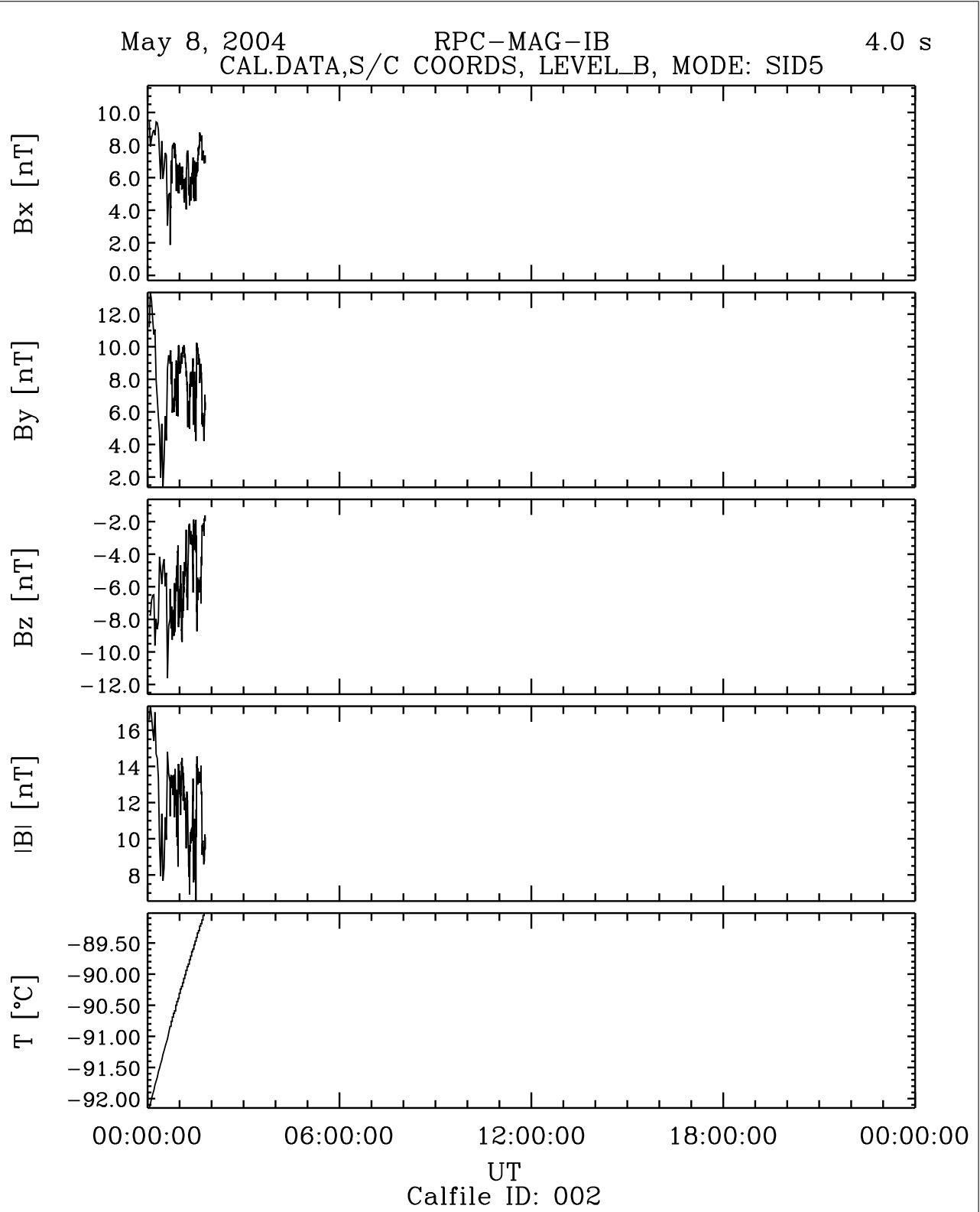


Figure 17: File: RPCMAG040508T0001\_CLB\_IB\_M5\_T0000\_2400\_002

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May 8, 2004                    RPC-MAG-IB                    5.0 samples/s  
CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID4

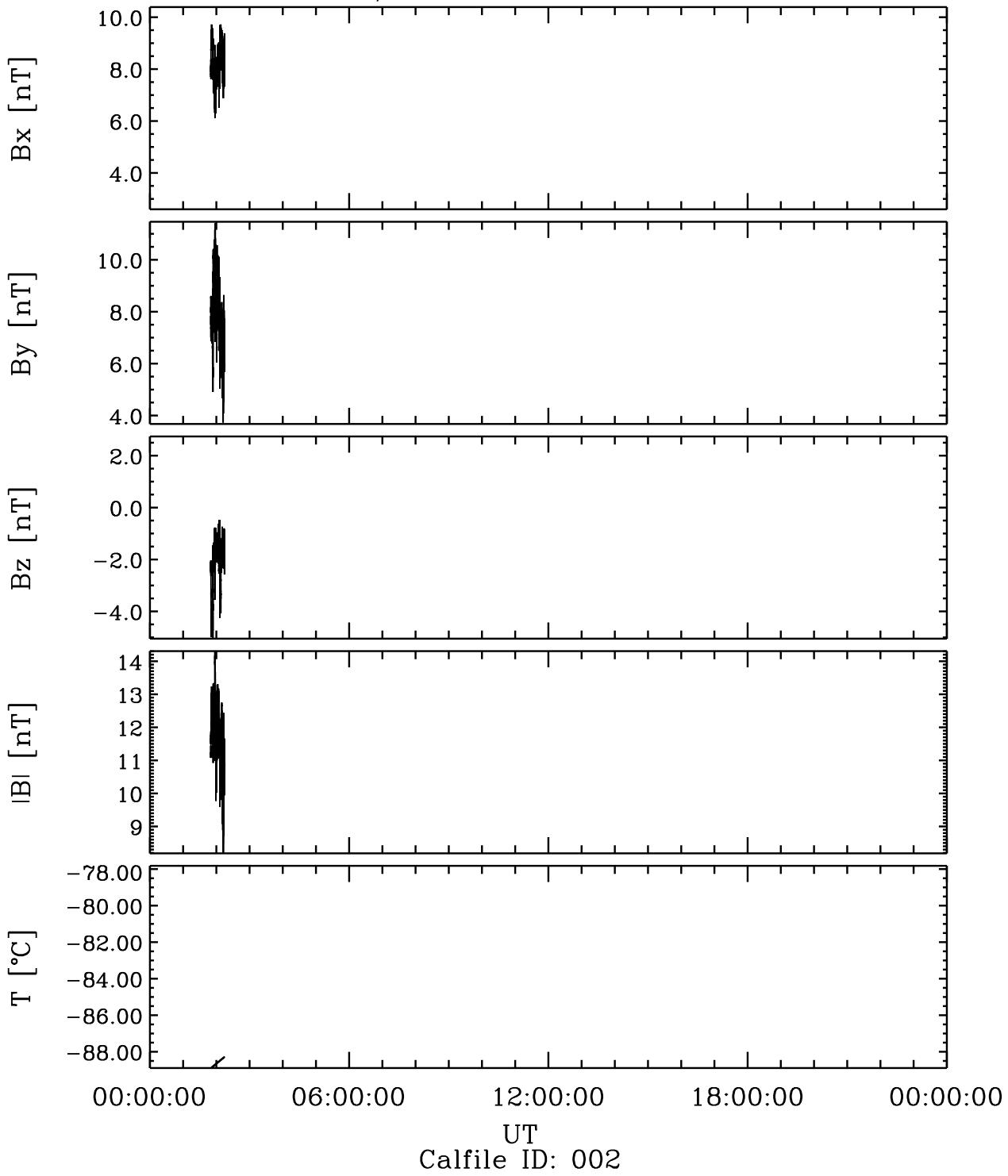


Figure 18: File: RPCMAG040508T0150\_CLB\_IB\_M4\_T0000\_2400\_002

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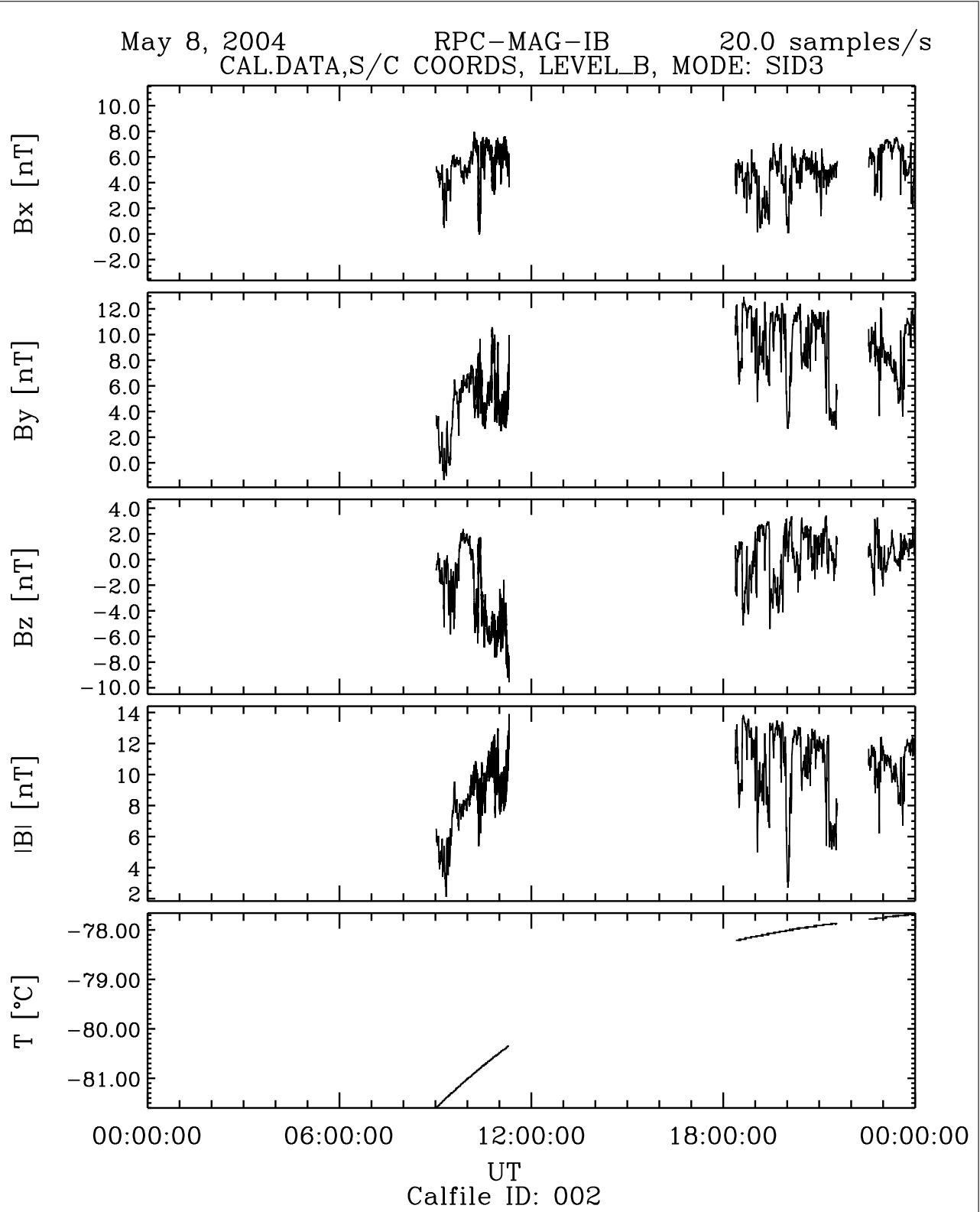


Figure 19: File: RPCMAG040508T0900\_CLB\_IB\_M3\_T0000\_2400\_002

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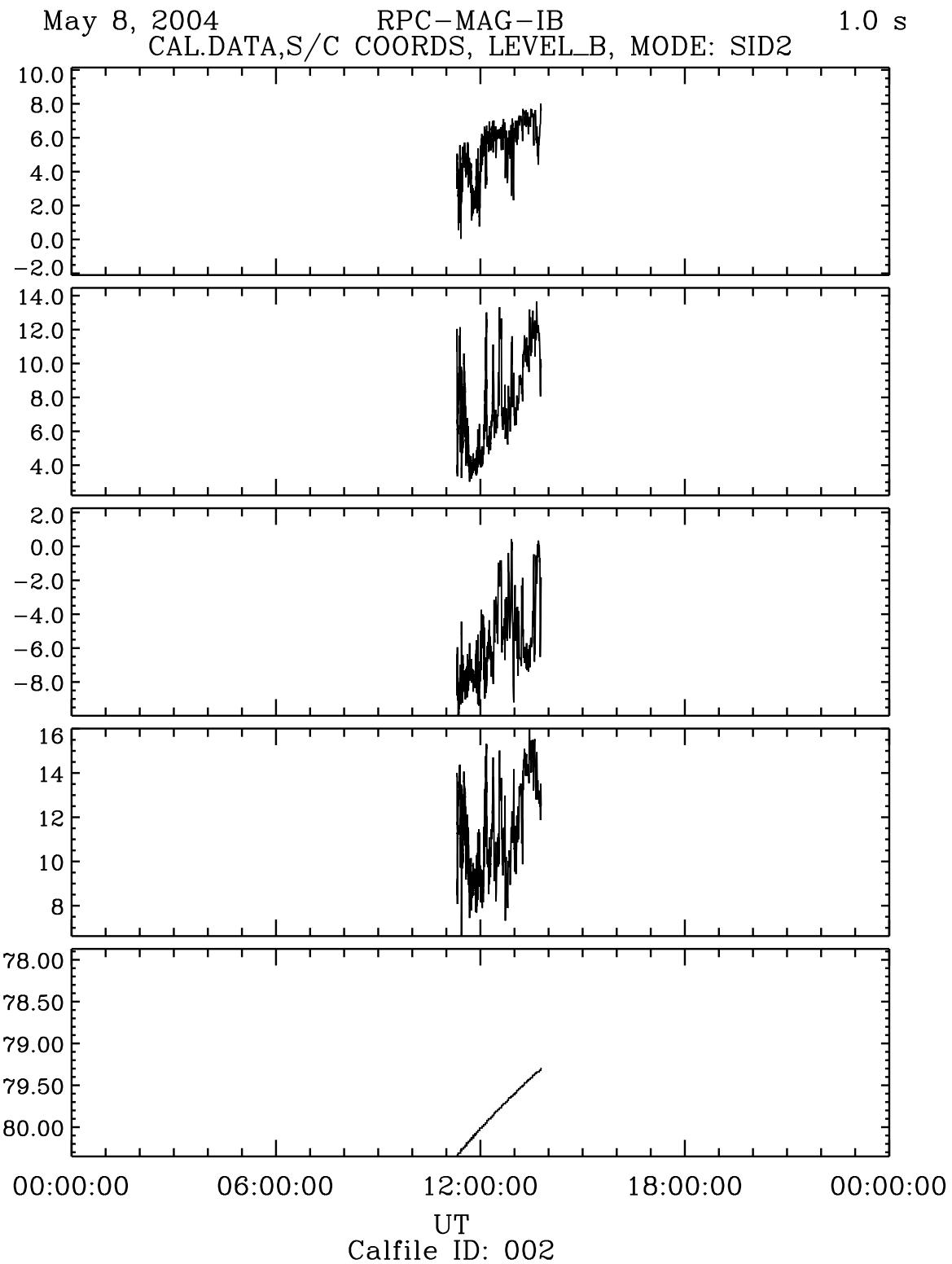


Figure 20: File: RPCMAG040508T1118\_CLB\_IB\_M2\_T0000\_2400\_002

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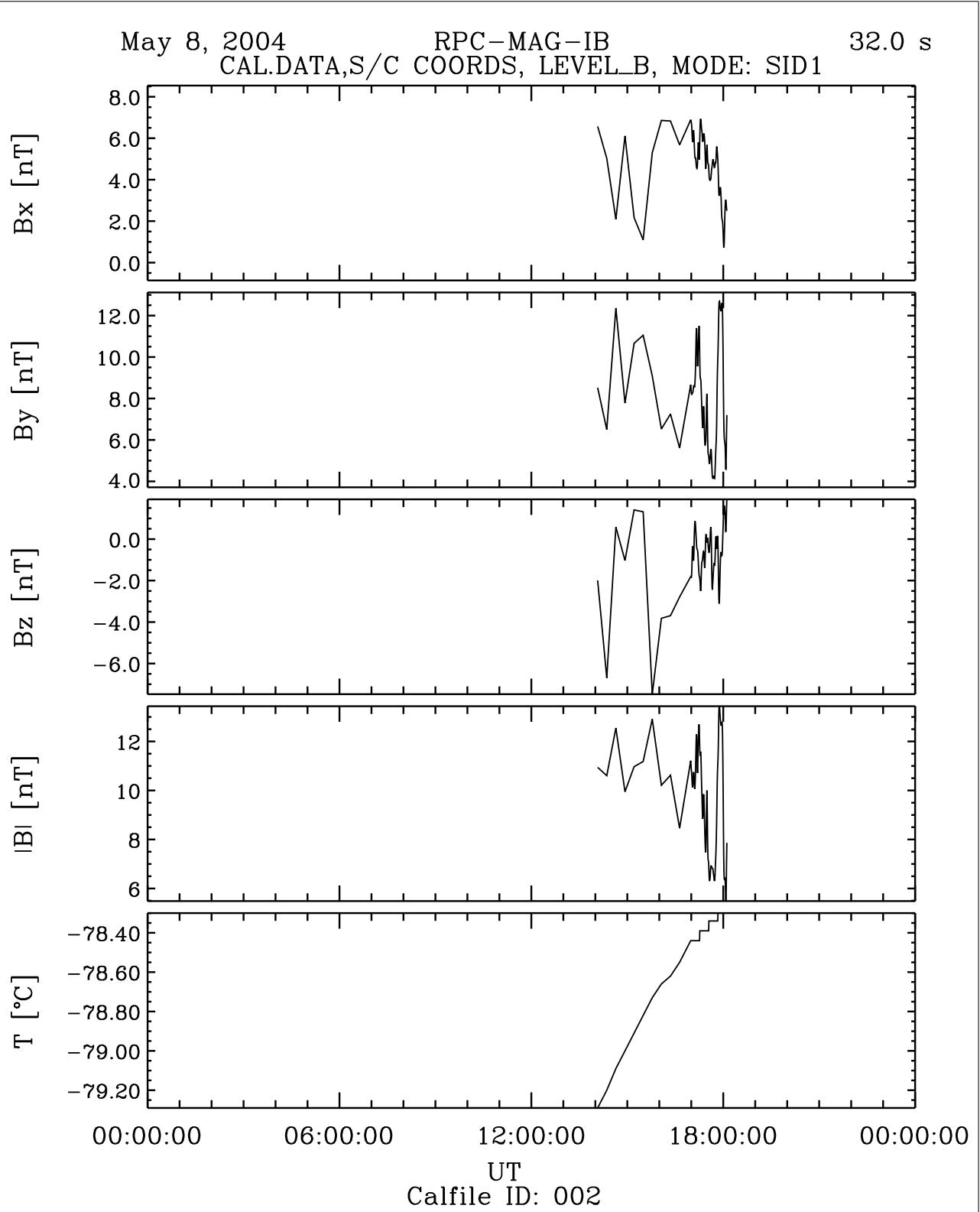


Figure 21: File: RPCMAG040508T1347\_CLB\_IB\_M1\_T0000\_2400\_002

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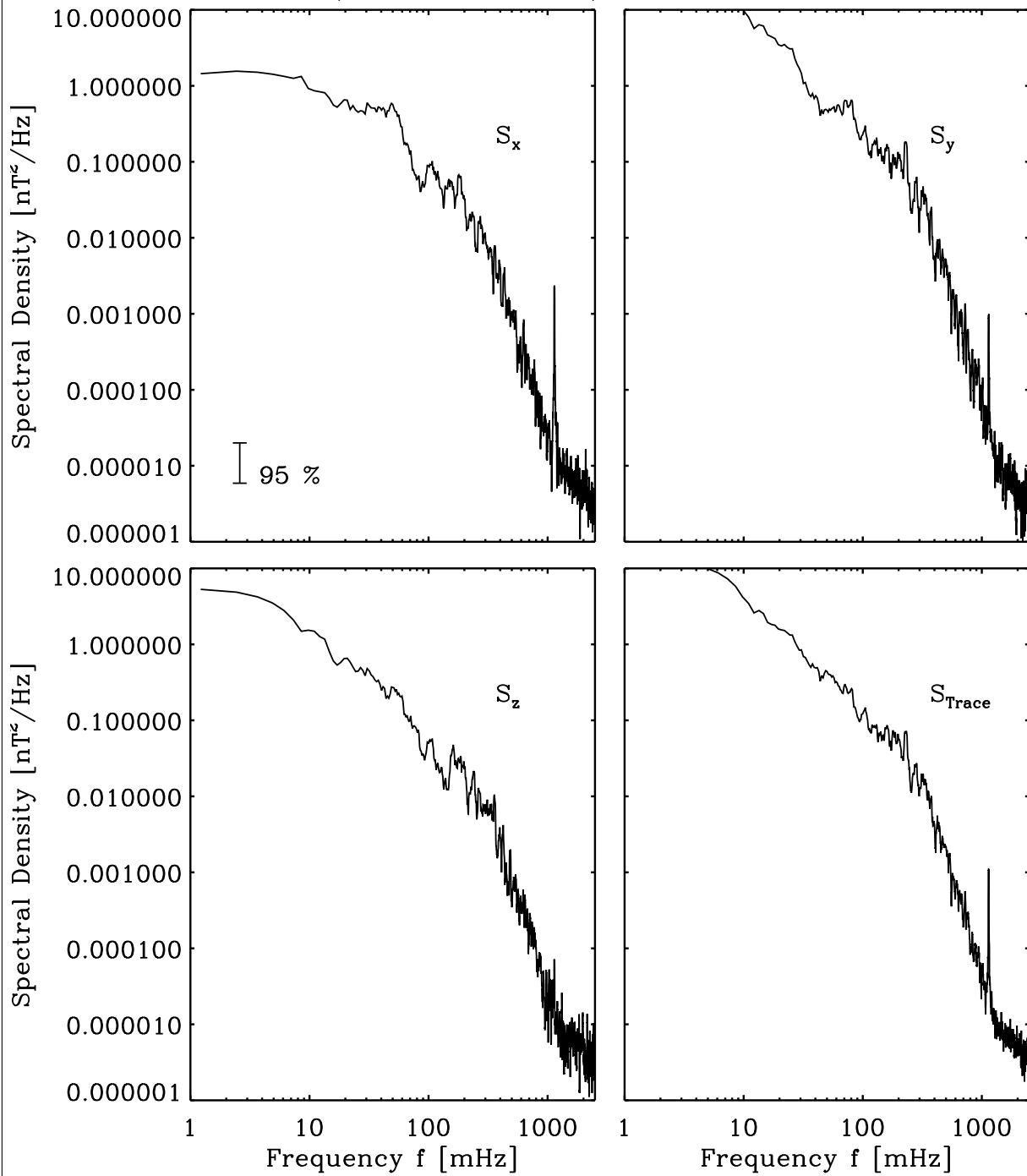
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0.20s

LEVEL\_B, POWER SPECTRUM, MODE: SID4 RPC-MAG-IB



Calfile ID: 002

Interval: 01:55:11.899 – 02:08:50.899

Figure 22: File: RPCMAG040508T0150\_CLB\_IB\_M4\_PS1\_10000\_002

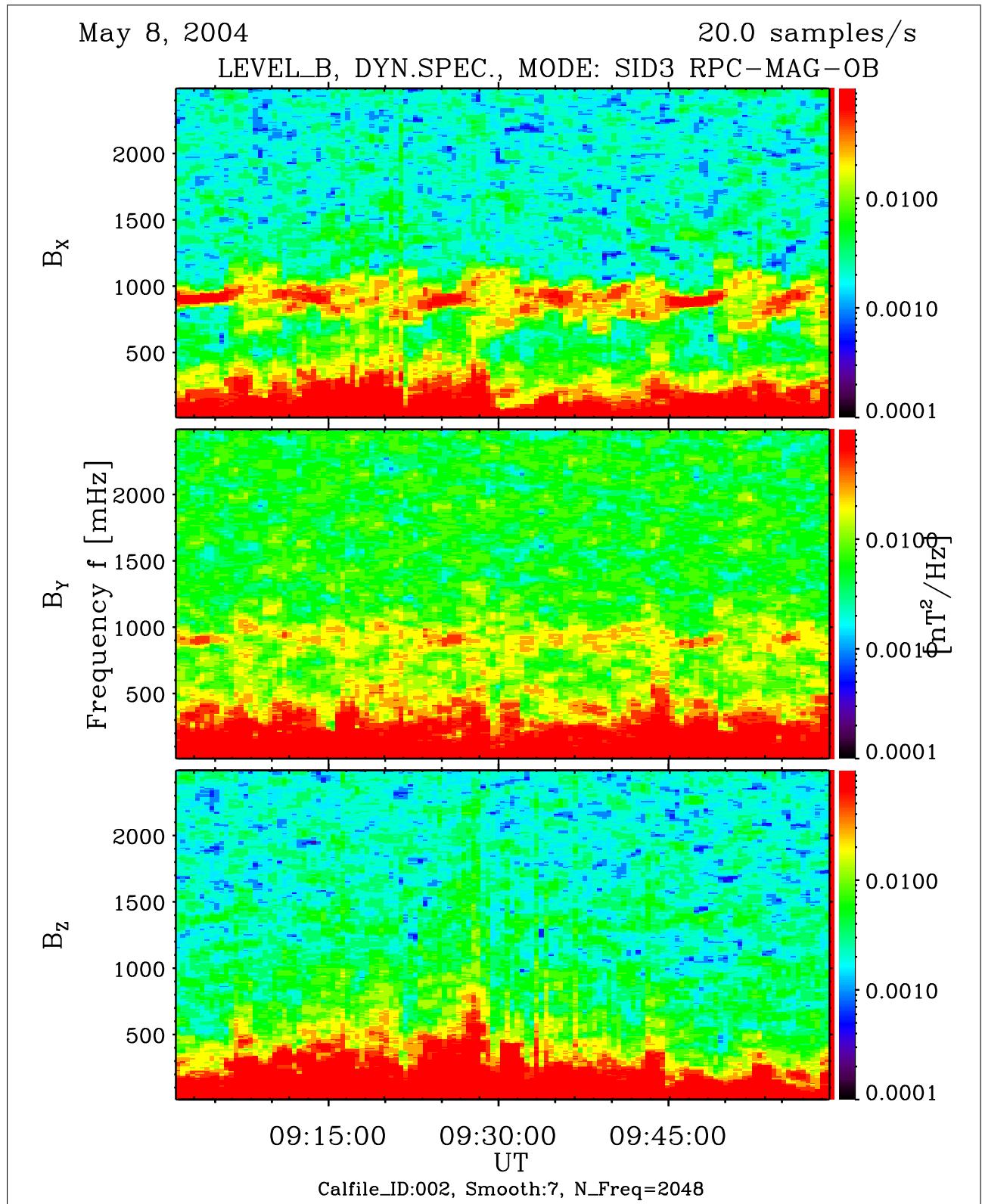


Figure 23: File: RPCMAG040508T0900\_CLB\_OB\_M3\_DS1e-2\_2500\_002

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LEVEL\_B, DYN.SPEC., MODE: SID3 RPC-MAG-IB

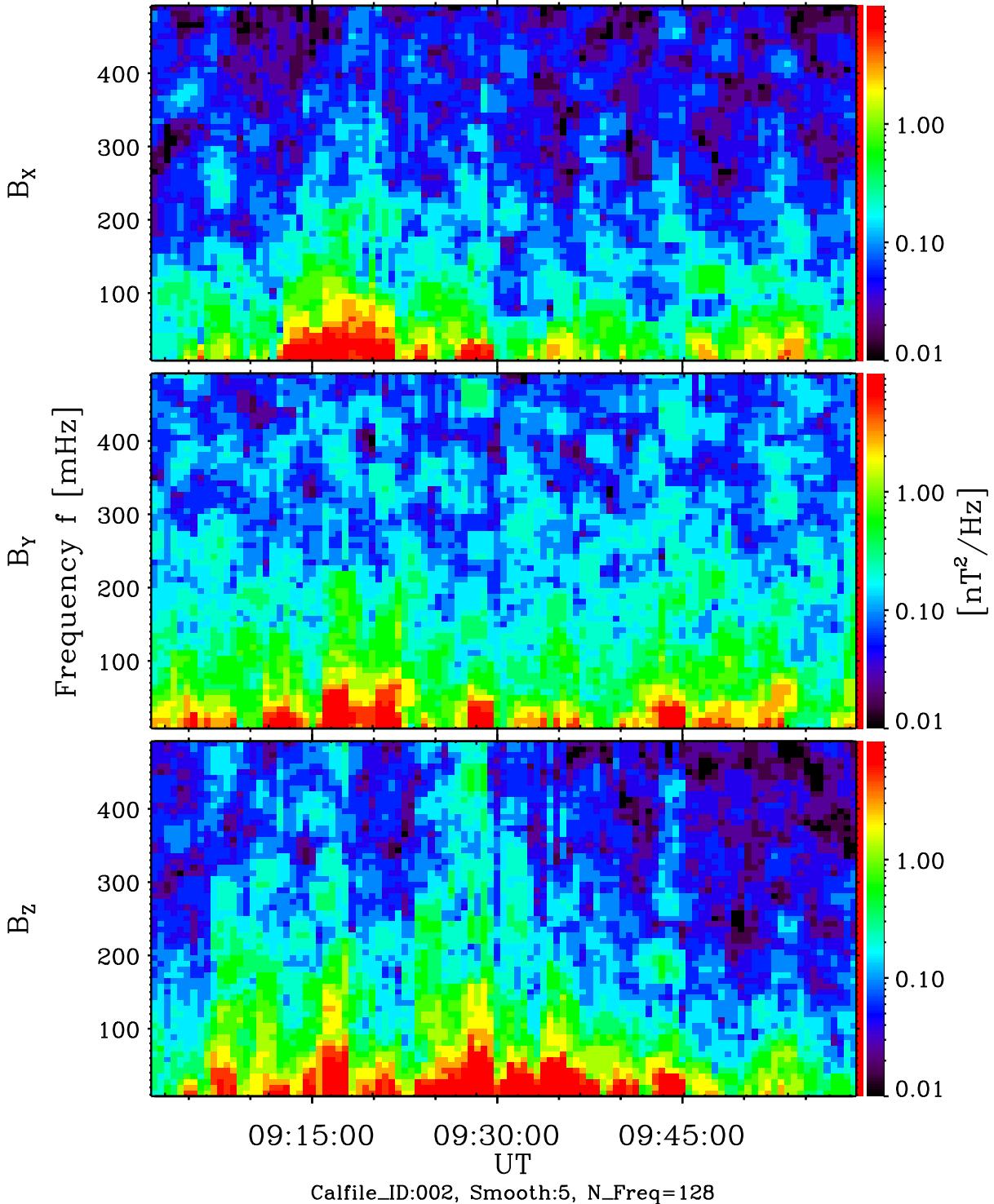


Figure 24: File: RPCMAG040508T0900\_CLB\_IB\_M3\_DS1e-2\_500\_002

# ROSETTA

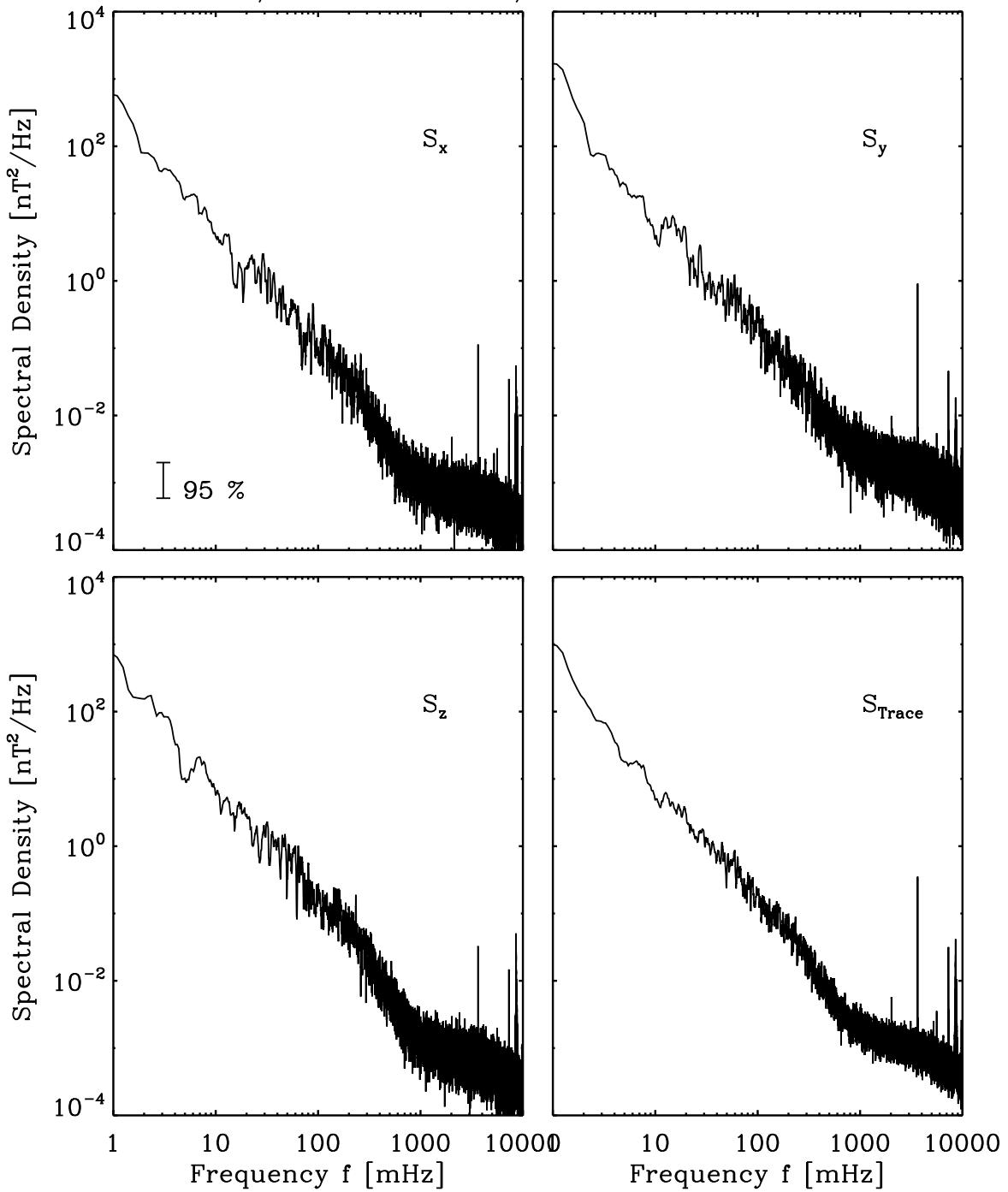
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0.049s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-OB



Calfile ID: 002

Interval: 19:05:23.227 – 20:54:36.777

Figure 25: File: RPCMAG040508T0900\_CLB\_OB\_M3\_PS1\_10000\_002

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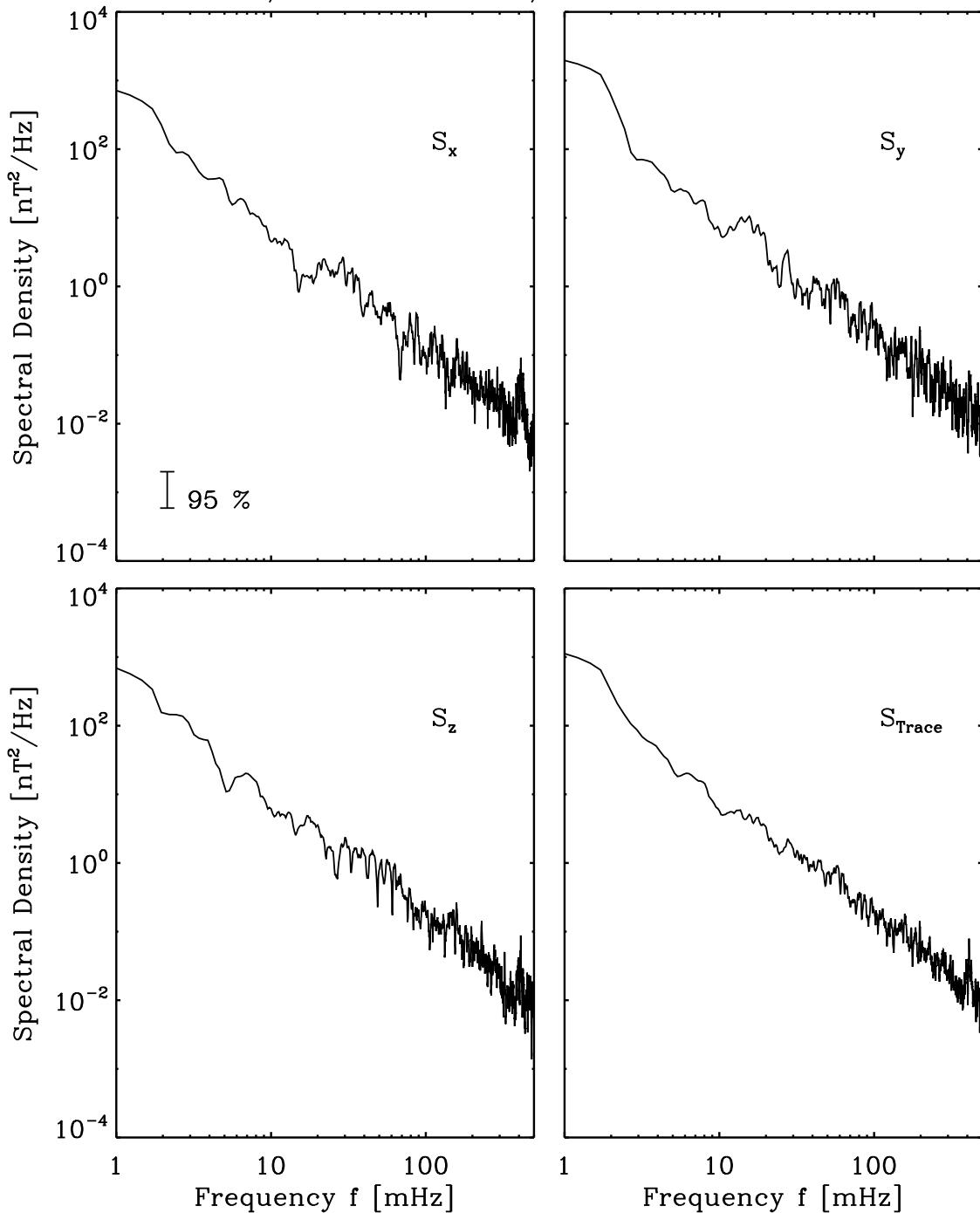
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1.00s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-IB



Calfile ID: 002

Interval: 19:25:52.062 – 20:34:07.062

Figure 26: File: RPCMAG040508T0900\_CLB\_IB\_M3\_PS1\_10000\_002

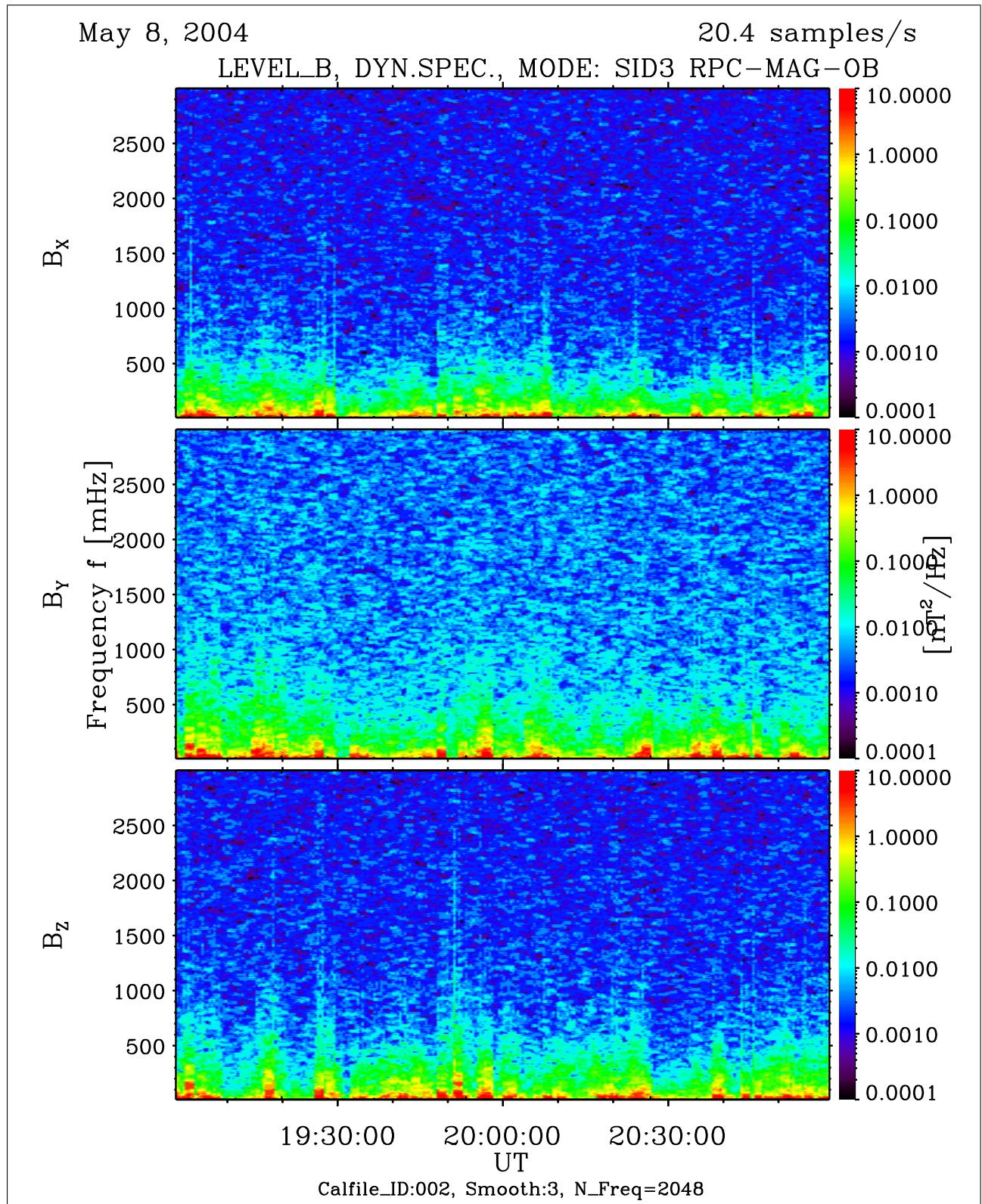


Figure 27: File: RPCMAG040508T0900\_CLB\_OB\_M3\_DS1e-2\_3000\_002

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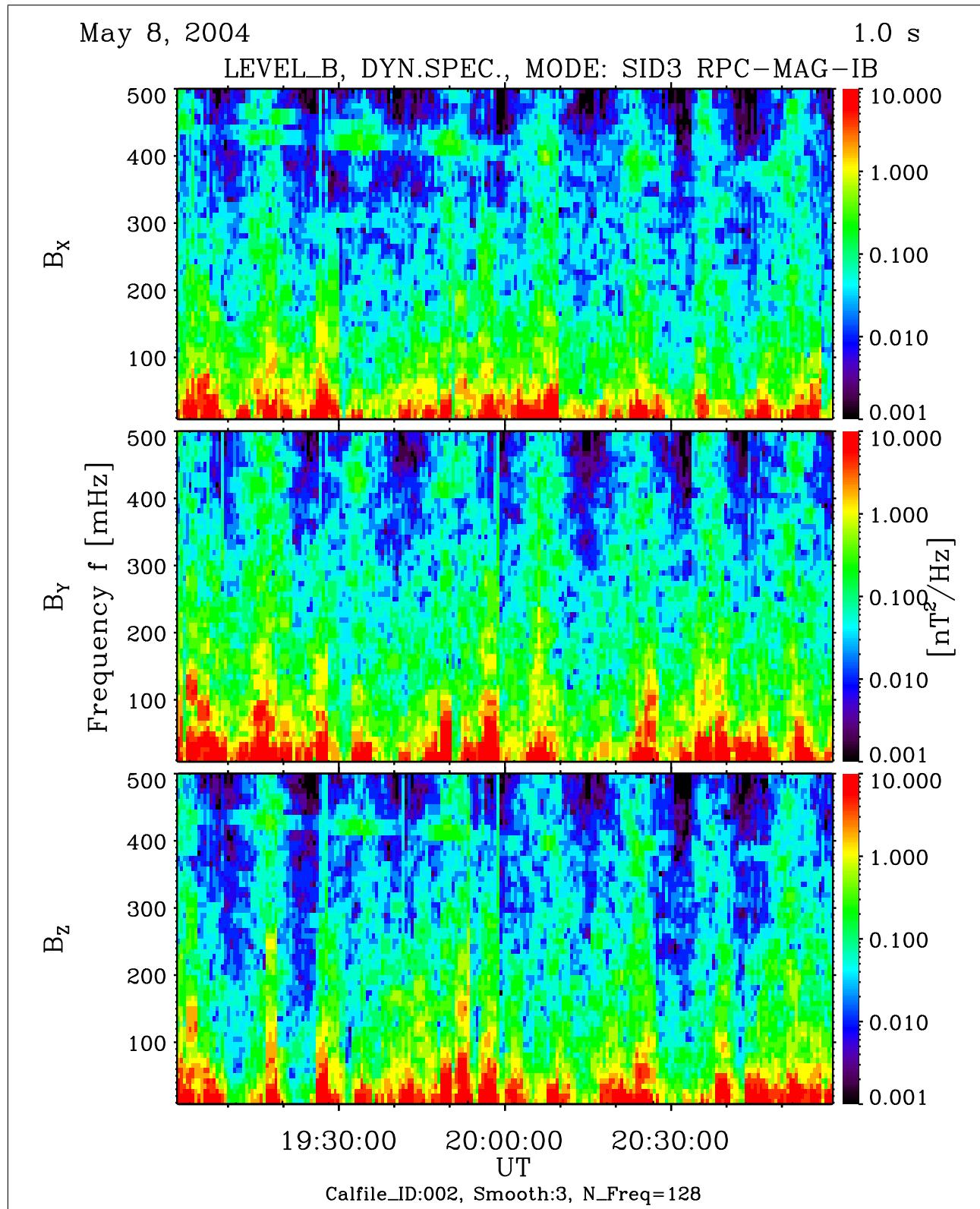
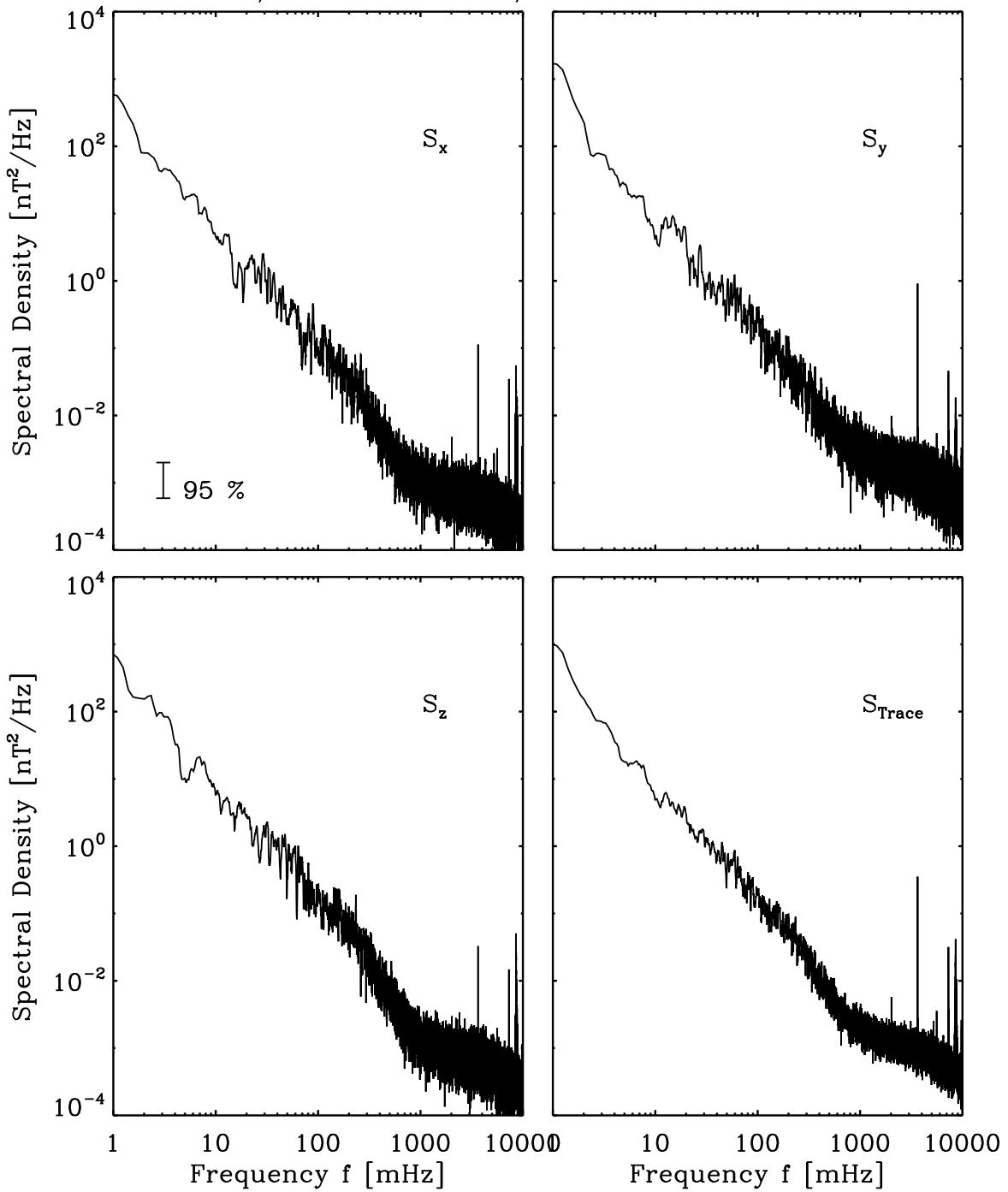


Figure 28: File: RPCMAG040508T0900\_CLB\_IB\_M3\_DS1e-2\_3000\_002

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0.049s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-OB



Calfile ID: 002

Interval: 19:05:23.227 – 20:54:36.777

Figure 29: File: RPCMAG040508T0900\_CLB\_OB\_M3\_PS1\_10000\_002

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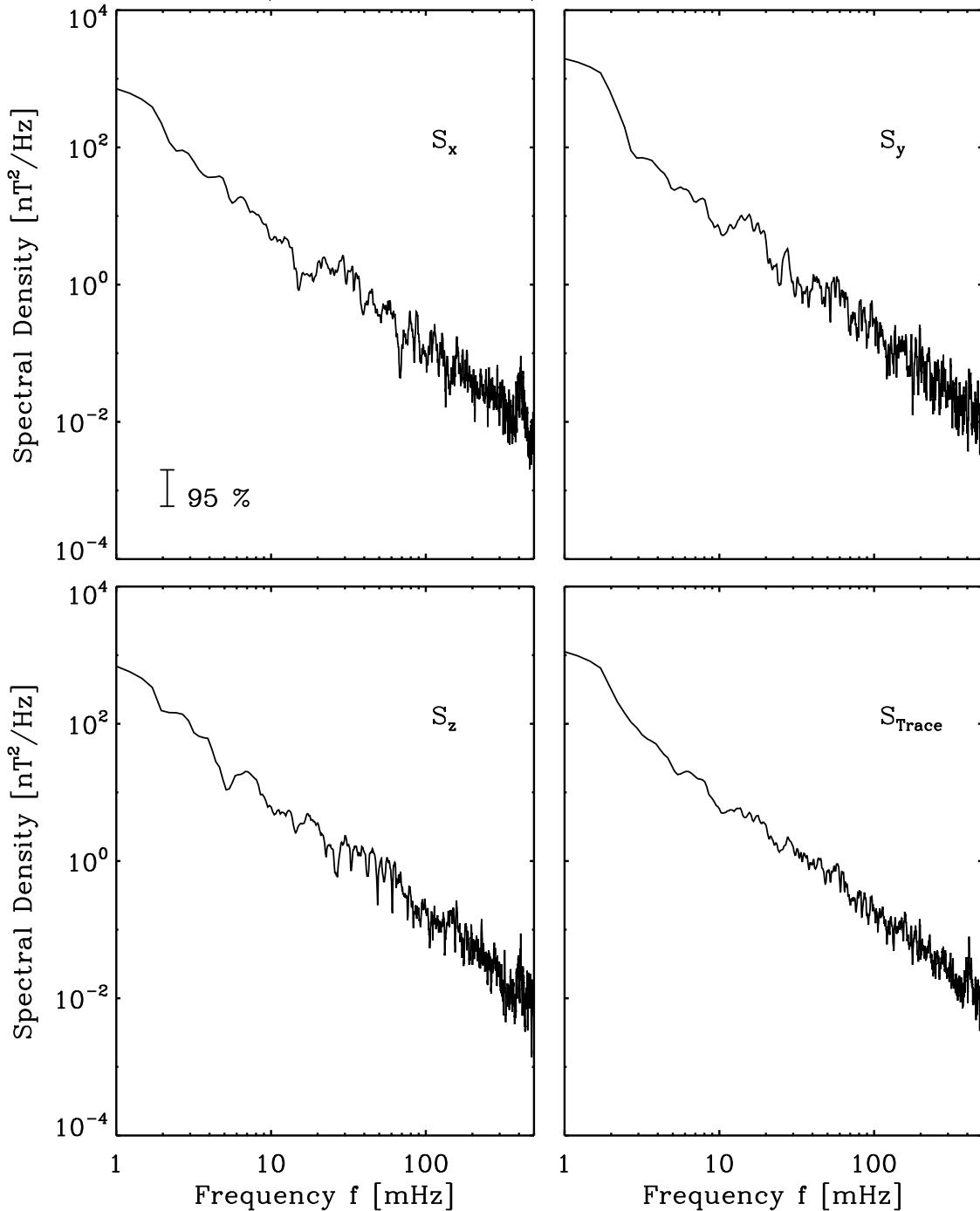
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1.00s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-IB



Calfile ID: 002

Interval: 19:25:52.062 – 20:34:07.062

Figure 30: File: RPCMAG040508T0900\_CLB\_IB\_M3\_PS1\_10000\_002

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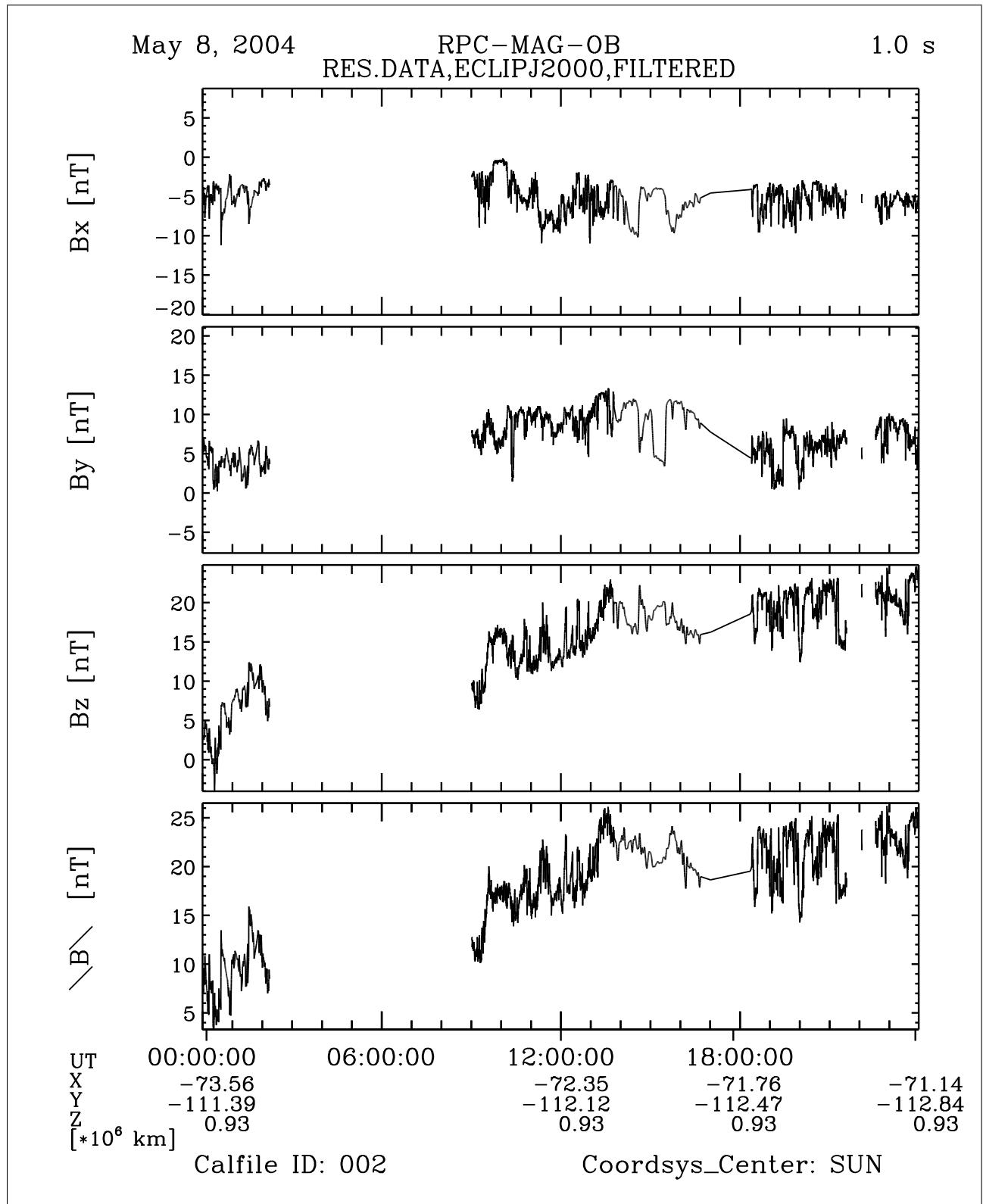


Figure 31: File: RPCMAG040508\_CLG\_OB\_A1\_T0000\_2359\_002

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May 8, 2004                    RPC-MAG-IB  
 RES.DATA,ECLIPJ2000,FILTERED                    1.0 s

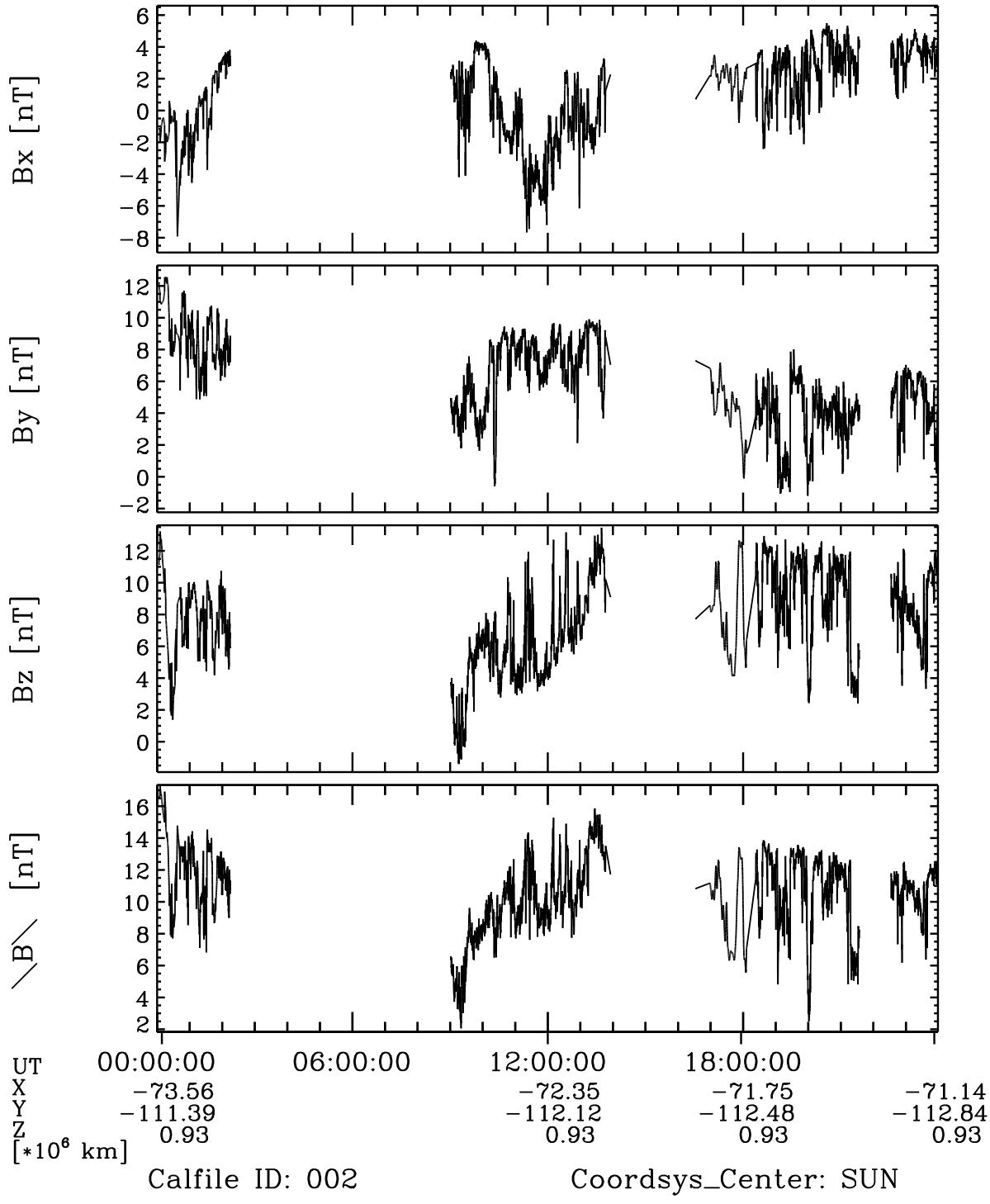


Figure 32: File: RPCMAG040508\_CLG\_IB\_A1\_T0000\_2359\_002

### 3.3 Plots of ROSETTA's Reaction Wheels Speeds

The following plots show the time series of the revolutions of the 4 reaction wheels. Two kinds of data are shown:

- The original reaction wheel data as they are stored in the DDS.
- The theoretical response of the wheels impact seen by an instrument sampling with different frequencies. Here the response in the at 20 Hz, 1 Hz and 0.25 Hz sampling frequency is plotted.

A comparison with the dynamic spectra of the MAG data gives an impressive accordance between the reaction wheel frequencies and the spectral lines observed in the dynamic MAG spectra.

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Revolutions of the four Rosetta Reaction Wheels  
May 8, 2004

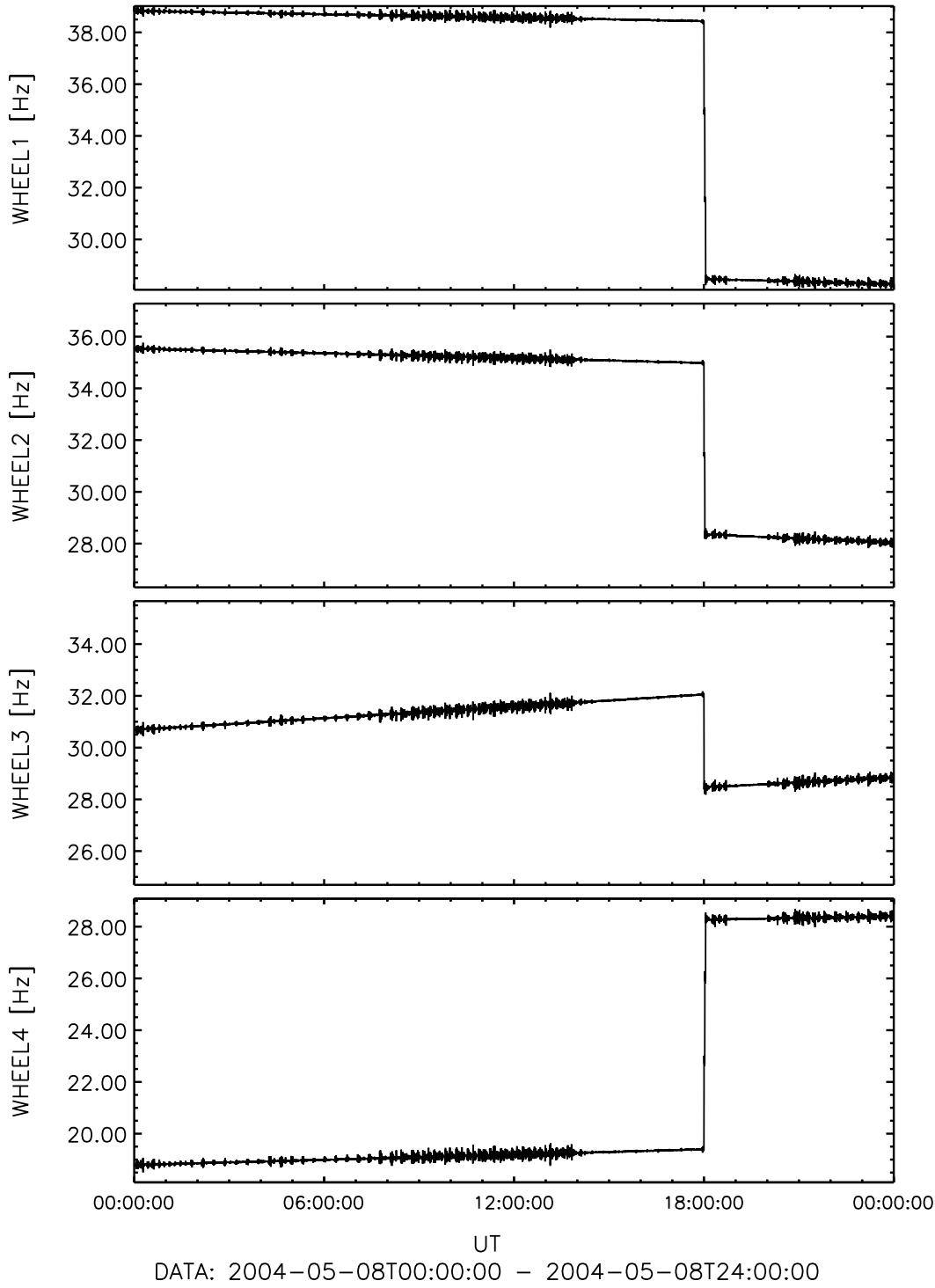


Figure 33: File: wheels\_Hz2004-05-08T00-00

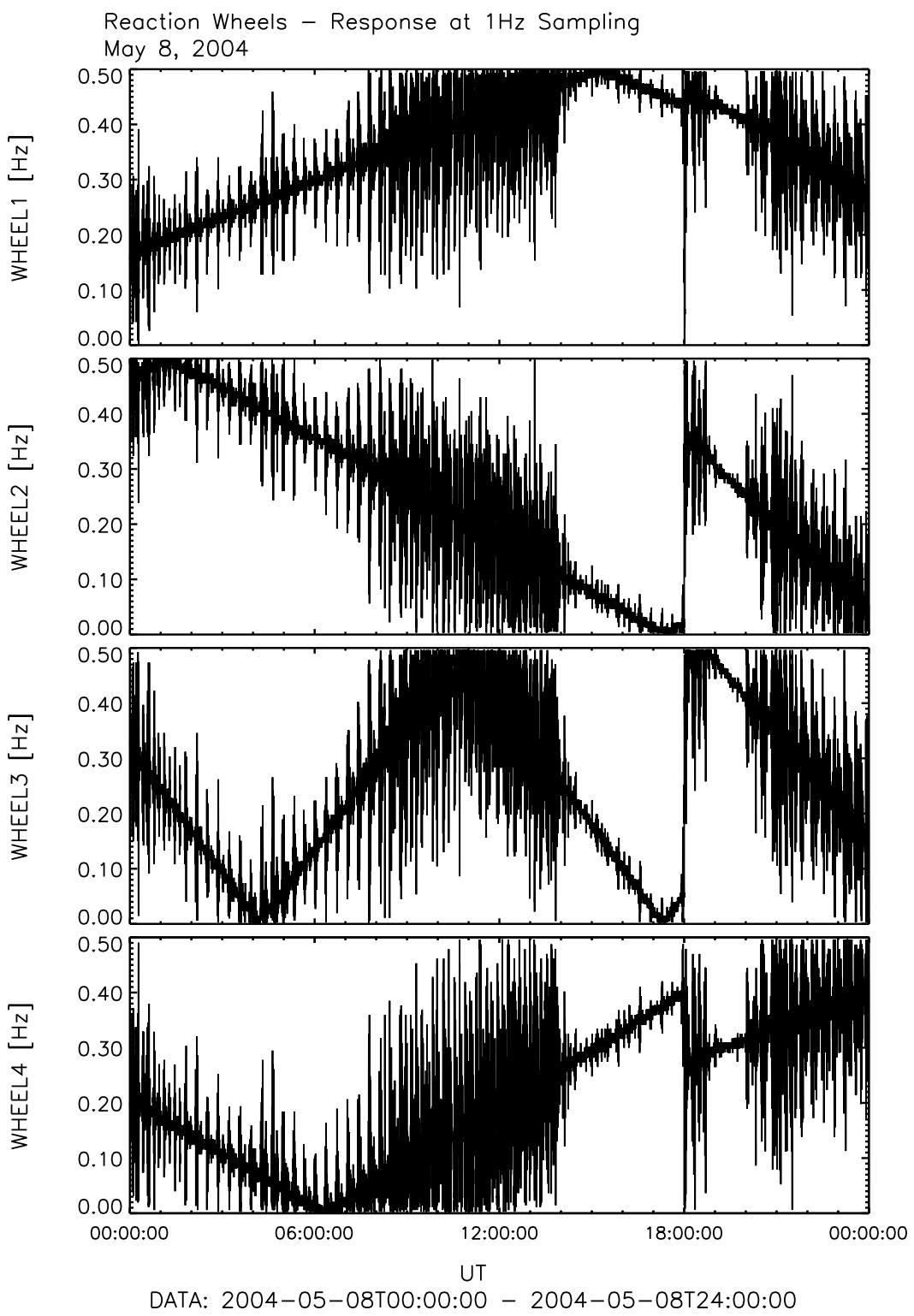


Figure 34: File: wheels\_1Hz\_Sampling2004-05-08T00-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 8, 2004

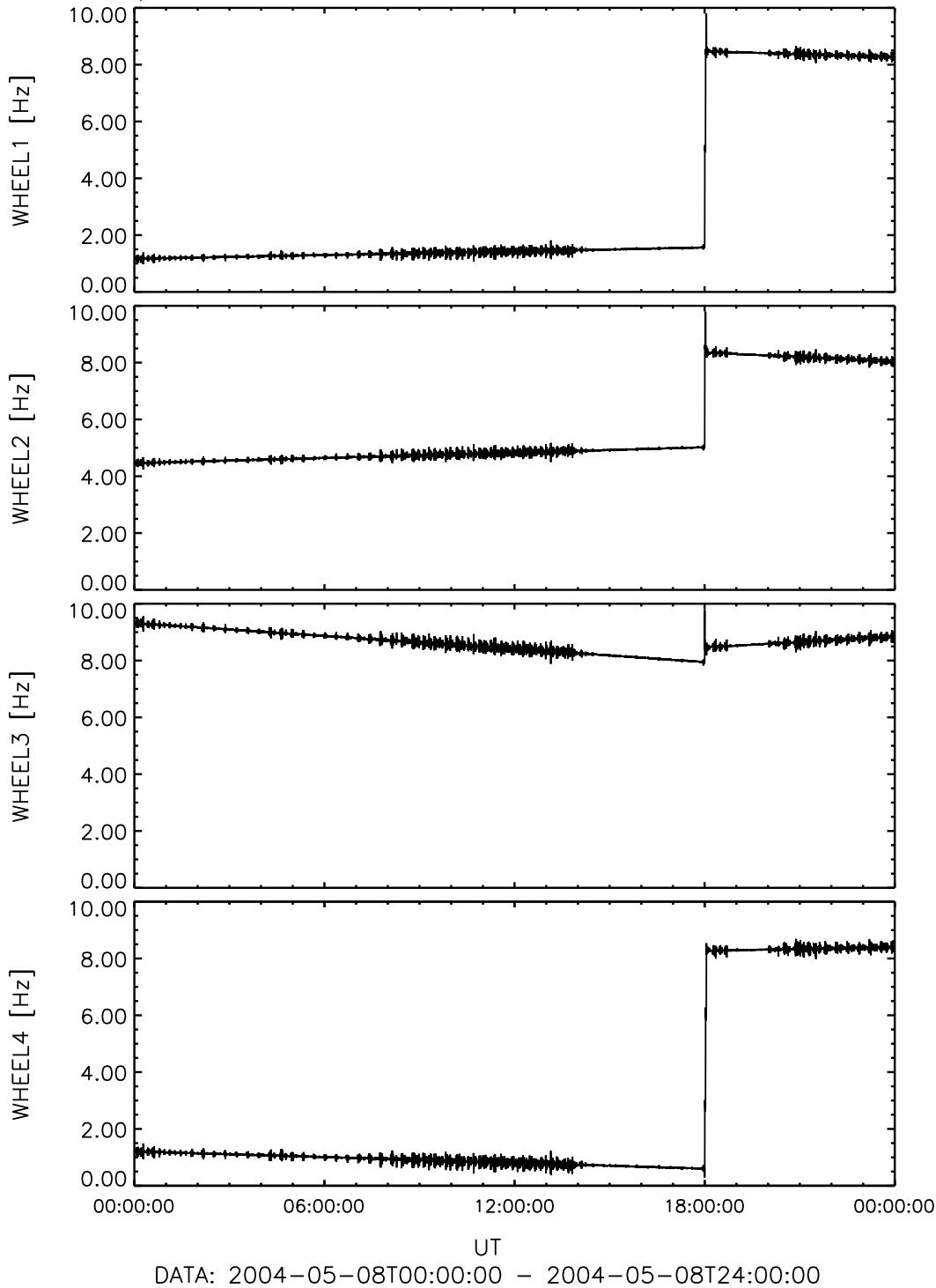


Figure 35: File: wheels\_20Hz\_Sampling2004-05-08T00-00

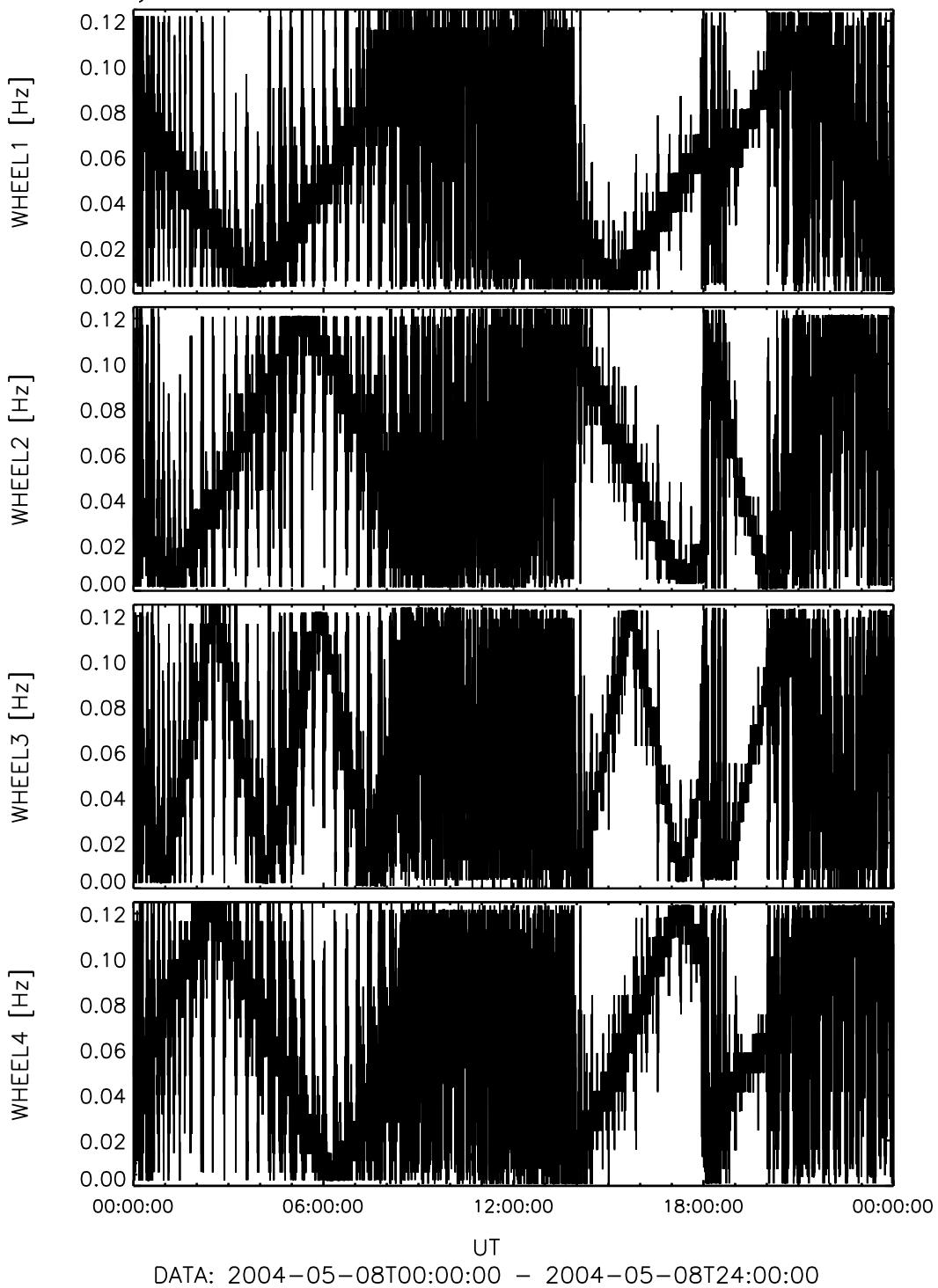
Reaction Wheels – Response at 0.25 Hz Sampling  
May 8, 2004

Figure 36: File: wheels\_025Hz\_Sampling2004-05-08T00-00

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Reaction Wheels – Response at 1Hz Sampling  
May 8, 2004

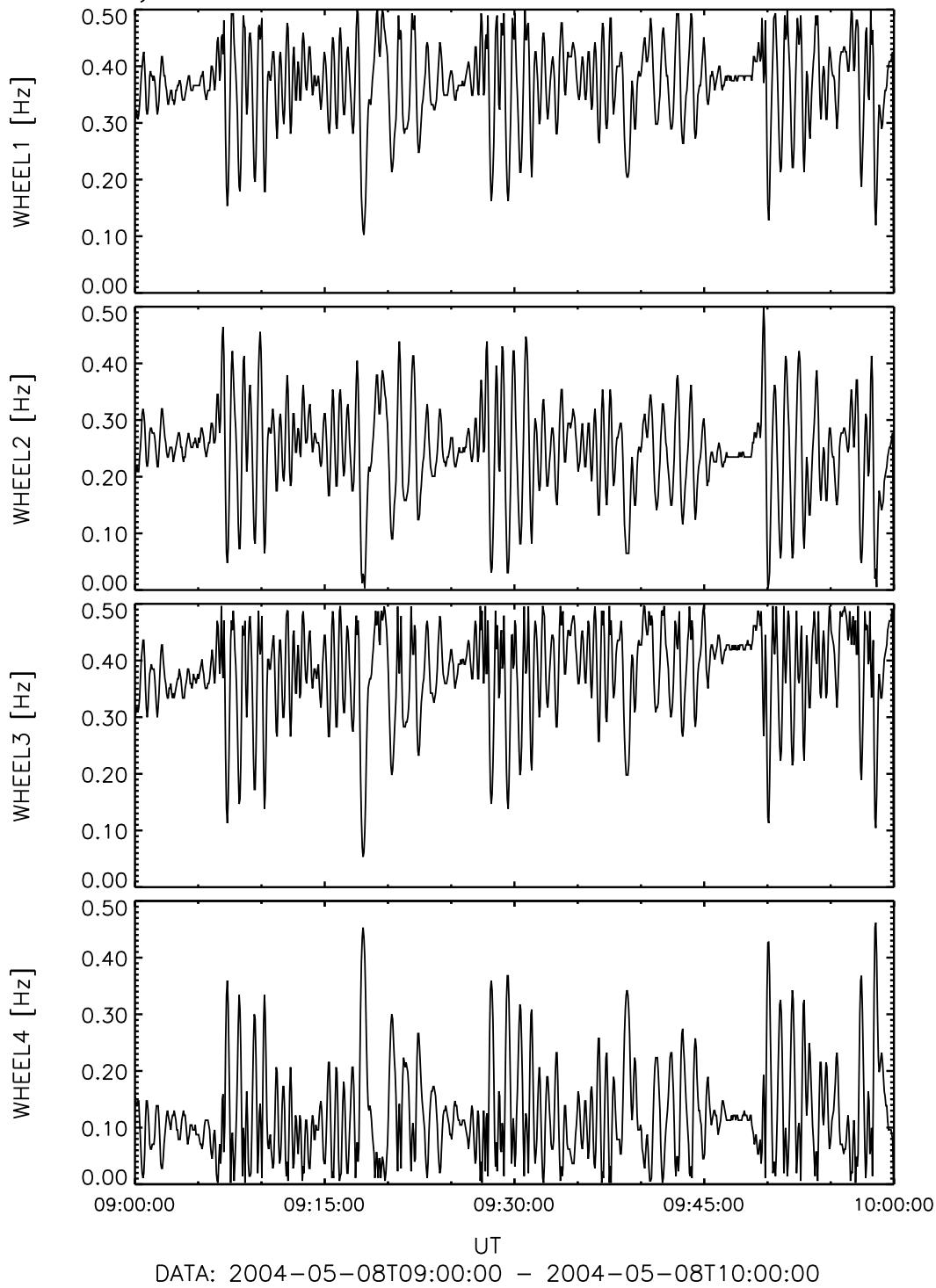


Figure 37: File: wheels\_1Hz\_Sampling2004-05-08T09-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 8, 2004

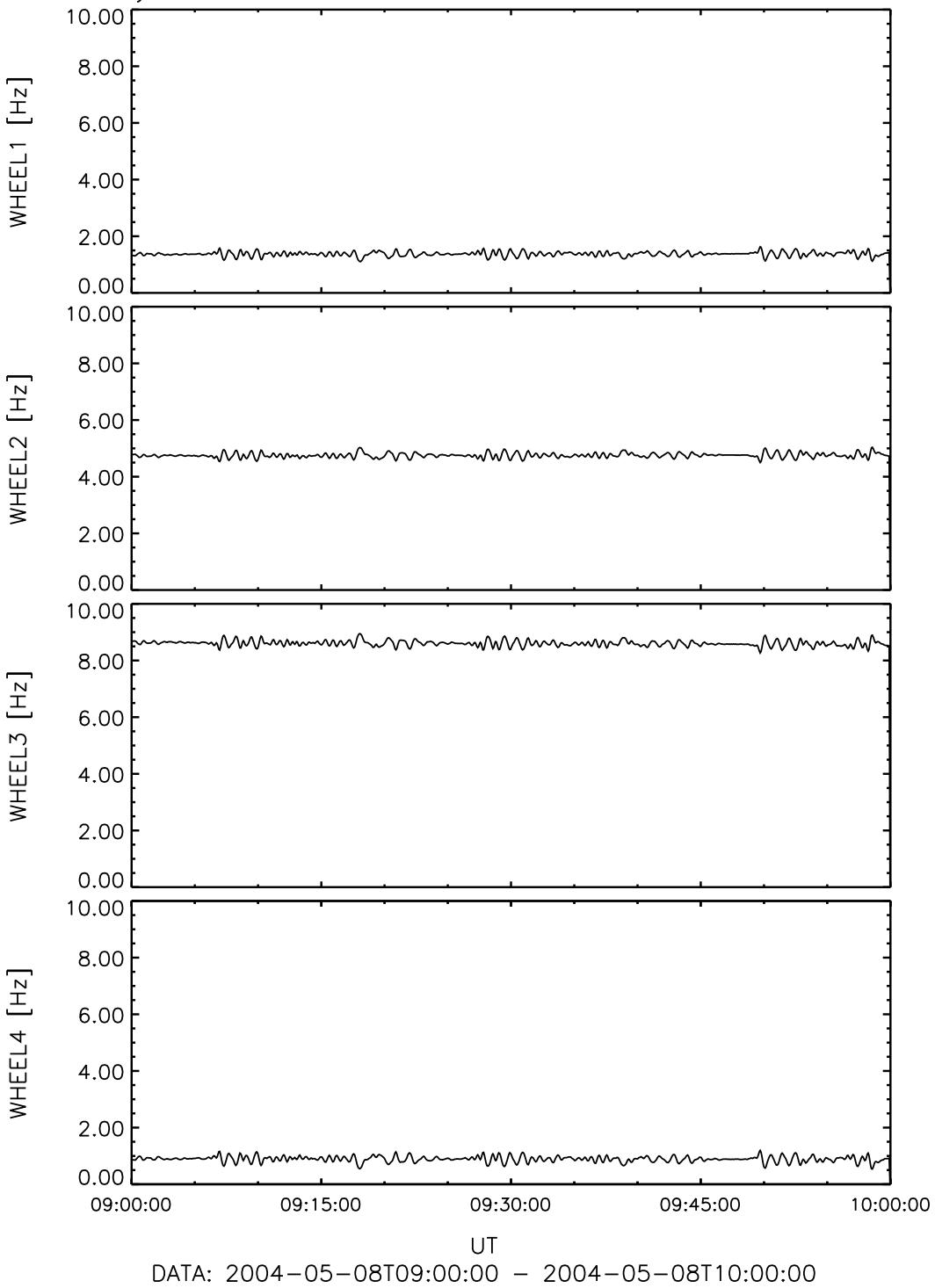


Figure 38: File: wheels\_20Hz\_Sampling2004-05-08T09-00

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Reaction Wheels – Response at 1Hz Sampling  
May 8, 2004

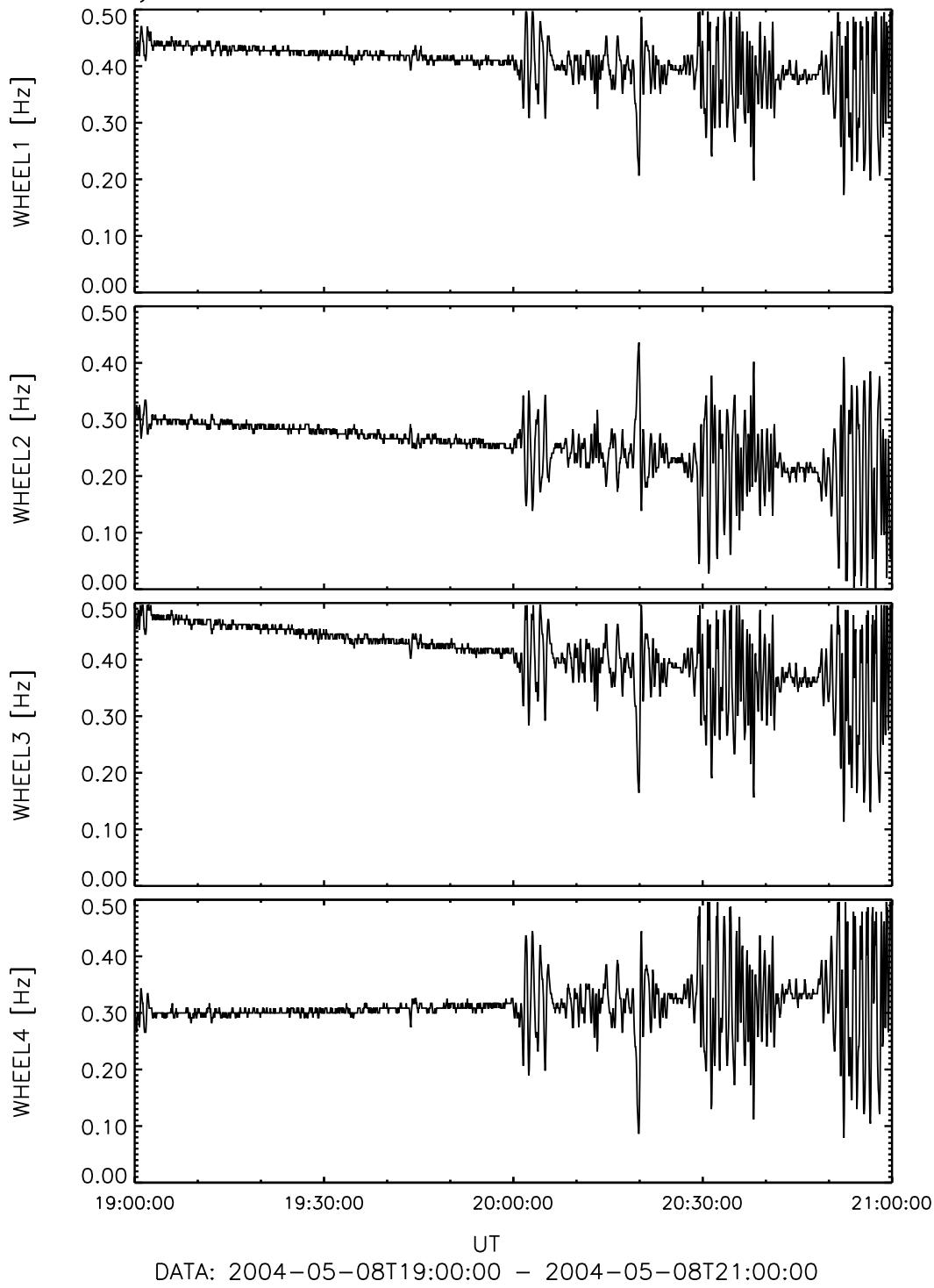


Figure 39: File: wheels\_1Hz\_Sampling2004-05-08T19-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 8, 2004

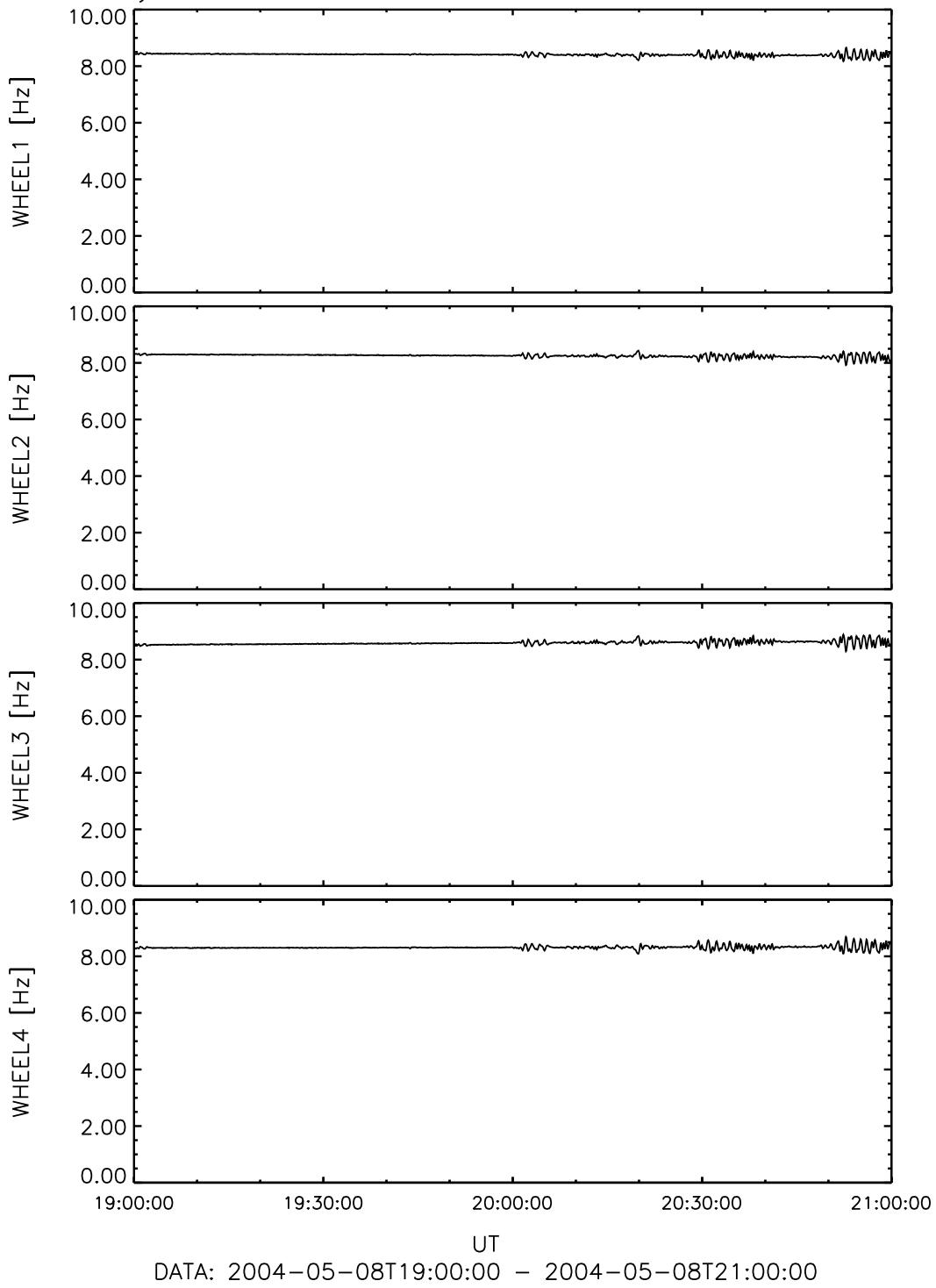


Figure 40: File: wheels\_20Hz\_Sampling2004-05-08T19-00

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## 4 May 09, 2004:

### 4.1 Actions

Also today the instrument was operated in different modes. The instrument worked fine.

Time	Stage A, Stage B, Filter cfg	Stage 1, Stage 2, Stage3	Mode
00:00 – 02:15	0 0 0	0 0 0	SID3
– 17:45	2 0 0	2 0 0	SID4
– 18:57	0 0 0	0 0 0	SID3
– 20:37	4 3 1	4 3 3	SID1
20:42 – 23:01	1 2 0	1 2 0	SID2
– 23:34	0 0 0	0 0 0	SID3
– 24:00	1 2 0	1 2 0	SID2

It is, however, remarkable that the very low frequent noise level is in the order of 8 nTpp. This seems to be caused by various spikes, whose origin is not clear. There is no specific frequency peak to be seen in the spectra.

The temperature data between 02:00 and 17:00 suggest a s/c rotation. The maximum temperature was reached at about 11:00.

### 4.2 Plots of Calibrated Data using the new Temperature Model

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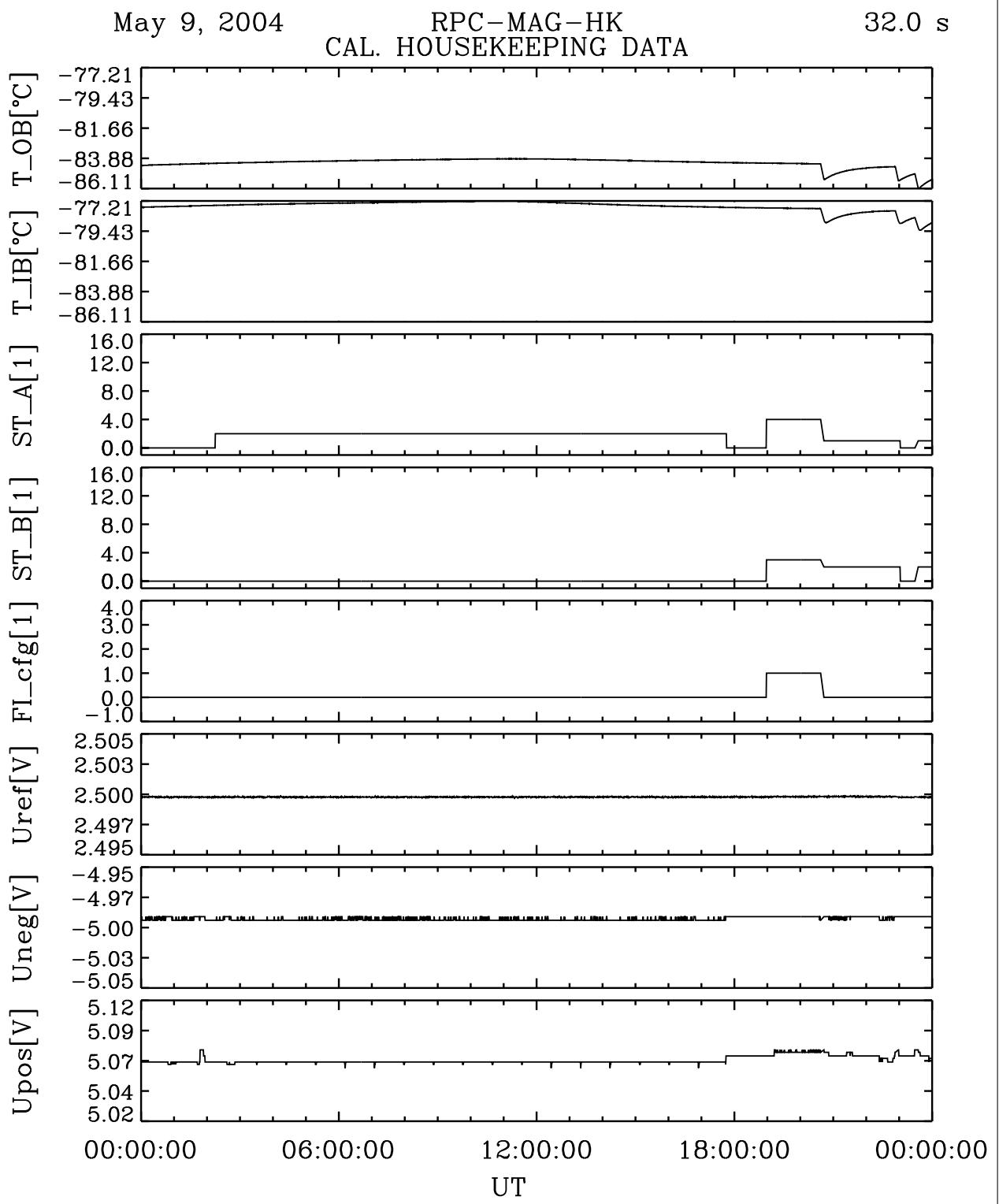


Figure 41: File: RPCMAG040509T0000\_CLA\_HK\_P0000\_2400

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May 9, 2004                    RPC-MAG-HK                    32.0 s  
HOUSEKEEPING B\_OB DATA

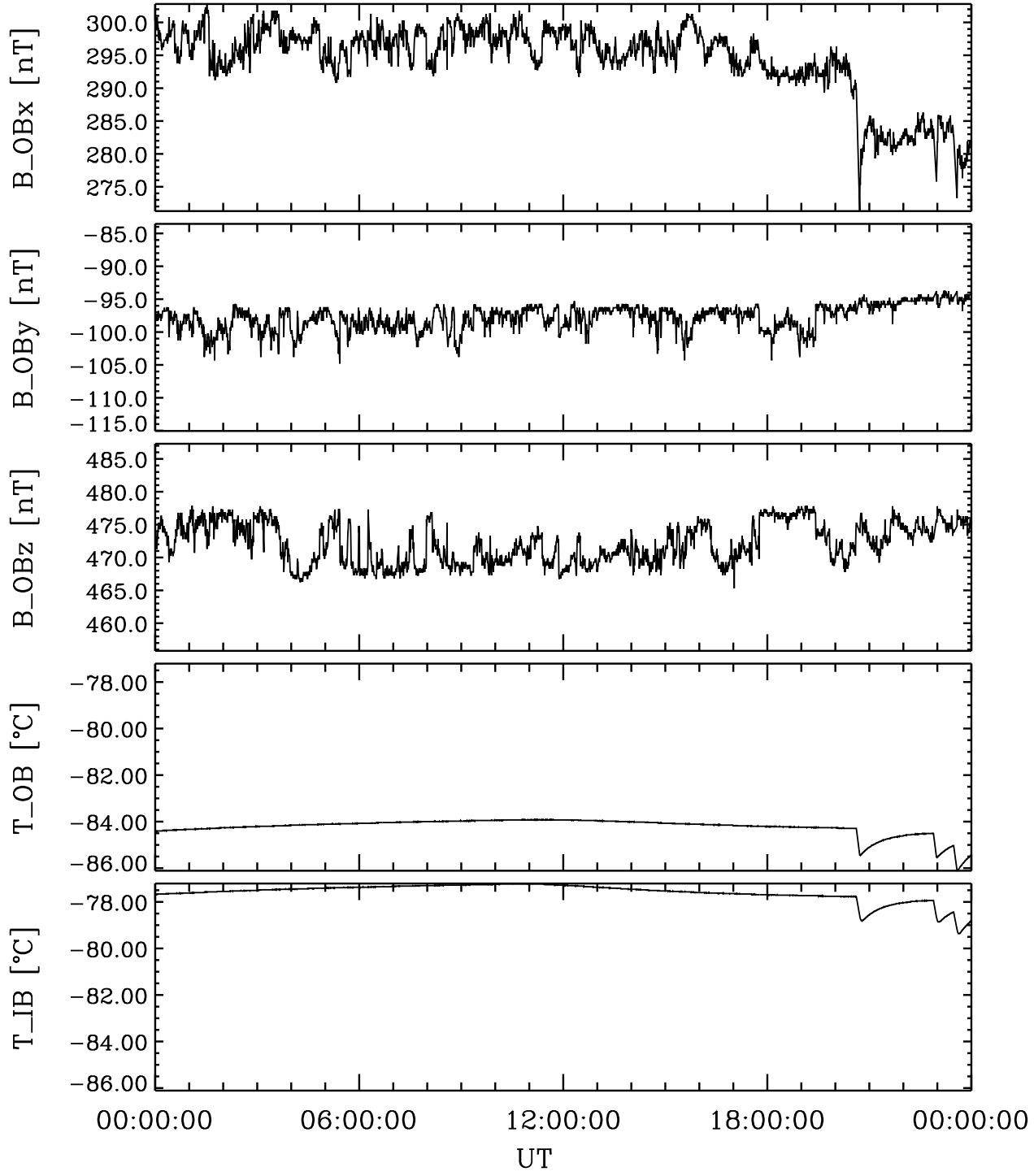


Figure 42: File: RPCMAG040509T0000\_CLA\_HK\_B\_P0000\_2400

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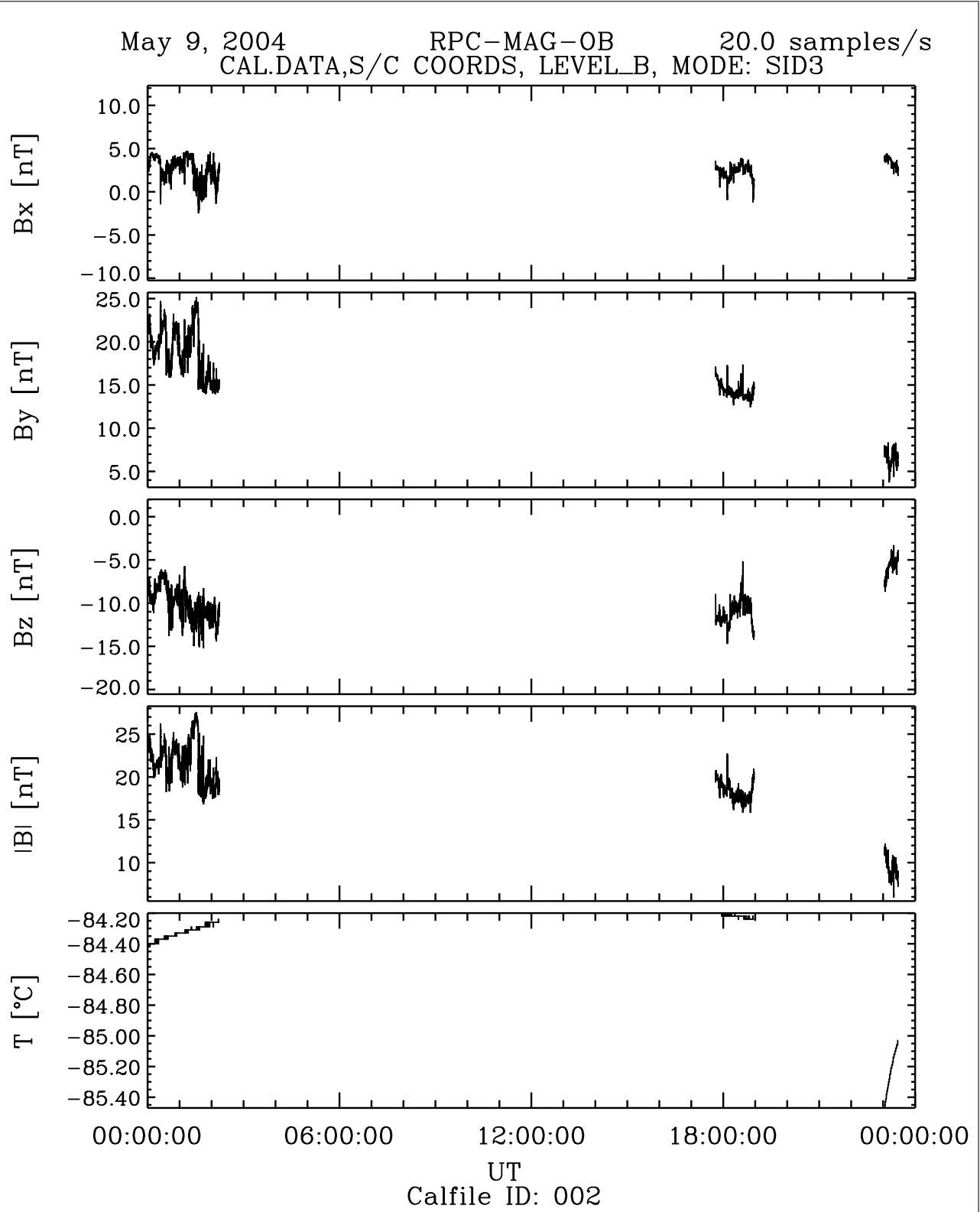


Figure 43: File: RPCMAG040509T0000\_CLB\_OB\_M3\_T0000\_2400\_002

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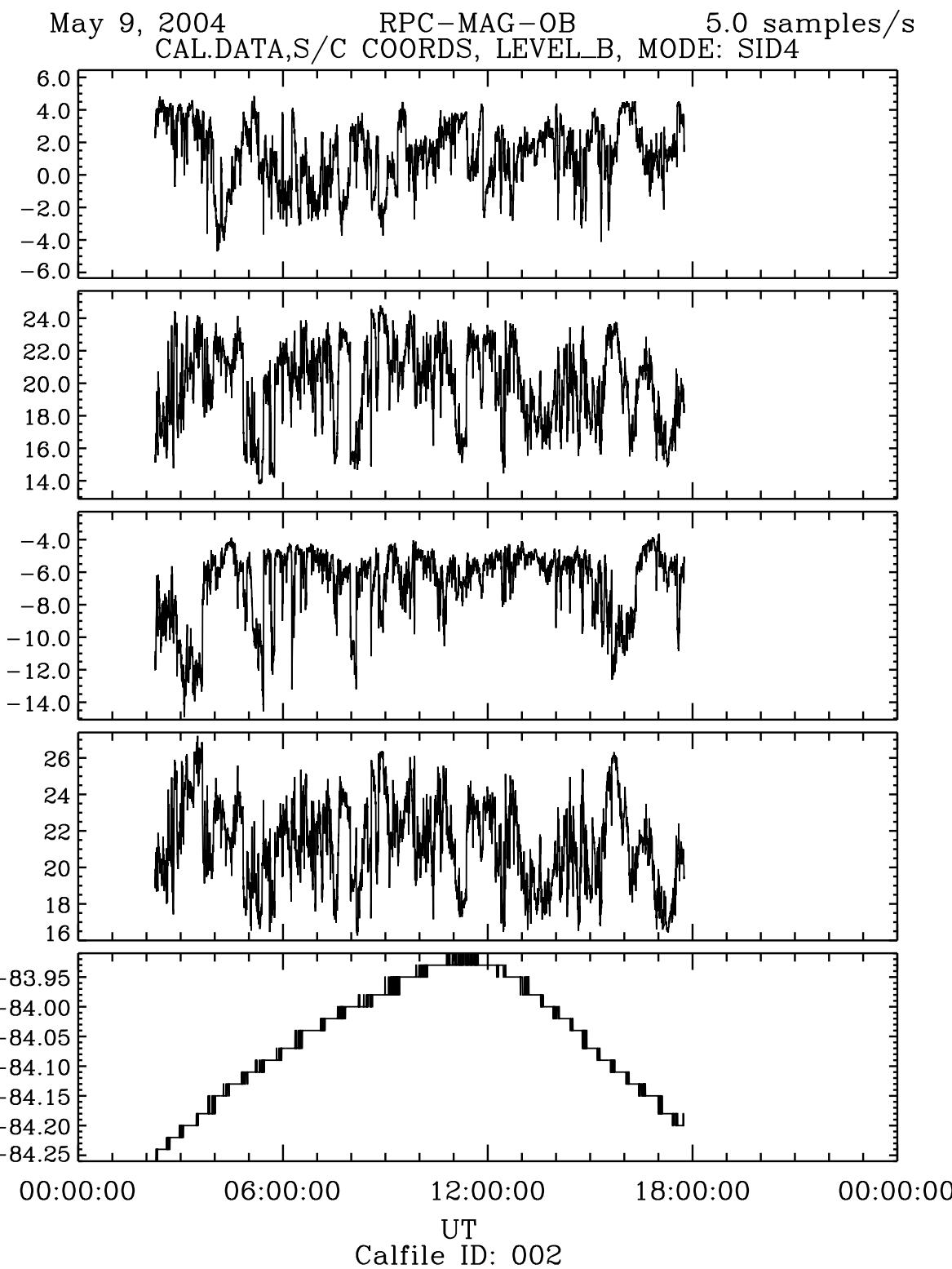


Figure 44: File: RPCMAG040509T0215\_CLB\_OB\_M4\_T0000\_2400\_002

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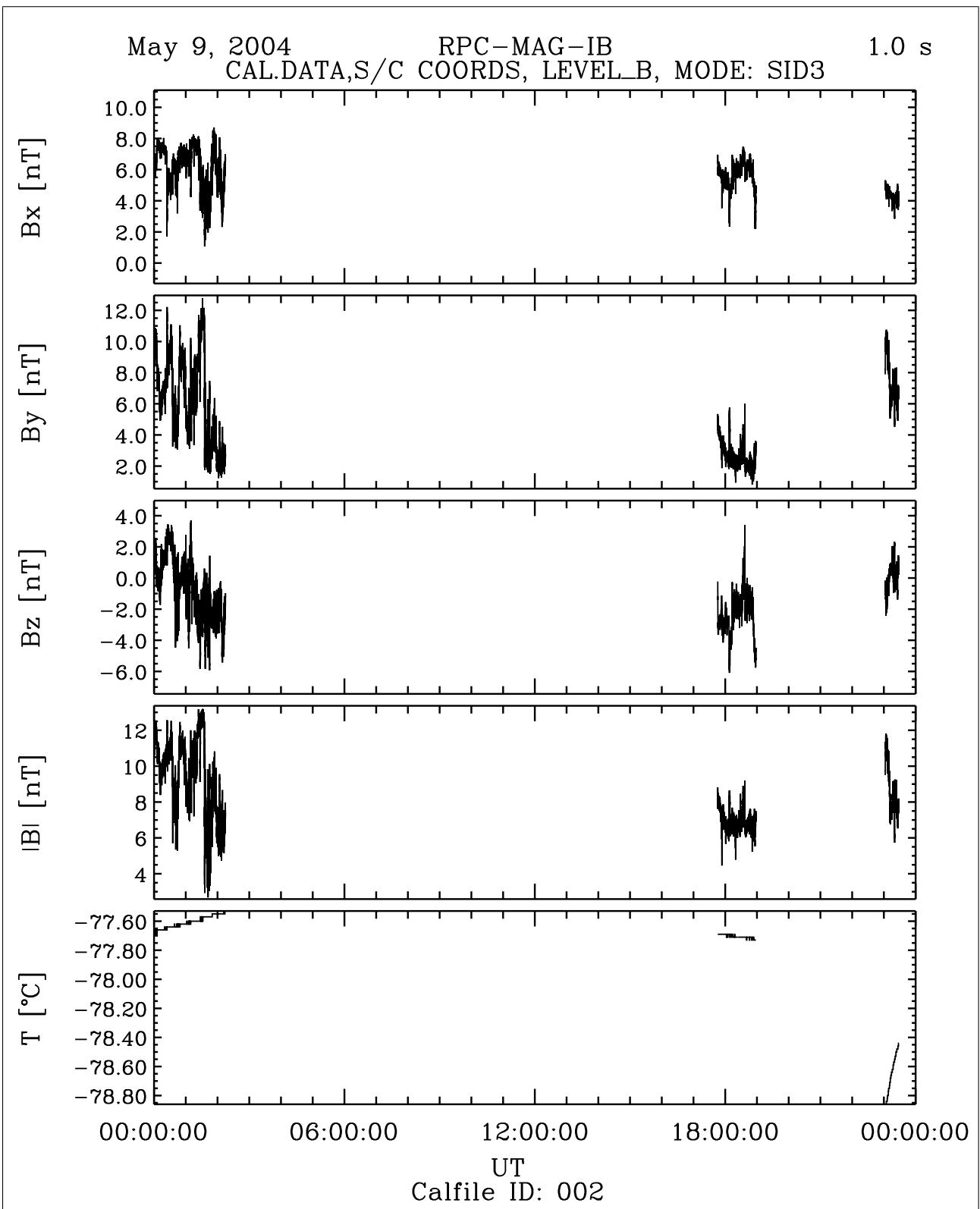


Figure 45: File: RPCMAG040509T0000\_CLB\_IB\_M3\_T0000\_2400\_002

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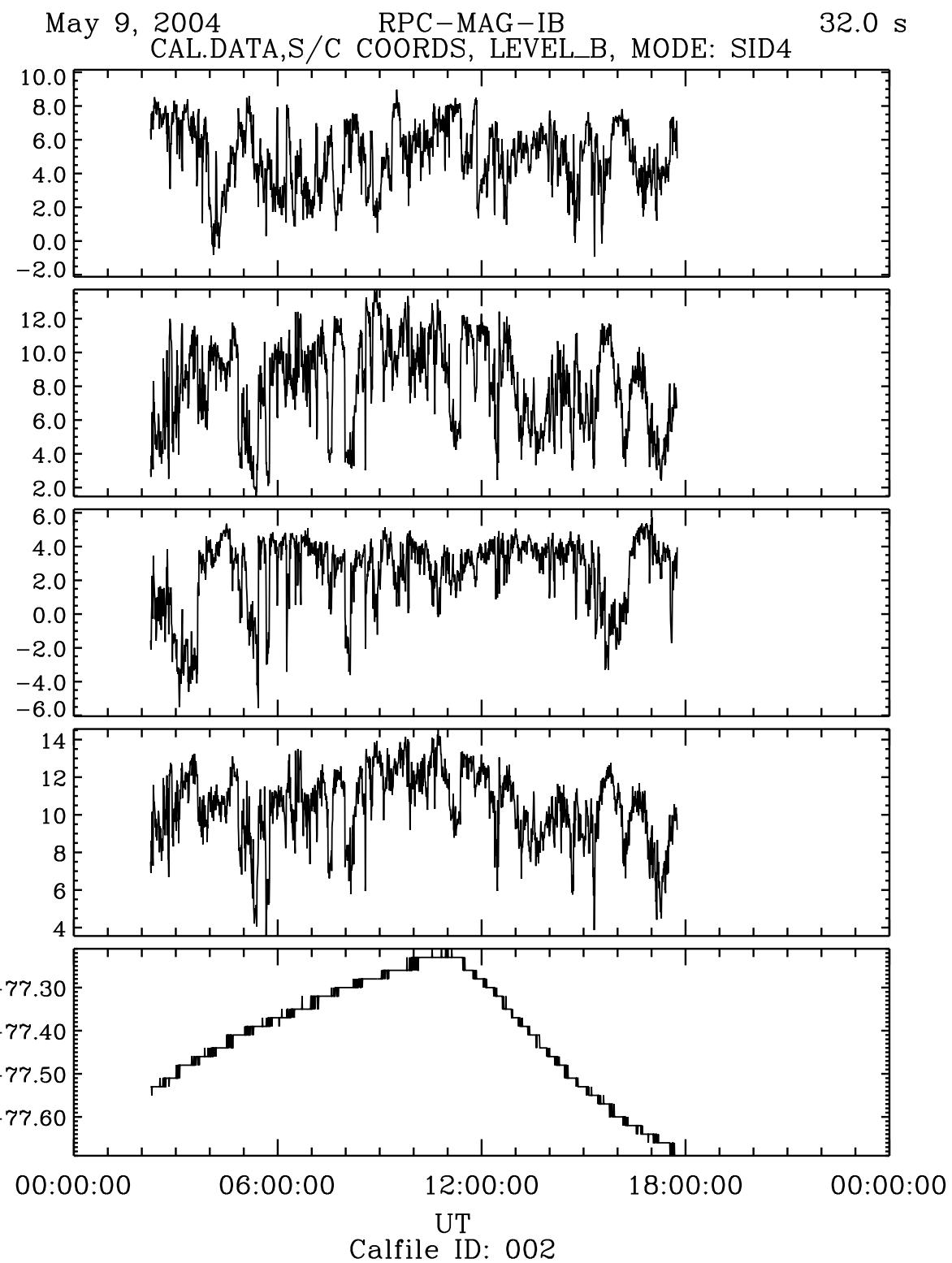


Figure 46: File: RPCMAG040509T0215\_CLB\_IB\_M4\_T0000\_2400\_002

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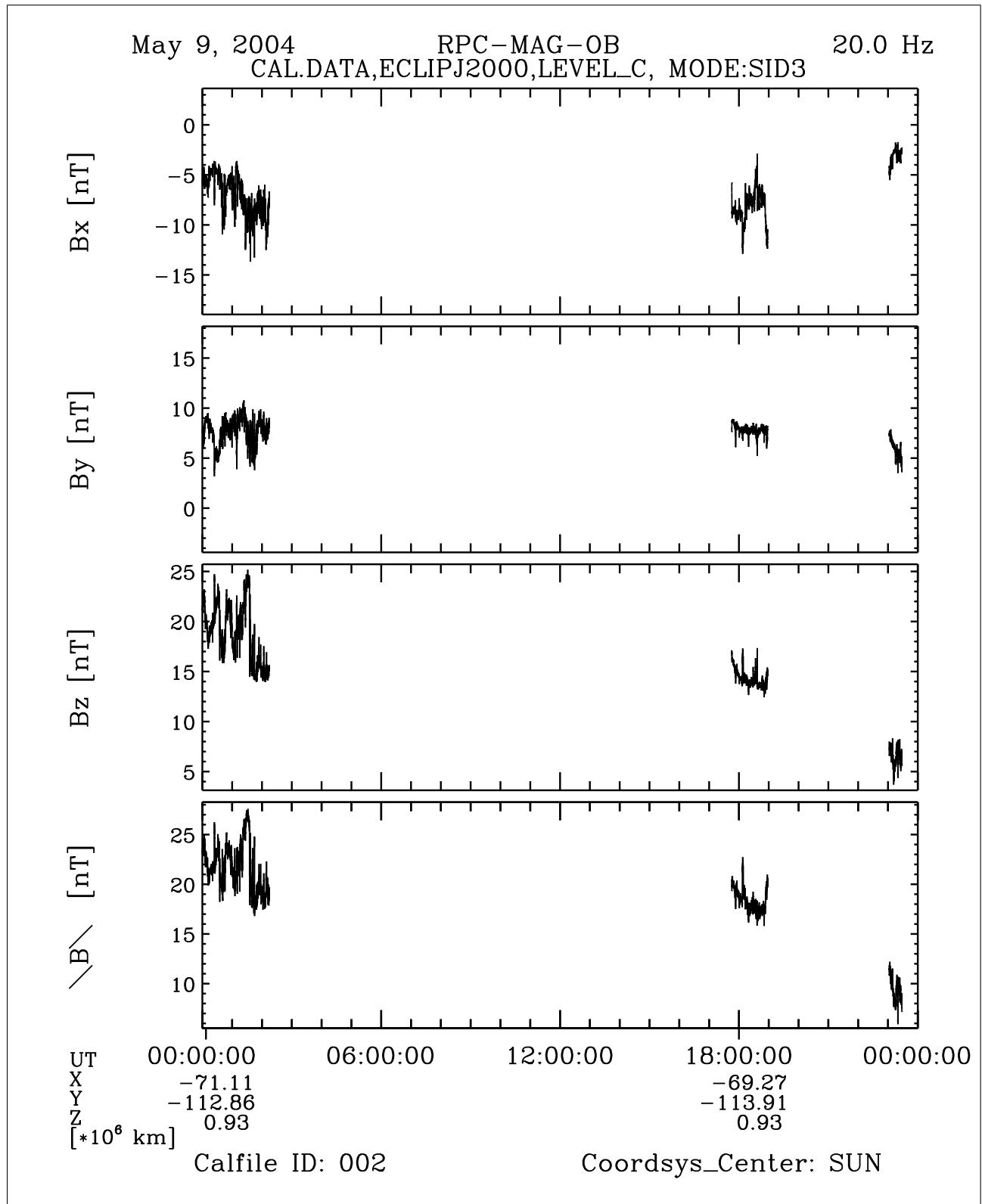


Figure 47: File: RPCMAG040509T0000\_CLC\_OB\_M3\_T0000\_2400\_002

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May 9, 2004                    RPC-MAG-OB                    5.0 Hz  
 CAL.DATA,ECLIPJ2000,LEVEL\_C, MODE:SID4

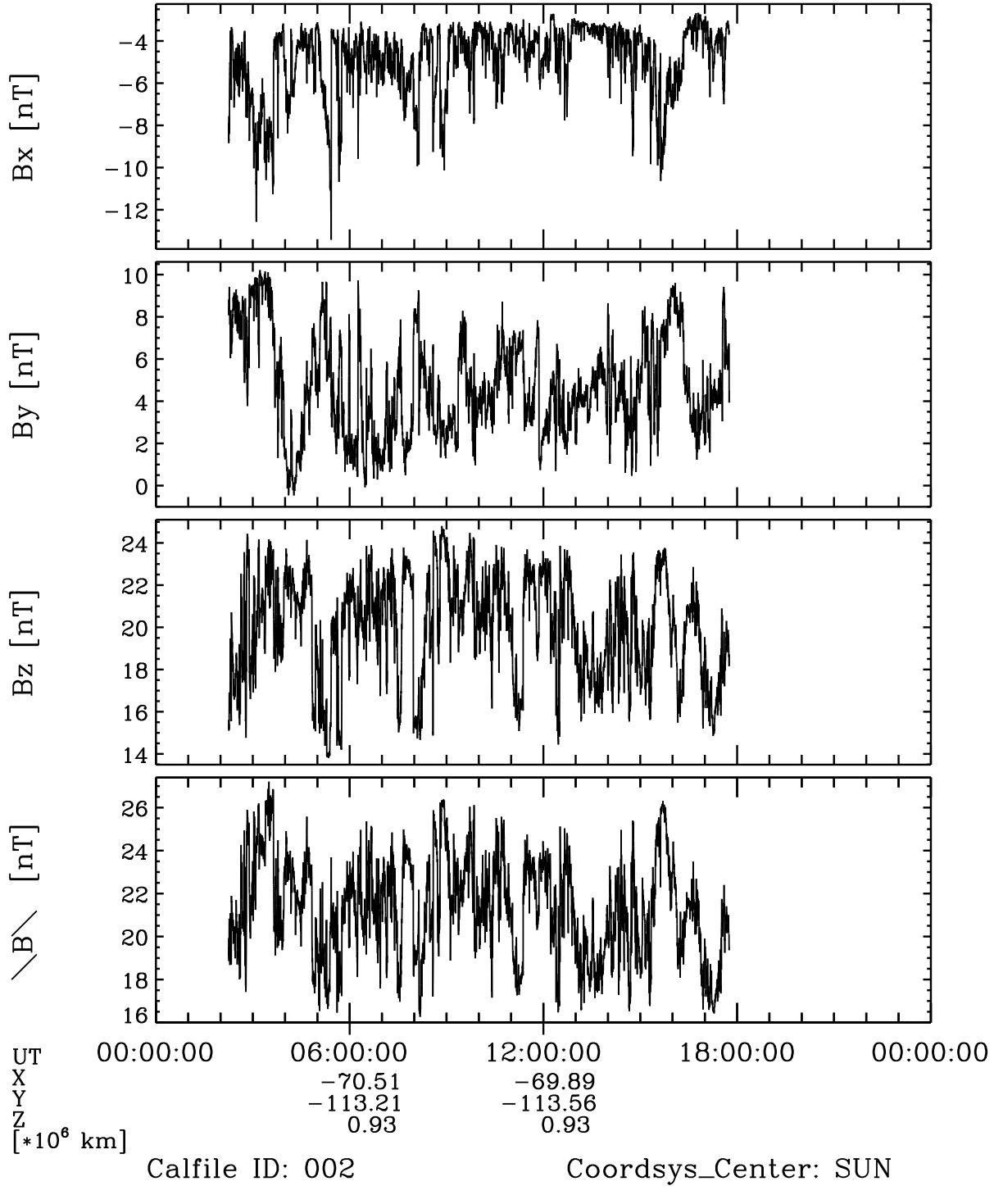


Figure 48: File: RPCMAG040509T0215\_CLC\_OB\_M4\_T0000\_2400\_002

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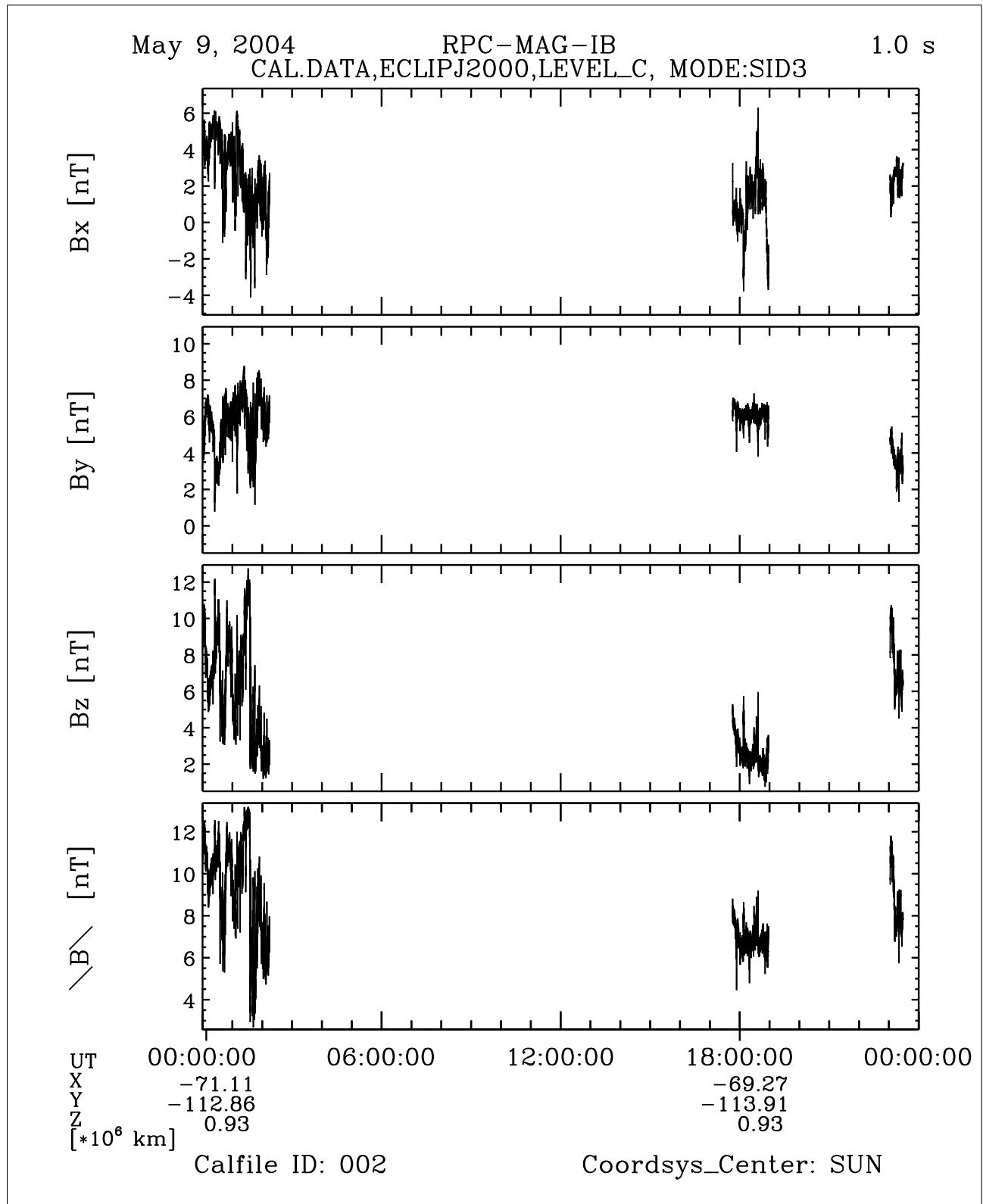


Figure 49: File: RPCMAG040509T0000\_CLC\_IB\_M3\_T0000\_2400\_002

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May 9, 2004                    RPC-MAG-IB                    32.0 s  
 CAL.DATA,ECLIPJ2000,LEVEL\_C, MODE:SID4

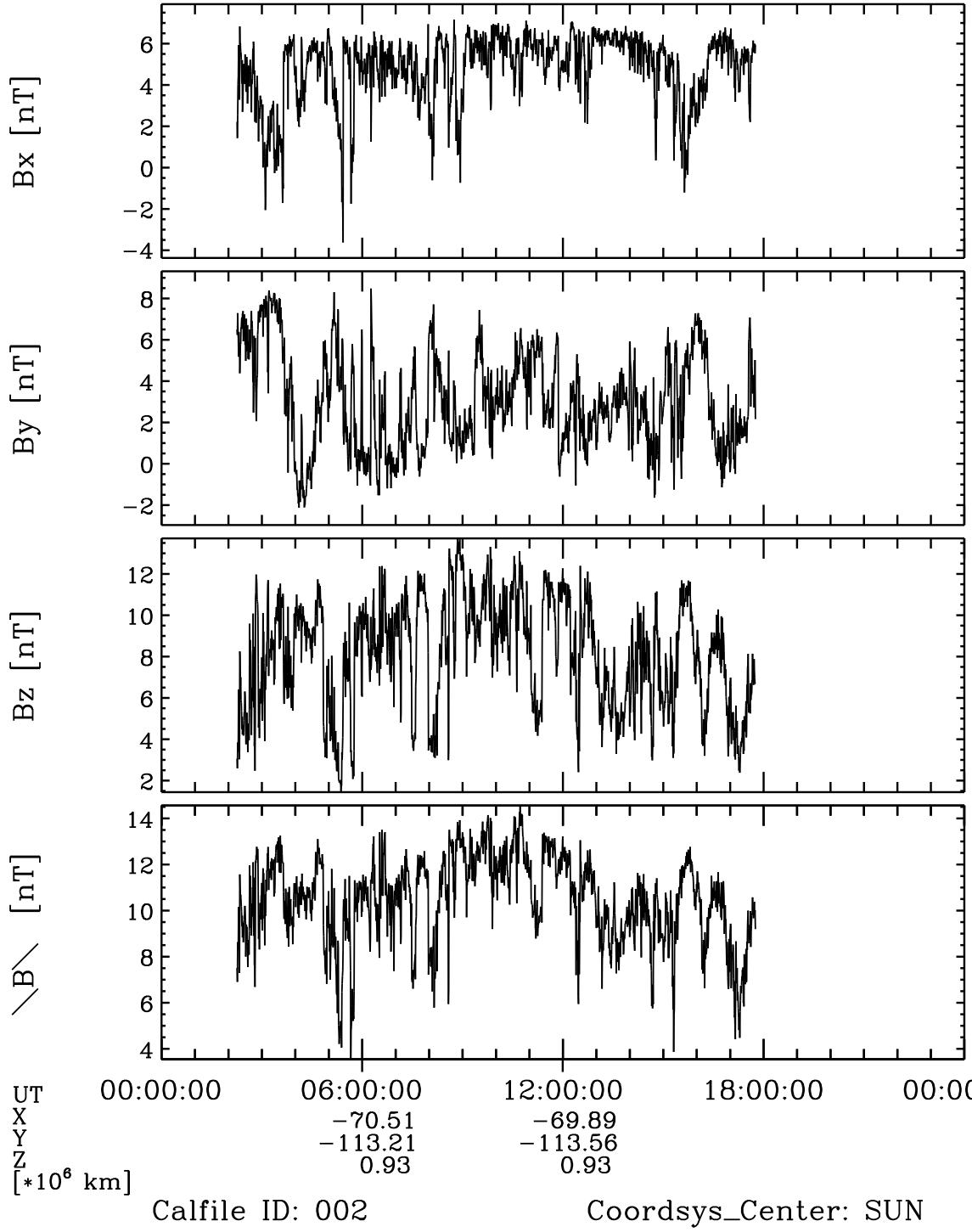


Figure 50: File: RPCMAG040509T0215\_CLC\_IB\_M4\_T0000\_2400\_002

# ROSETTA

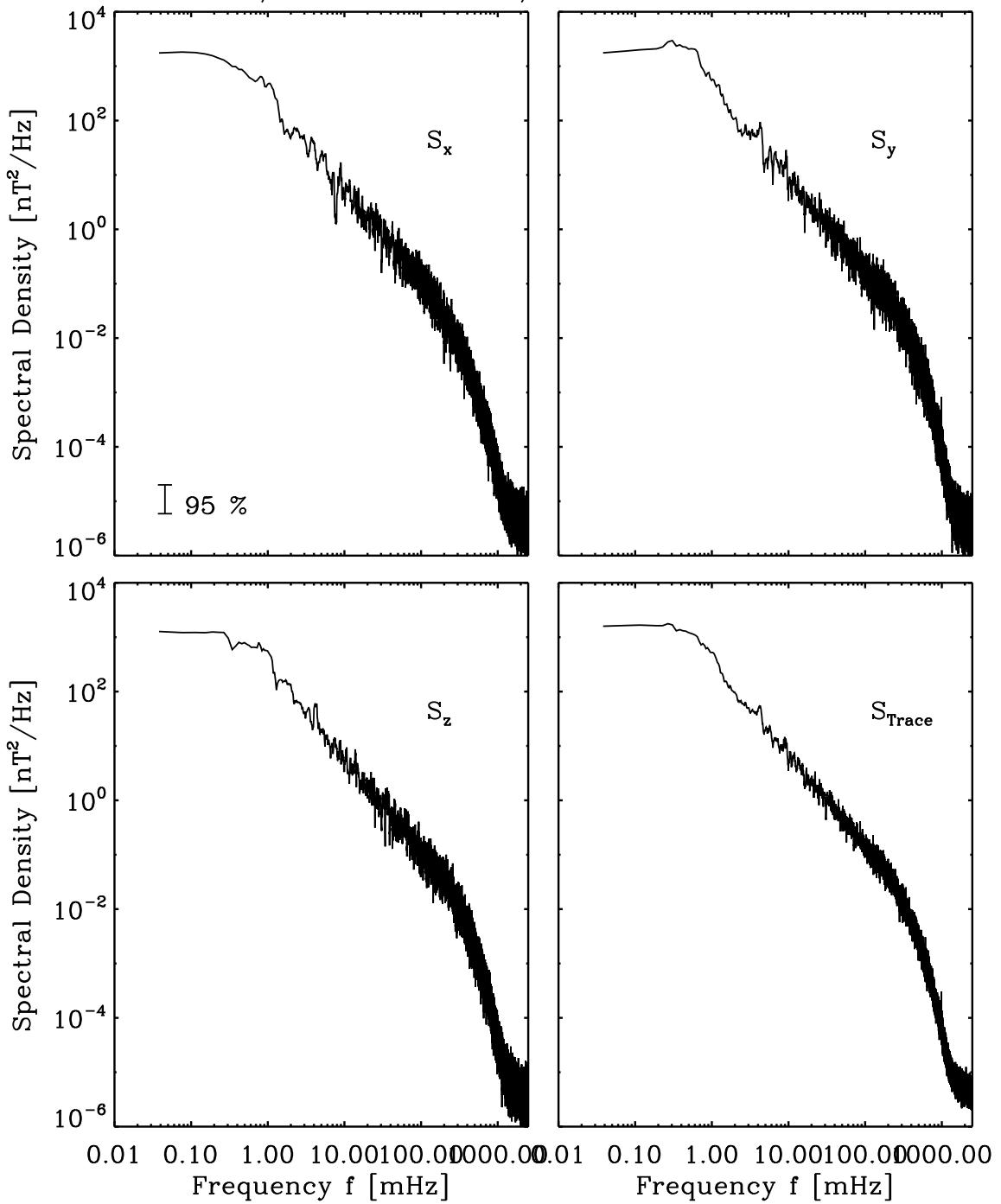
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0.20s

LEVEL\_B, POWER SPECTRUM, MODE: SID4 RPC-MAG-OB



Calfile ID: 002

Interval: 03:29:04.049 – 10:45:58.250

Figure 51: File: RPCMAG040509T0215\_CLB\_OB\_M4\_PS1e-2\_10000\_002

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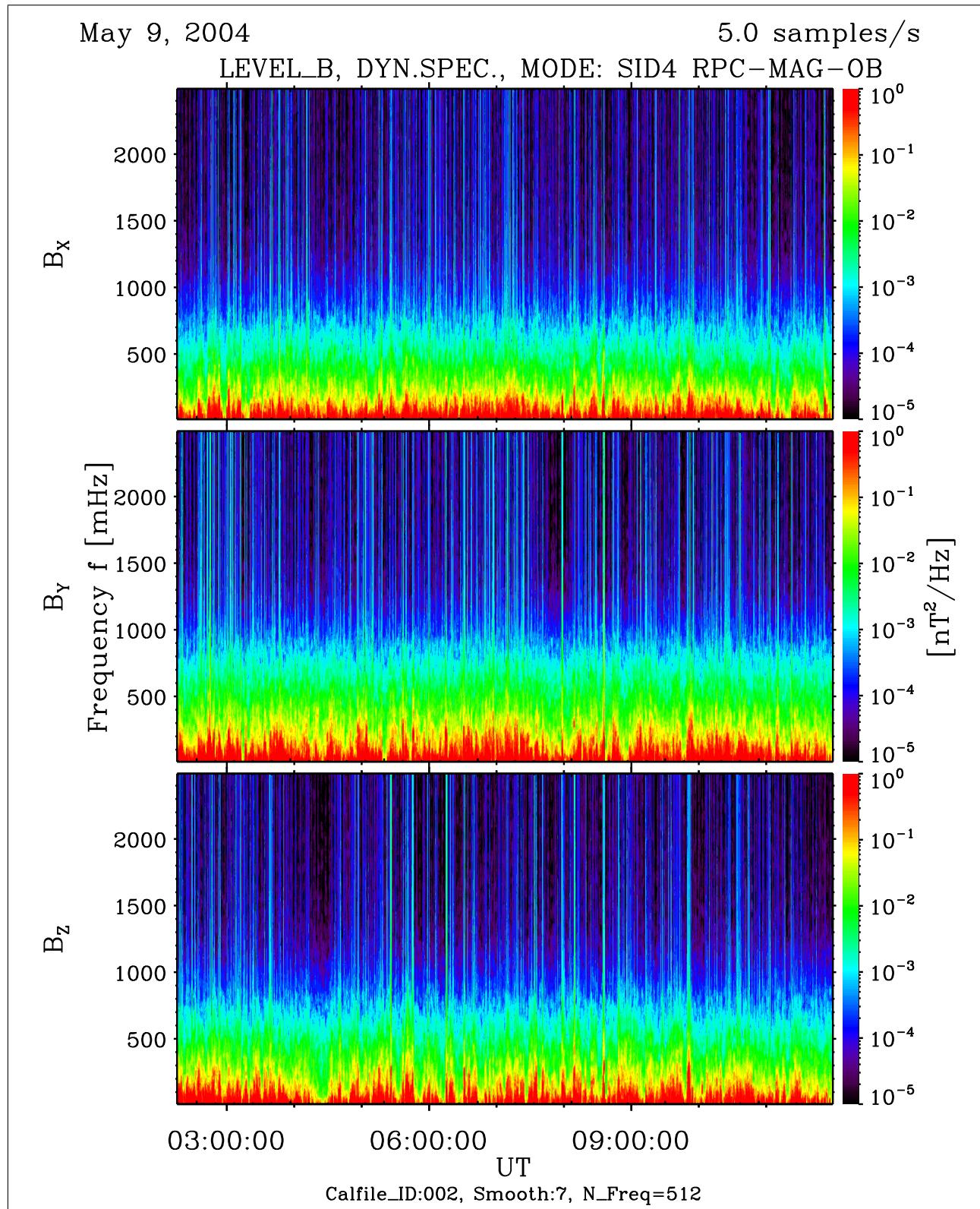


Figure 52: File: RPCMAG040509T0215\_CLB\_OB\_M4\_DS1e-2\_2500\_002

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RPC-MAG-OB  
 RES.DATA,ECLIPJ2000,FILTERED

1.0 s

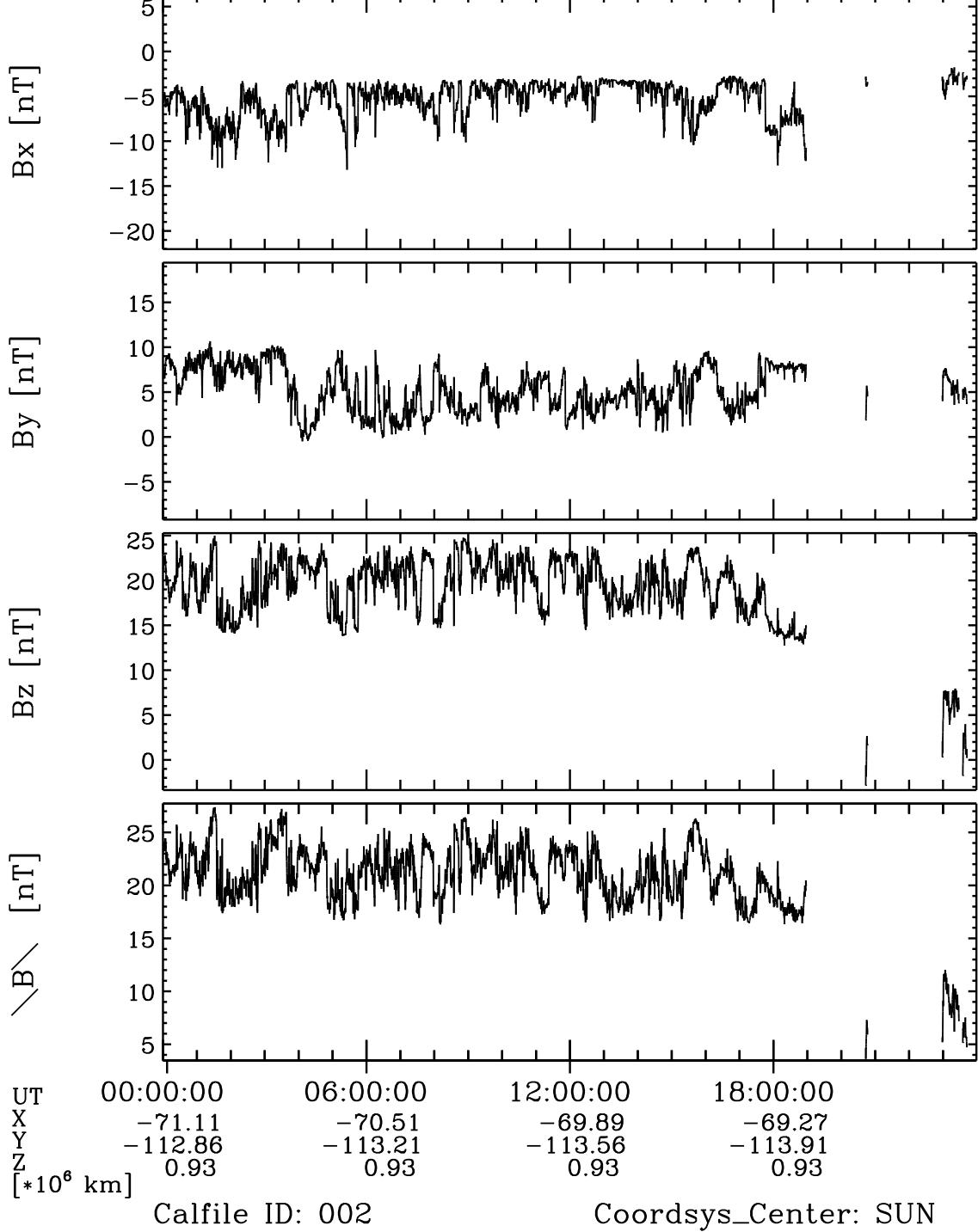


Figure 53: File: RPCMAG040509\_CLG\_OB\_A1\_T0000\_2359\_002

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May 9, 2004                    RPC-MAG-IB  
 RES.DATA,ECLIPJ2000,FILTERED                    1.0 s

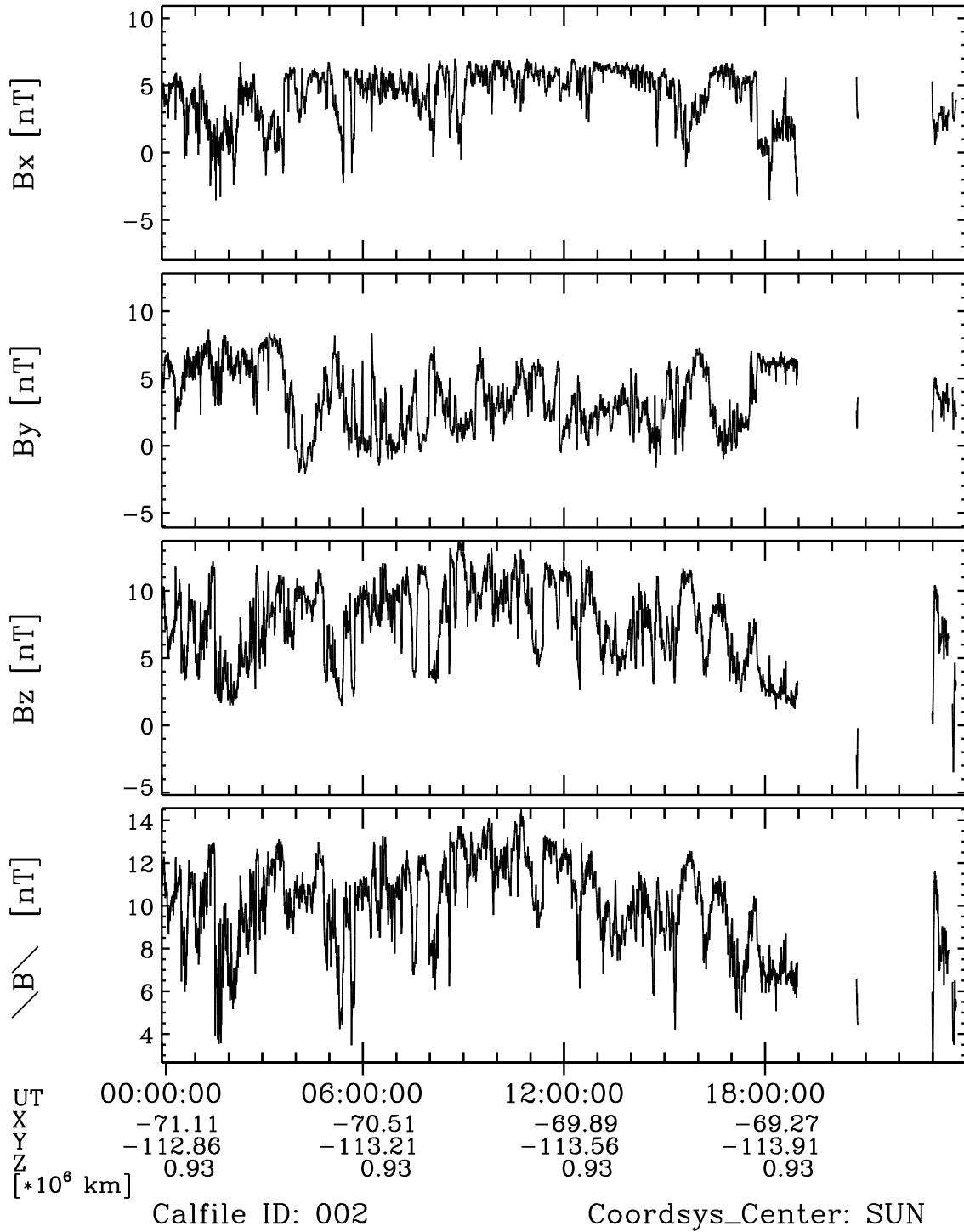


Figure 54: File: RPCMAG040509\_CLG\_IB\_A1\_T0000\_2359\_002

### 4.3 Plots of ROSETTA's Reaction Wheels Speeds

The following plots show the time series of the revolutions of the 4 reaction wheels. Two kinds of data are shown:

- The original reaction wheel data as they are stored in the DDS.
- The theoretical response of the wheels impact seen by an instrument sampling with different frequencies. Here the response in the at 20 Hz, 5 Hz and 1 Hz sampling frequency is plotted.

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Revolutions of the four Rosetta Reaction Wheels  
May 9, 2004

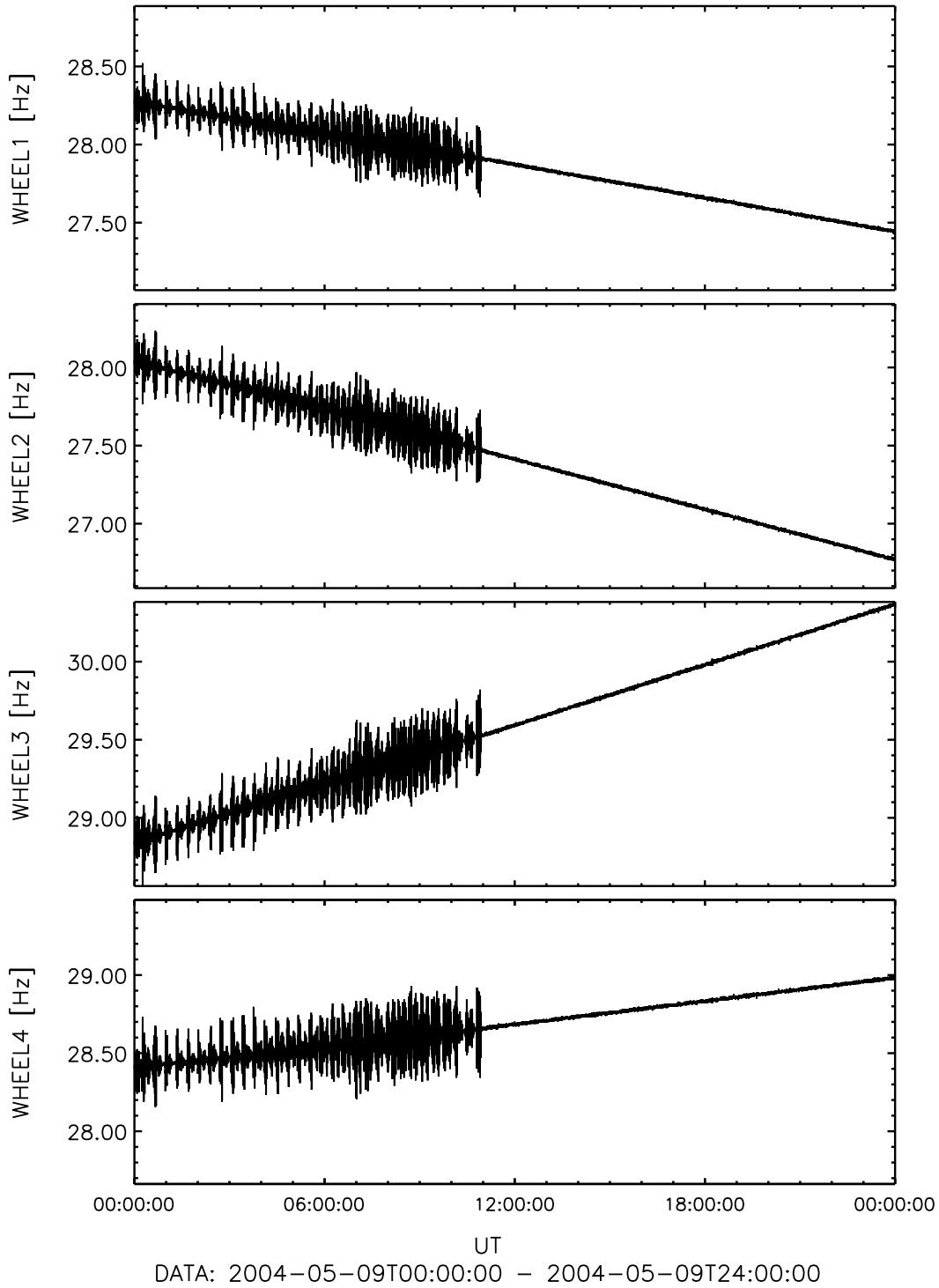


Figure 55: File: wheels\_Hz2004-05-09T00-00

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Reaction Wheels – Response at 1Hz Sampling  
May 9, 2004

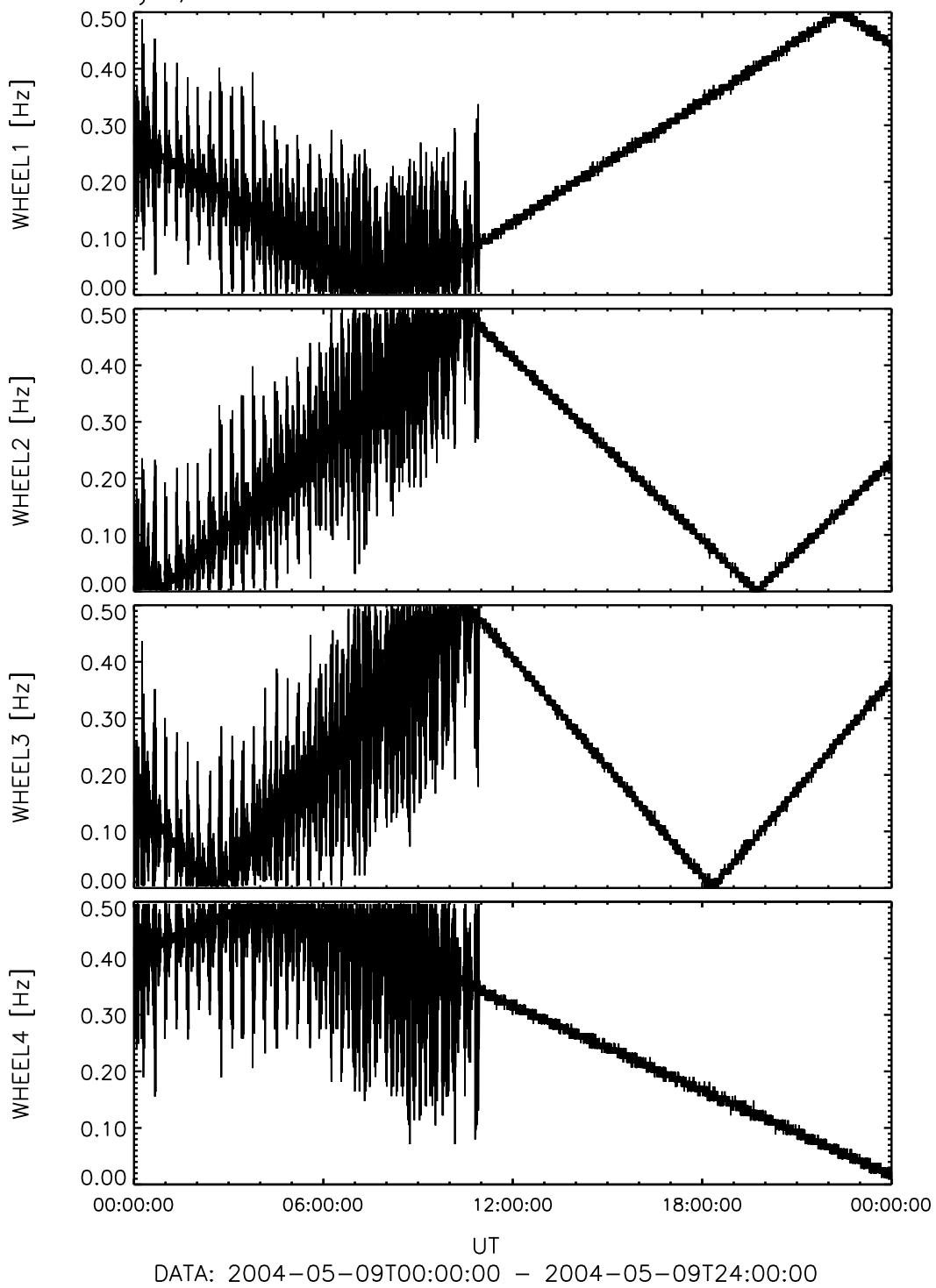


Figure 56: File: wheels\_1Hz\_Sampling2004-05-09T00-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 9, 2004

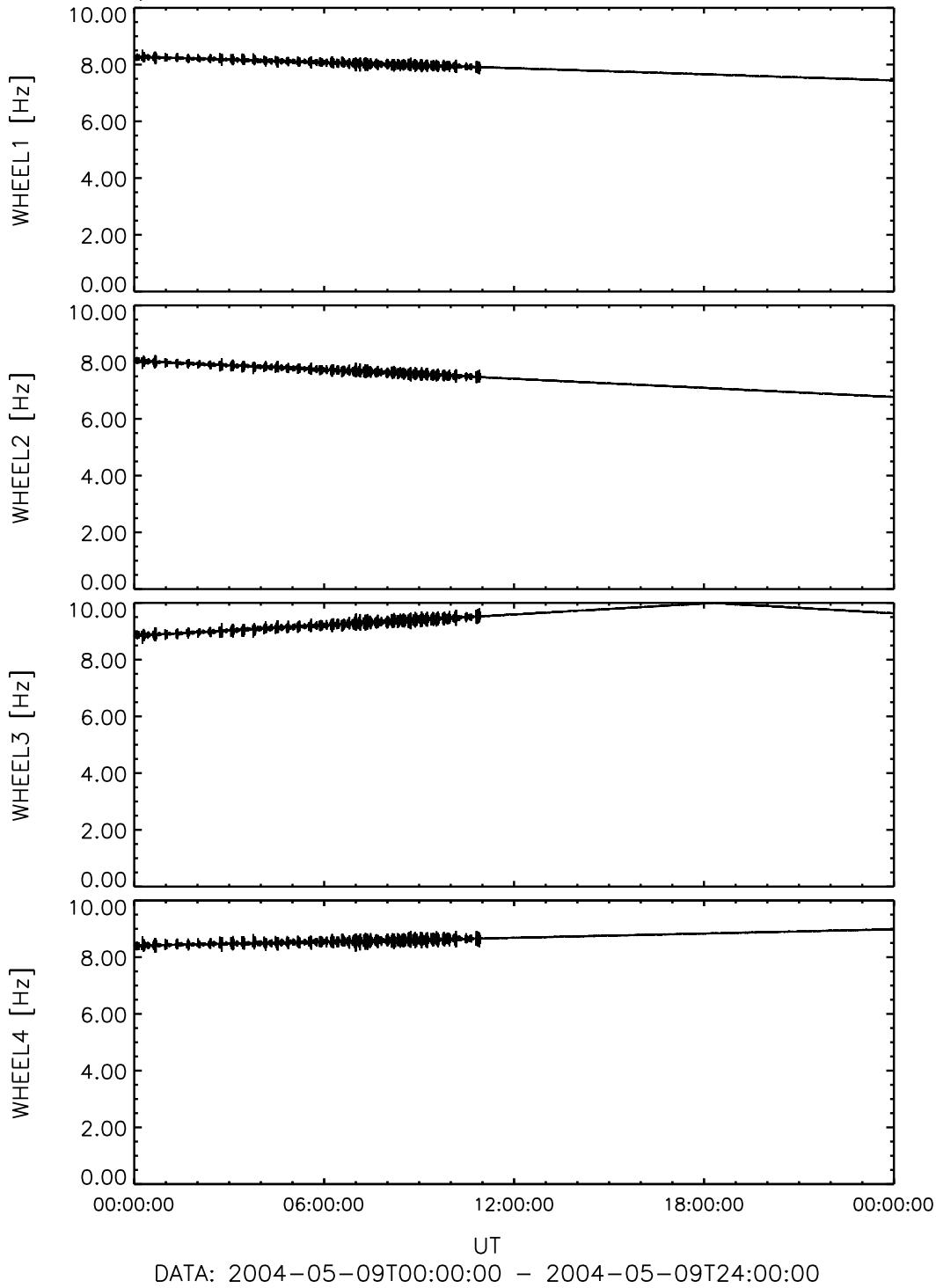


Figure 57: File: wheels\_20Hz\_Sampling2004-05-09T00-00

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Reaction Wheels – Response at 5 Hz Sampling  
May 9, 2004

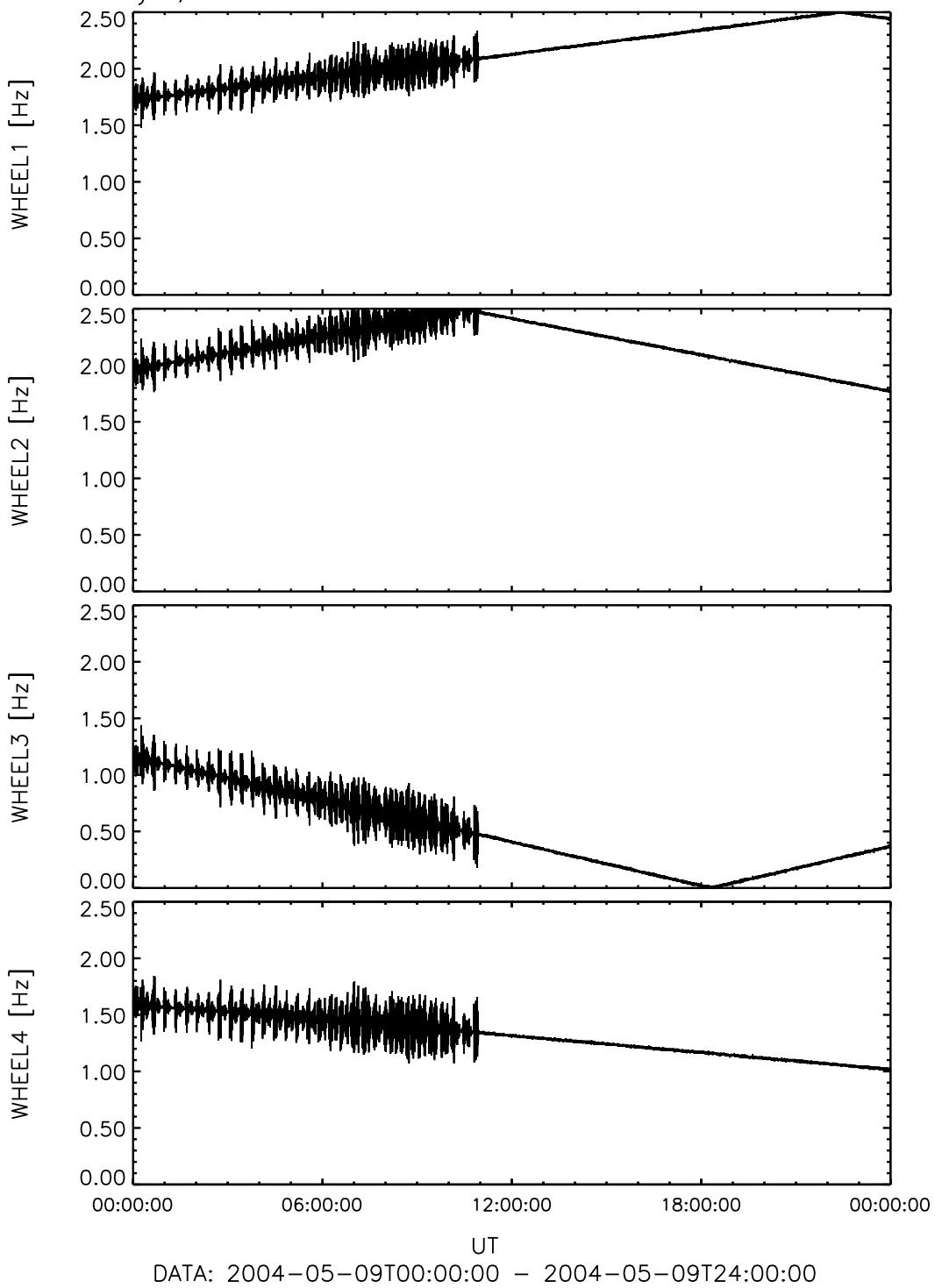


Figure 58: File: wheels\_5Hz\_Sampling2004-05-09T00-00

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Reaction Wheels – Response at 5 Hz Sampling  
May 9, 2004

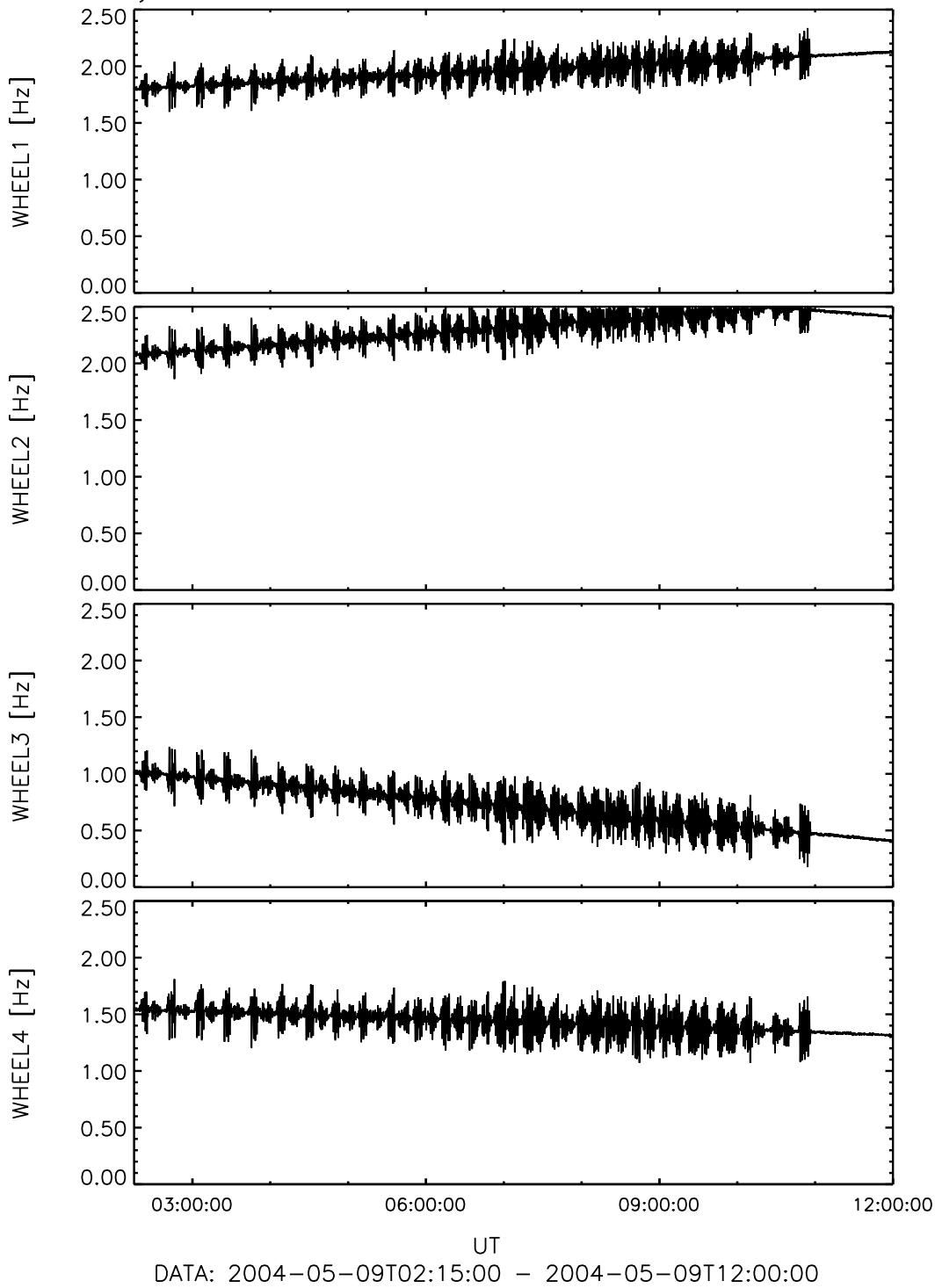


Figure 59: File: wheels\_5Hz\_Sampling2004-05-09T02-15

## 5 May 10, 2004:

### 5.1 Actions

Today we got some SID3 data in the early morning hours. There were no special events.

The spectrum shows significant peaks at 300 mHz and 400 mHz.

### 5.2 Plots of Calibrated Data using the new Temperature Model

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RPC-MAG-HK  
CAL. HOUSEKEEPING DATA

32.0 s

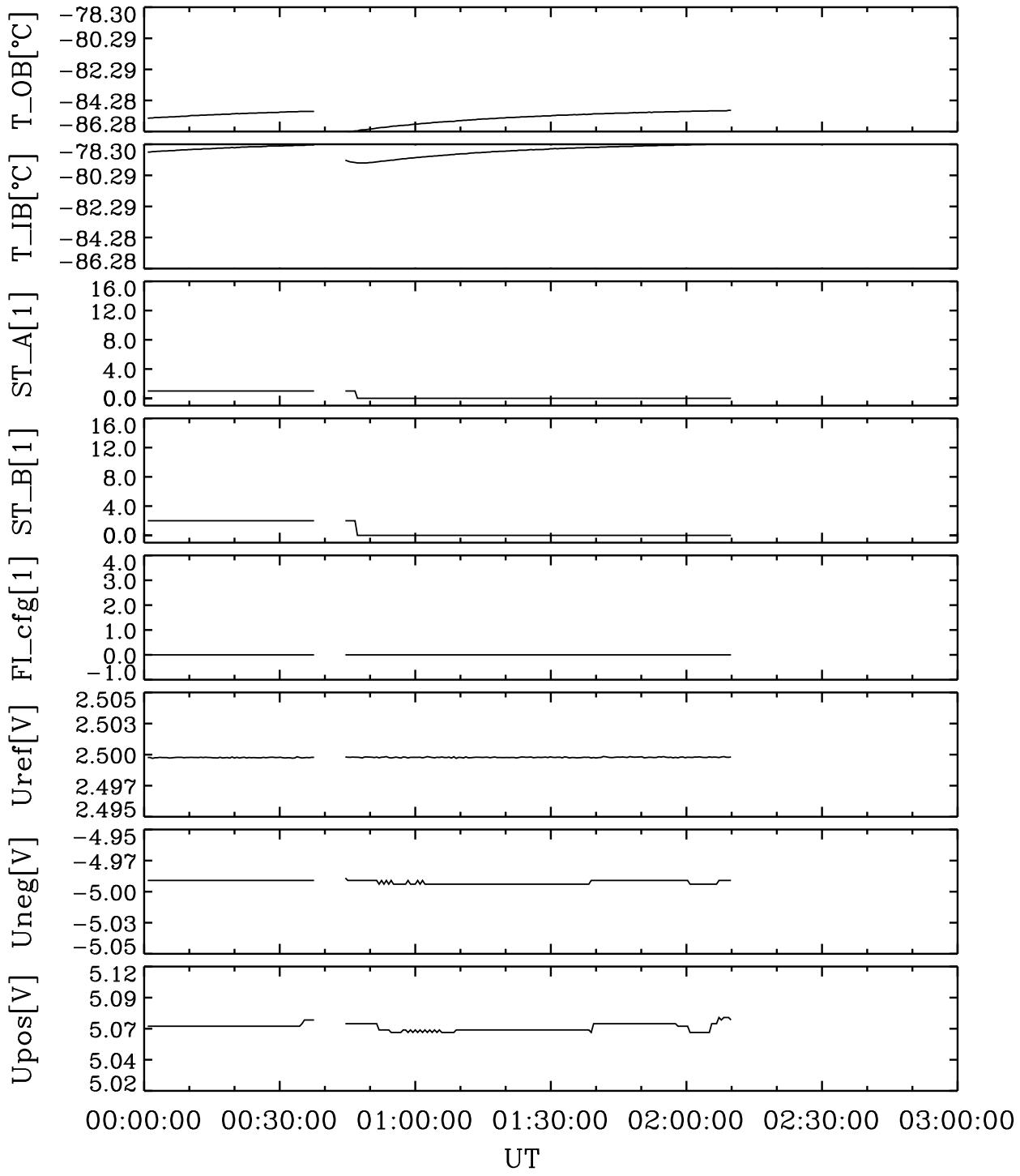


Figure 60: File: RPCMAG040510T0000\_CLA\_HK\_P0000\_0300

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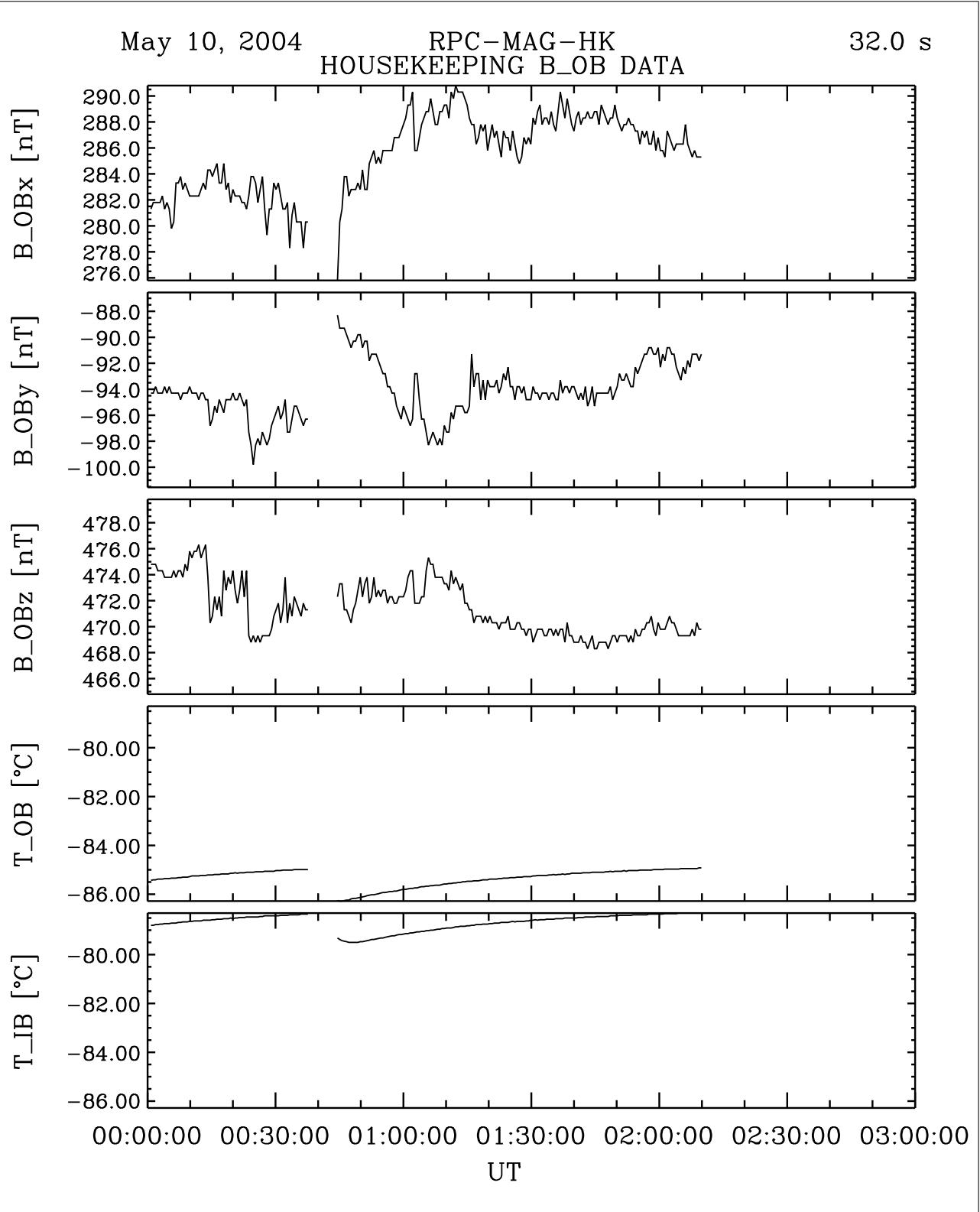


Figure 61: File: RPCMAG040510T0000\_CLA\_HK\_B\_P0000\_0300

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May 10, 2004                    RPC-MAG-OB                    20.0 samples/s  
CAL.DATA,S/C COORDS, LEVEL\_B, MODE: SID3

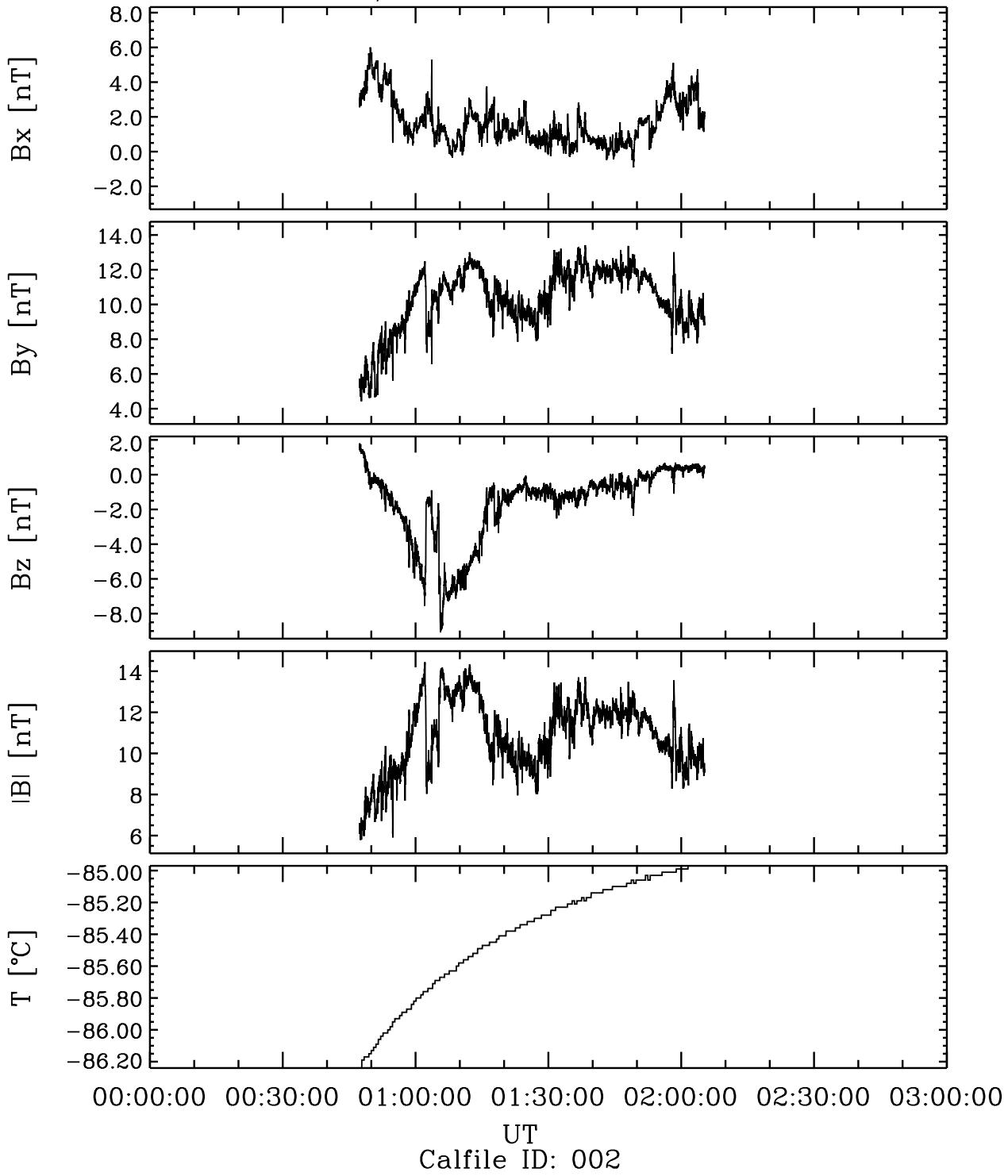


Figure 62: File: RPCMAG040510T0047\_CLB\_OB\_M3\_T0000\_0300\_002

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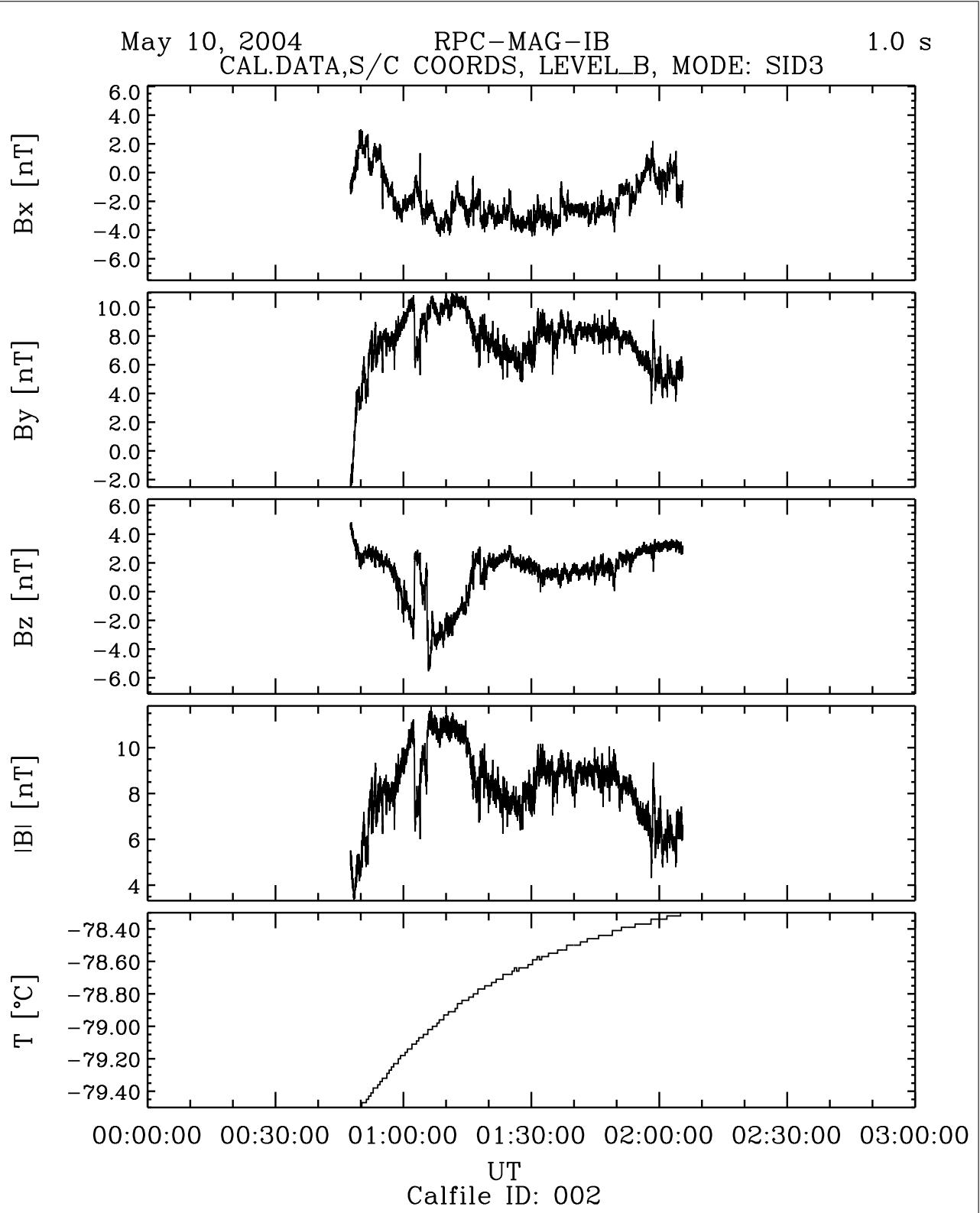


Figure 63: File: RPCMAG040510T0047\_CLB\_IB\_M3\_T0000\_0300\_002

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May 10, 2004      RPC-MAG-OB      20.0 Hz  
 CAL.DATA,ECLIPJ2000,LEVEL\_C, MODE:SID3

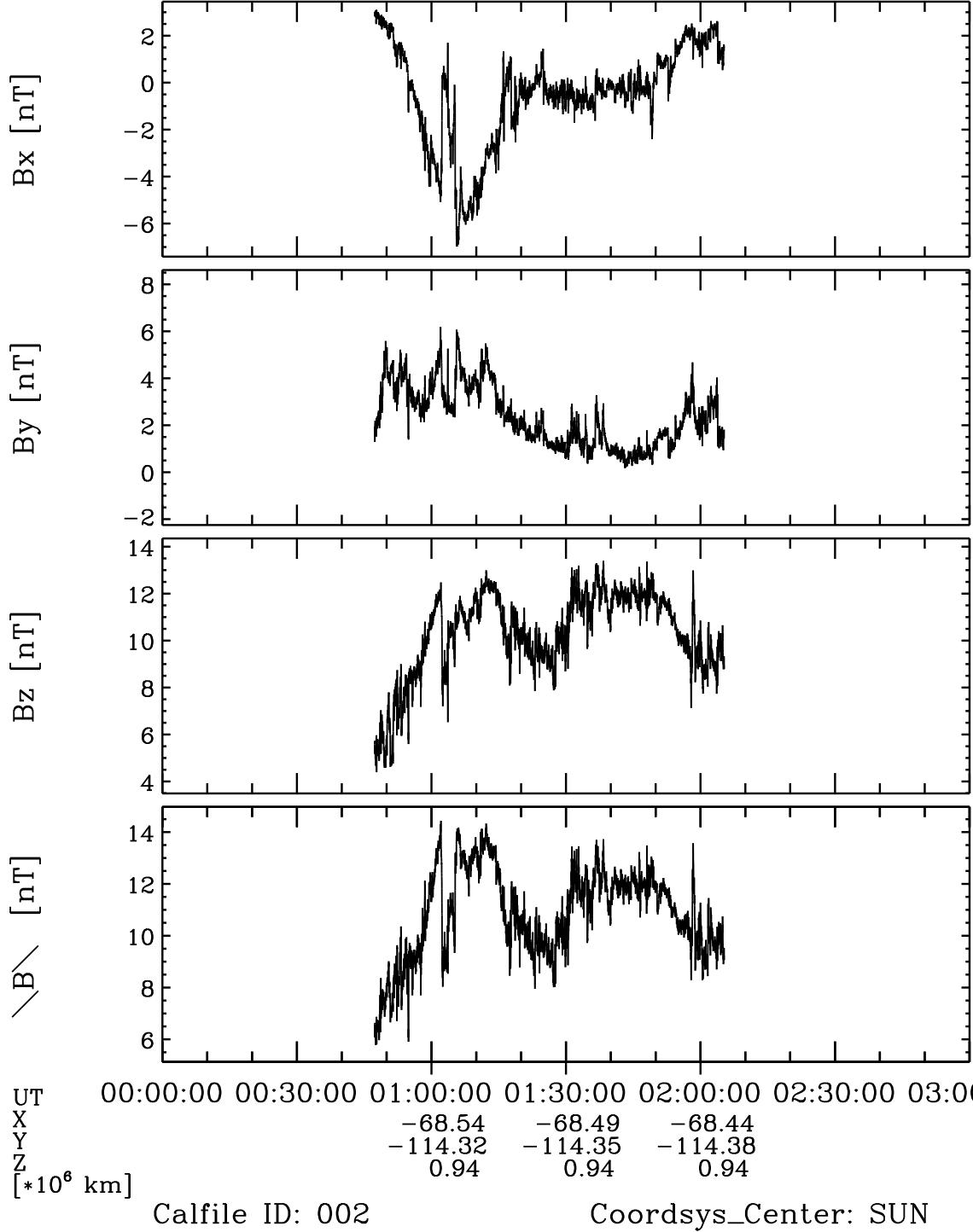


Figure 64: File: RPCMAG040510T0047\_CLC\_OB\_M3\_T0000\_0300\_002

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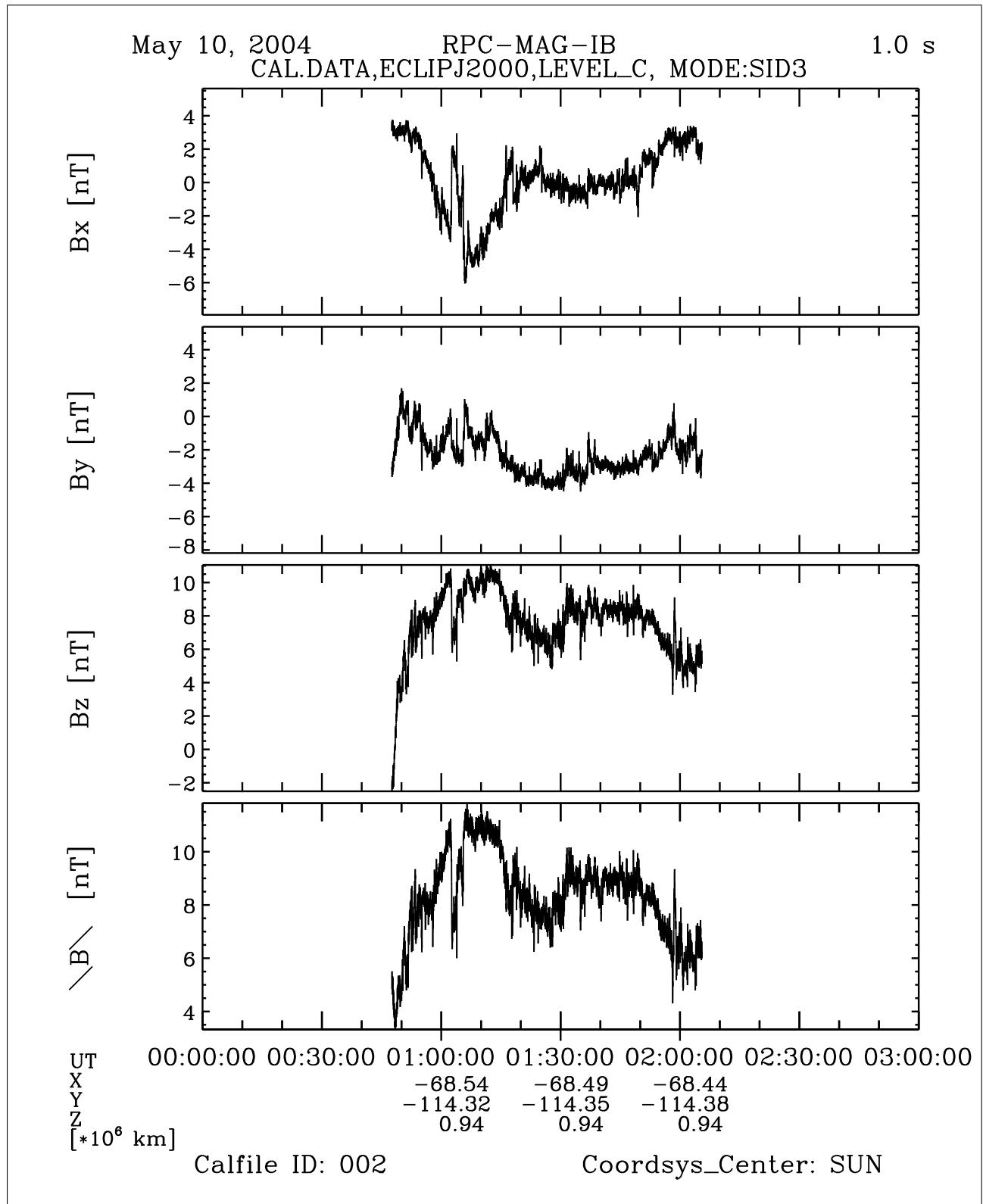


Figure 65: File: RPCMAG040510T0047\_CLC\_IB\_M3\_T0000\_0300\_002

# ROSETTA

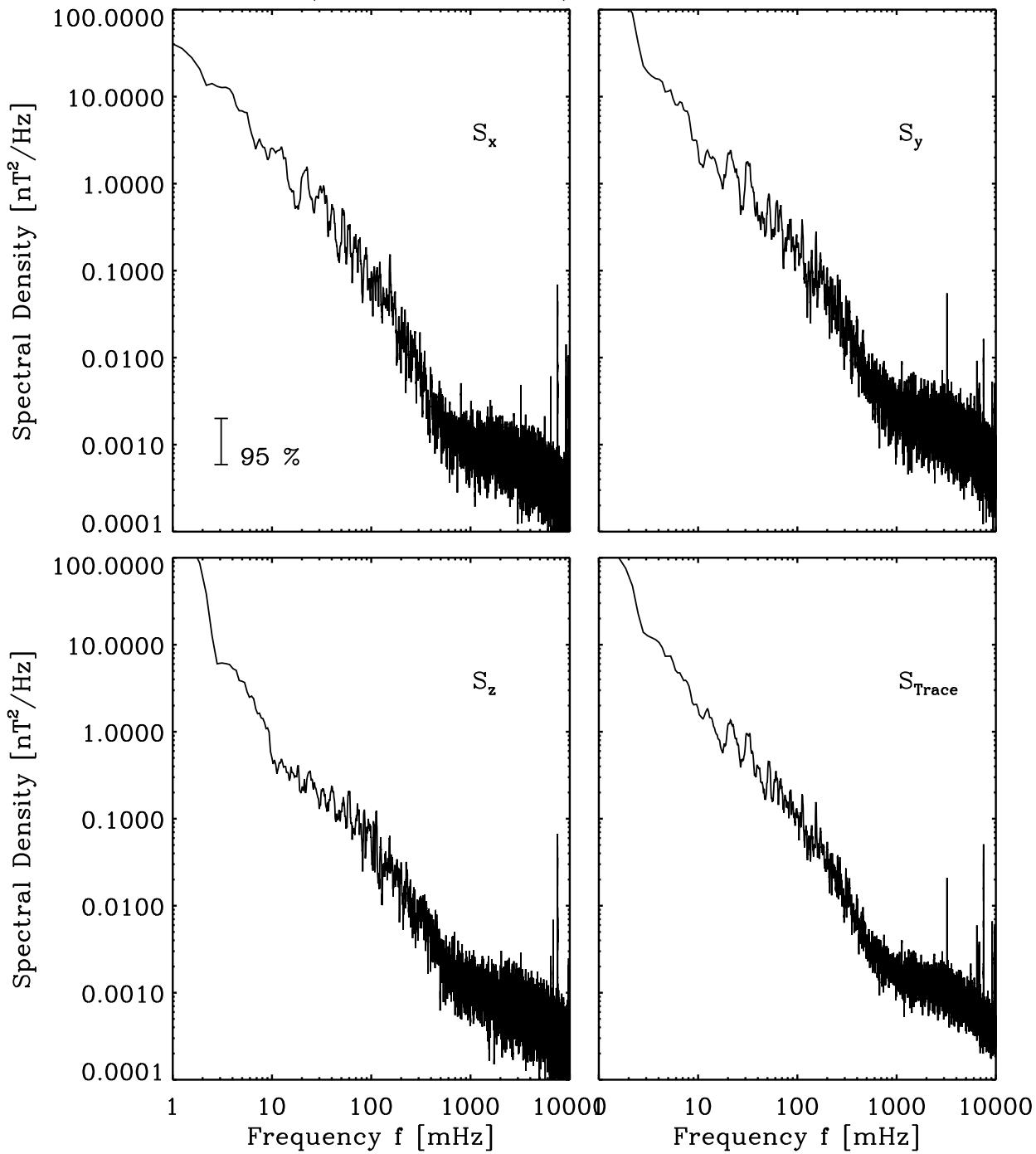
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0.049s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-OB



Calfile ID: 002

Interval: 01:02:41.632 – 01:57:18.382

Figure 66: File: RPCMAG040510T0047\_CLB\_OB\_M3\_PS1\_10000\_002

# ROSETTA

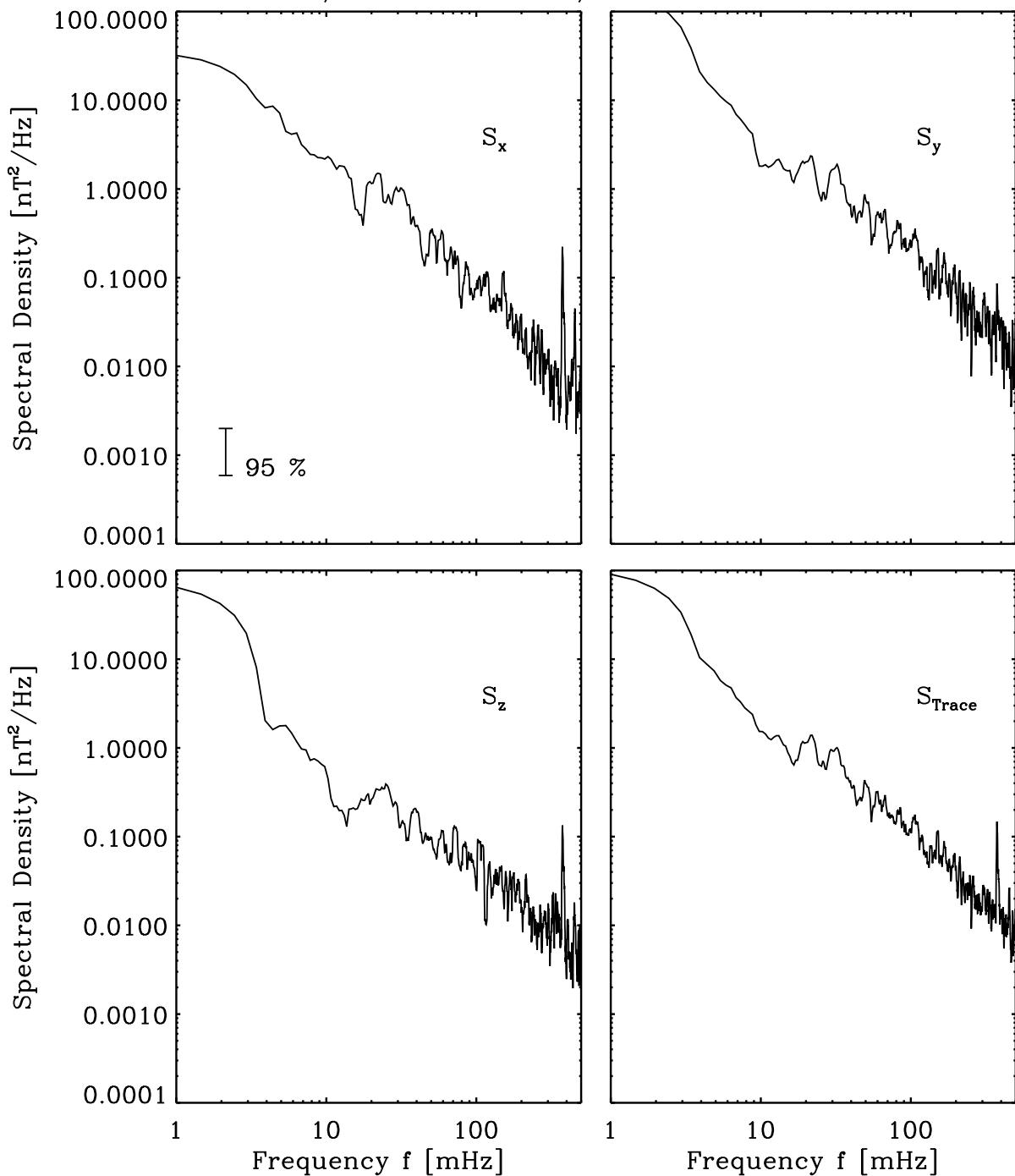
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1.00s

LEVEL\_B, POWER SPECTRUM, MODE: SID3 RPC-MAG-IB



Calfile ID: 002

Interval: 01:12:56.517 – 01:47:03.517

Figure 67: File: RPCMAG040510T0047\_CLB\_IB\_M3\_PS1\_10000\_002

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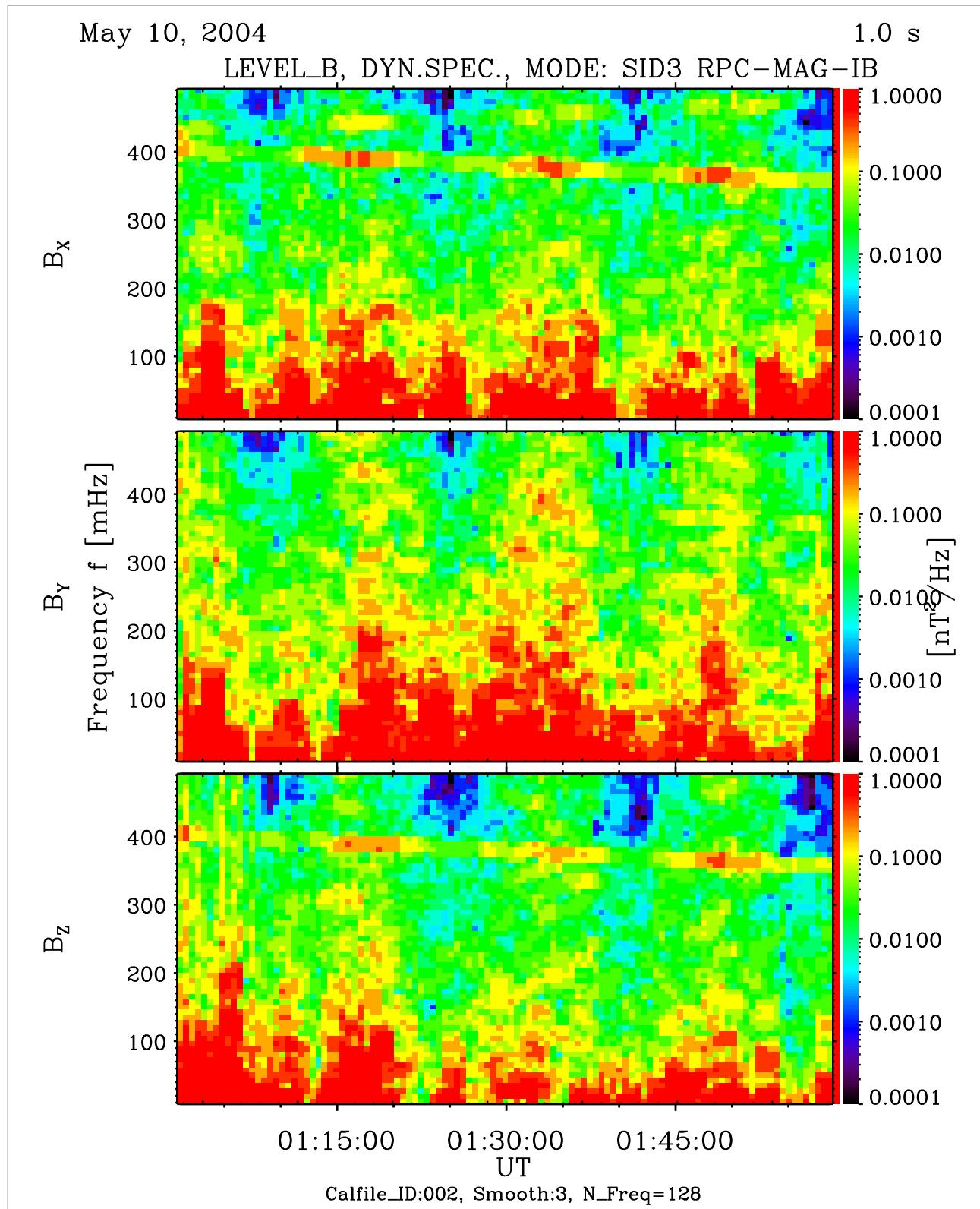


Figure 68: File: RPCMAG040510T0047\_CLB\_IB\_M3\_DS1\_500\_002

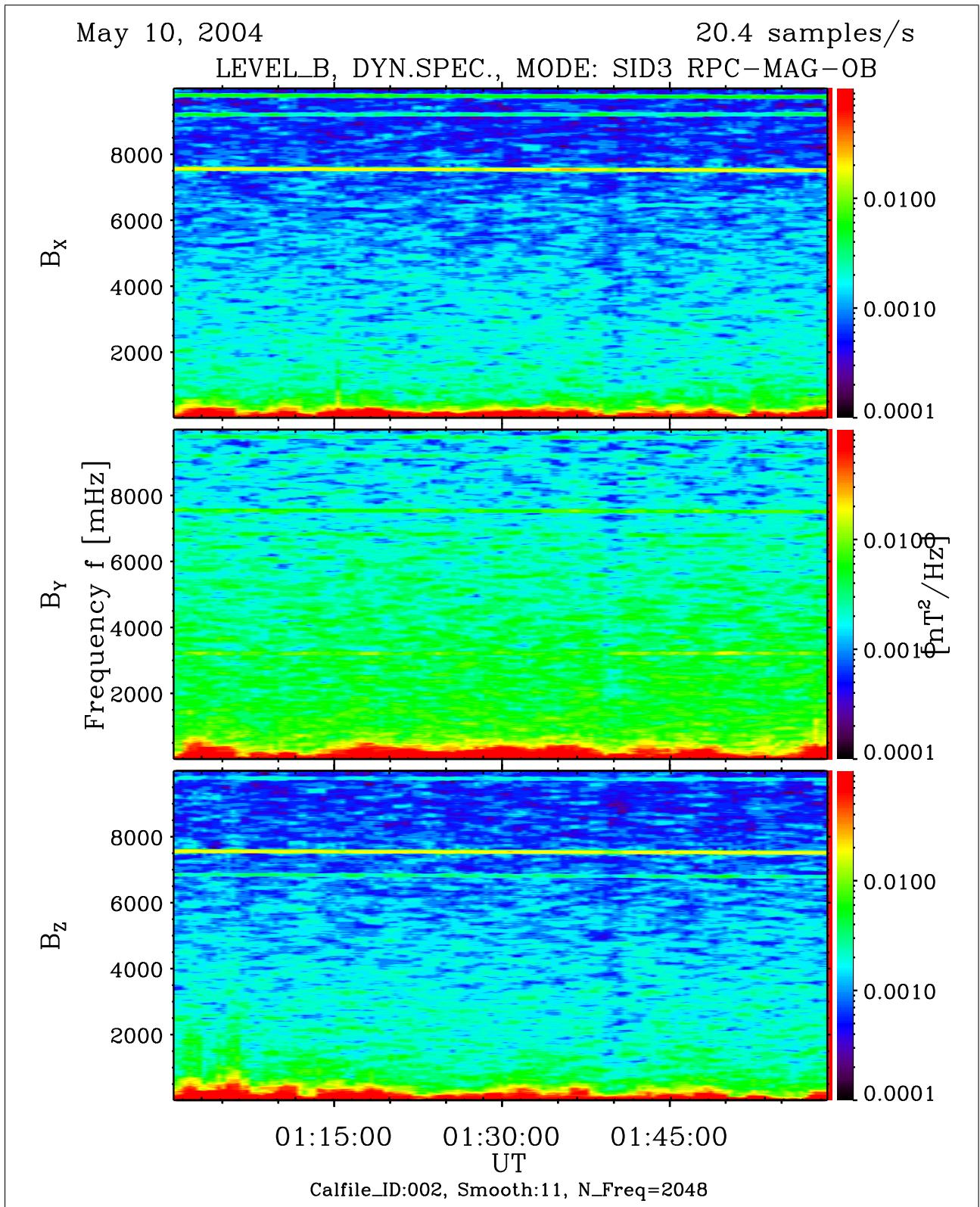


Figure 69: File: RPCMAG040510T0047\_CLB\_OB\_M3\_DS2\_10000\_002

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### 5.3 Plots of ROSETTA's Reaction Wheels Speeds

The following plots show the time series of the revolutions of the 4 reaction wheels. Two kinds of data are shown:

- The original reaction wheel data as they are stored in the DDS.
- The theoretical response of the wheels impact seen by an instrument sampling with different frequencies. Here the response in the at 20 Hz, 1 Hz and 0.25 Hz sampling frequency is plotted.

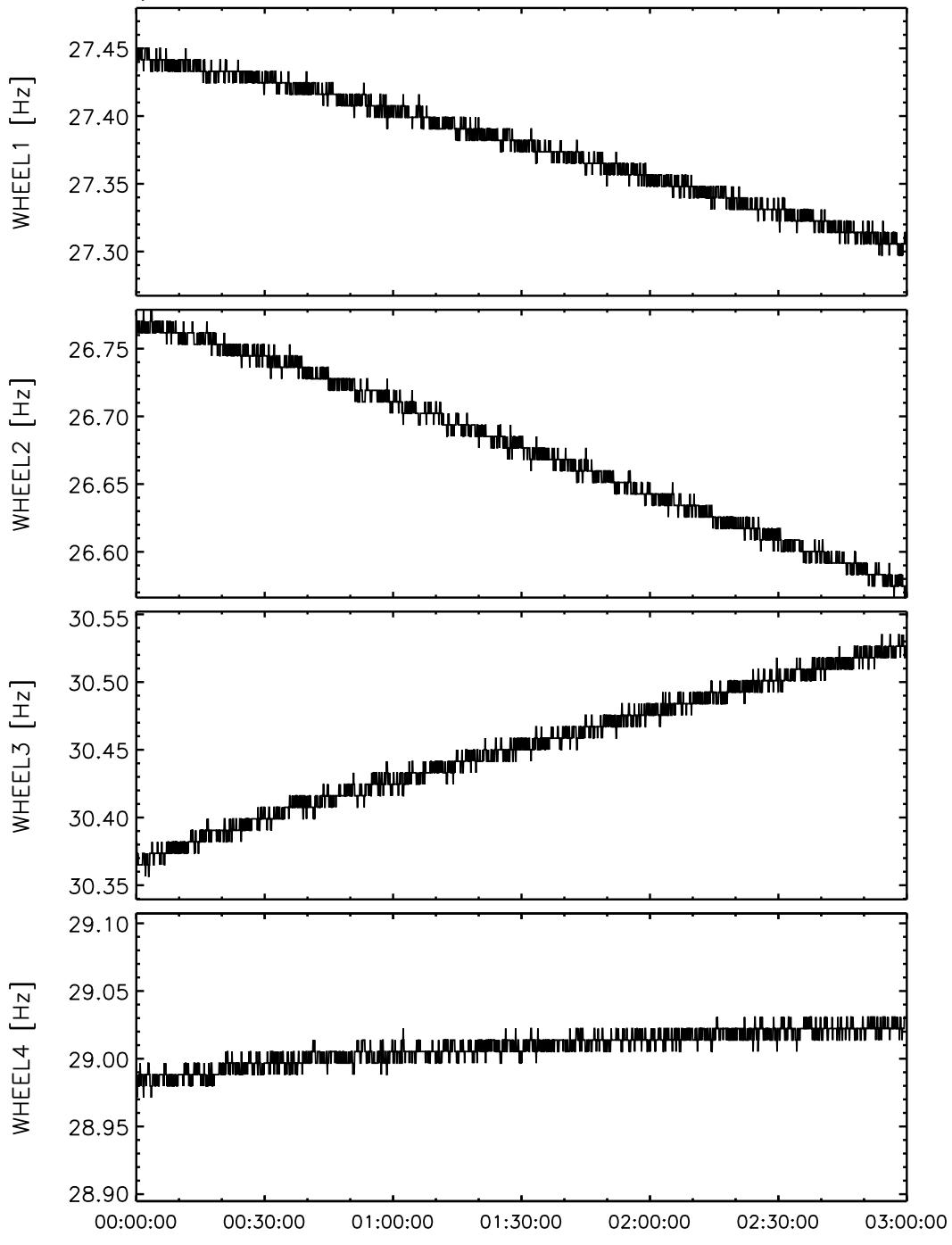
A comparison with the dynamic spectra of the MAG data gives an impressive accordance between the reaction wheel frequencies and the spectral lines observed in the dynamic MAG spectra.

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Revolutions of the four Rosetta Reaction Wheels  
May 10, 2004



DATA: 2004-05-10T00:00:00 – 2004-05-10T03:00:00

Figure 70: File: wheels\_Hz2004-05-10T00-00

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Reaction Wheels – Response at 1Hz Sampling  
May 10, 2004

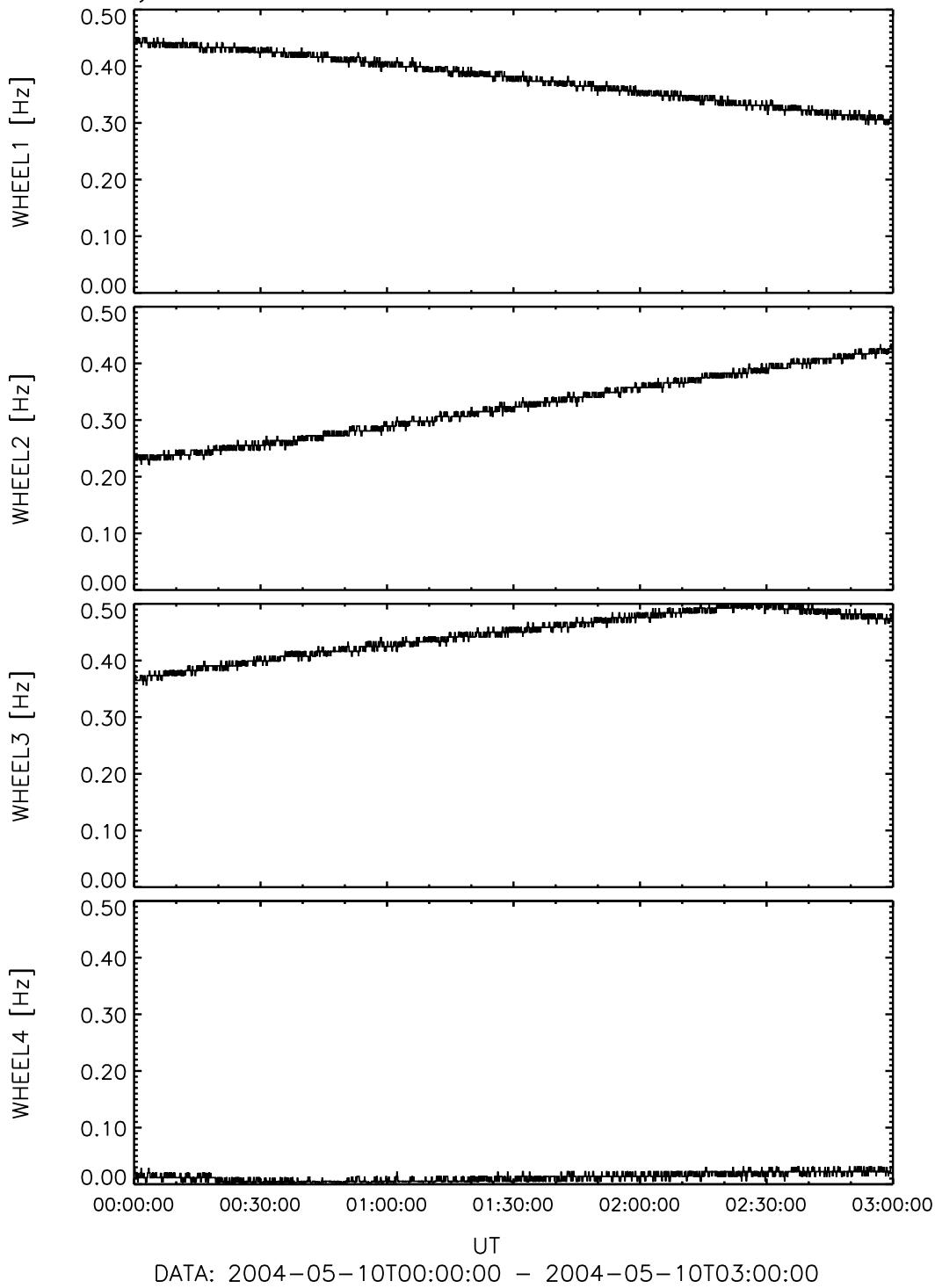


Figure 71: File: wheels\_1Hz\_Sampling2004-05-10T00-00

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Reaction Wheels – Response at 20 Hz Sampling  
May 10, 2004

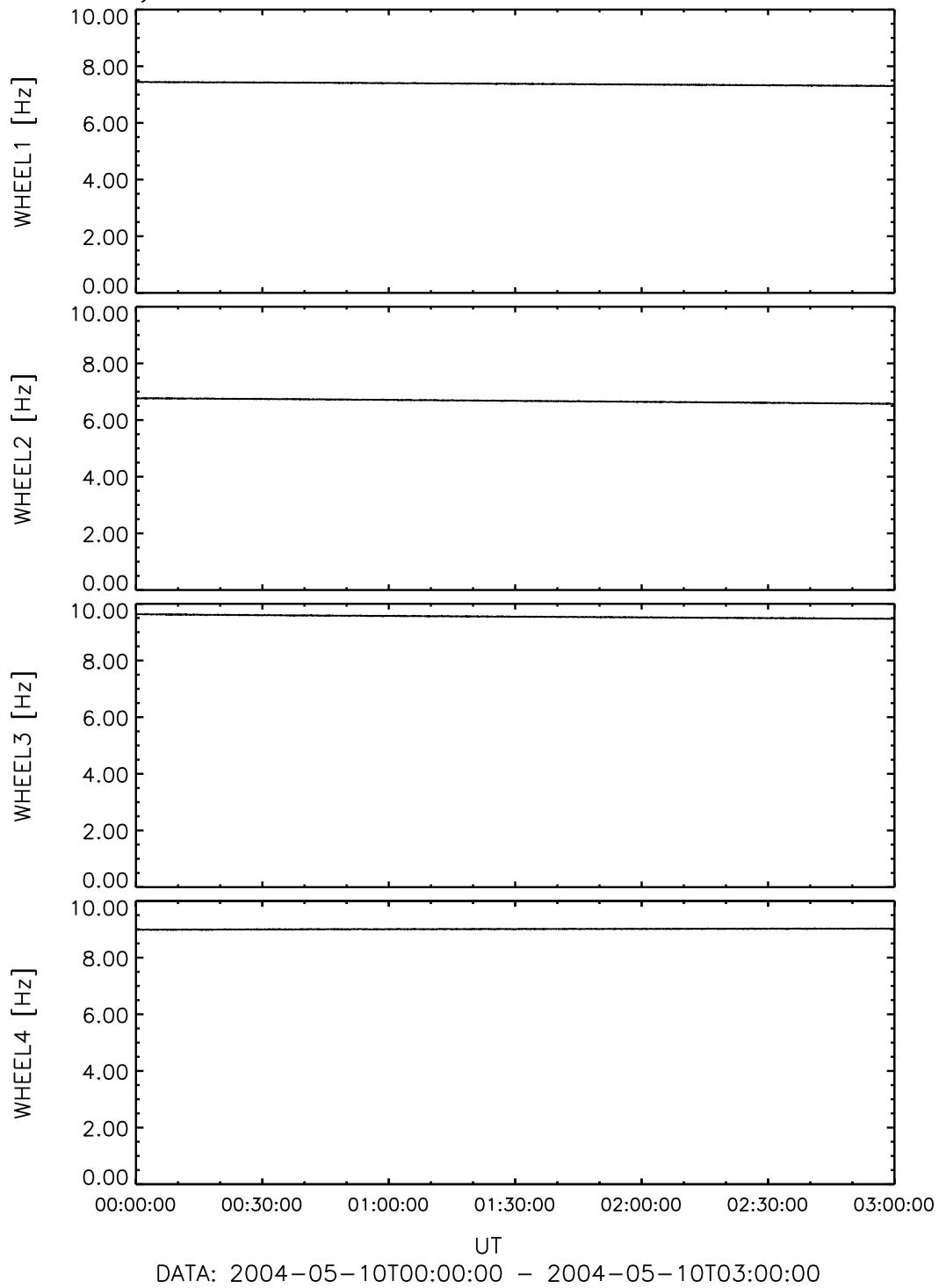


Figure 72: File: wheels\_20Hz\_Sampling2004-05-10T00-00