LoCo Lab EDGES Memo 145
Mid-Band 'Metadata': GHA, Sun Elevation, Temperature, and Humidity

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1 Description

Here we show the daily Mid-Band 'metadata' from days 2018-146 to 2018-220. Specifically, we show the daily Galactic Hour Angle (GHA), Sun Elevation, Ambient Temperature, Ambient Humidity, and Receiver Temperature.

The metadata are presented in Figures 1 through 59. In the plots we indicate the edges of the GHA range $6-18$ hr, which is the one used to compute the Mid-Band integrated spectrum.

This document is intended to help understand the daily Mid-Band spectral residuals, and inform the computation of the Mid-Band integrated spectrum.

2 Discussion

After examining the data in the figures, especially in , there are a few things to consider for the computation of the Mid-Band integrated spectrum:

1. The GHA range $6-18$ hr used for the Mid-Band integrated spectrum mostly corresponds to daytime. Every day only up to $\sim$ three hours correspond to nighttime. In the first part of the season (day 146 and a few days afterward) the nighttime observations captured the range GHA $\approx 16-18$ hr, while toward the end of the season (close to and on day 220) the nighttime observations captured the range GHA $\approx 6-9$ hr.

2. Daytime observations will lead to larger ionospheric effects impacting the sky spectrum. In addition, during daytime observations the temperature variation is — in general — wider and faster. Although the EDGES blade antenna has low sensitivity to temperature variations, the sensitivity is not zero, and large and fast temperature variations could lead to mechanical changes that, in turn, would change the antenna S11. If these S11 changes are not tracked and calibrated away, the integrated spectra will suffer from calibration errors.

3. The humidity at the MRO is normally low. In the figures we see that when the humudity goes up above $\sim 50\%$, the probability is high of it quickly reaching 100%. A humidity threshold could be implemented to avoid using data in the analysis which were potentially taken during rain or condensation on the antenna.

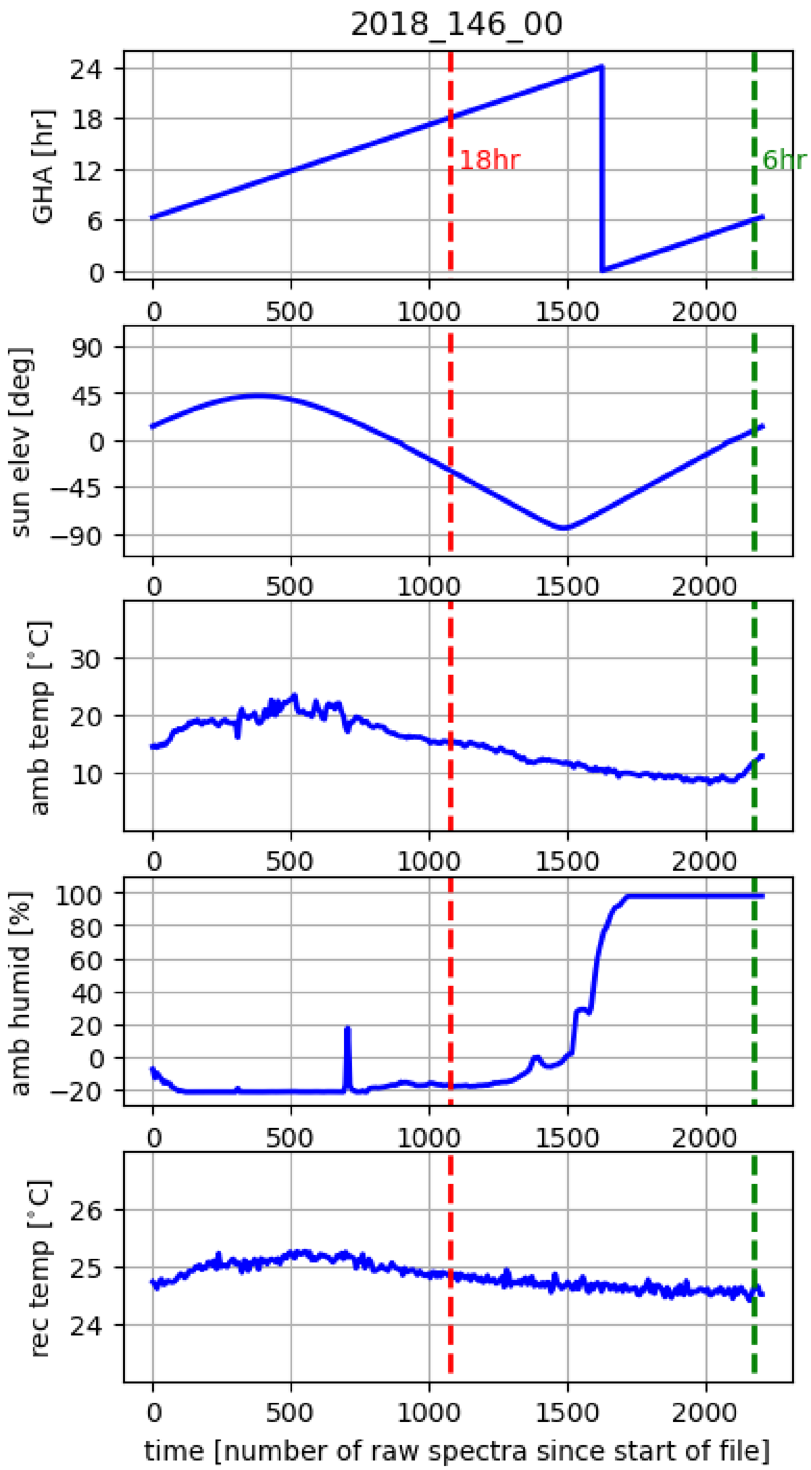
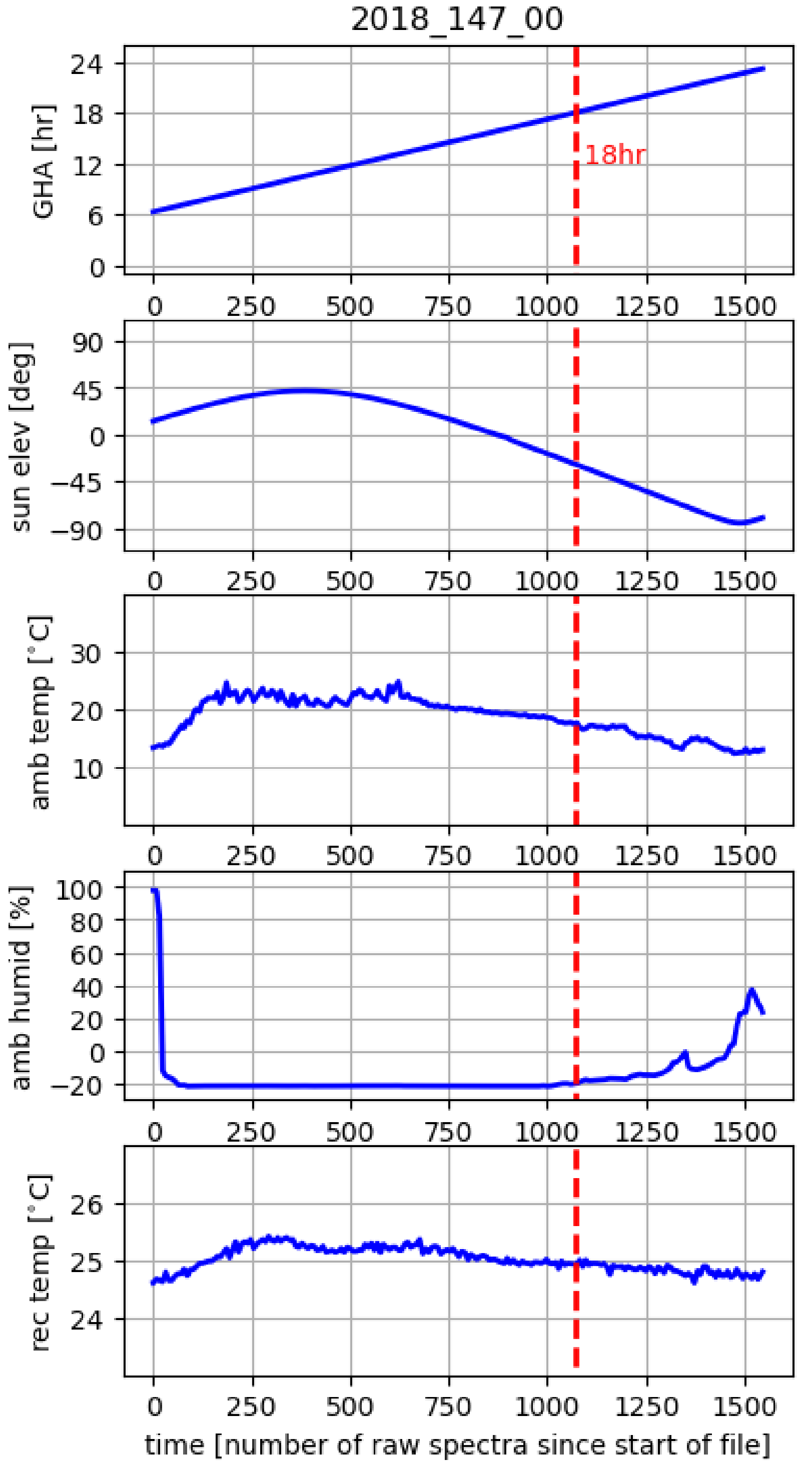

2018_146_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 1: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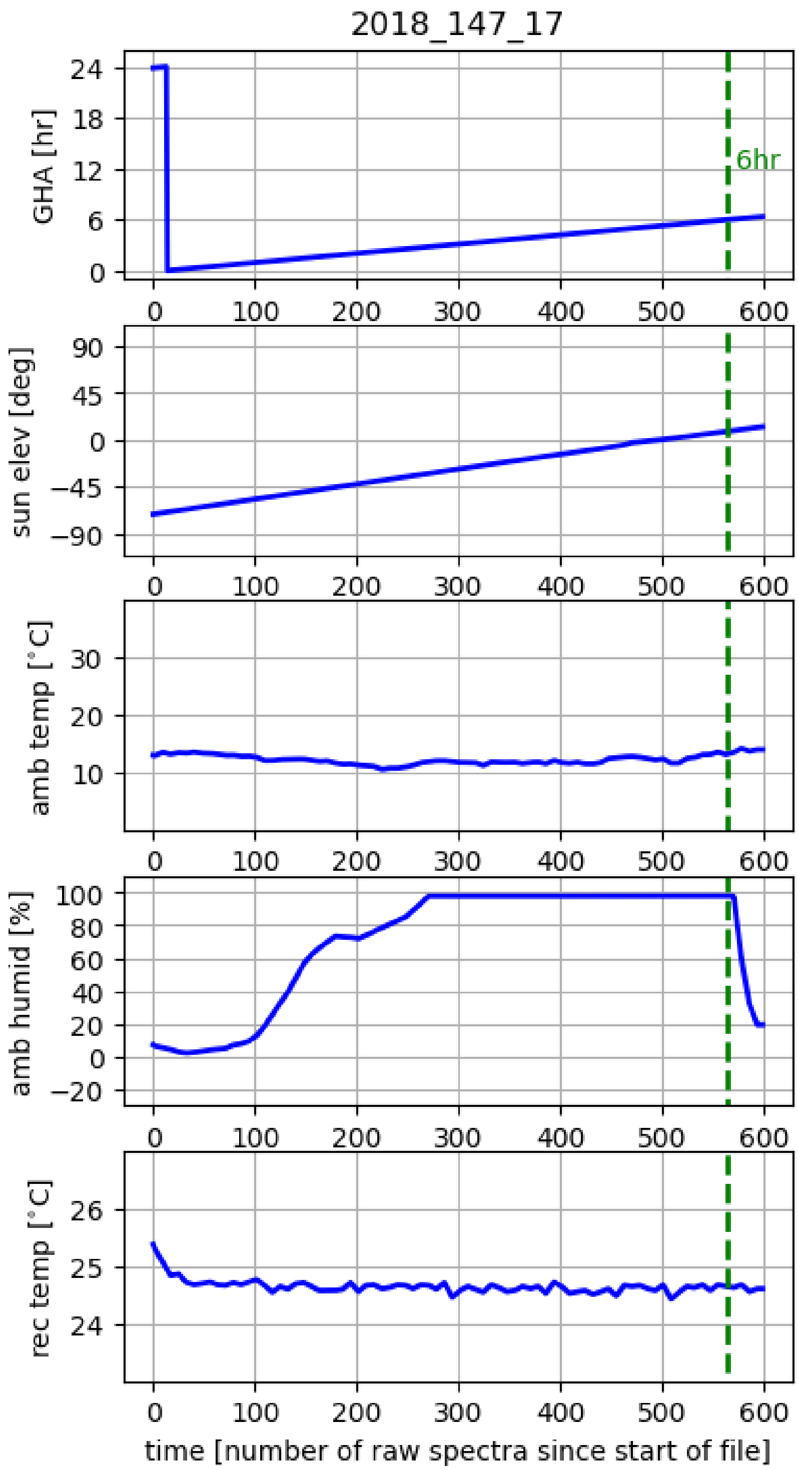
18
12
6
0
18hr
0
250
500
750
1000
1250
1500
sun elev [deg]
90
45
0
−45
−90
amb temp [°C]
30
20
10
amb humid [%]
100
80
60
40
20
0
−20
rec temp [°C]
26
25
24
time [number of raw spectra since start of file]

Figure 2: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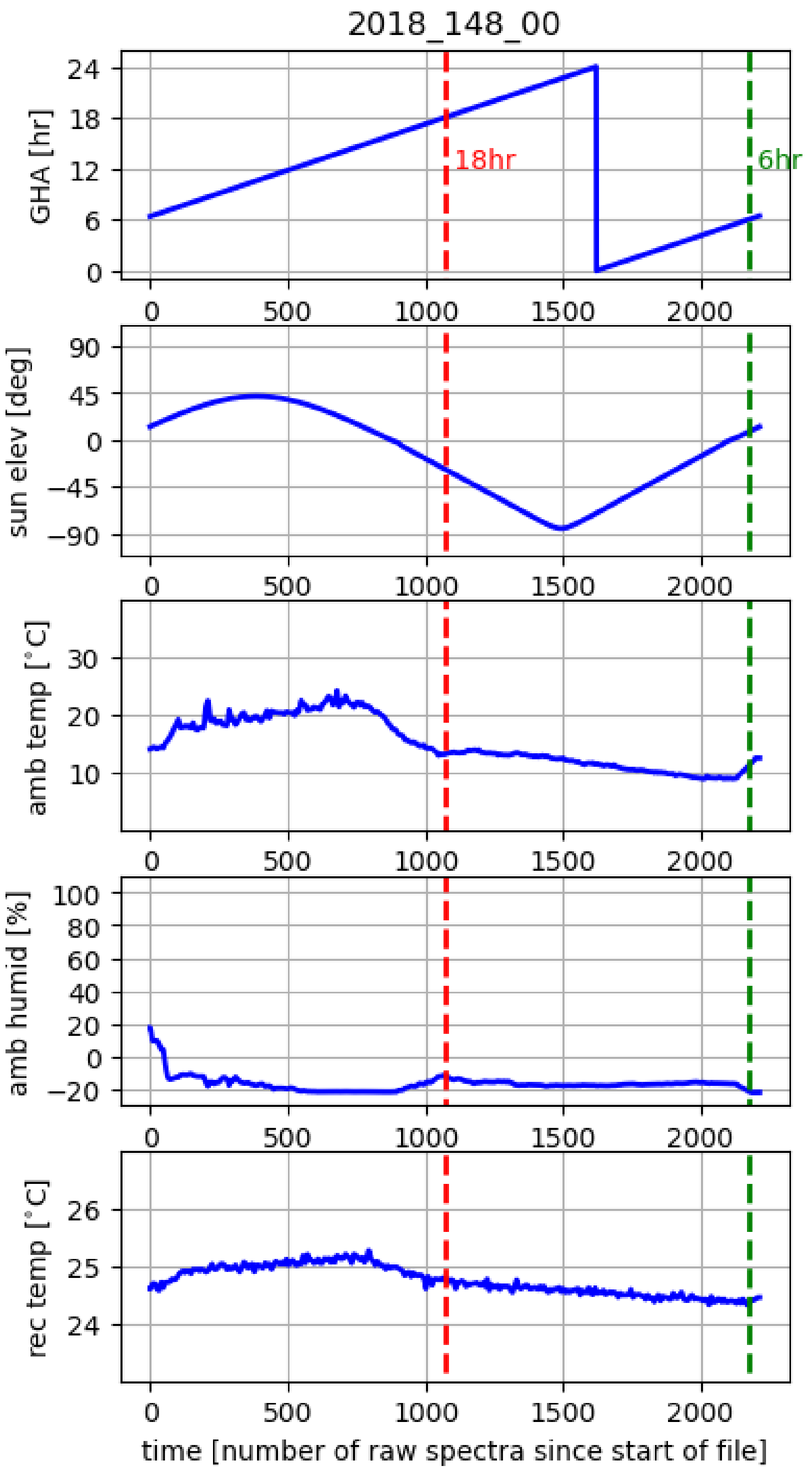
GHA [hr]
6hr
sun elev [deg]
amb temp [$^{\circ}$C]
amb humid [%]
rec temp [$^{\circ}$C]
time [number of raw spectra since start of file]

Figure 3: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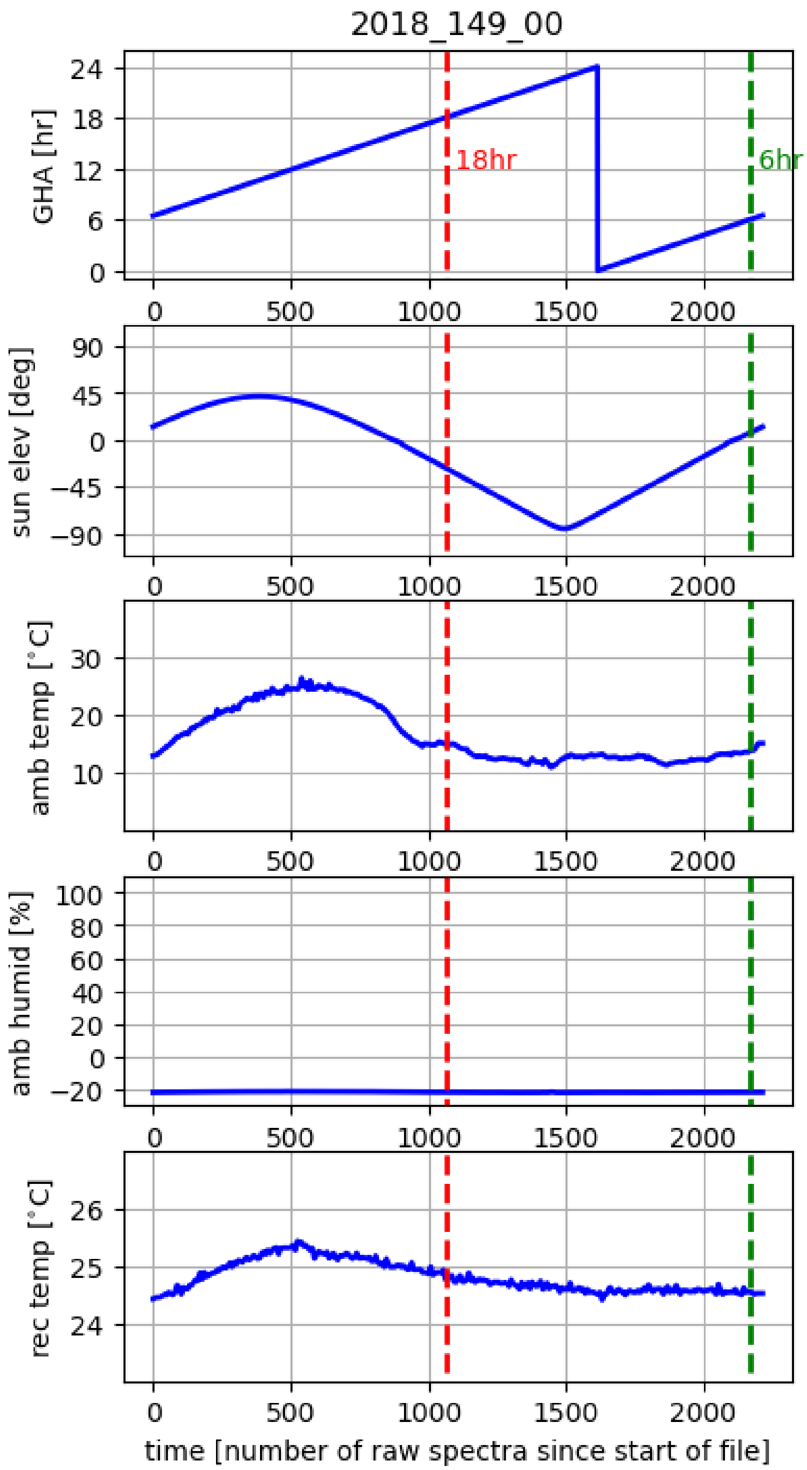
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 4:



2018_149_00
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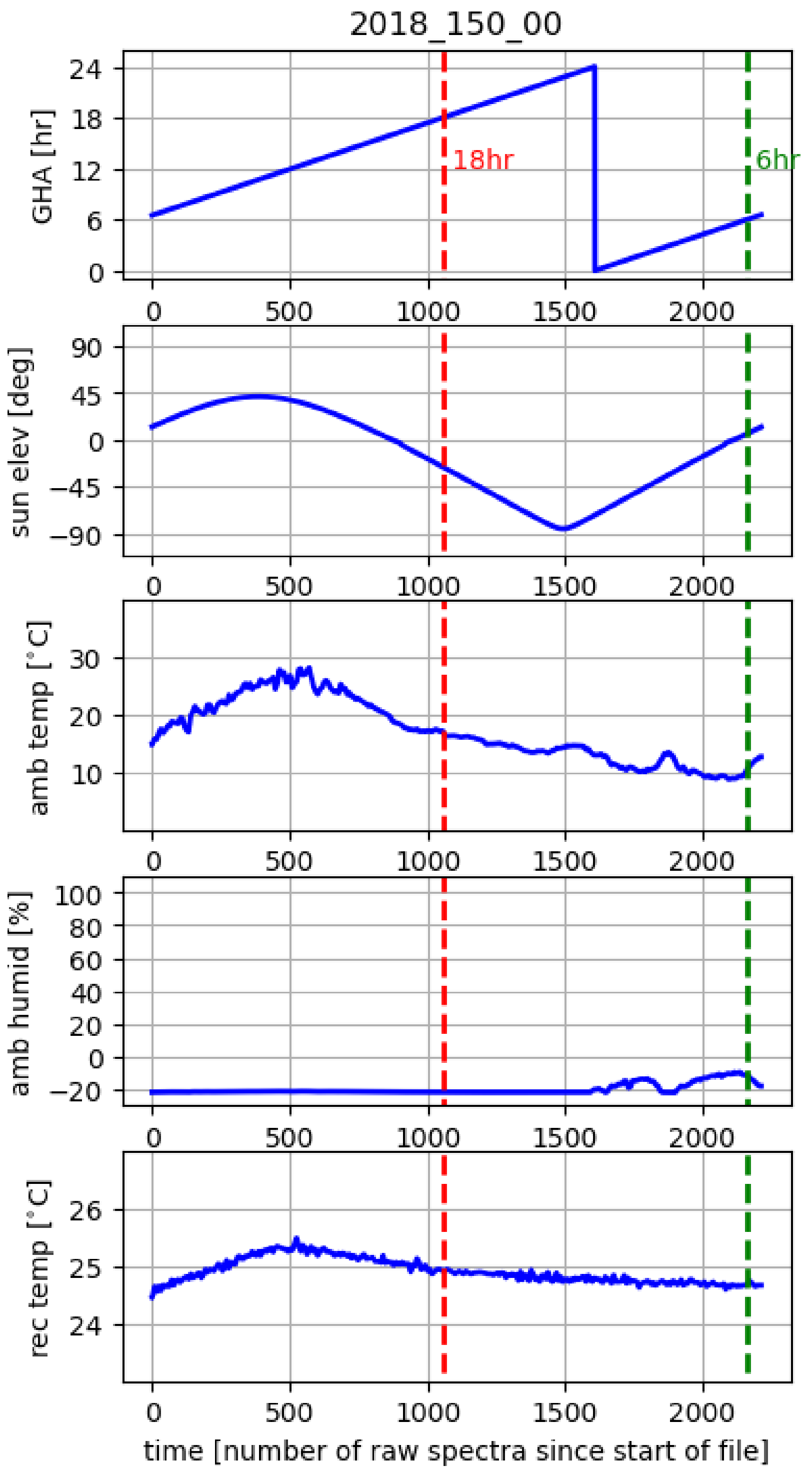
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 5: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18
12
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0
18hr
6hr
sun elev [deg]
90
45
0
−45
−90
amb temp [°C]
30
20
10
amb humid [%]
100
80
60
40
20
0
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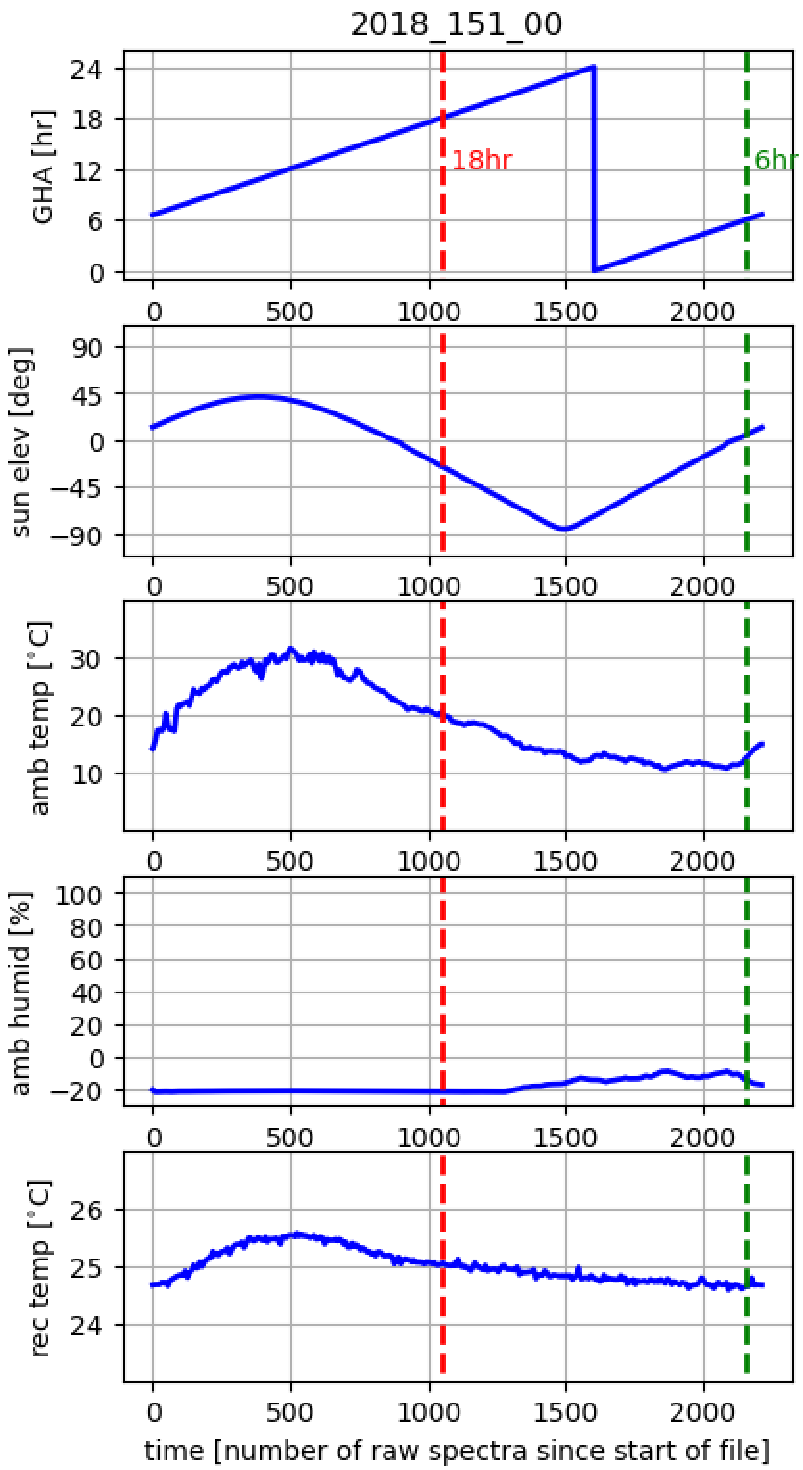
rec temp [°C]
26
25
24
0
500
1000
1500
2000
time [number of raw spectra since start of file]

Figure 6: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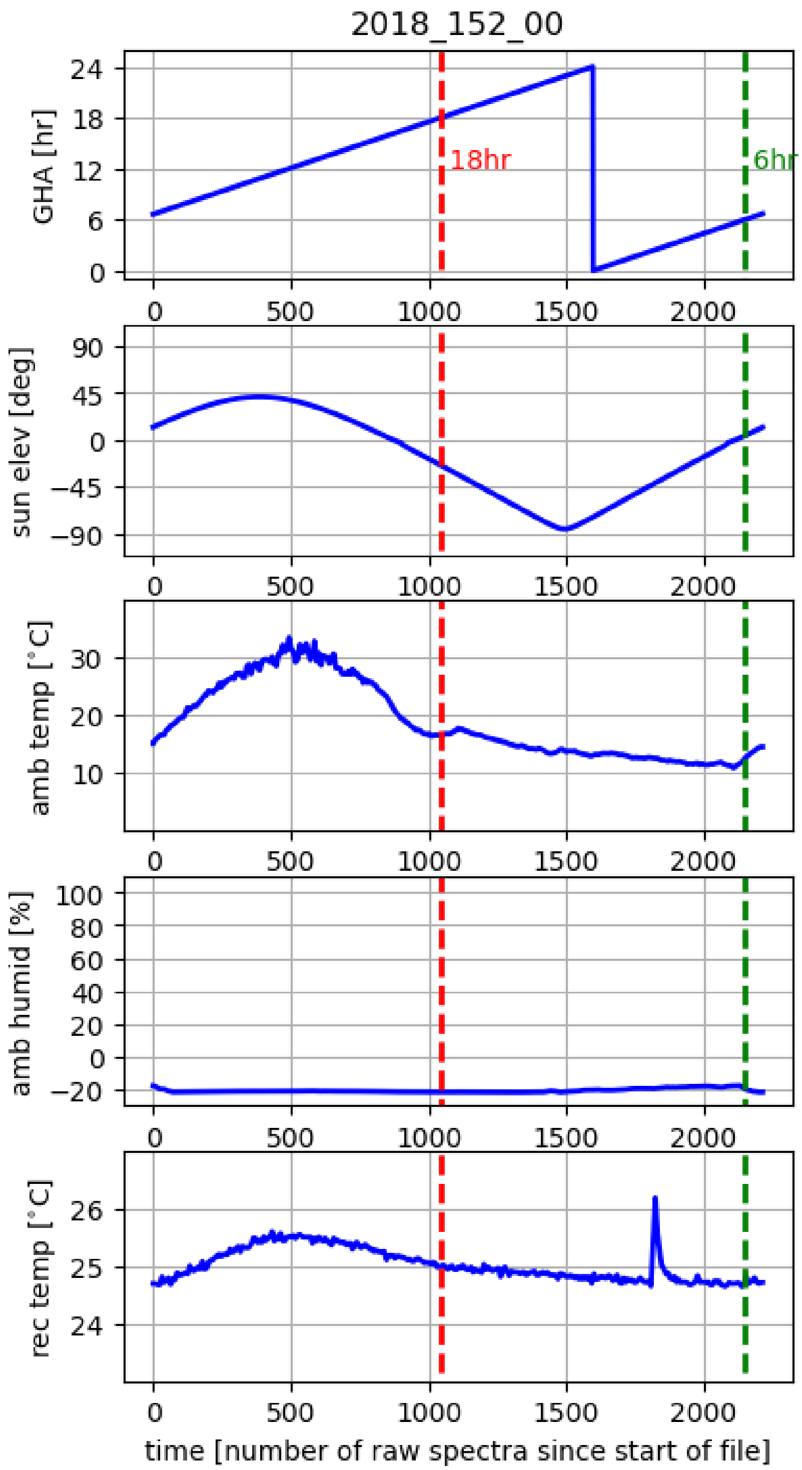
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 7: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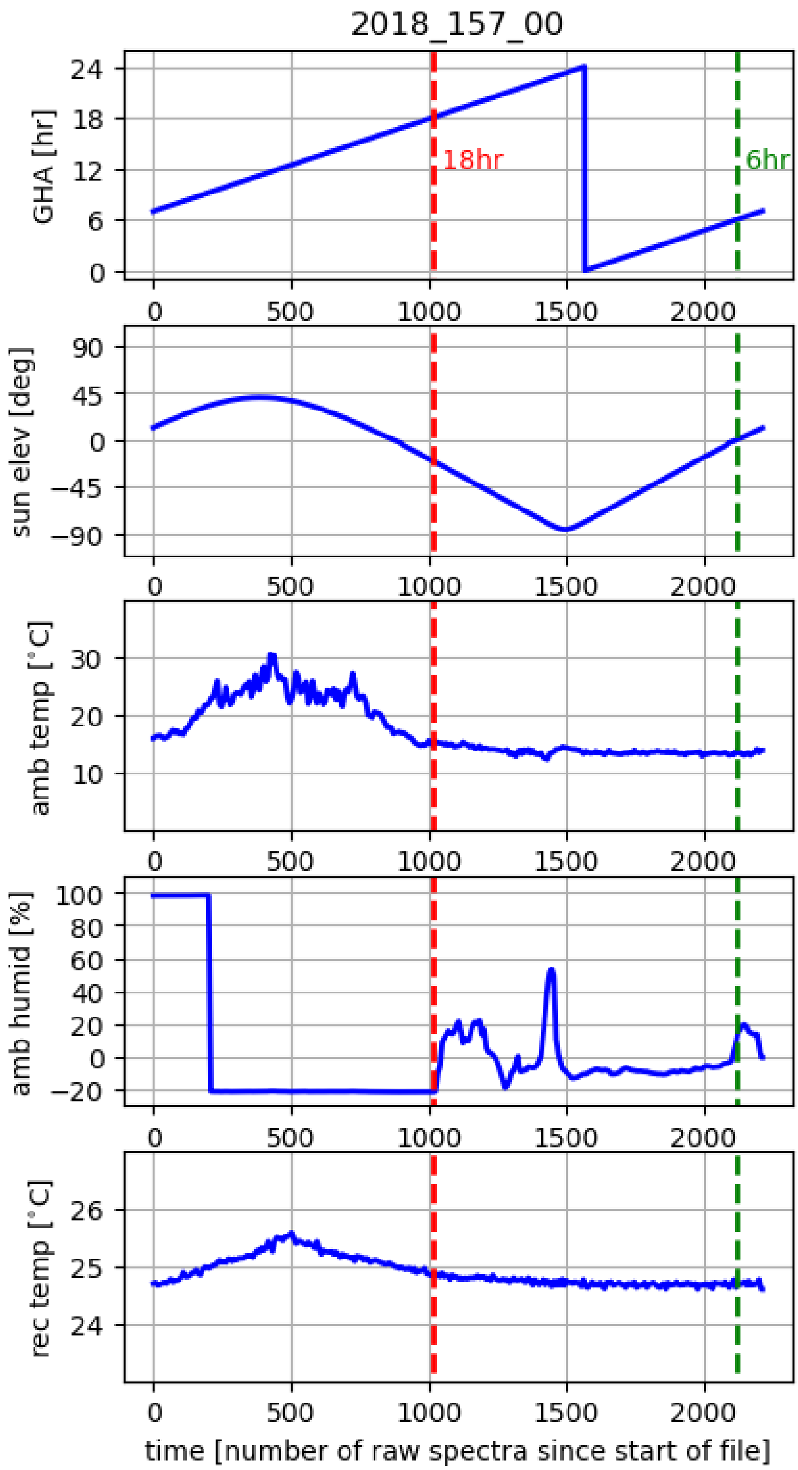
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 8: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amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

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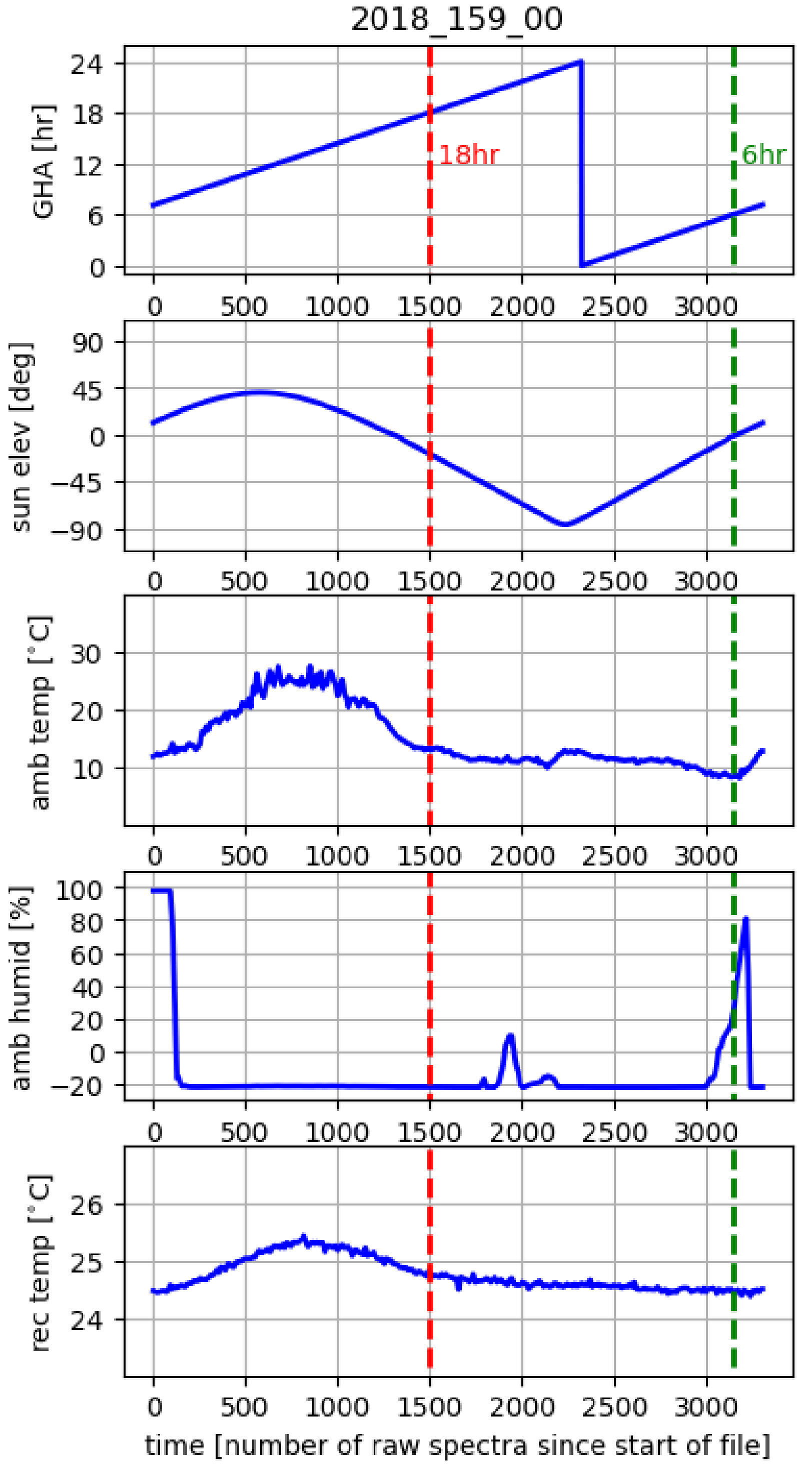

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GHA [hr]
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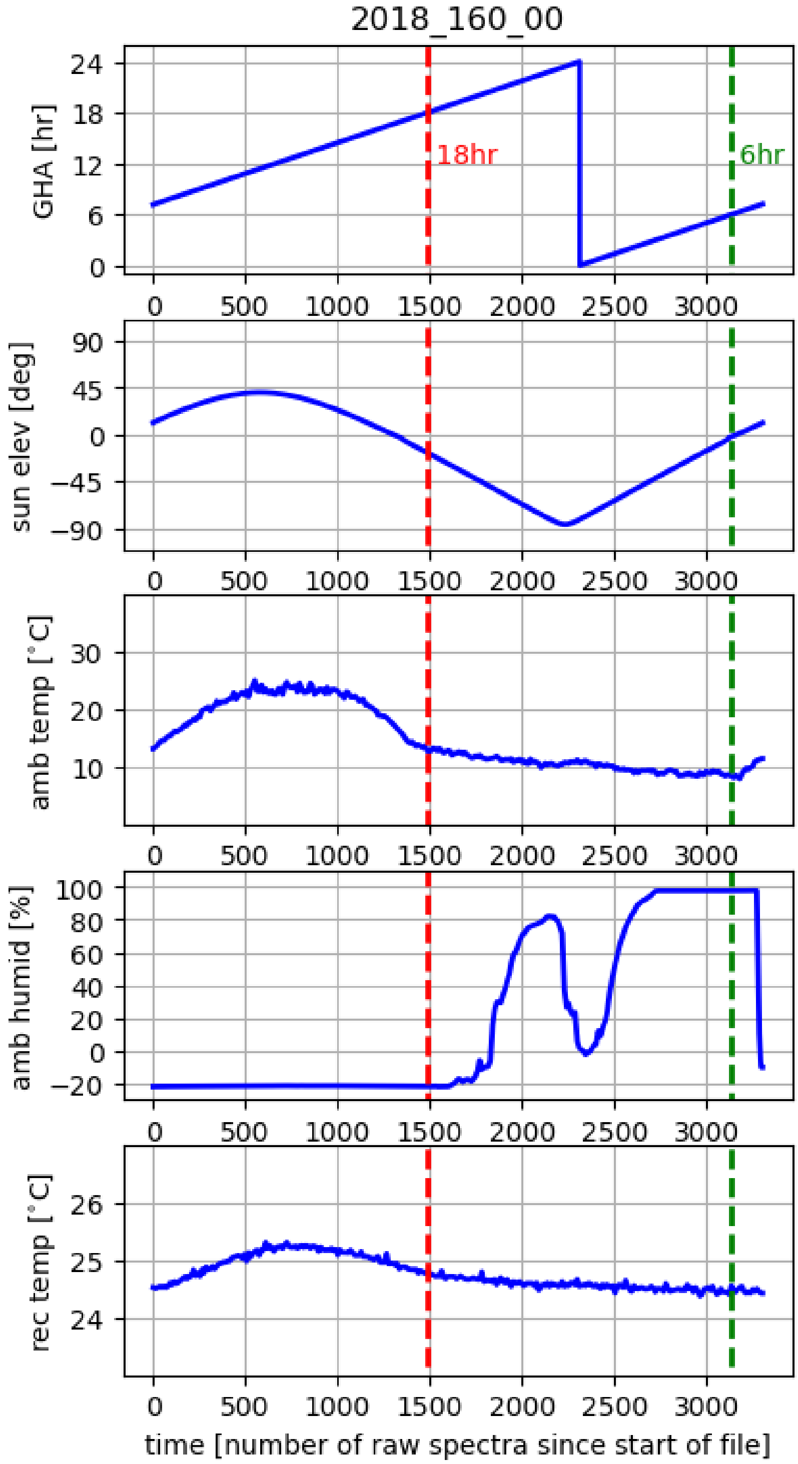
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 10:



2018_160_00
GHA [hr]
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sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 11:

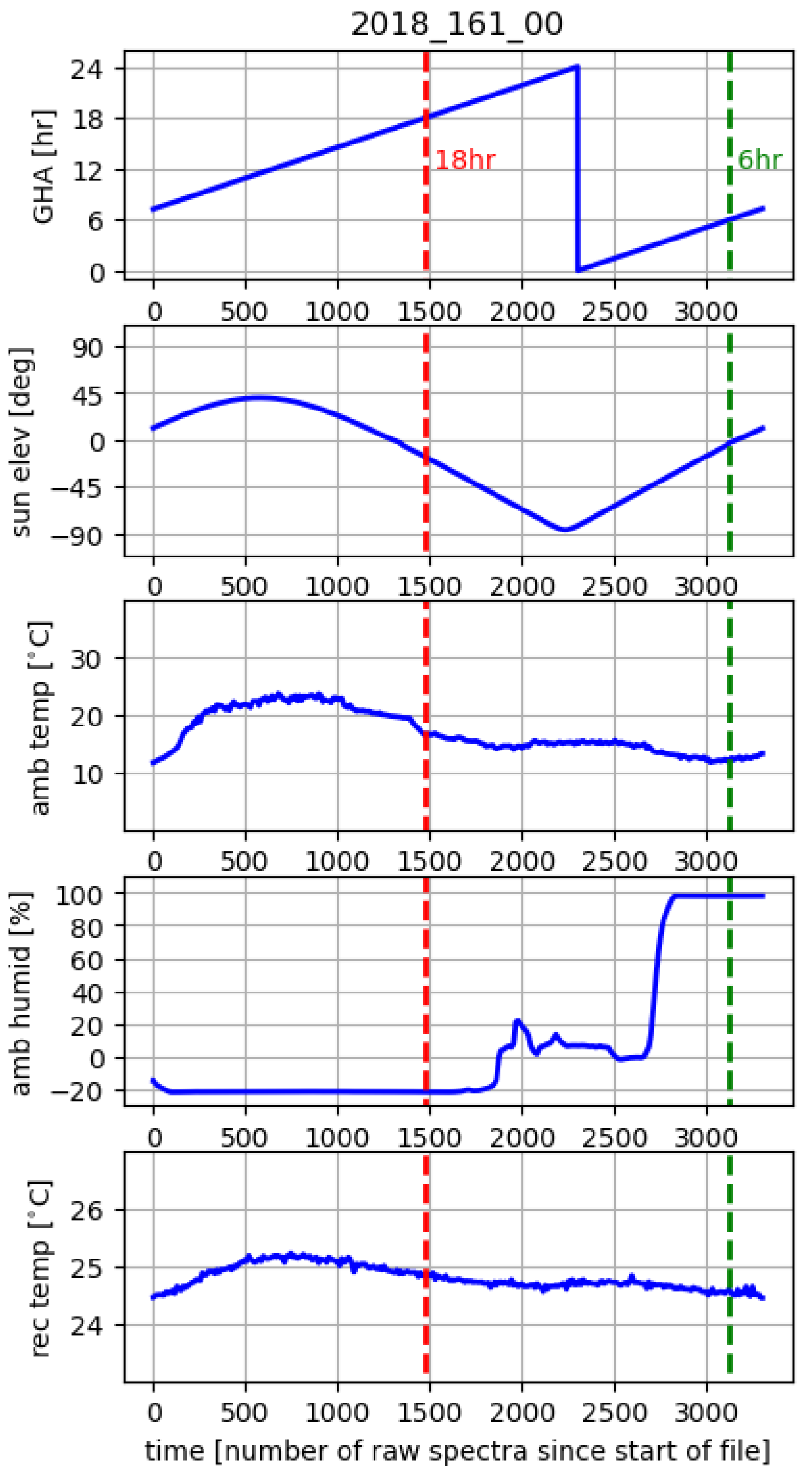

2018_161_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 12:

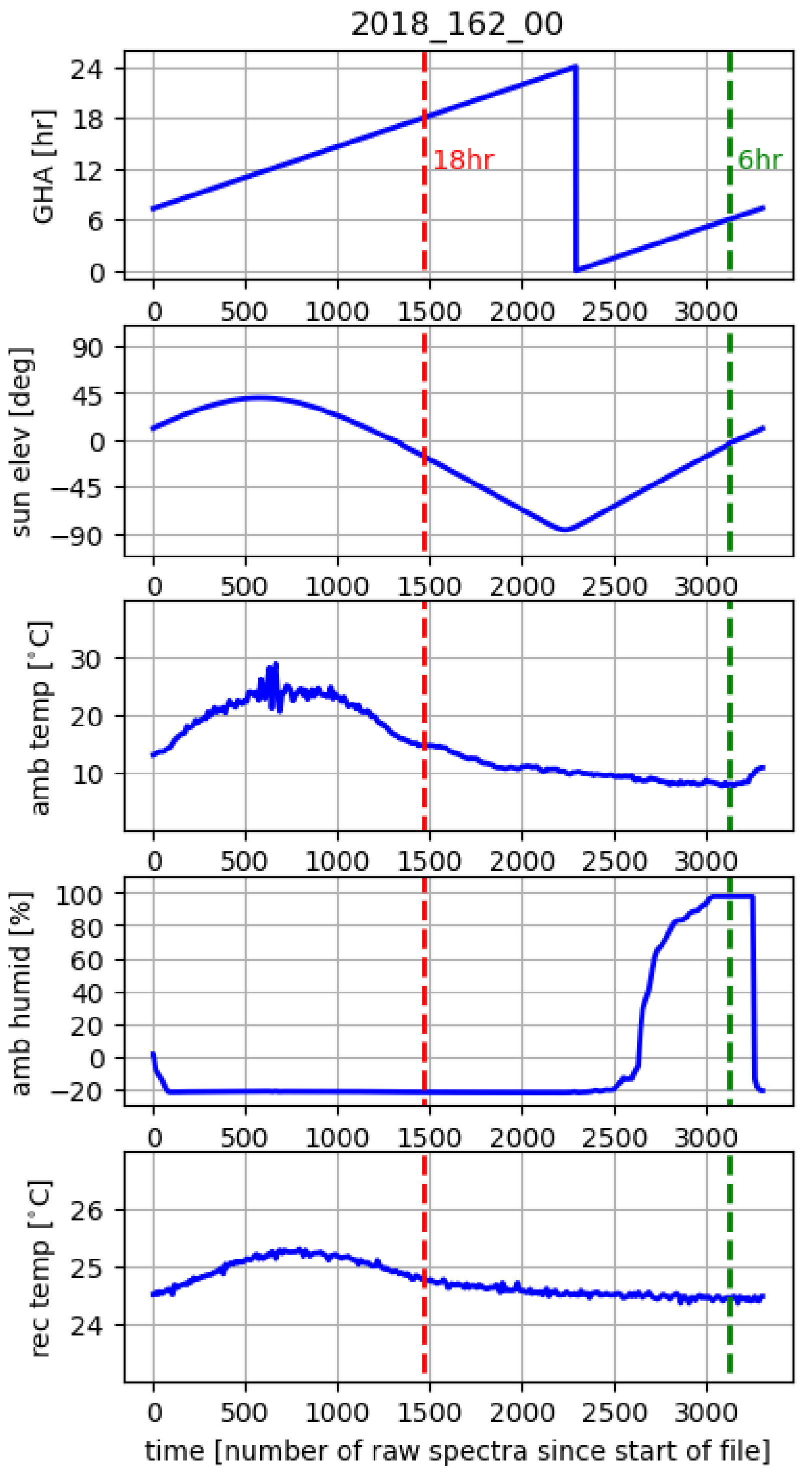
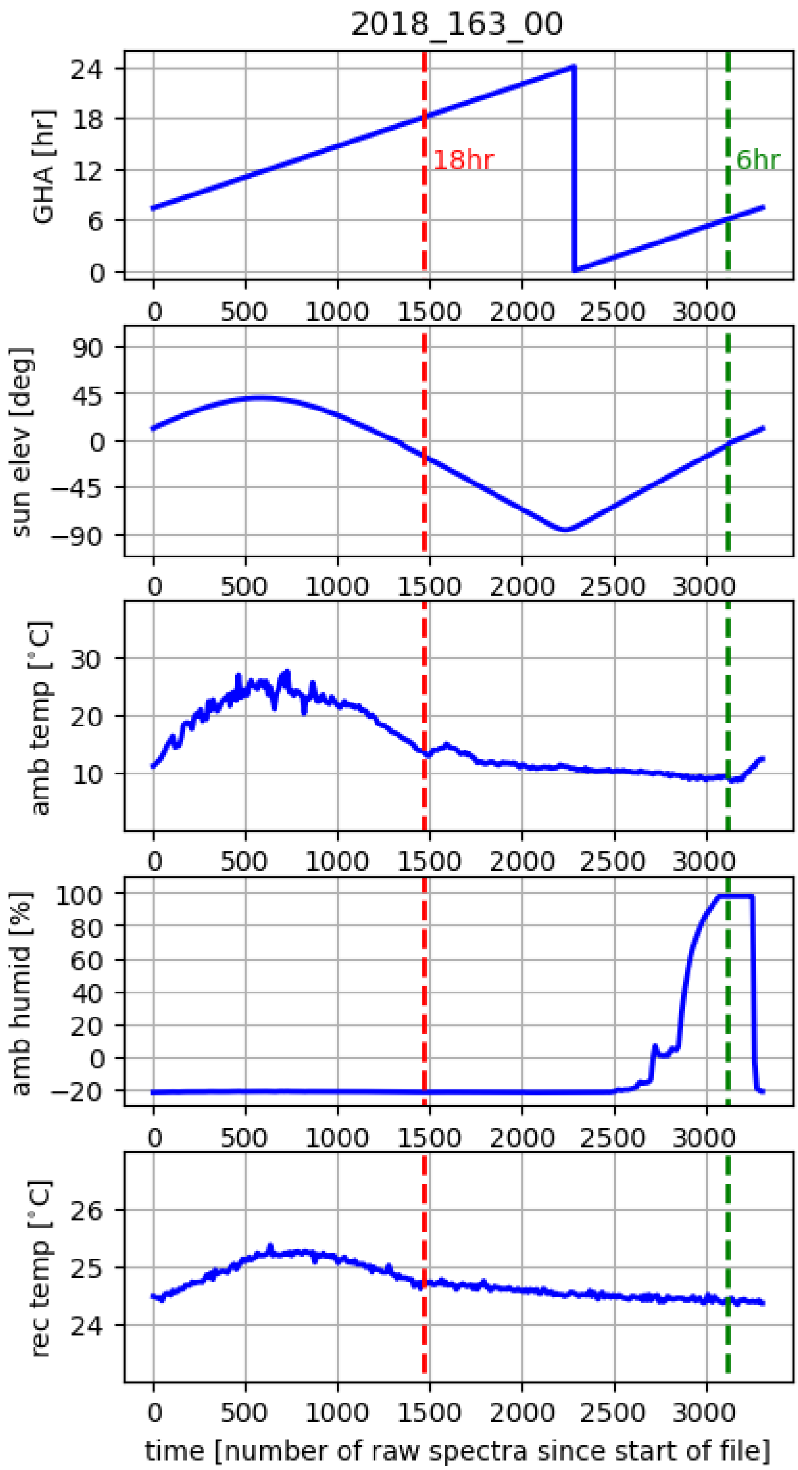

2018_162_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 13:


2018_163_00
GHA [hr]
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sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 14:

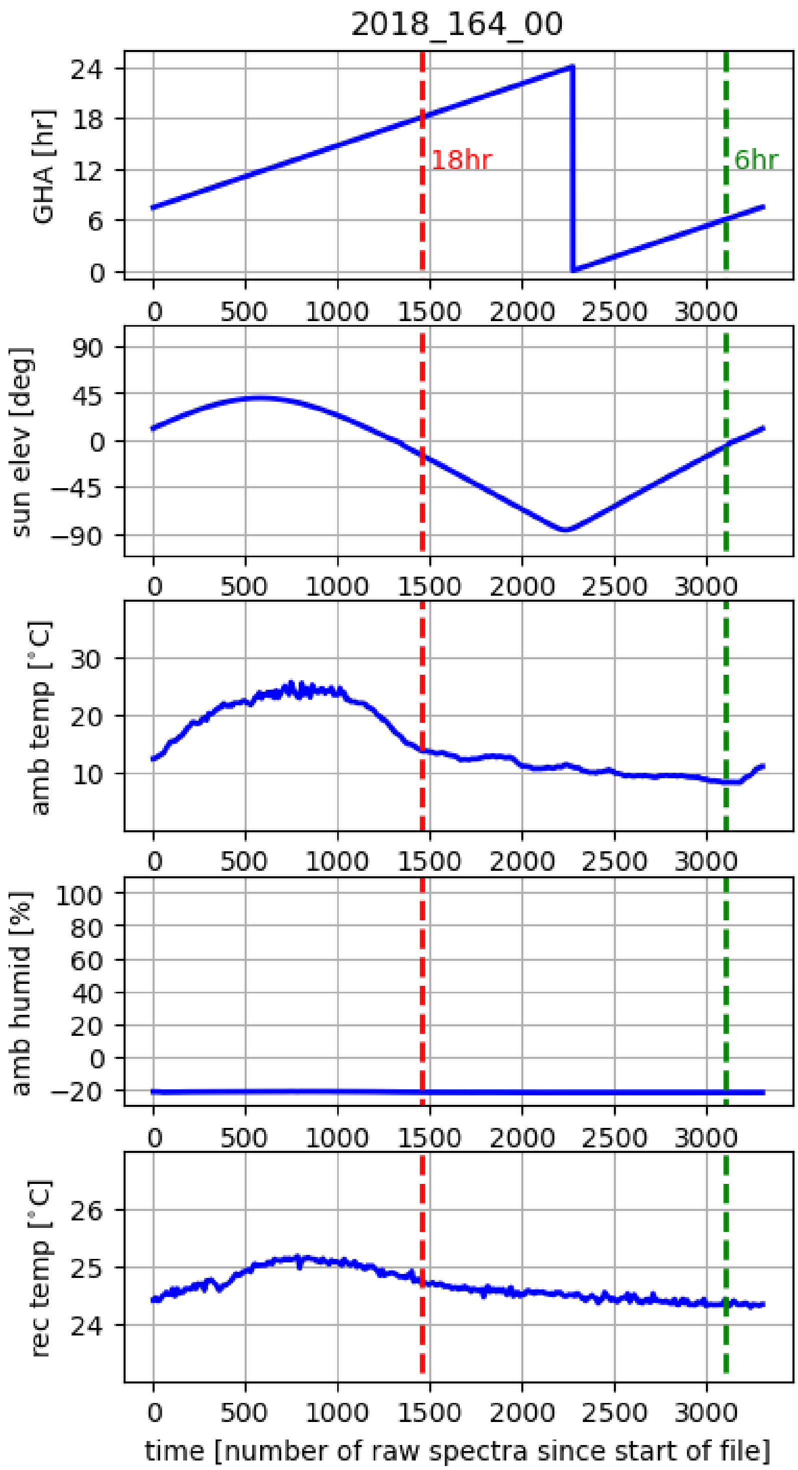

2018_164_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 15:

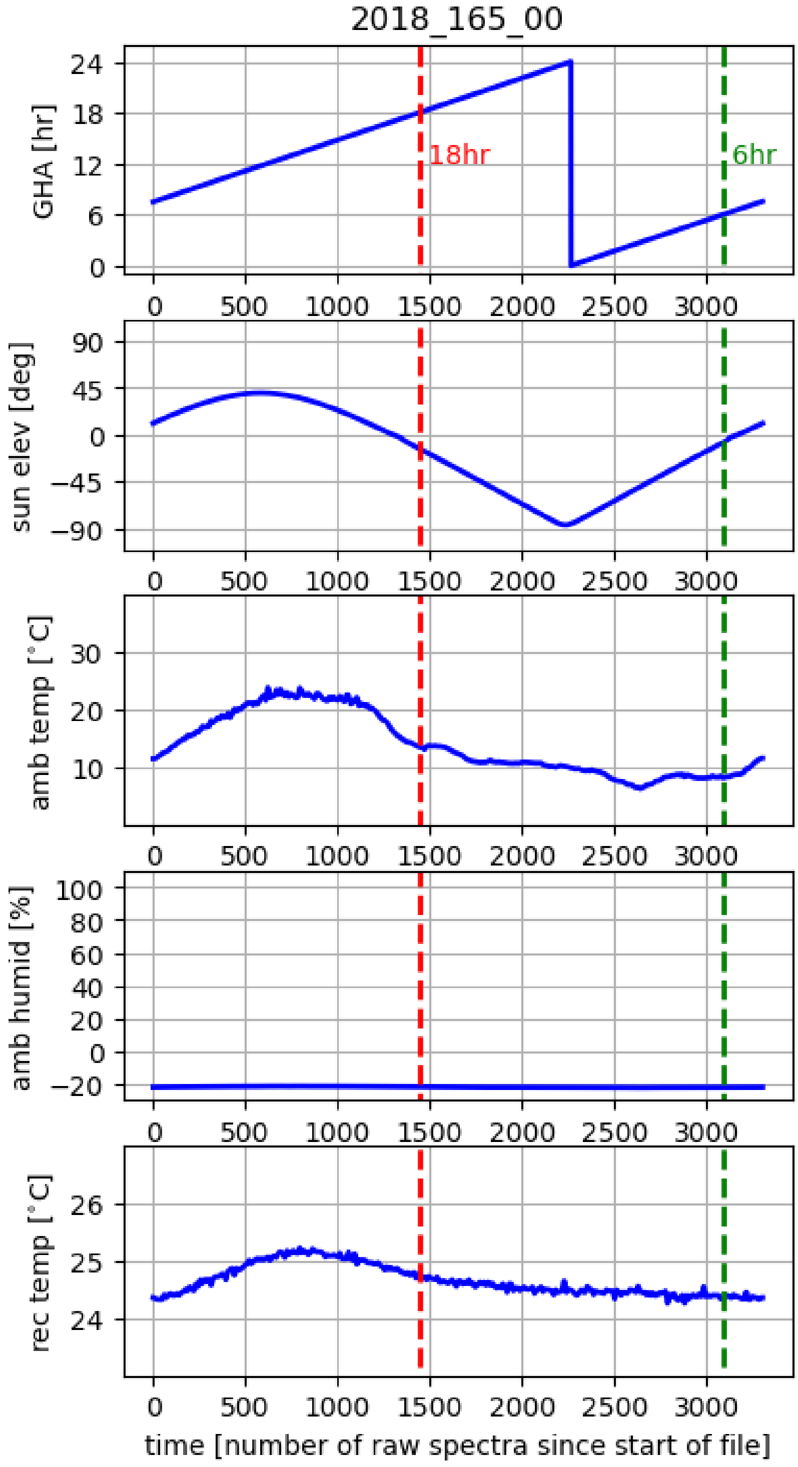
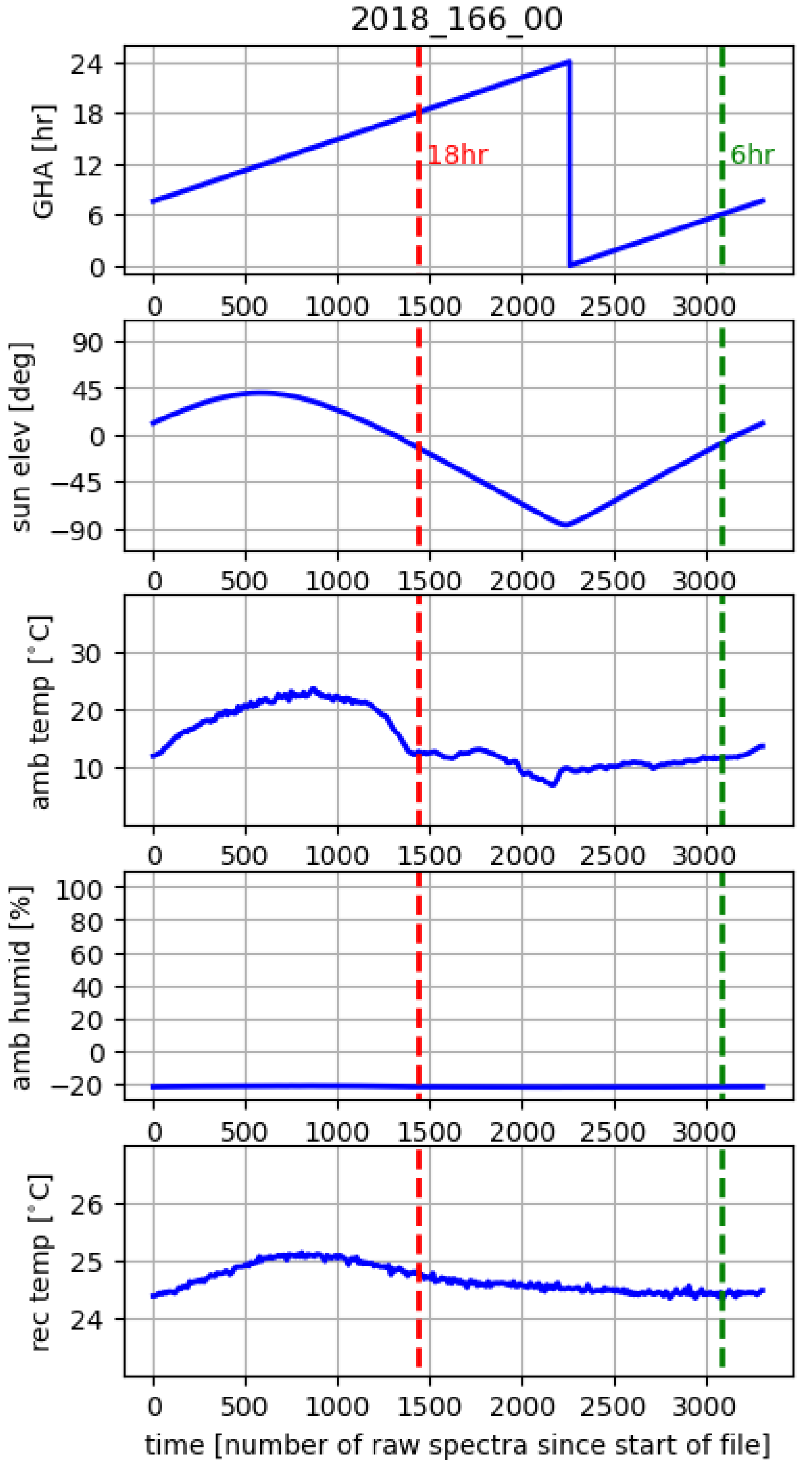

2018_165_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 16: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GHA [hr]
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sun elev [deg]
90
45
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−45
−90
amb temp [°C]
30
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10
amb humid [%]
100
80
60
40
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rec temp [°C]
26
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24
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500
1000
1500
2000
2500
3000
time [number of raw spectra since start of file]

Figure 17:

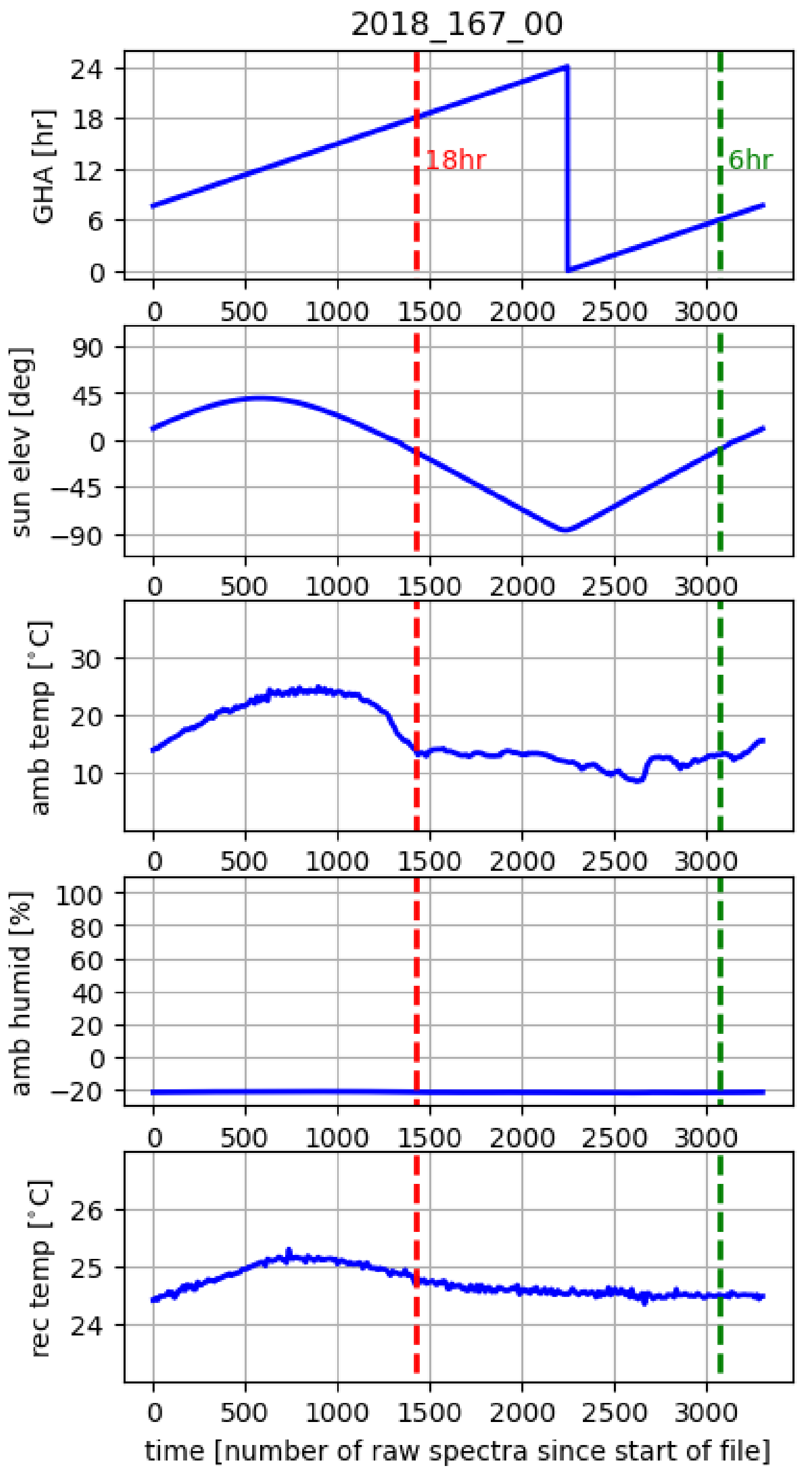

2018_167_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 18:

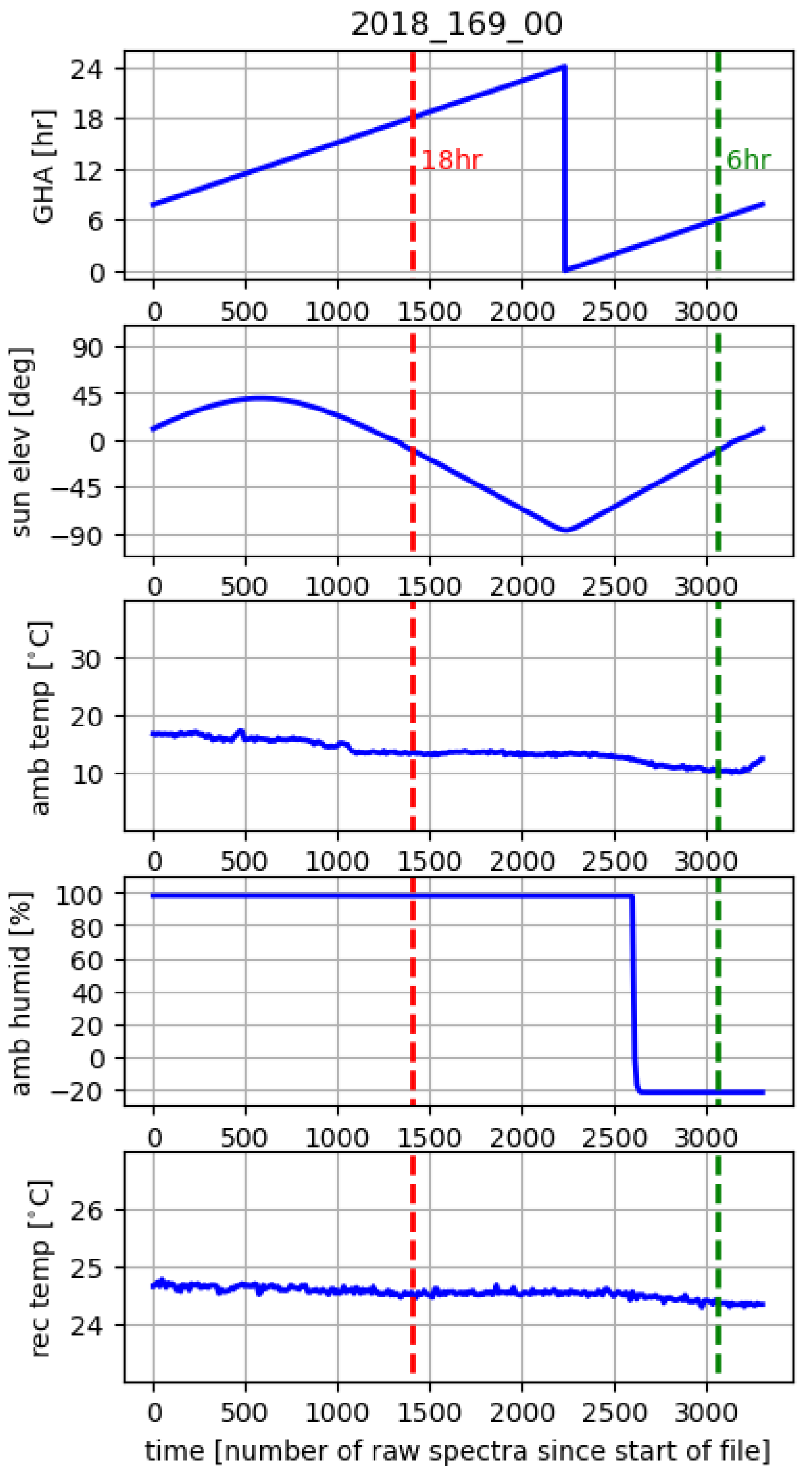
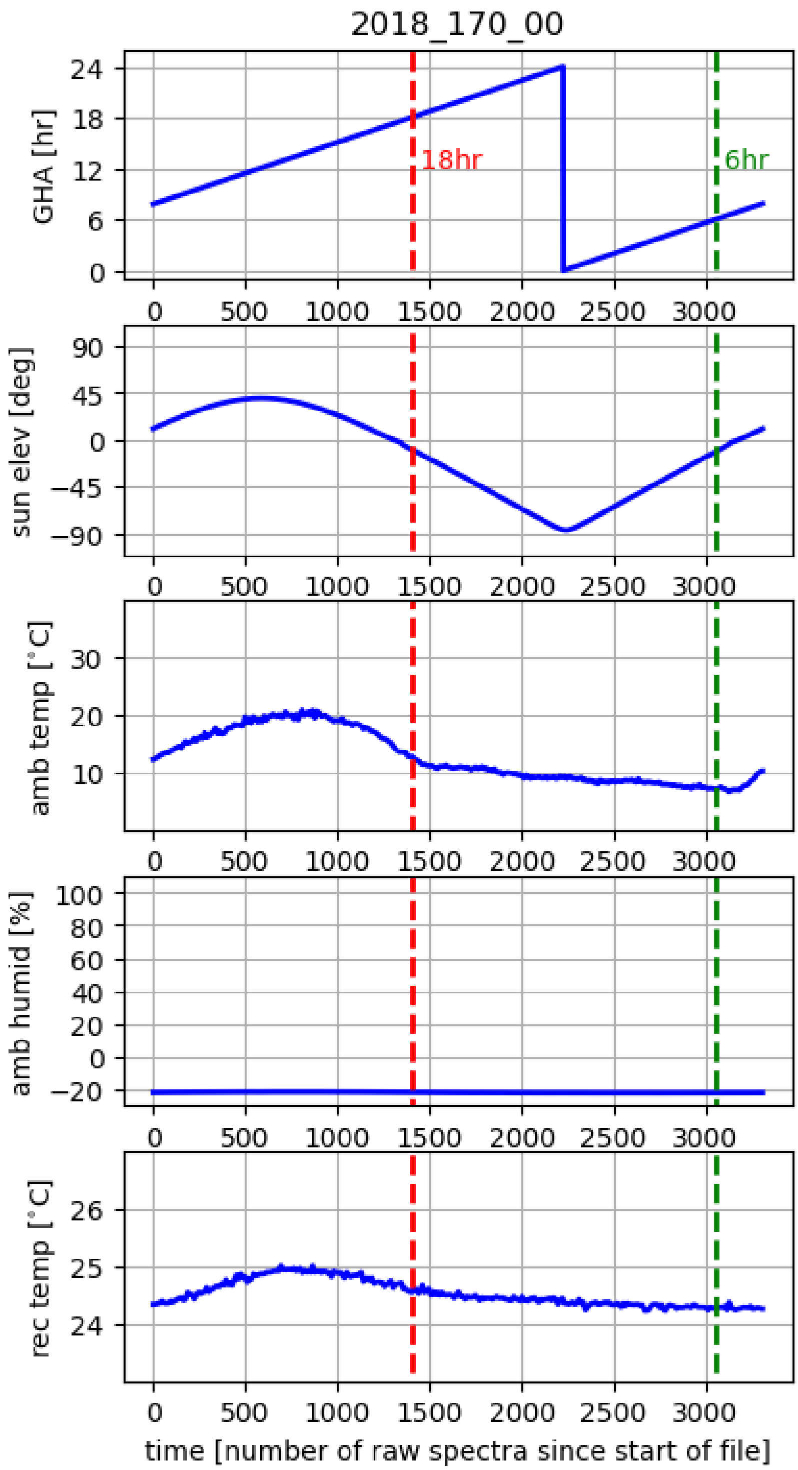

2018_169_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 19: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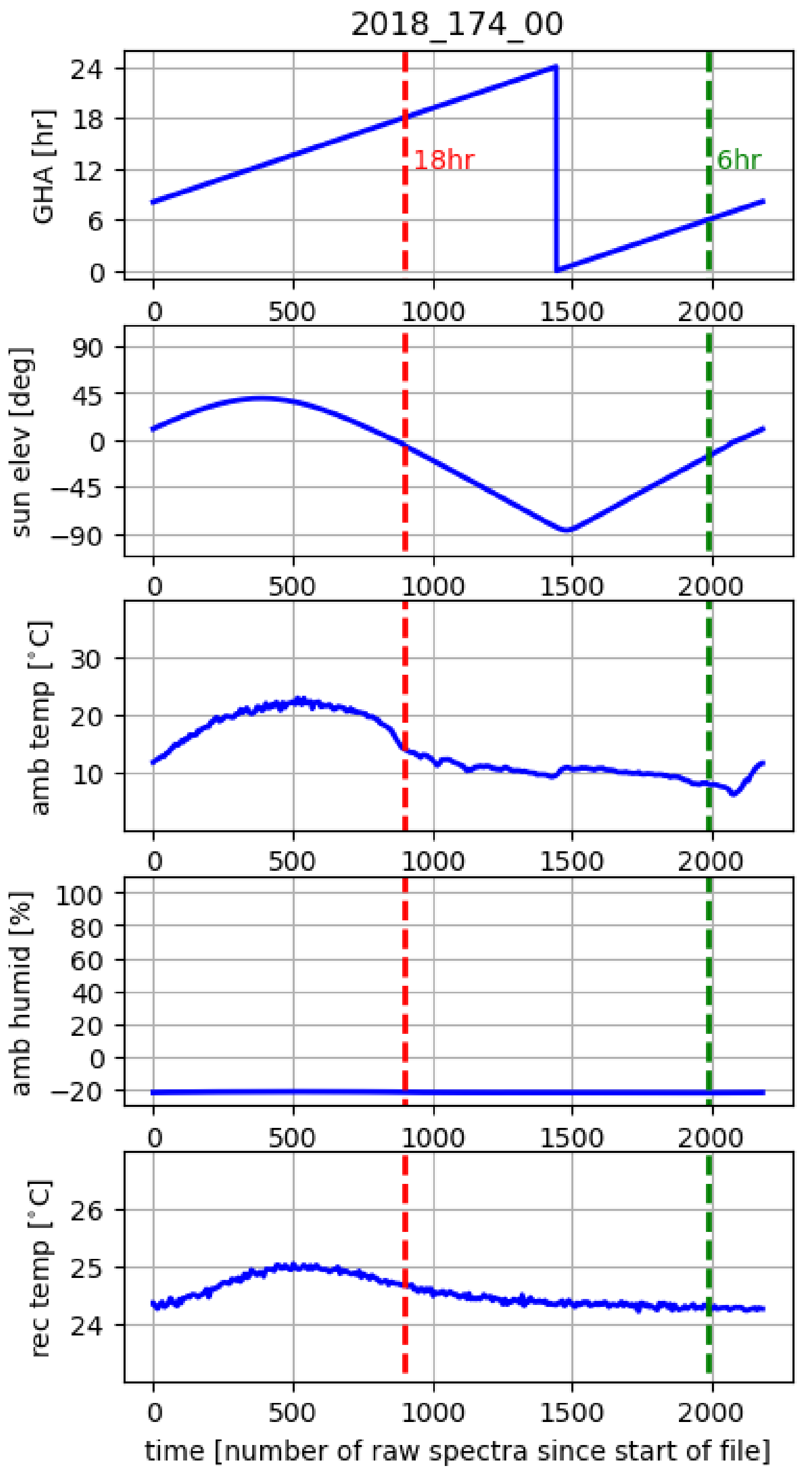
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 20:


2018_174_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

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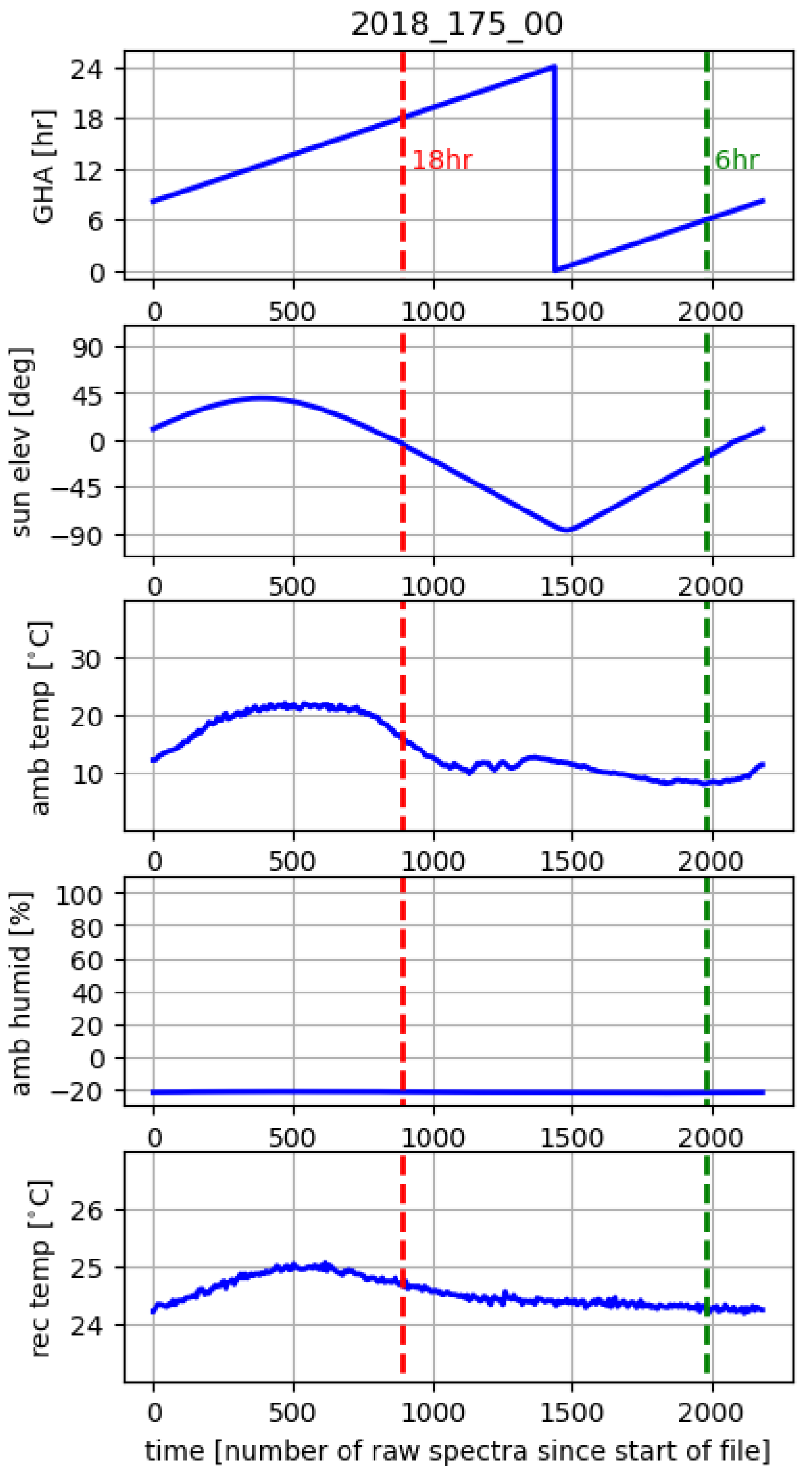

2018_175_00
GHA [hr]
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6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

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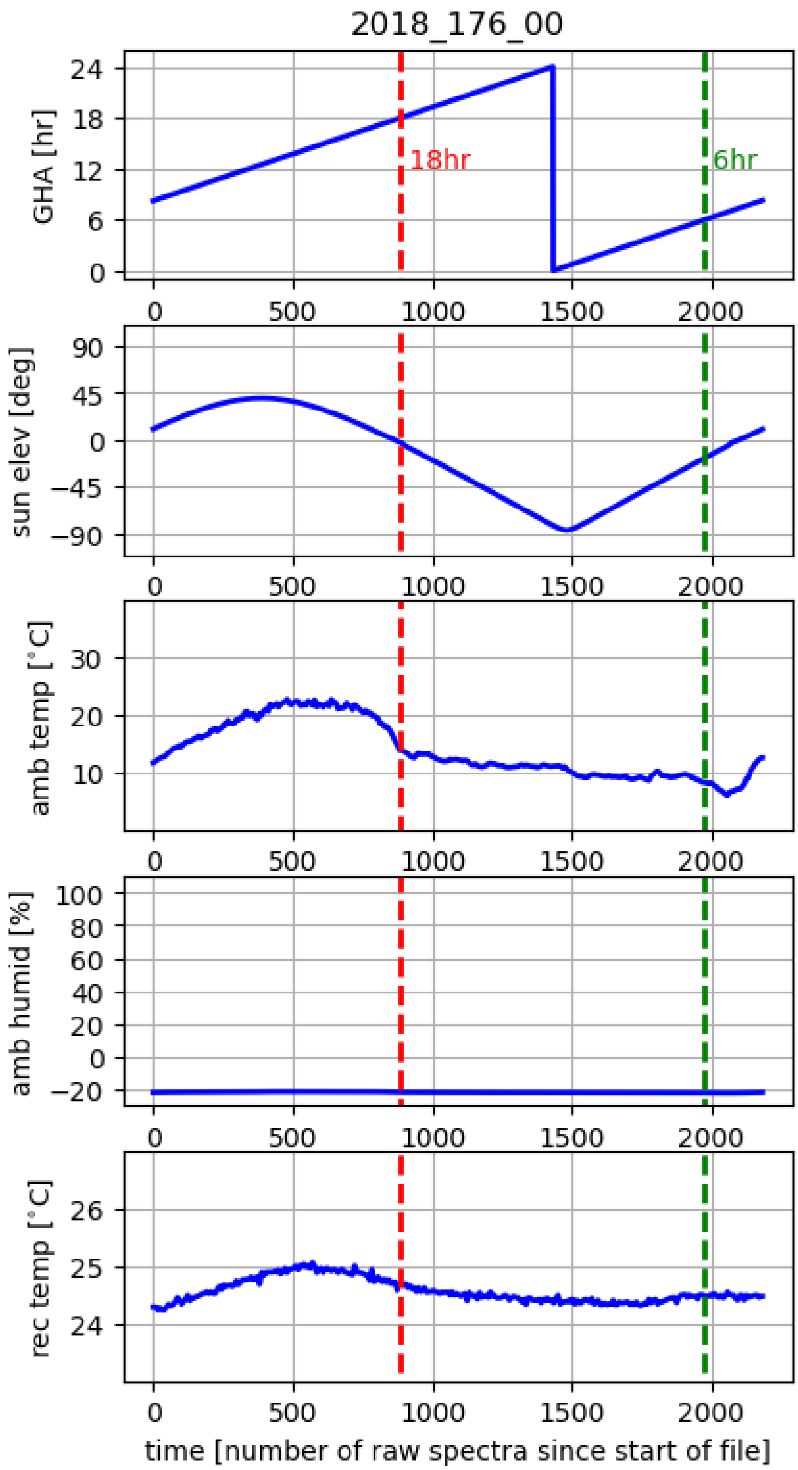


2018_176_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 23:

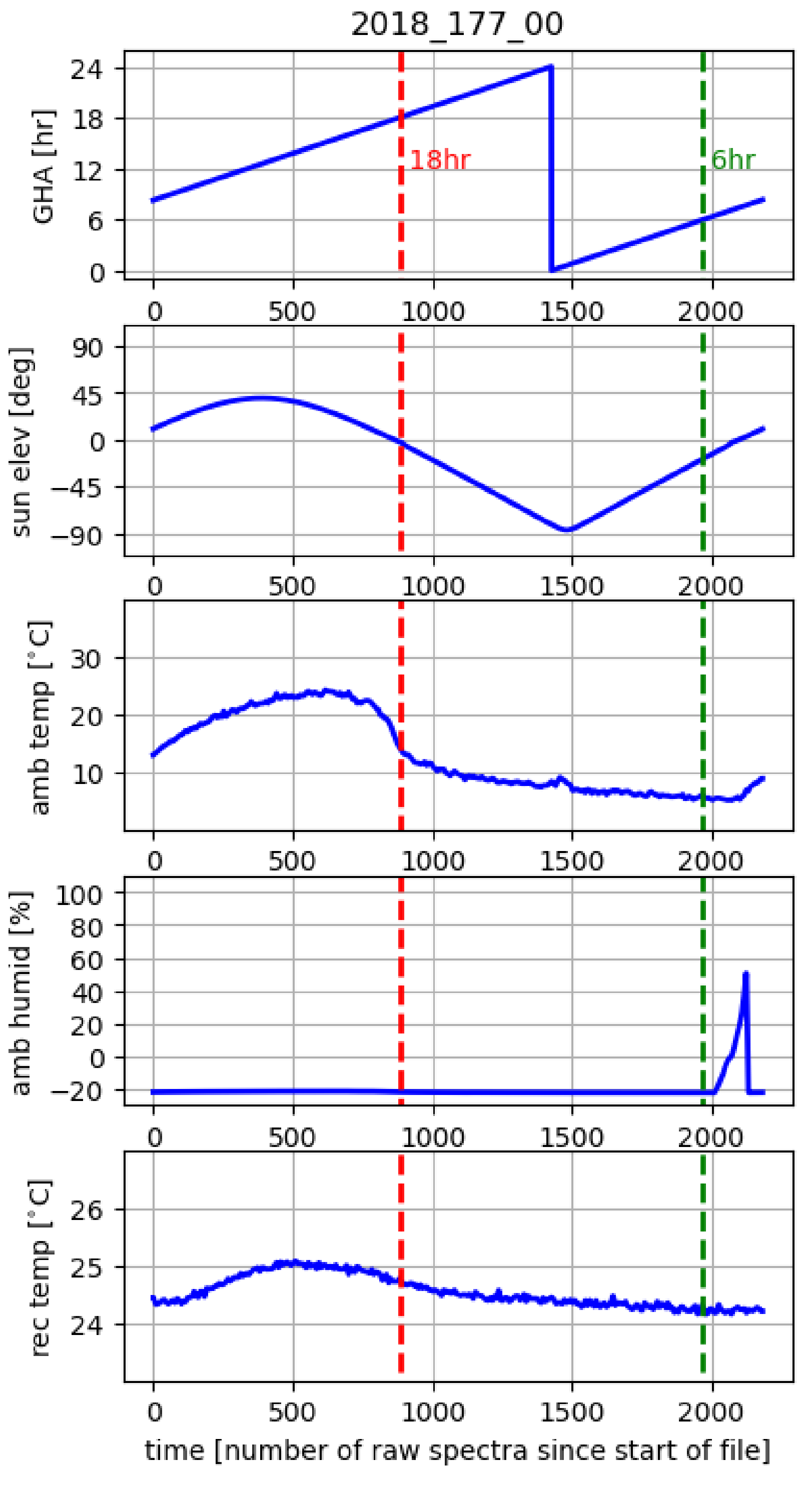
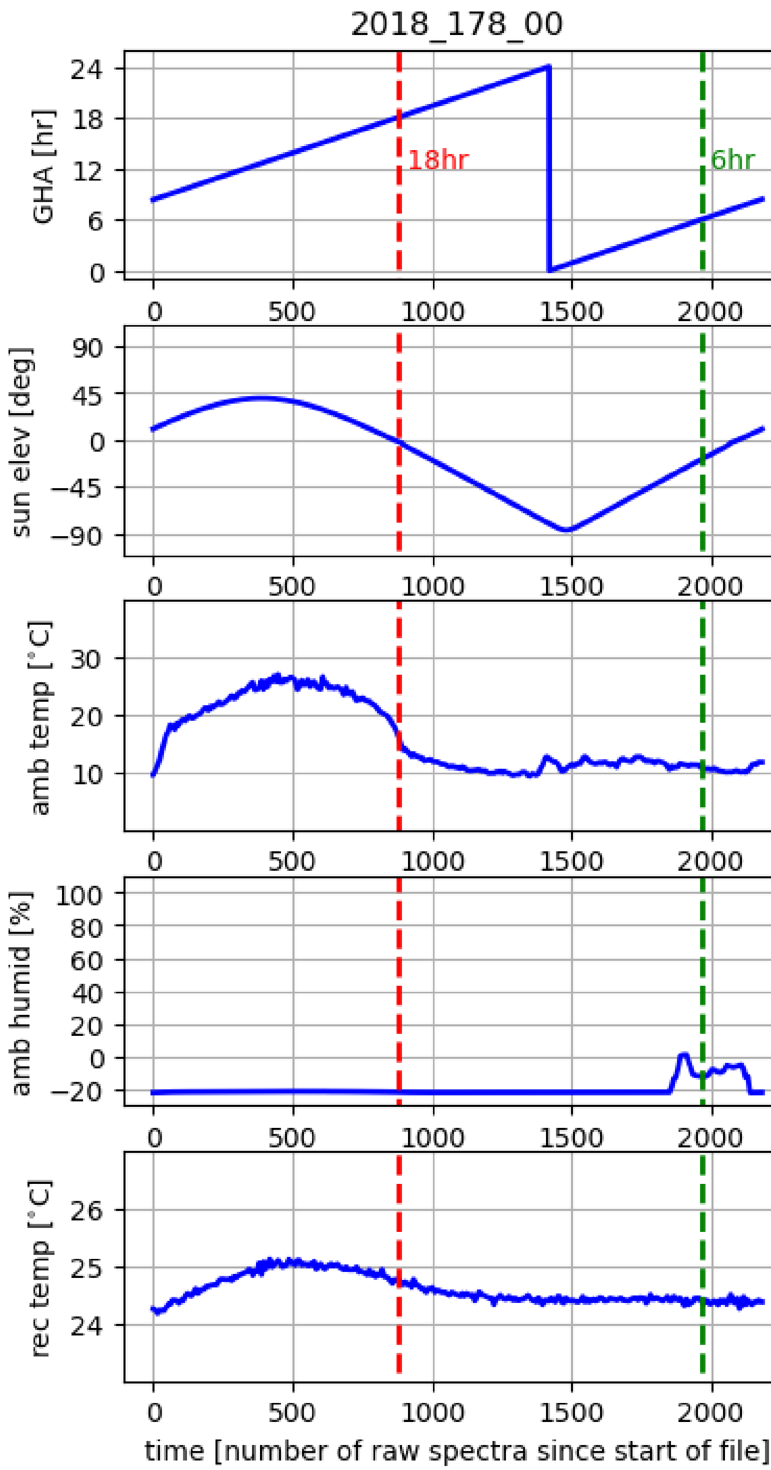
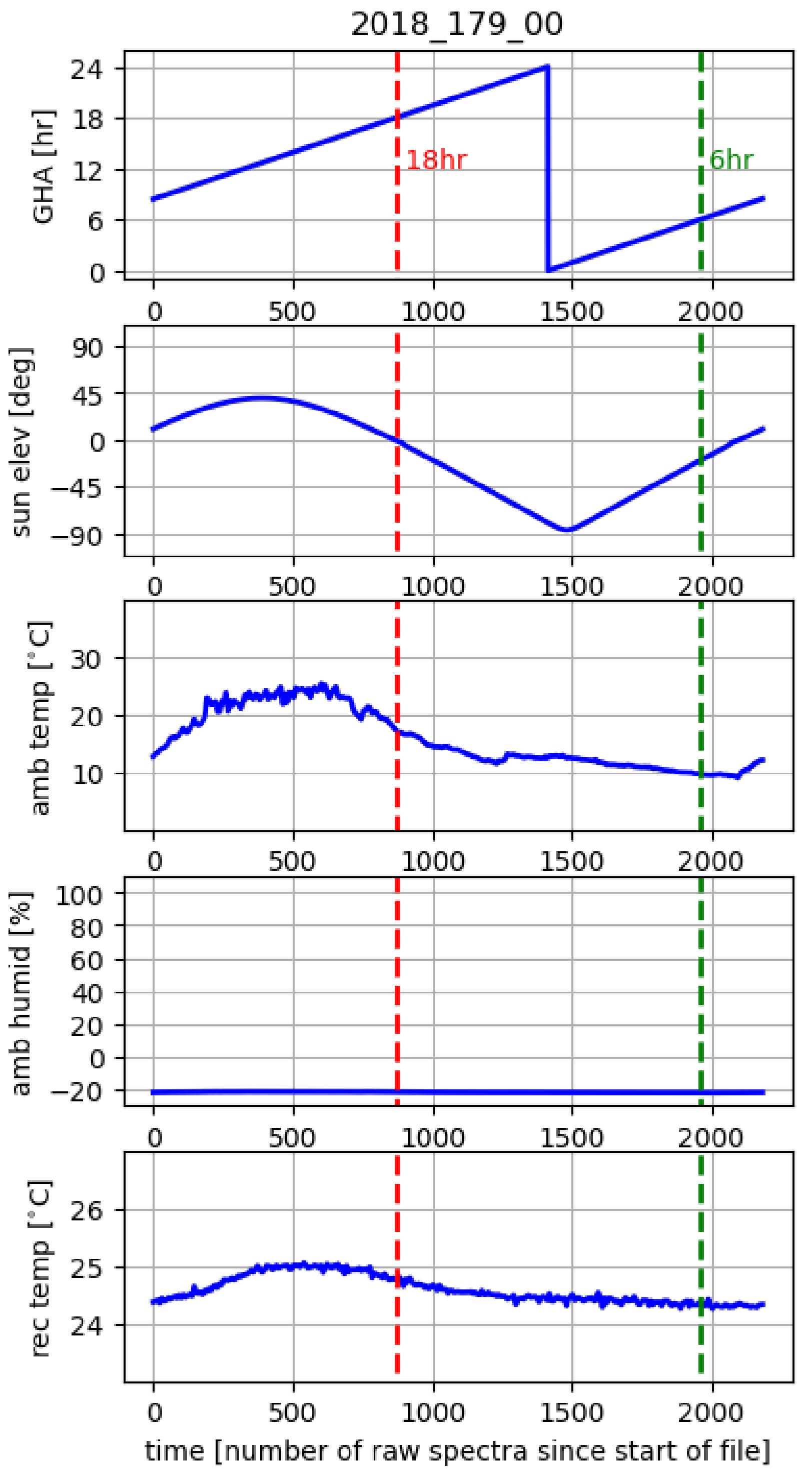

2018_177_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 24:



2018_178_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 25: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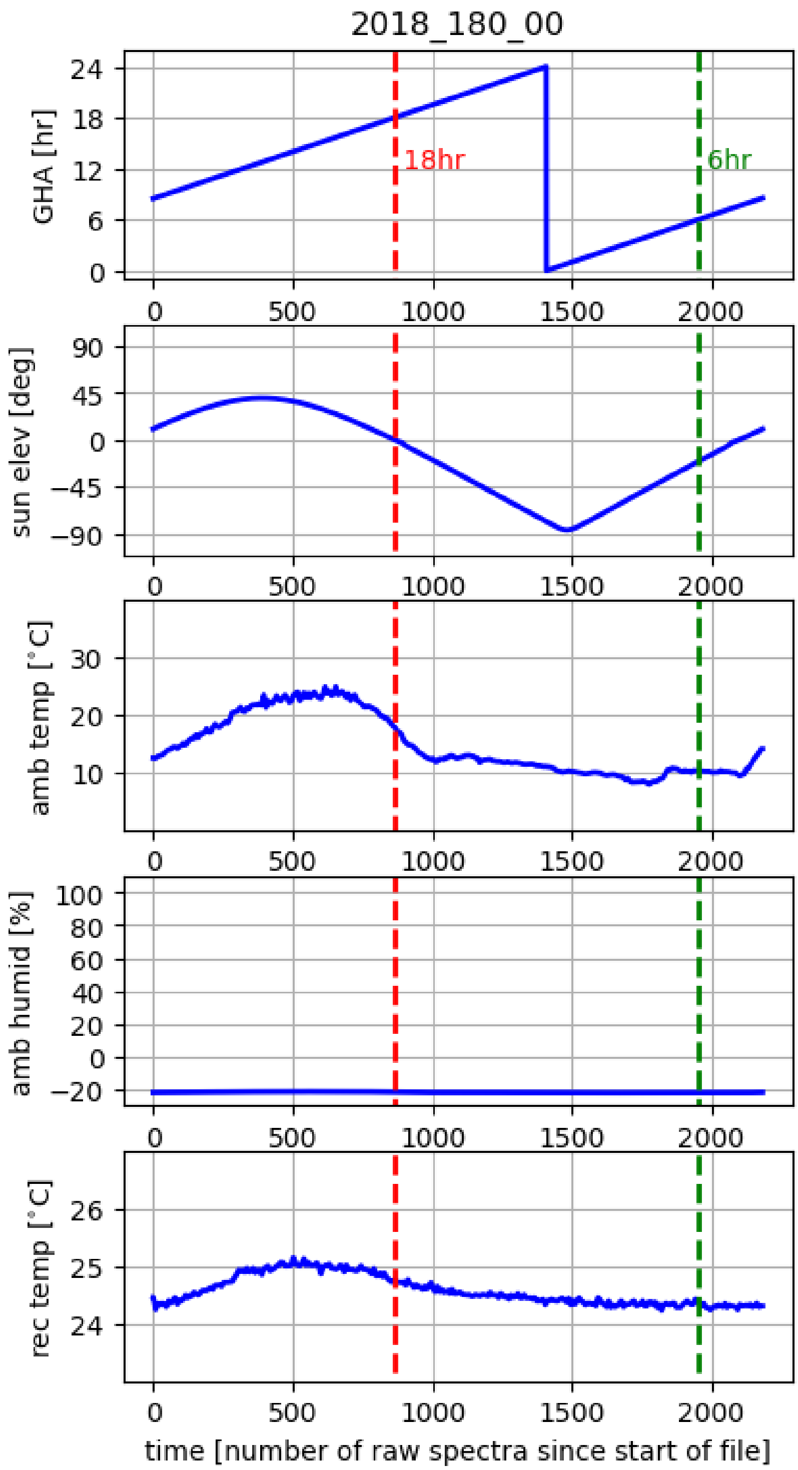
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 26: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18hr
6hr
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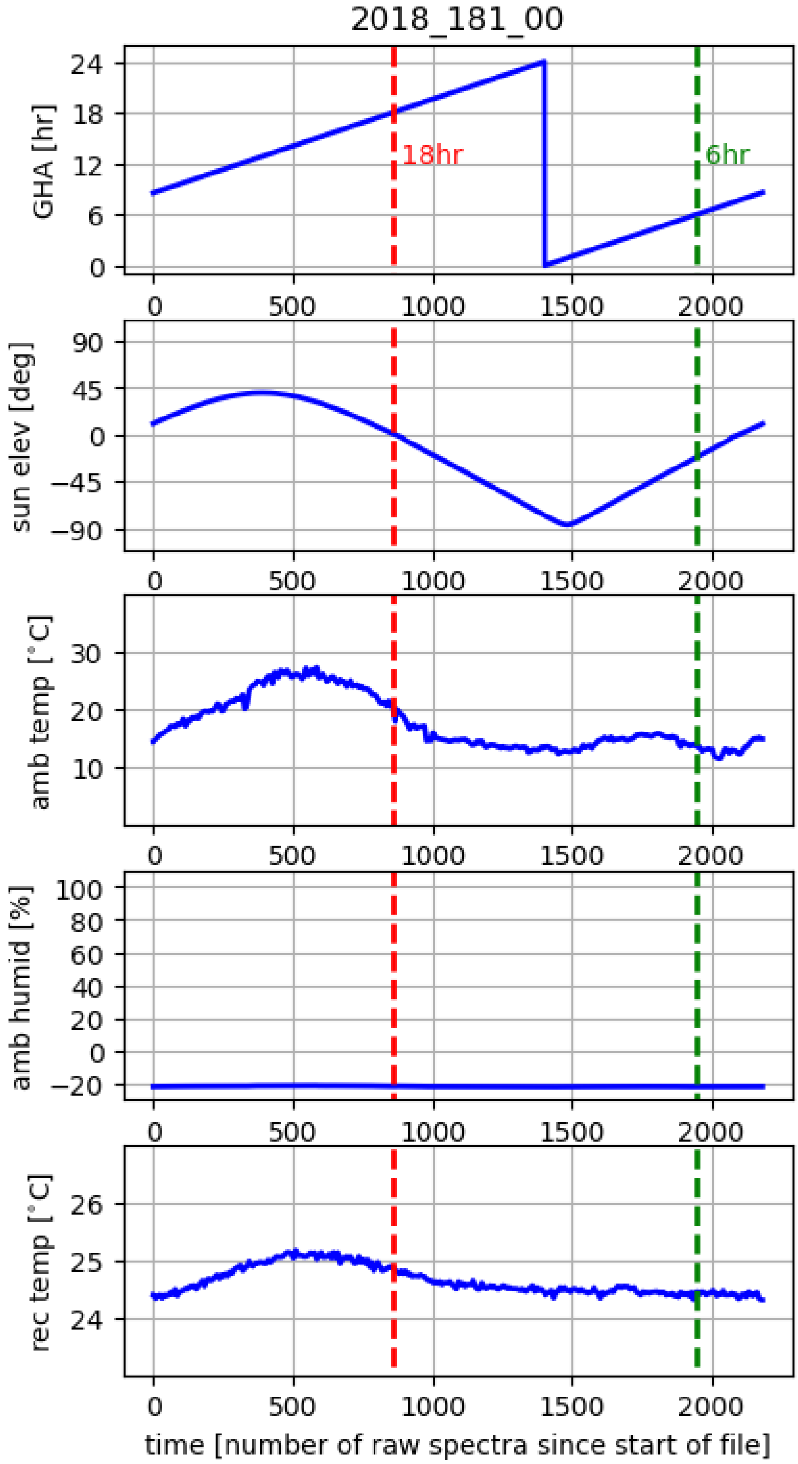
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 27: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6hr
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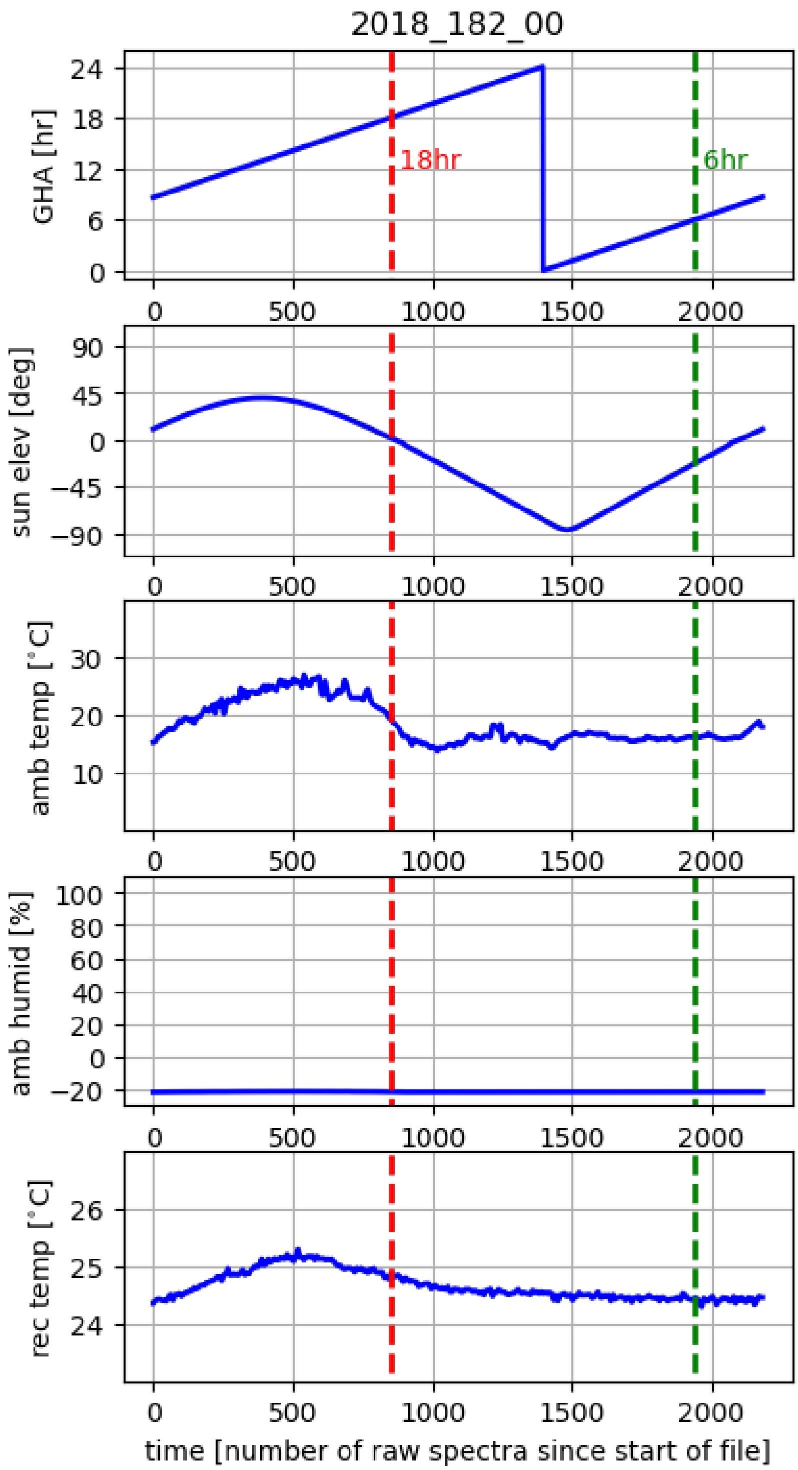
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 28: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GHA [hr]
24
18
12
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2000
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45
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−45
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amb temp [°C]
30
20
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amb humid [%]
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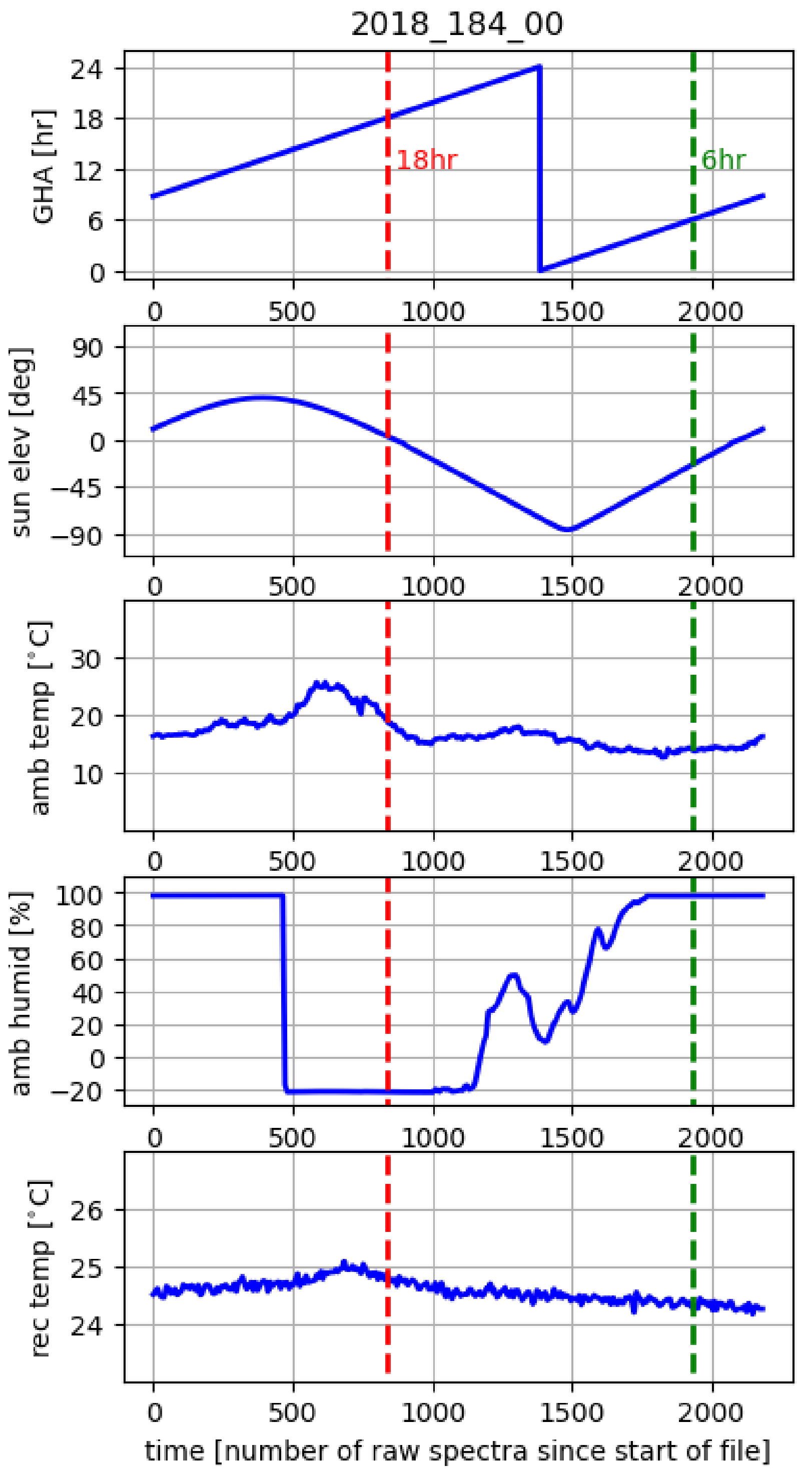
−20
rec temp [°C]
26
25
24
time [number of raw spectra since start of file]

Figure 29:


2018_184_00
GHA [hr]
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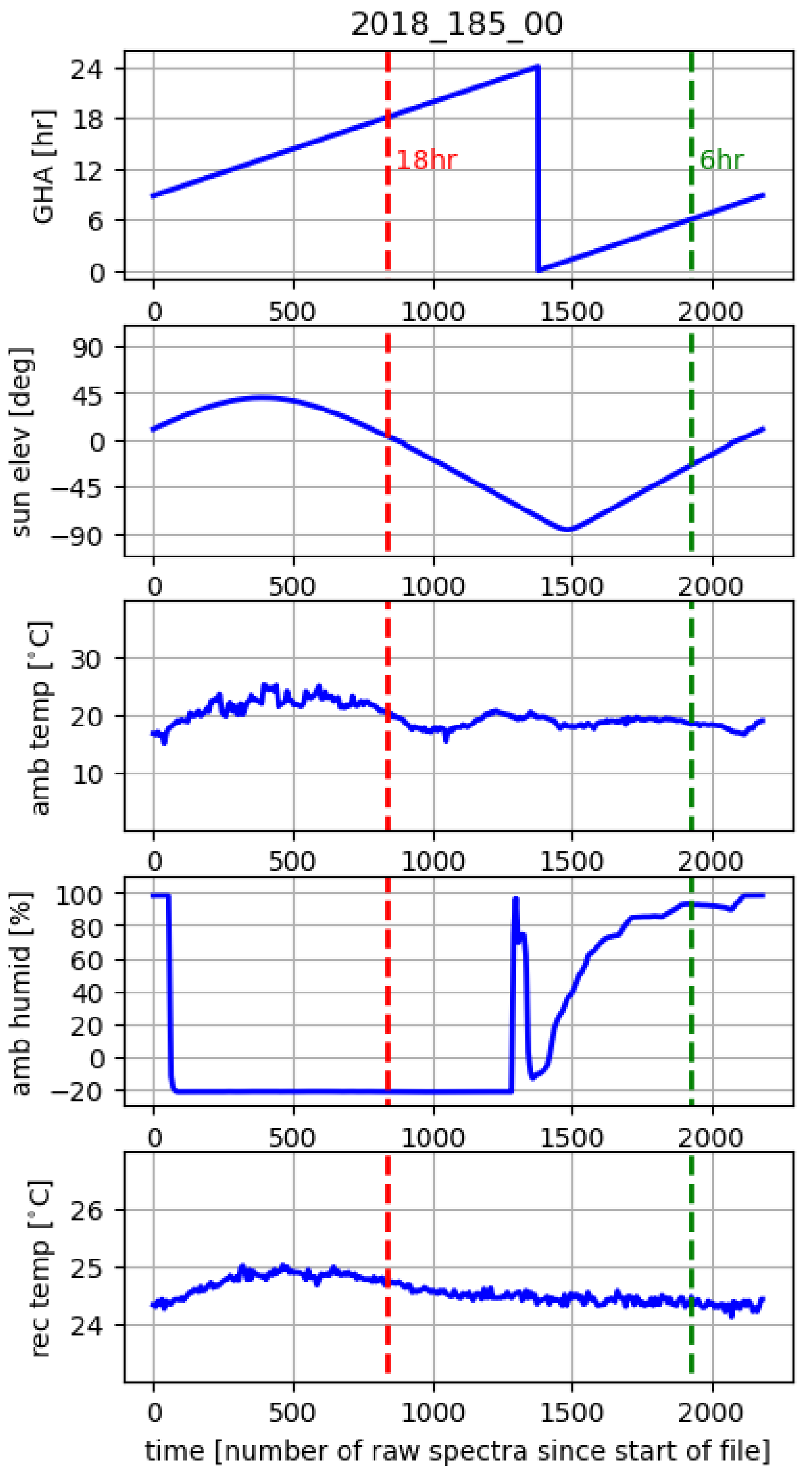
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 30:


2018_185_00
GHA [hr]
18hr
6hr
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amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 31:

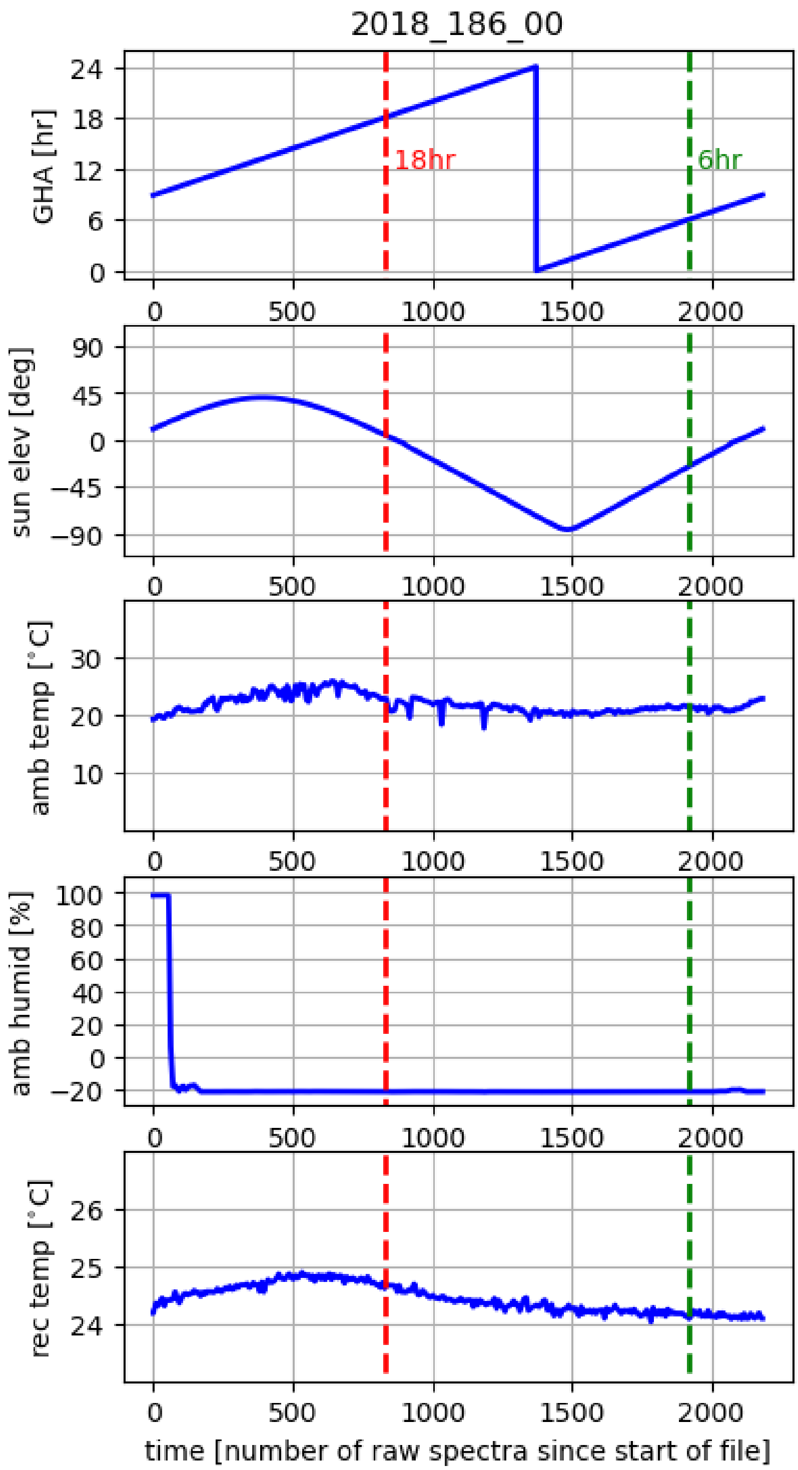

2018_186_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 32:

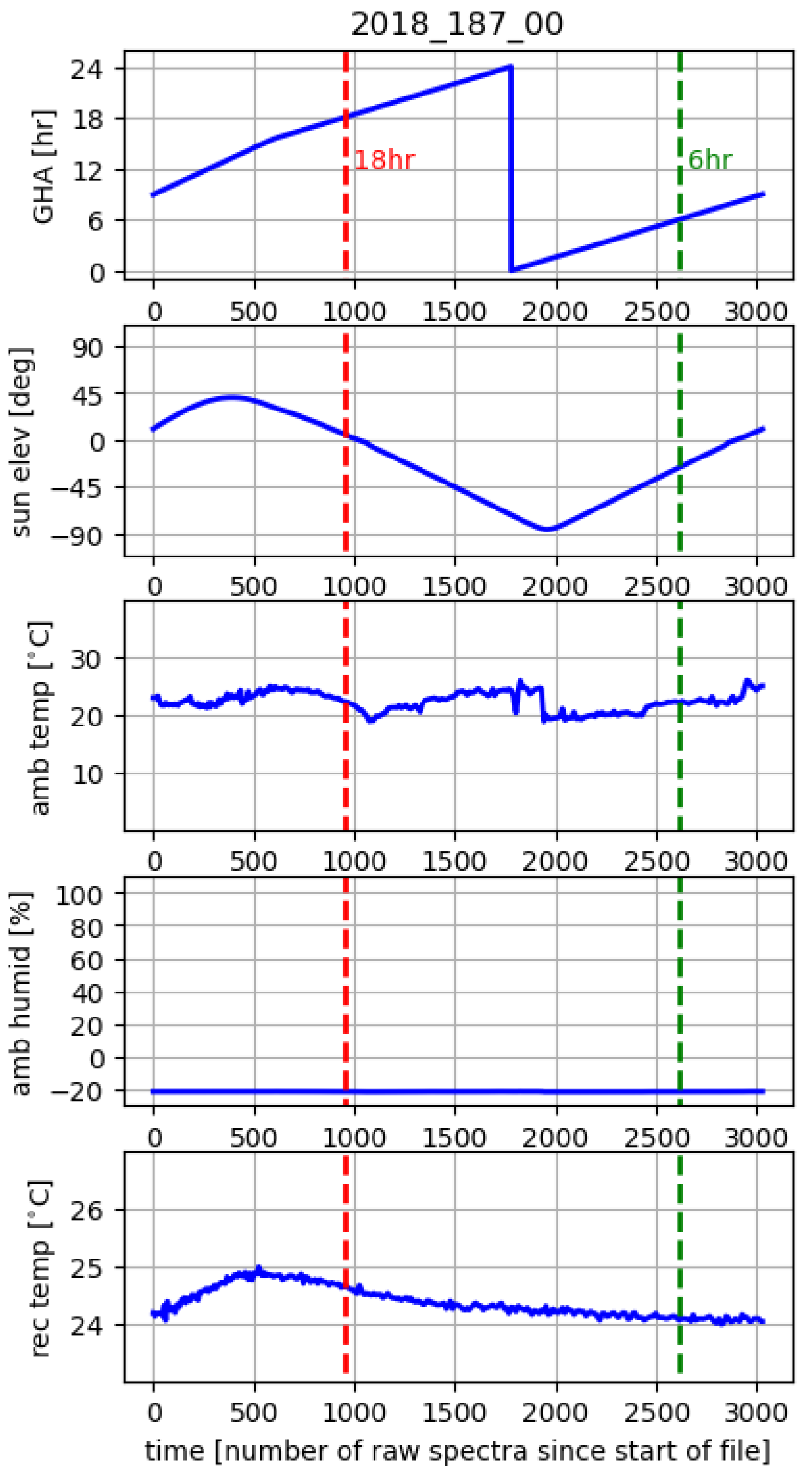

2018_187_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 33:

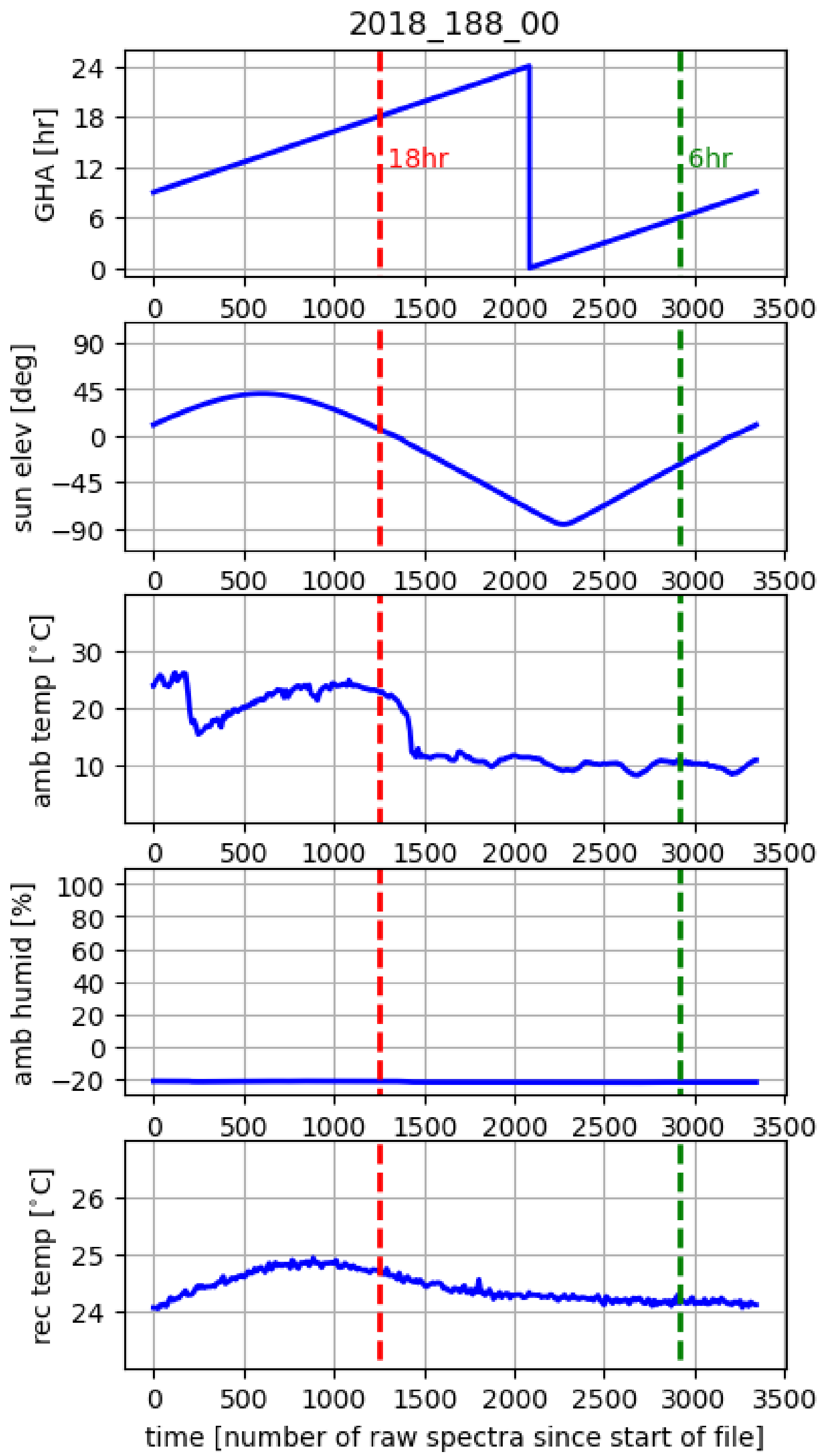

2018_188_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 34:

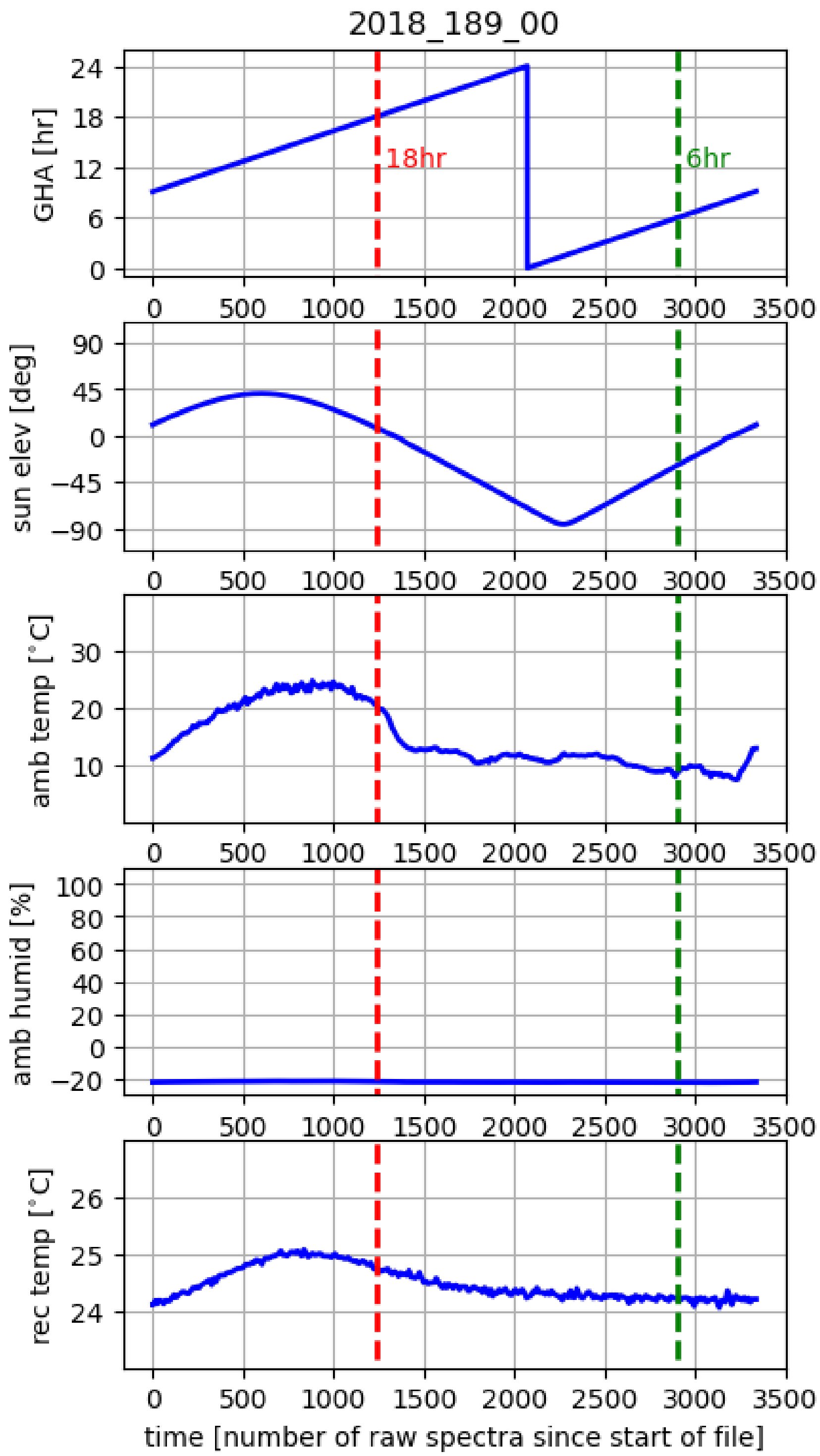
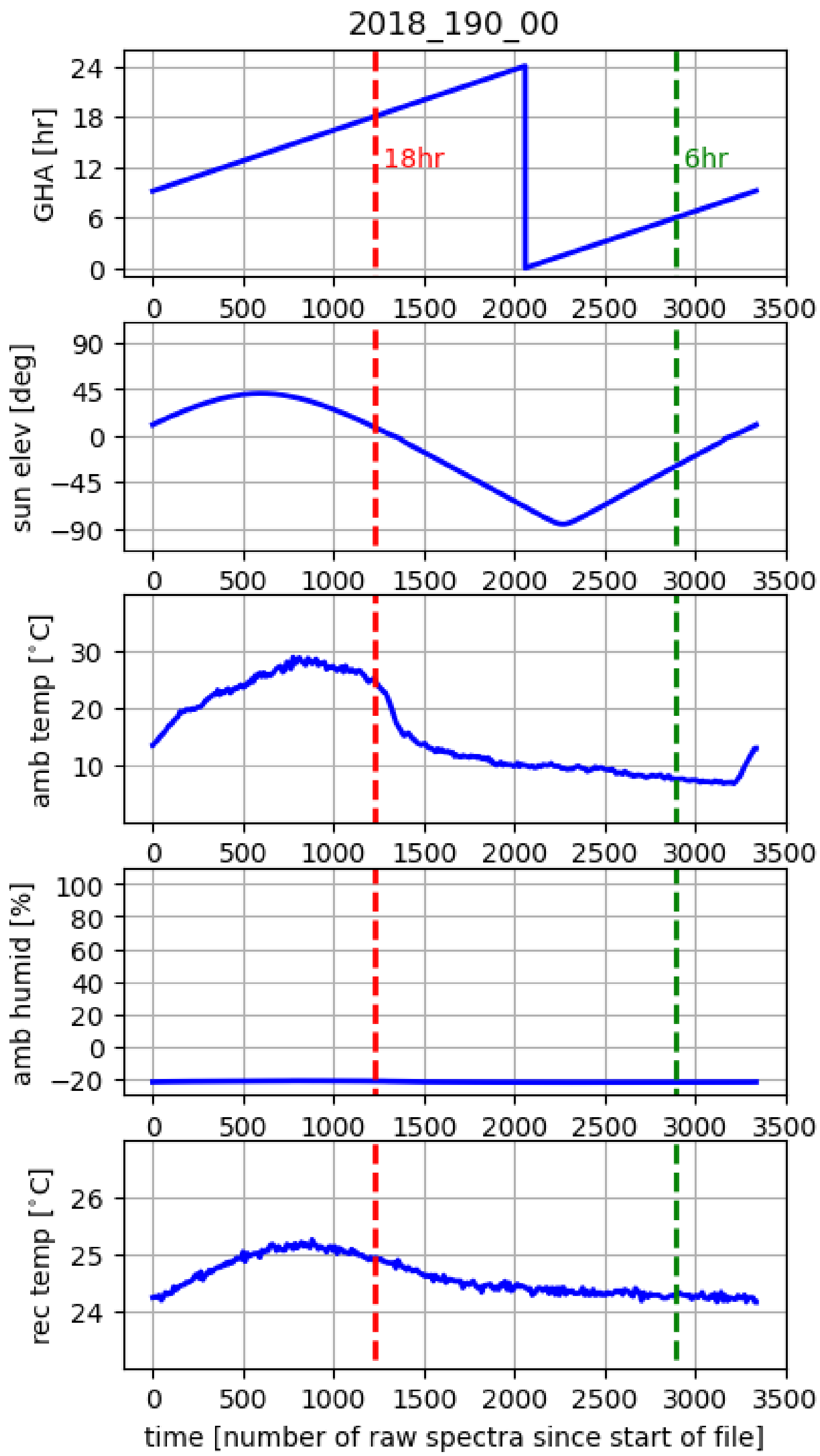

2018_189_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 35:



2018_190_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 36:

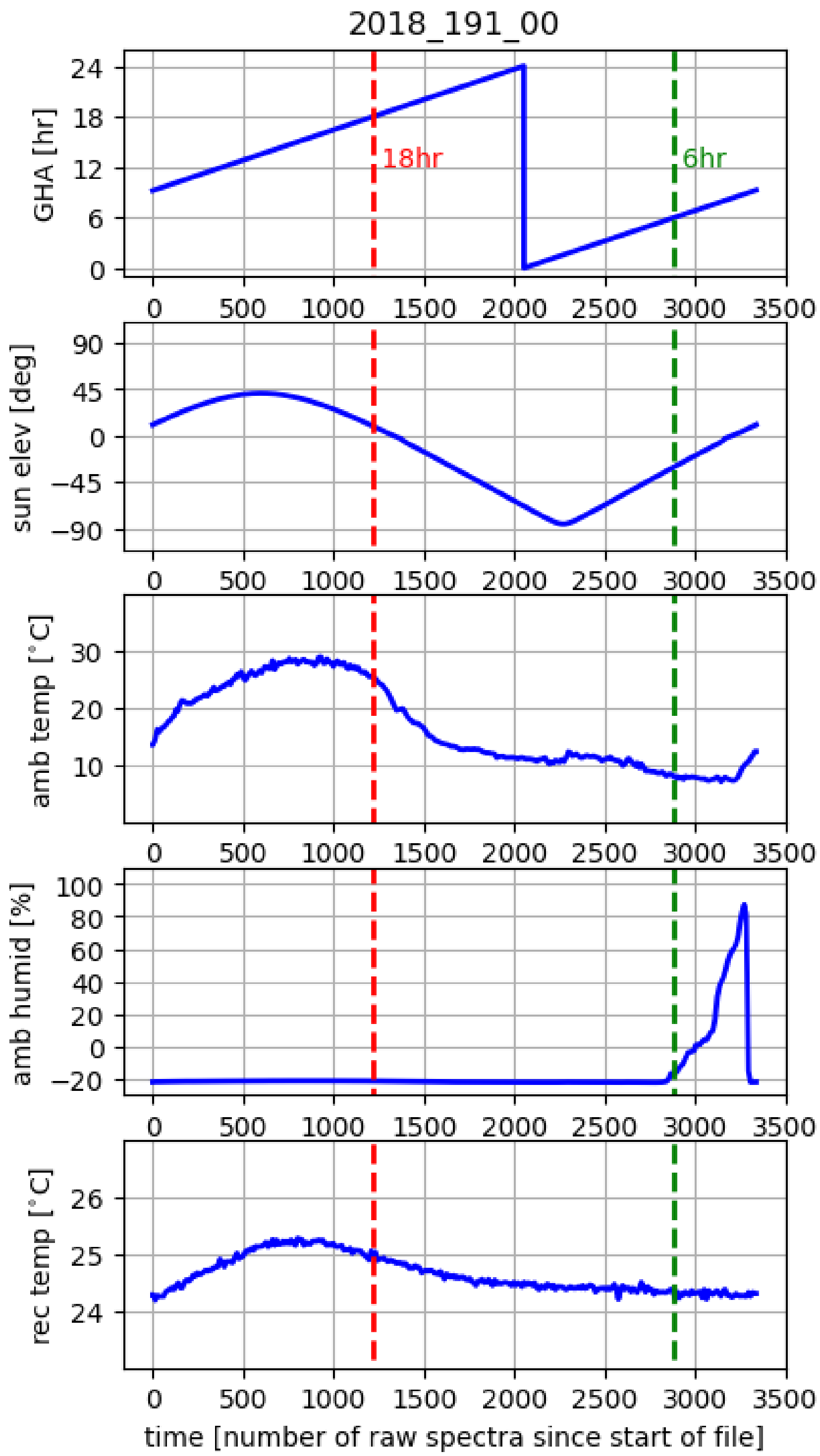
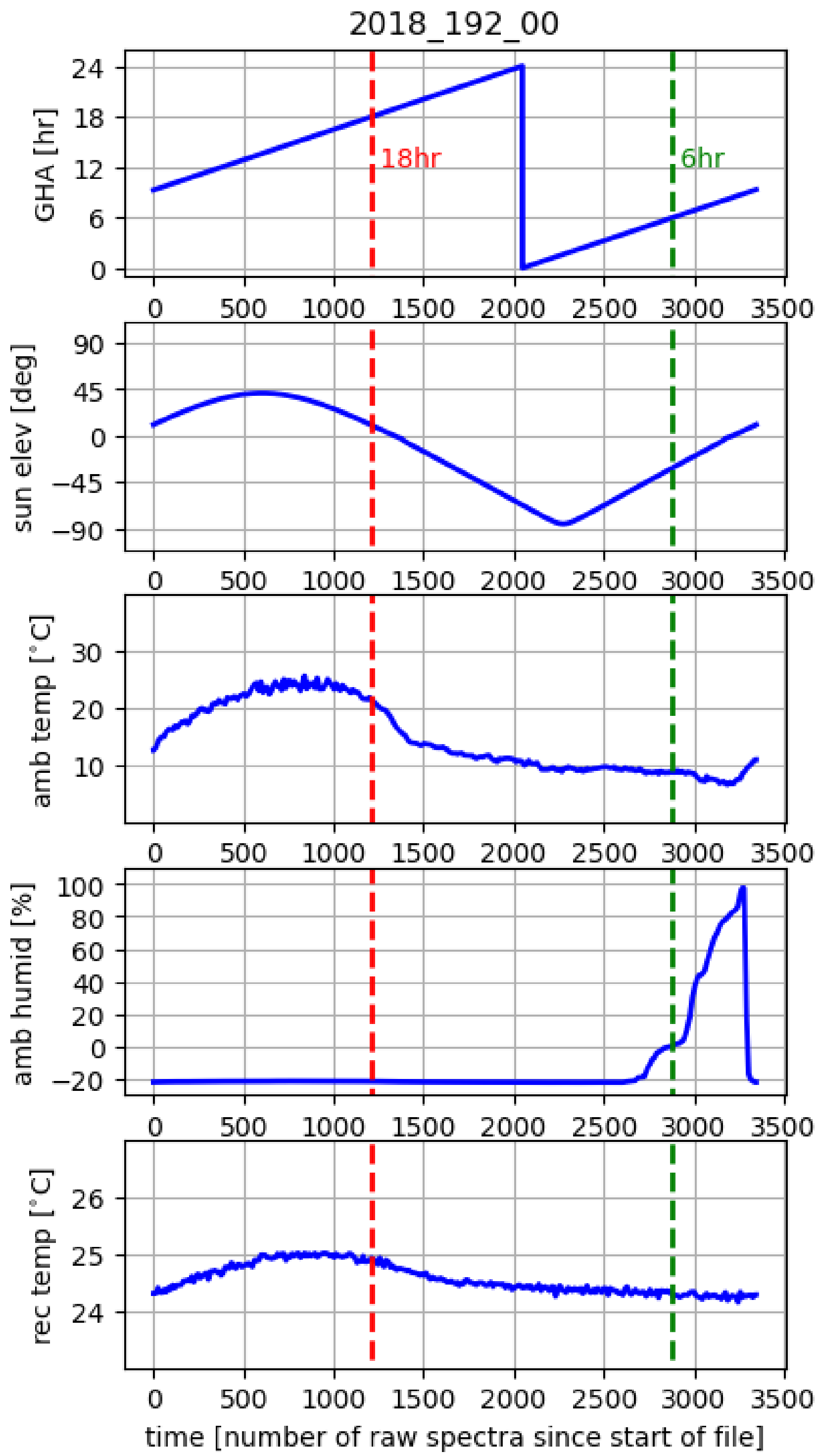

2018_191_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 37:



2018_192_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 38:

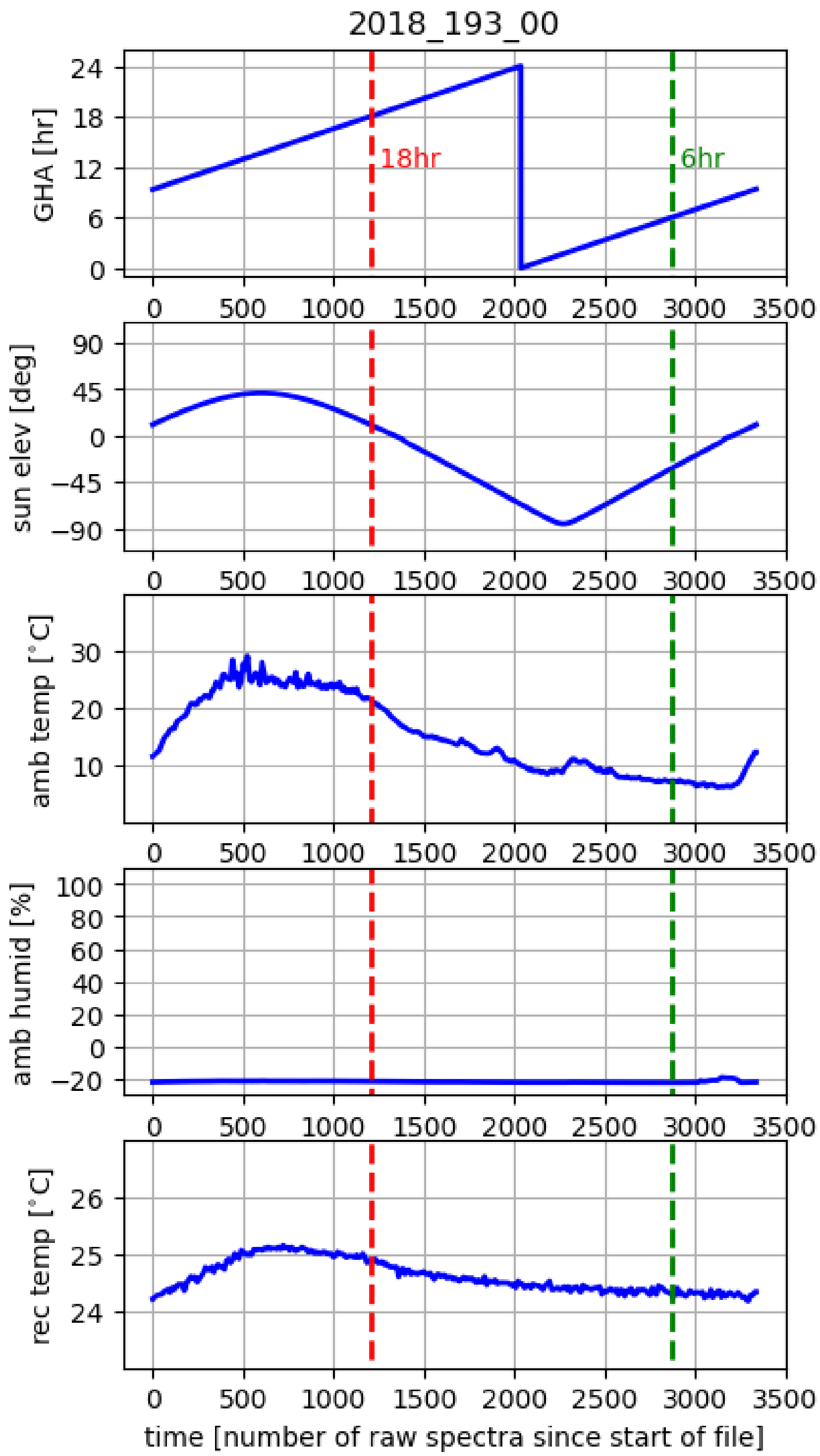

2018_193_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 39:

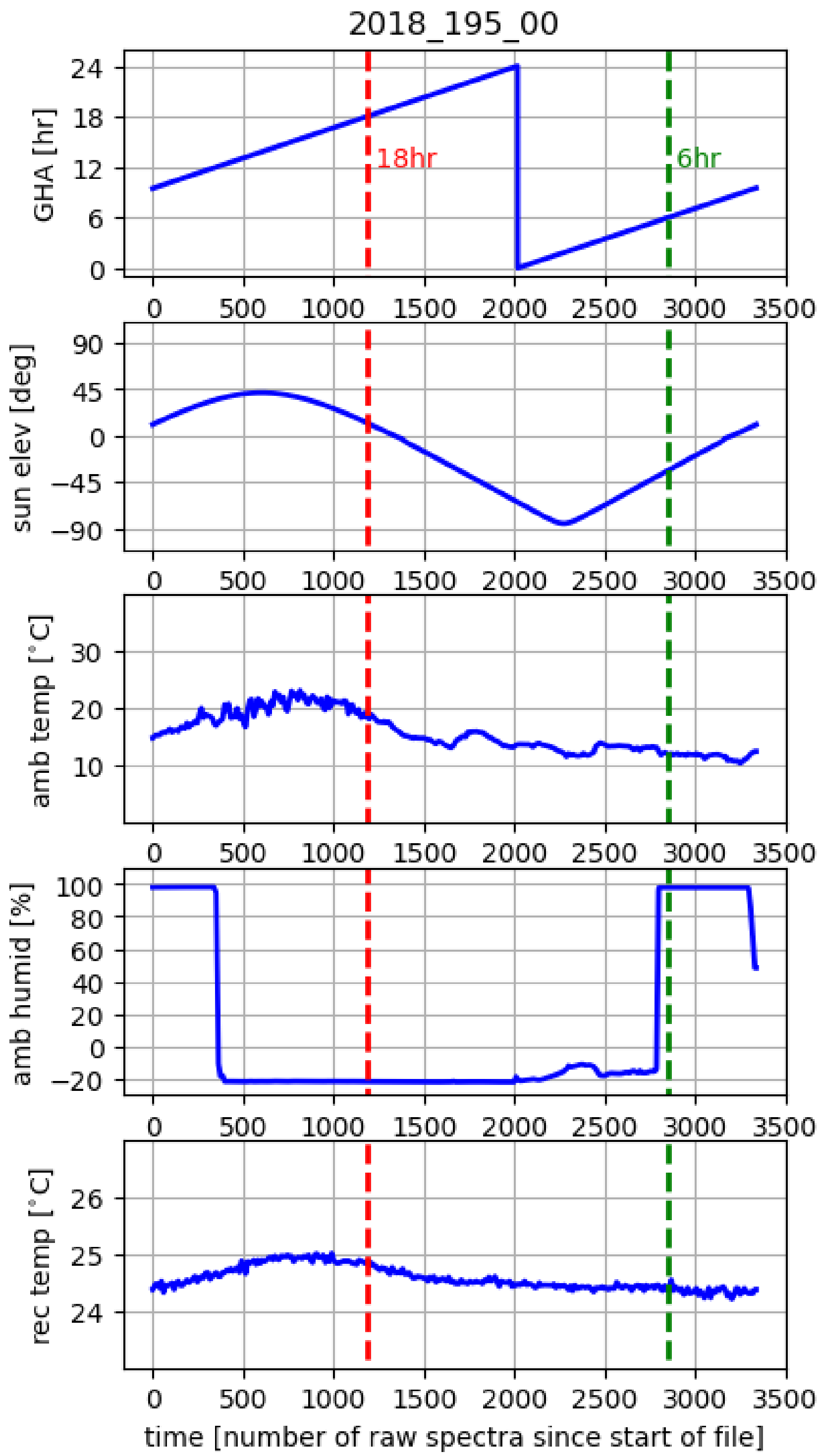

2018_195_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 40:

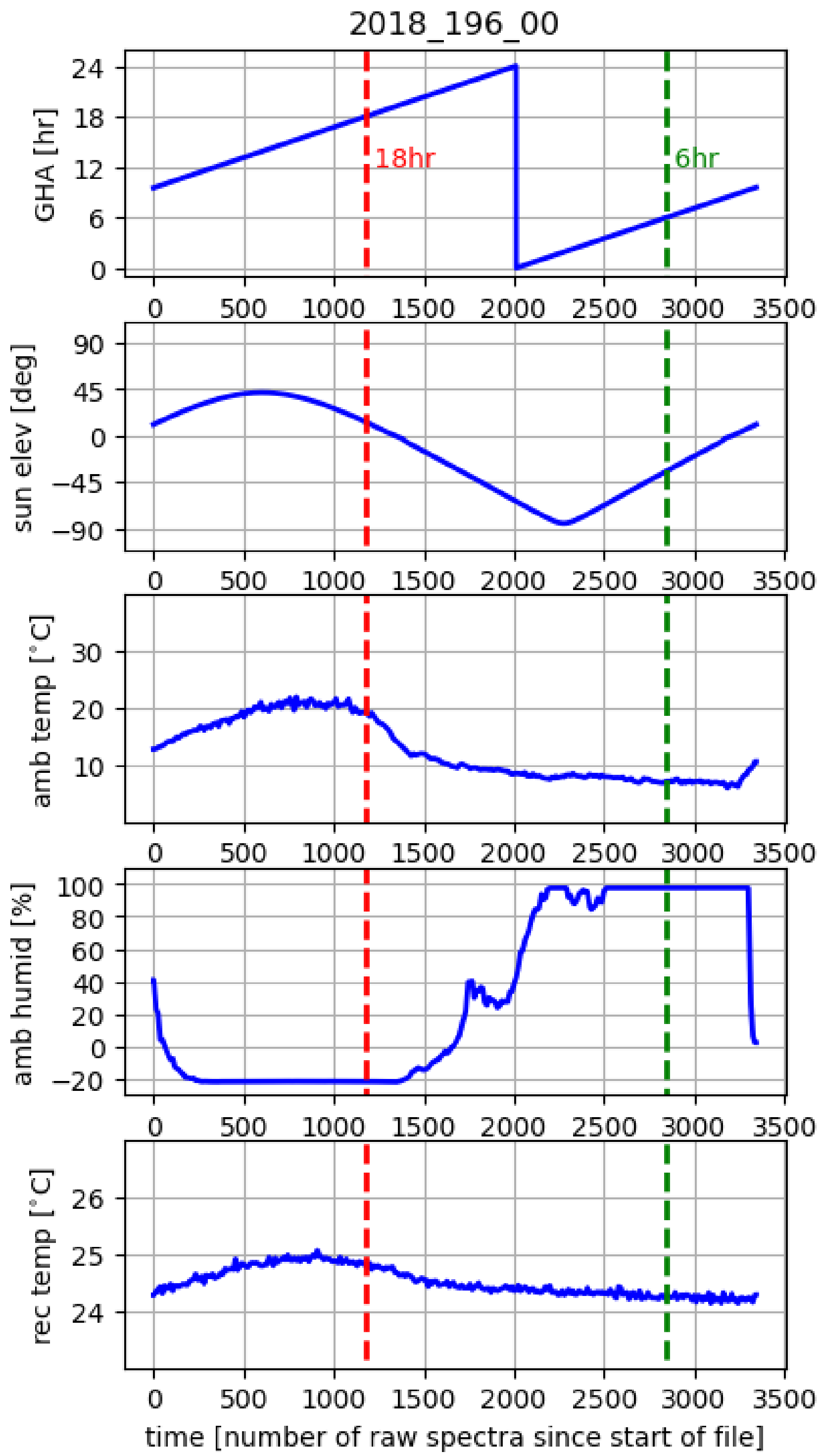

2018_196_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 41:

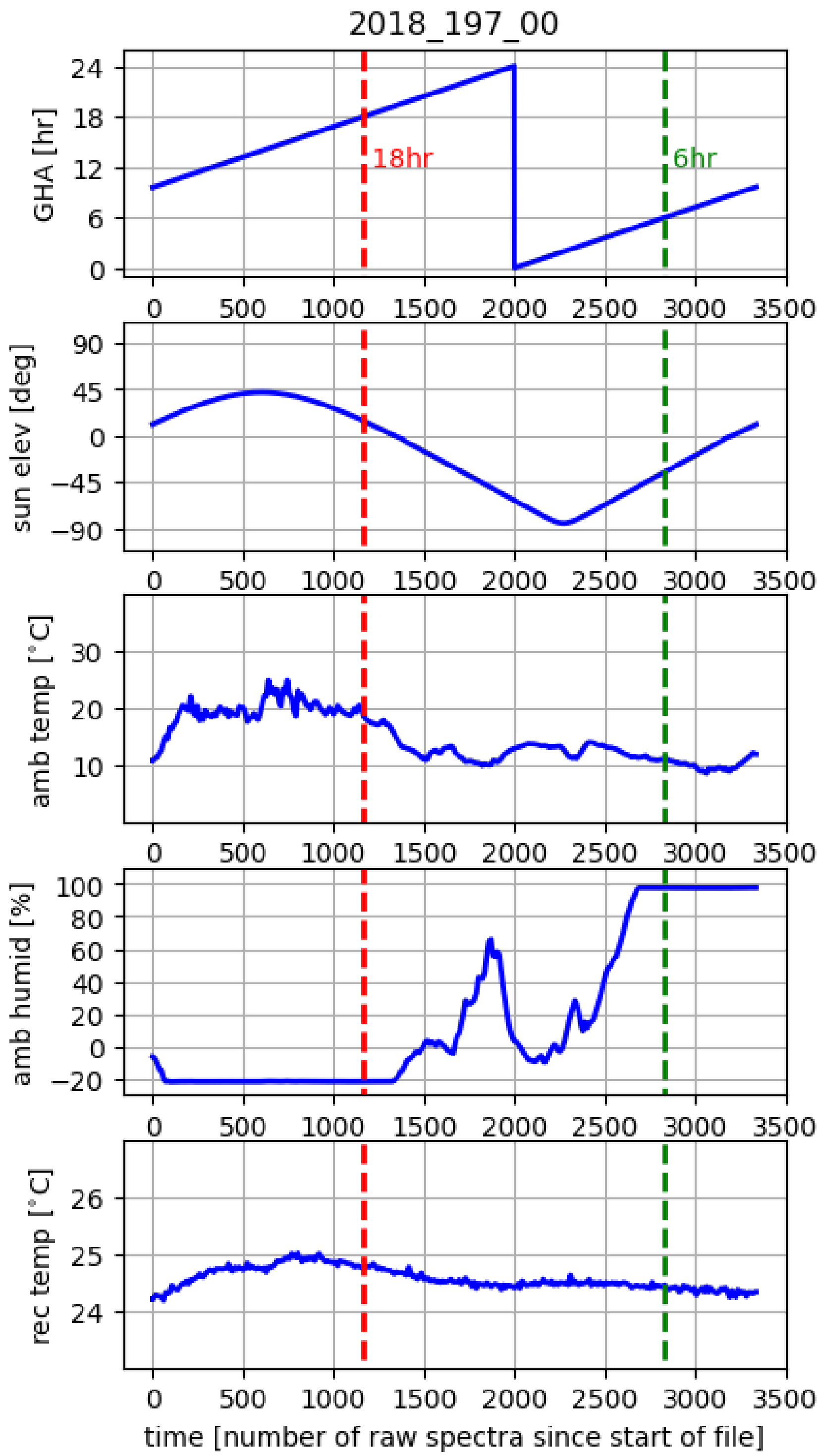

2018_197_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 42:

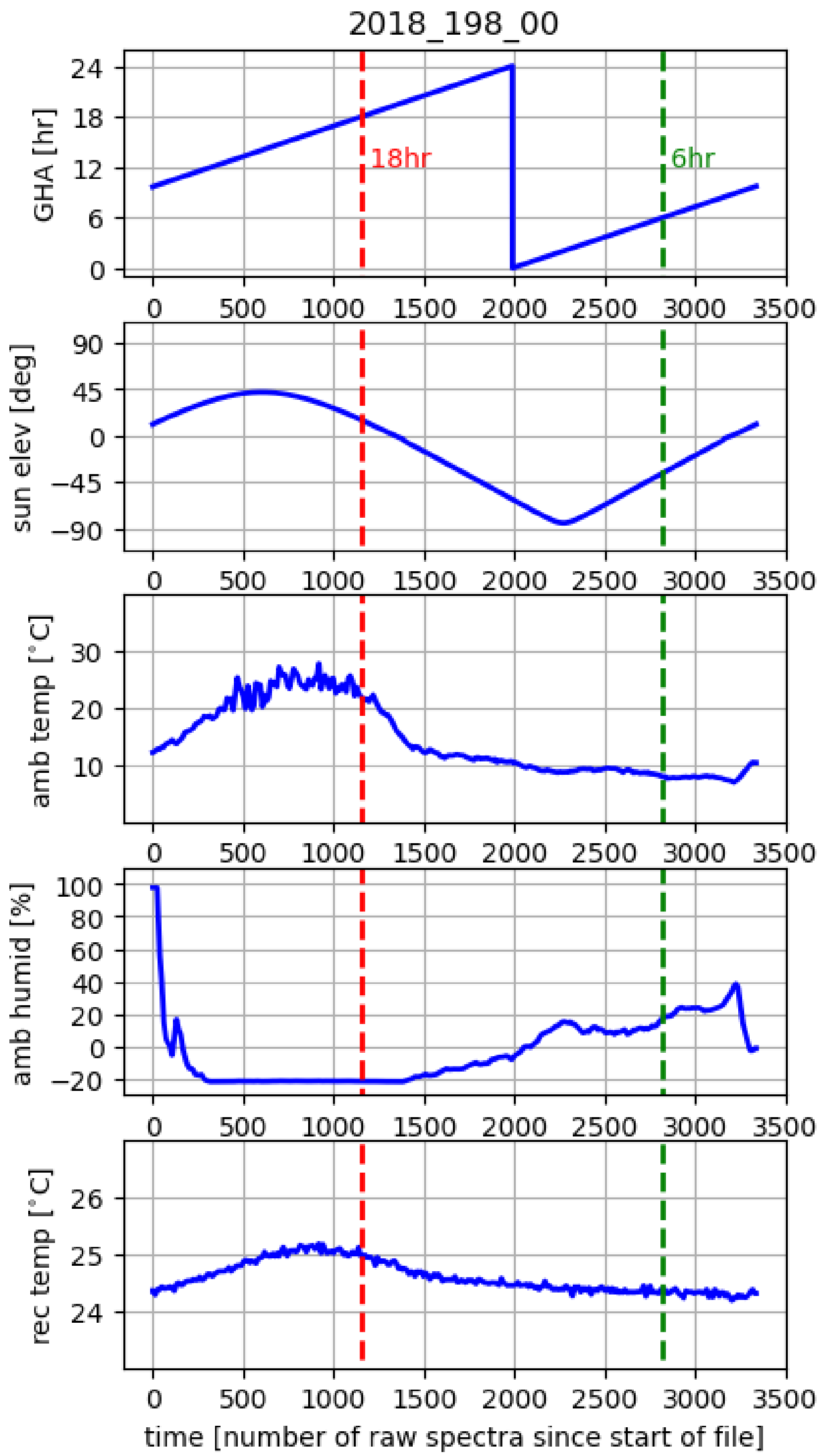

2018_198_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 43:

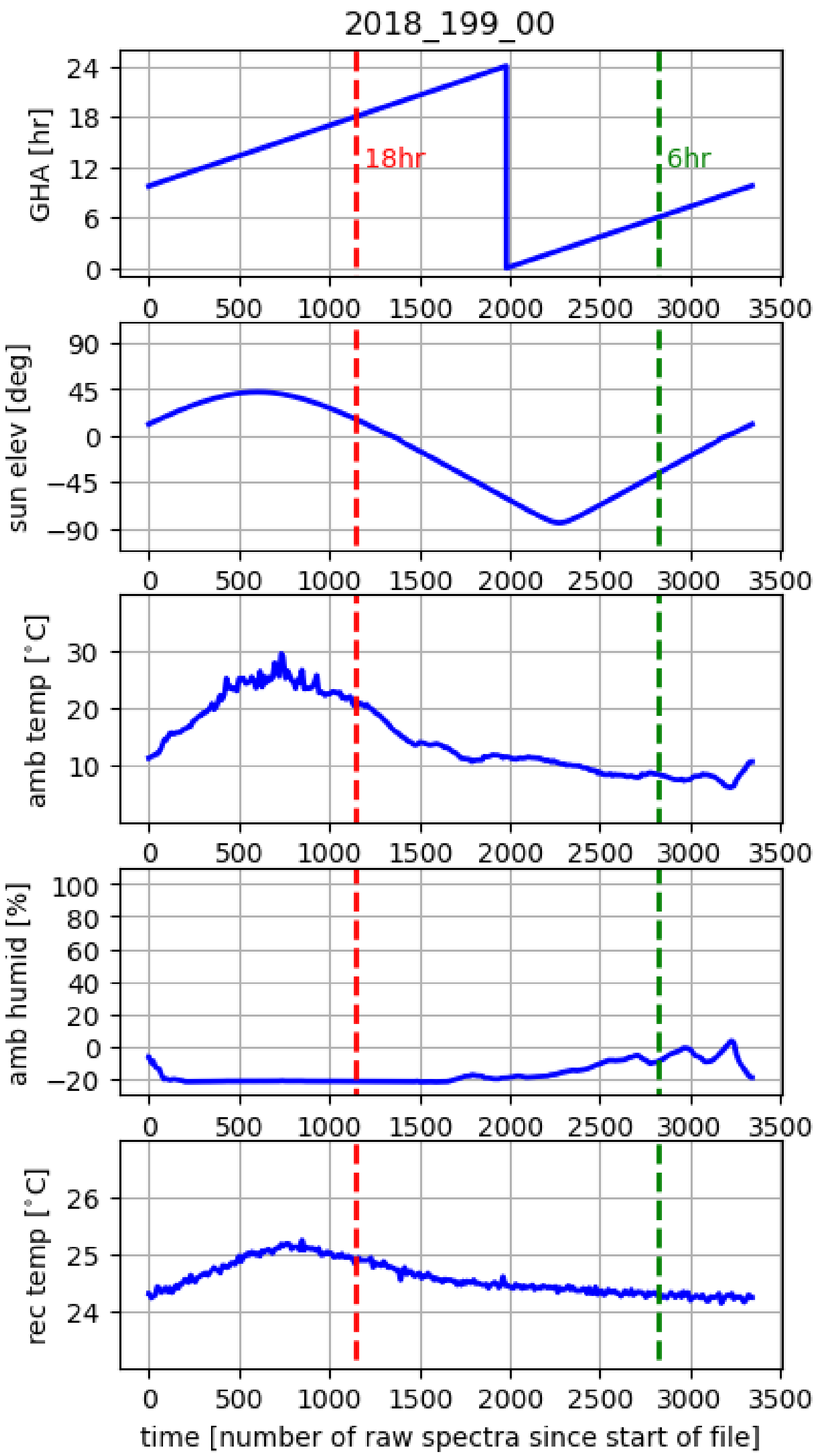
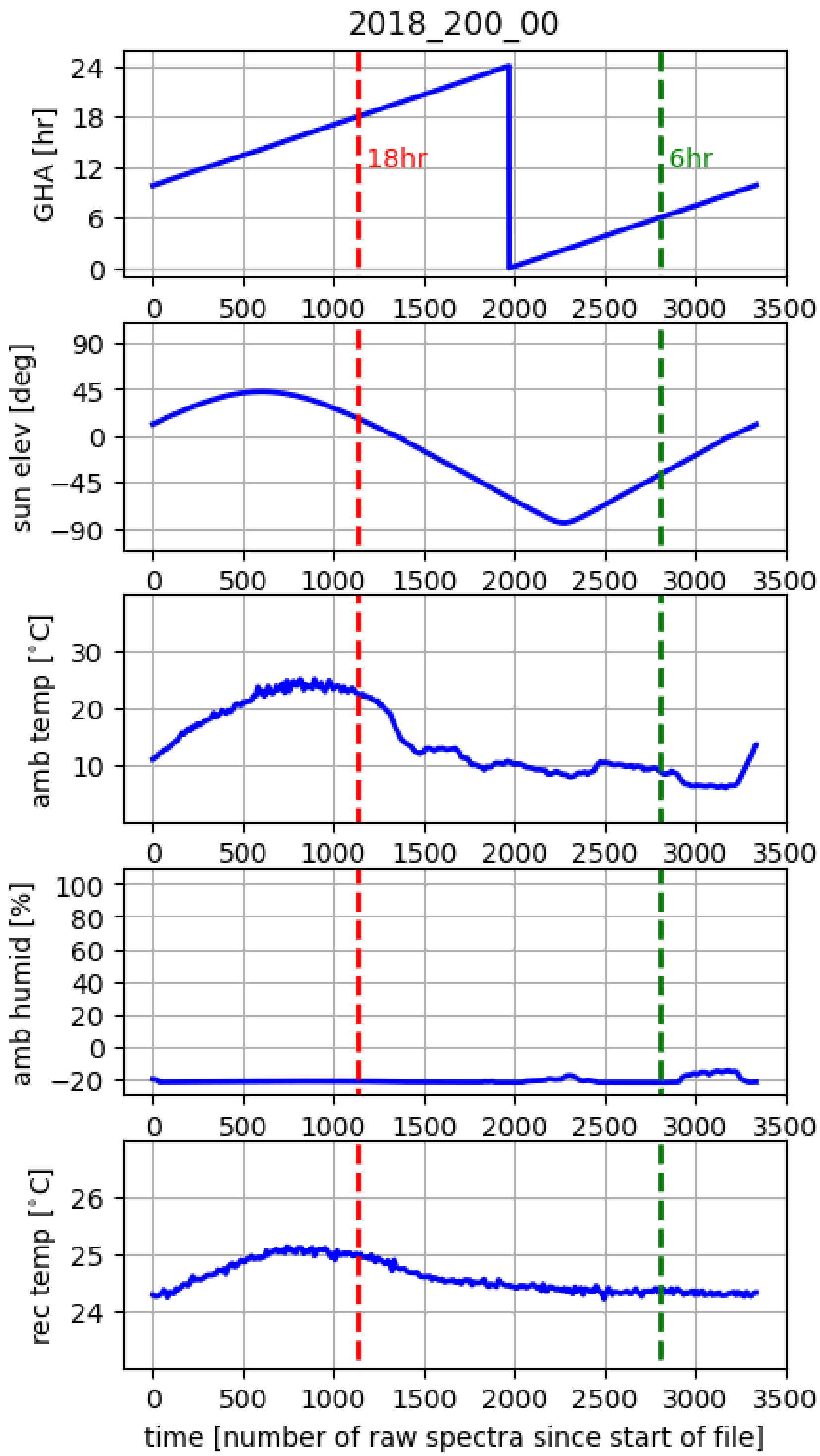

2018_199_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 44:



2018_200_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 45:

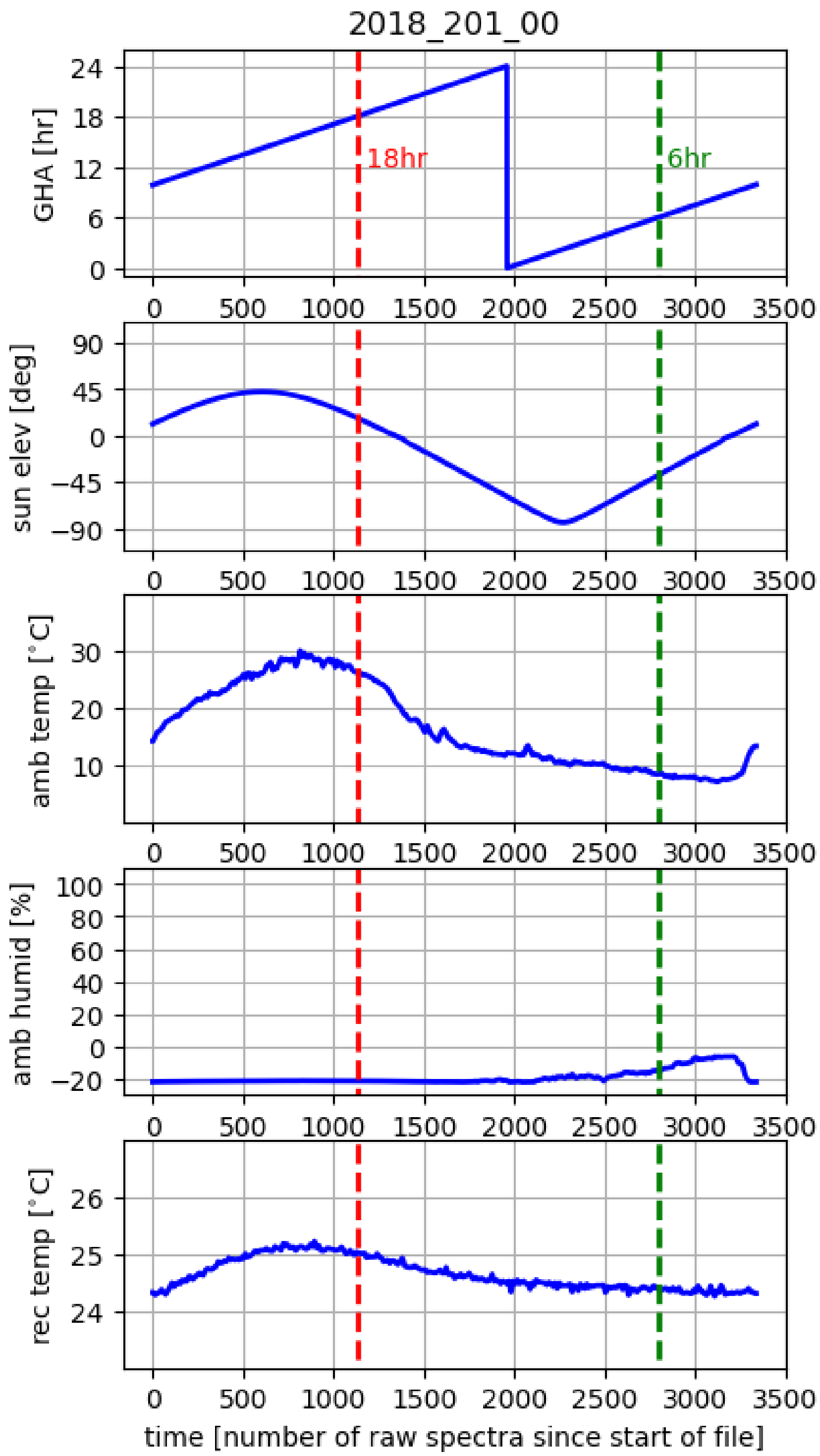

2018_201_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 46:

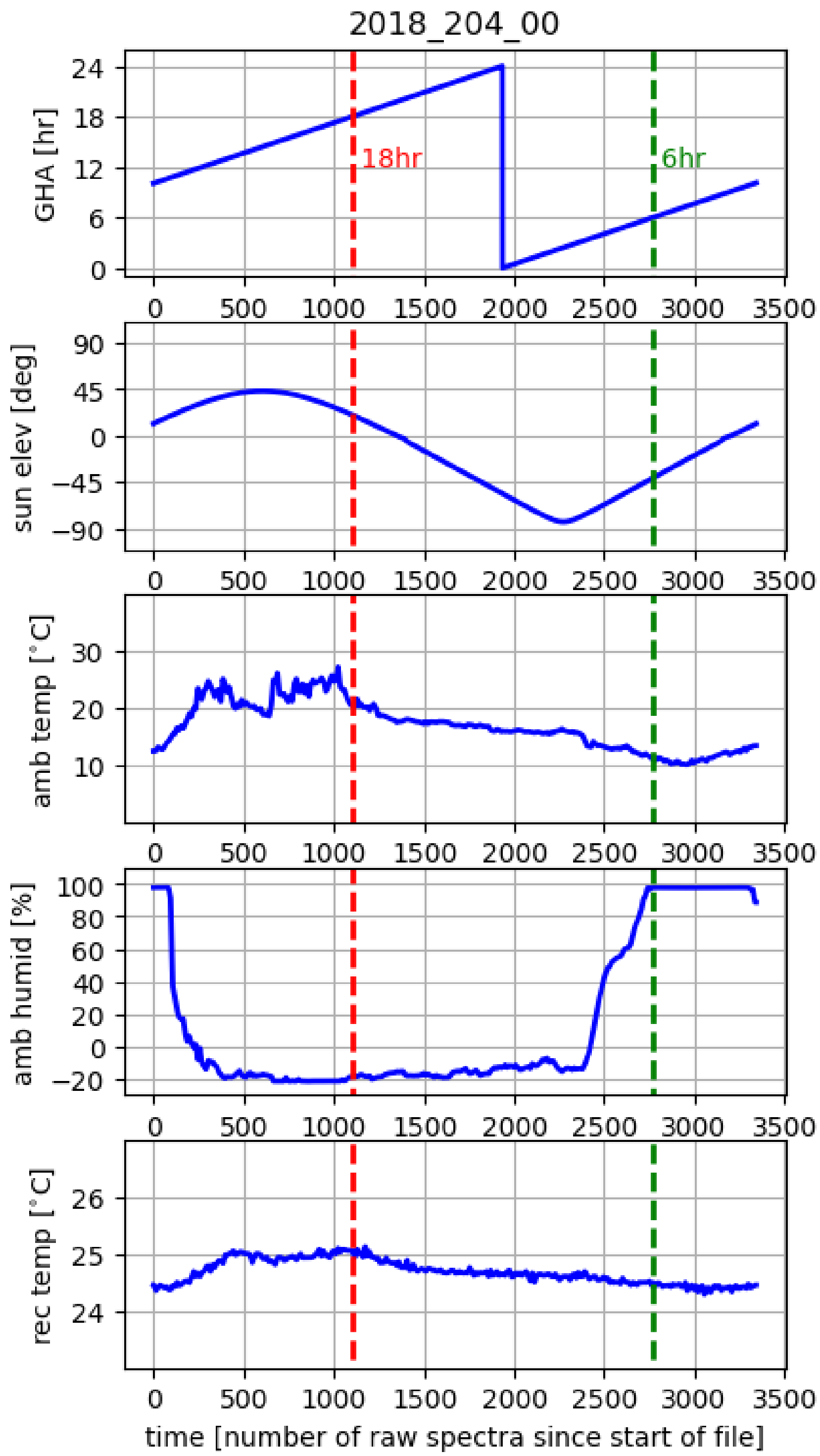

2018_204_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 47:

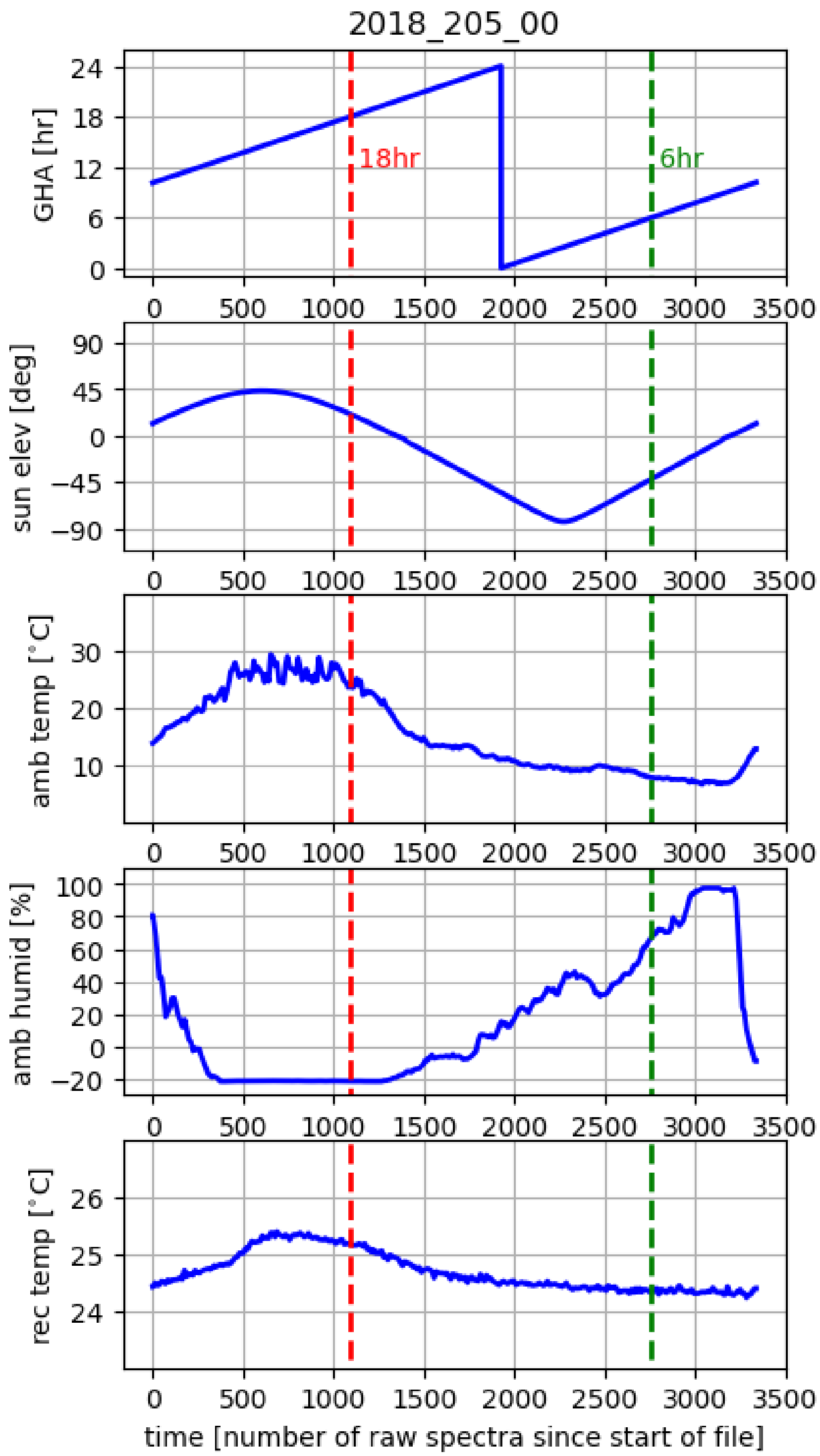

2018_205_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 48:

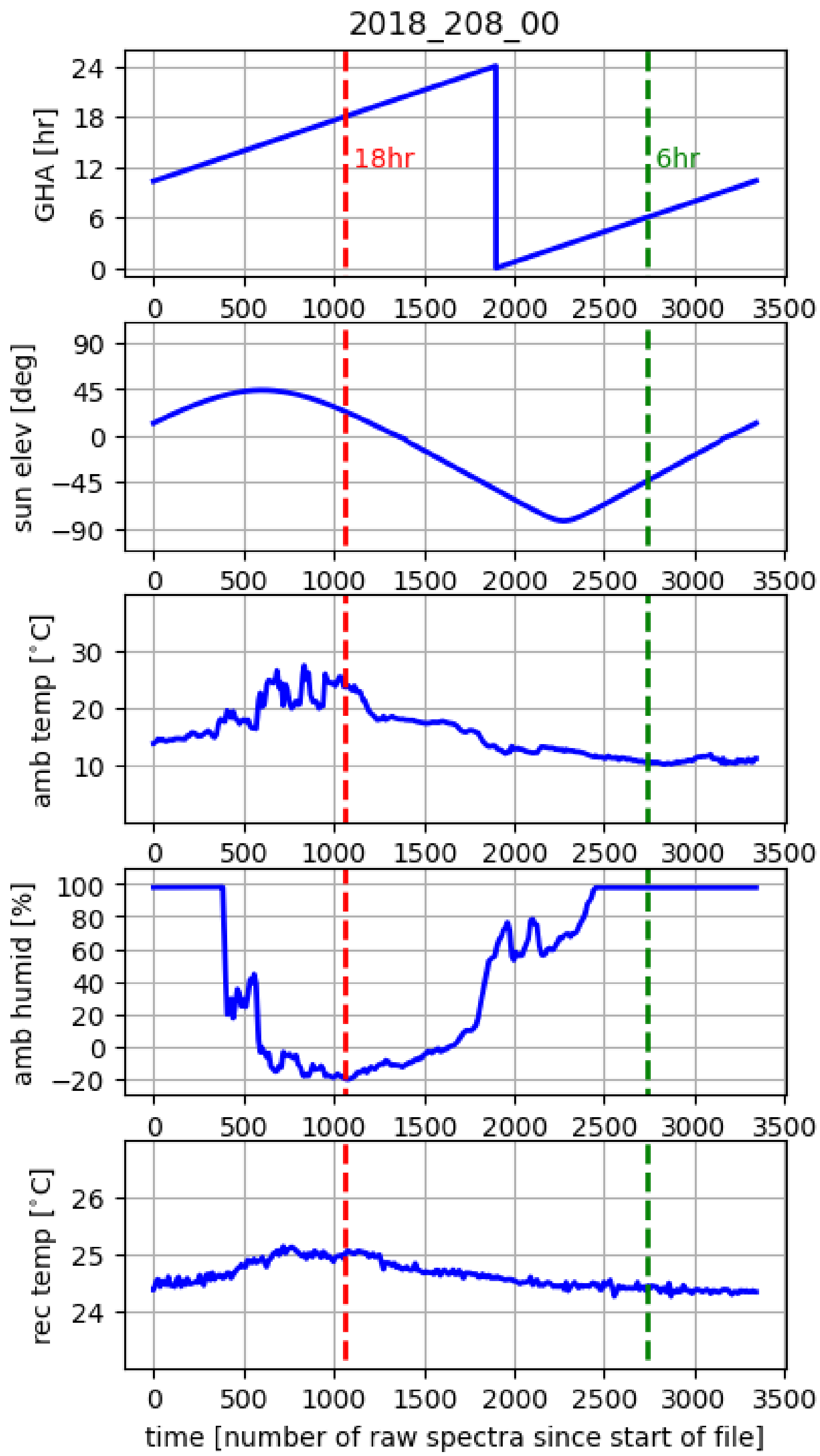
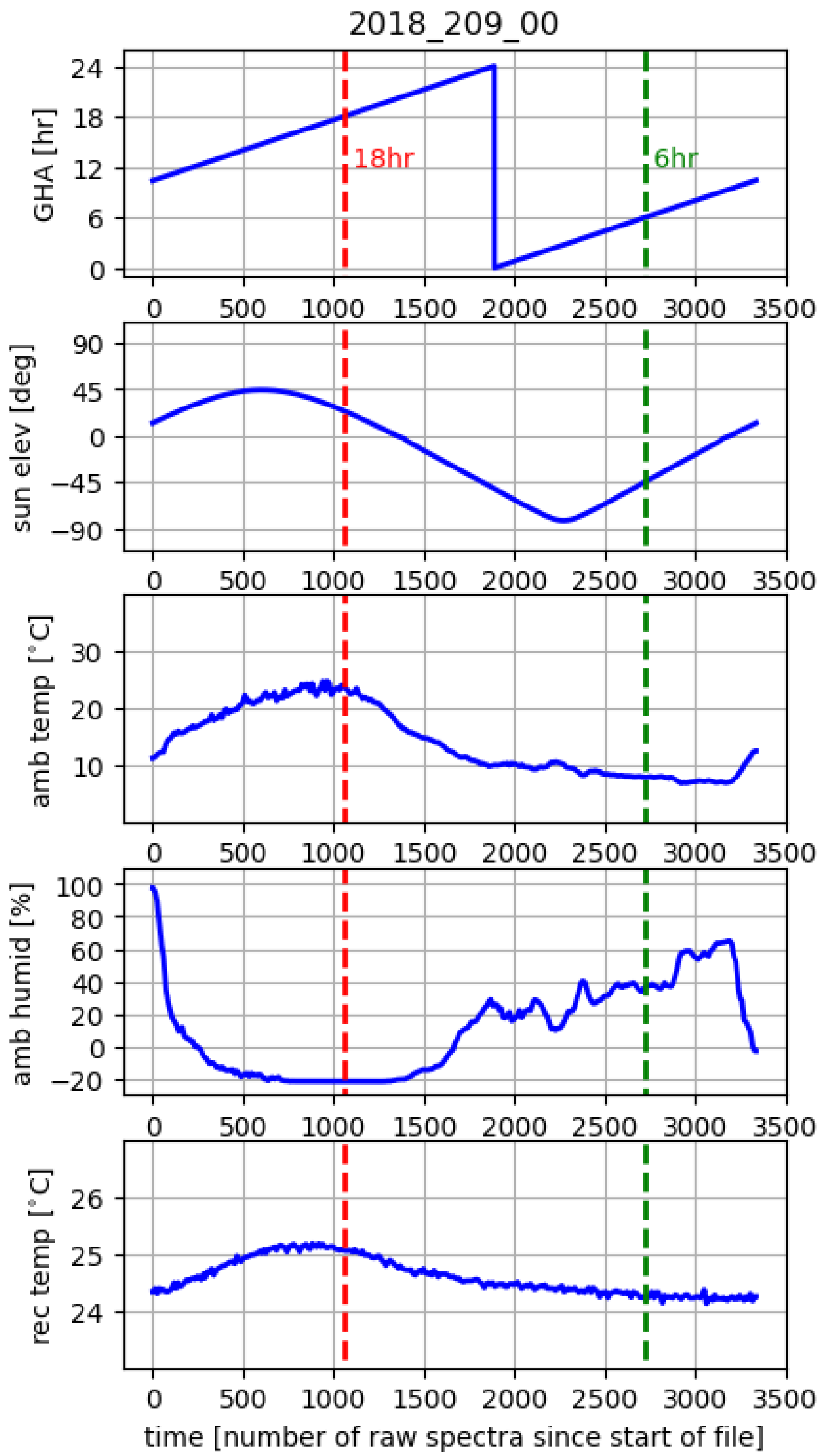

2018_208_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 49:



2018_209_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 50:

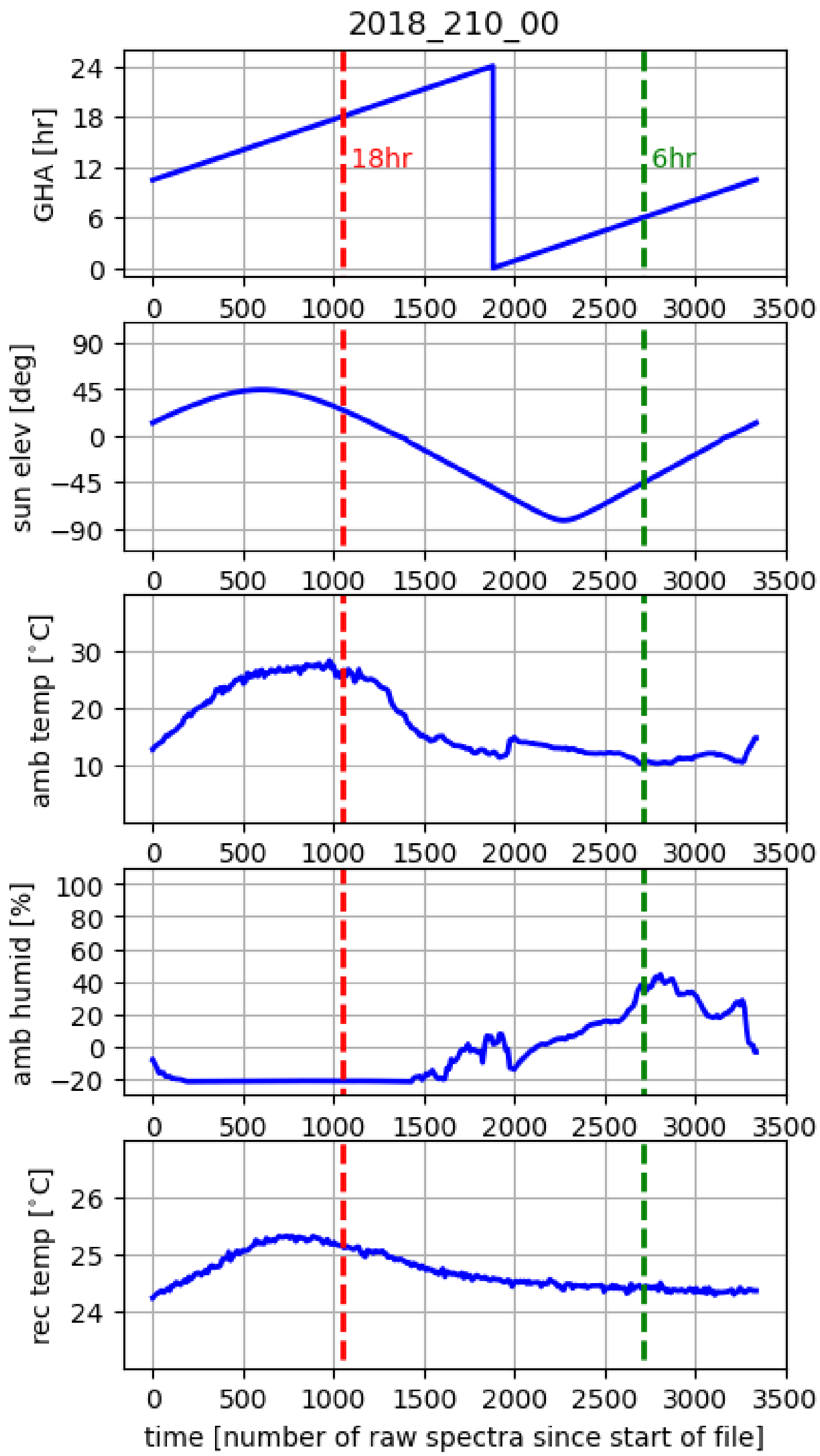

2018_210_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 51:

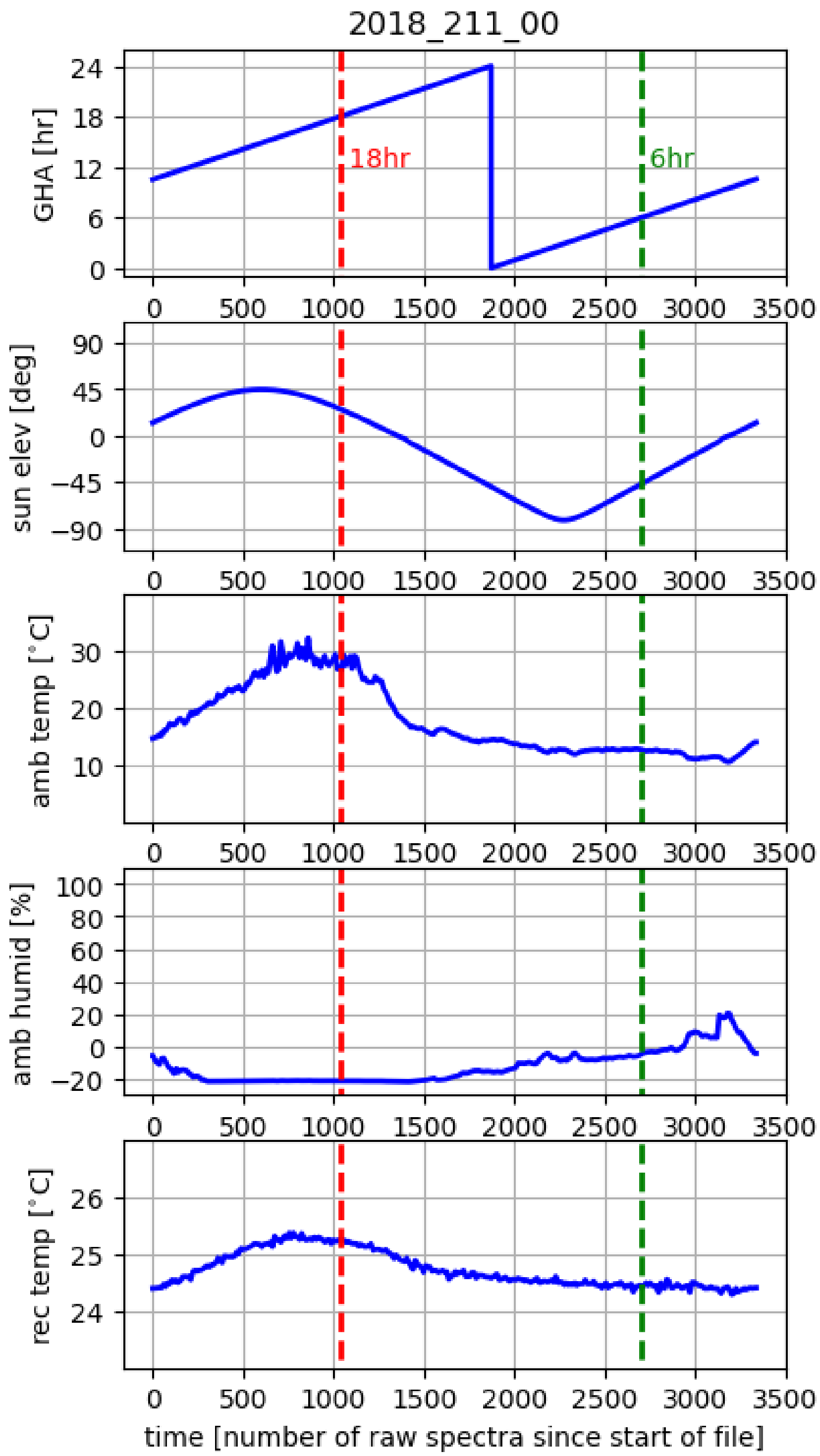

2018_211_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 52:

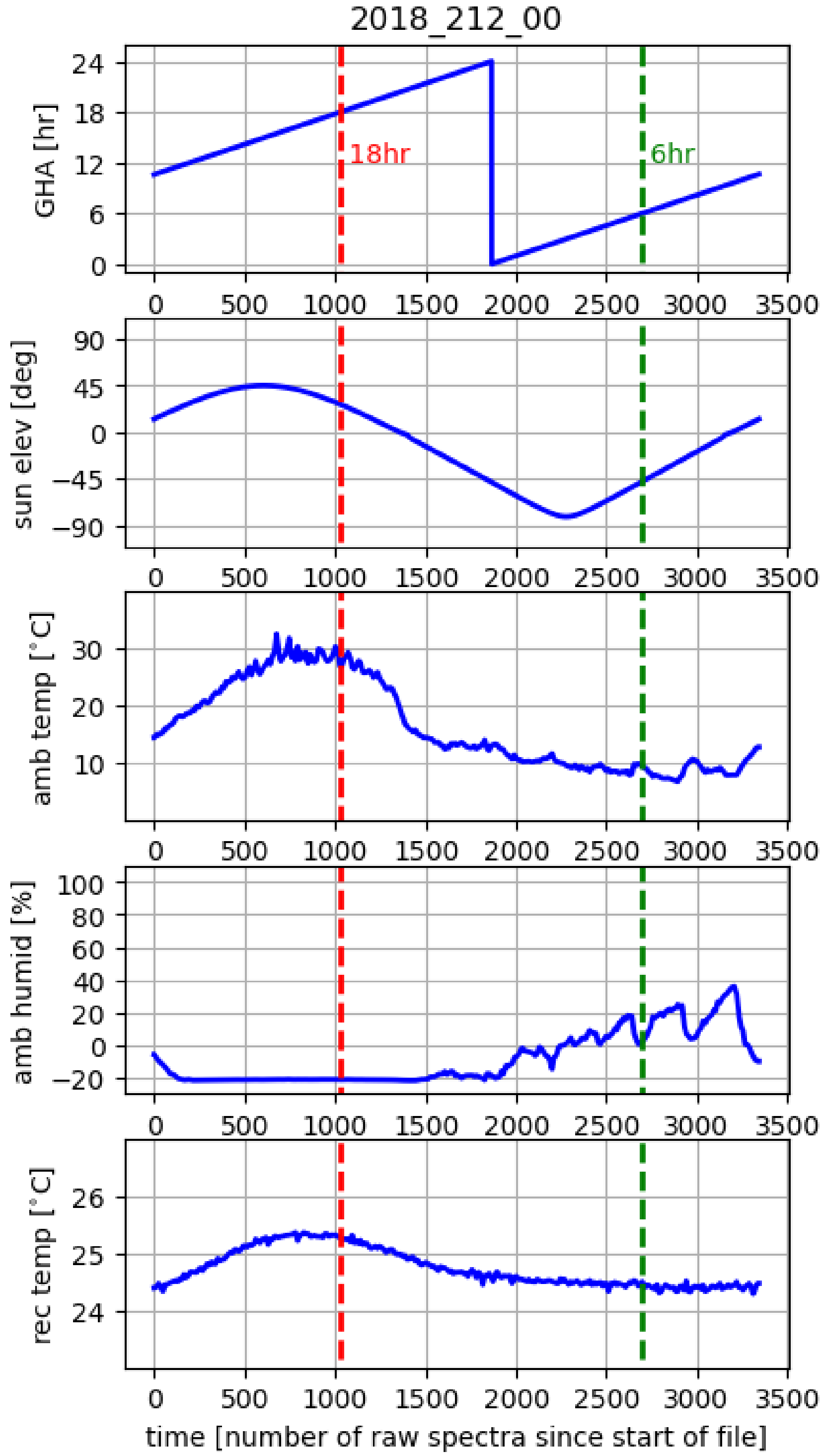

2018_212_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 53:

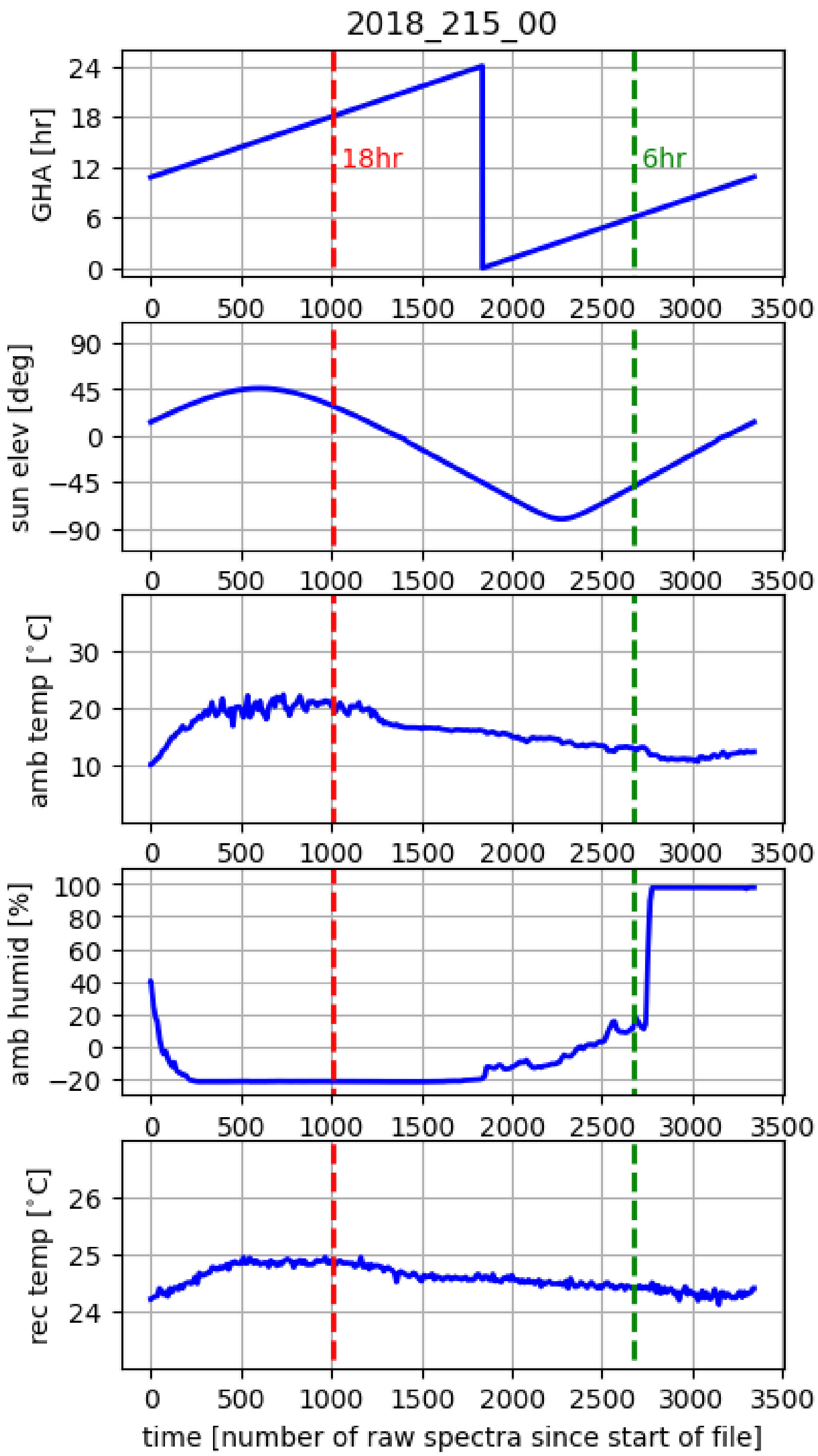

2018_215_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 54:

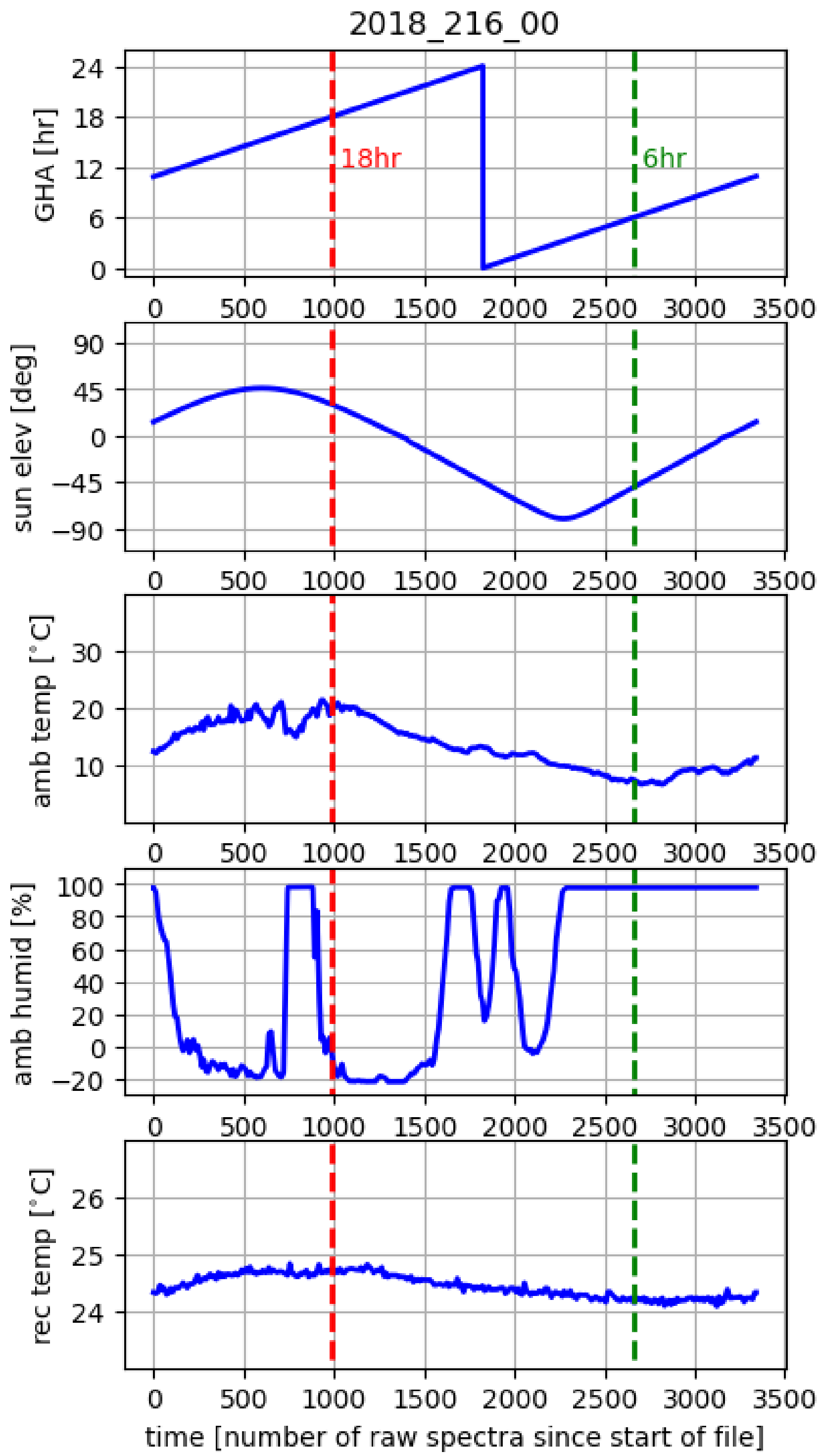

2018_216_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 55:

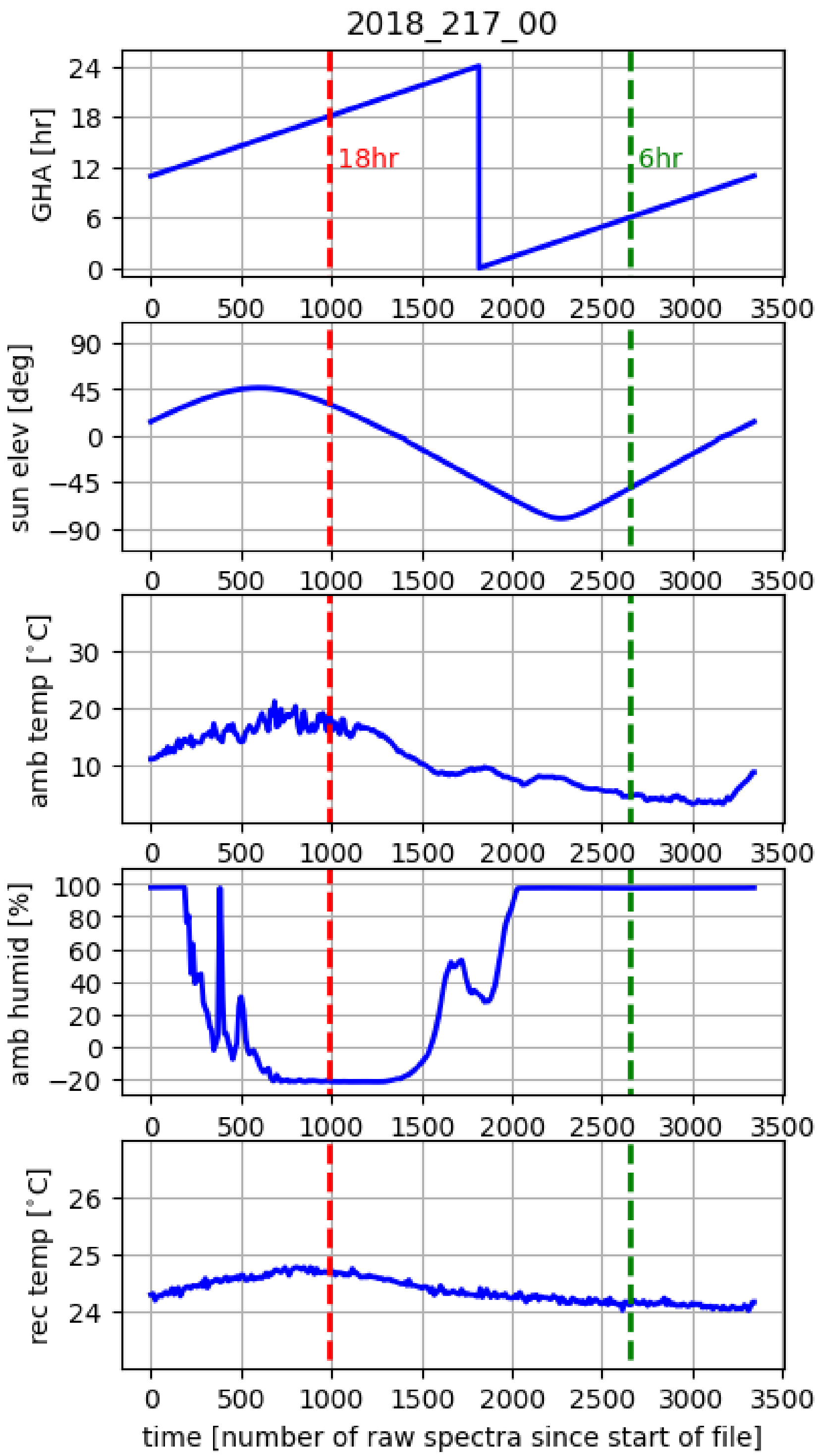
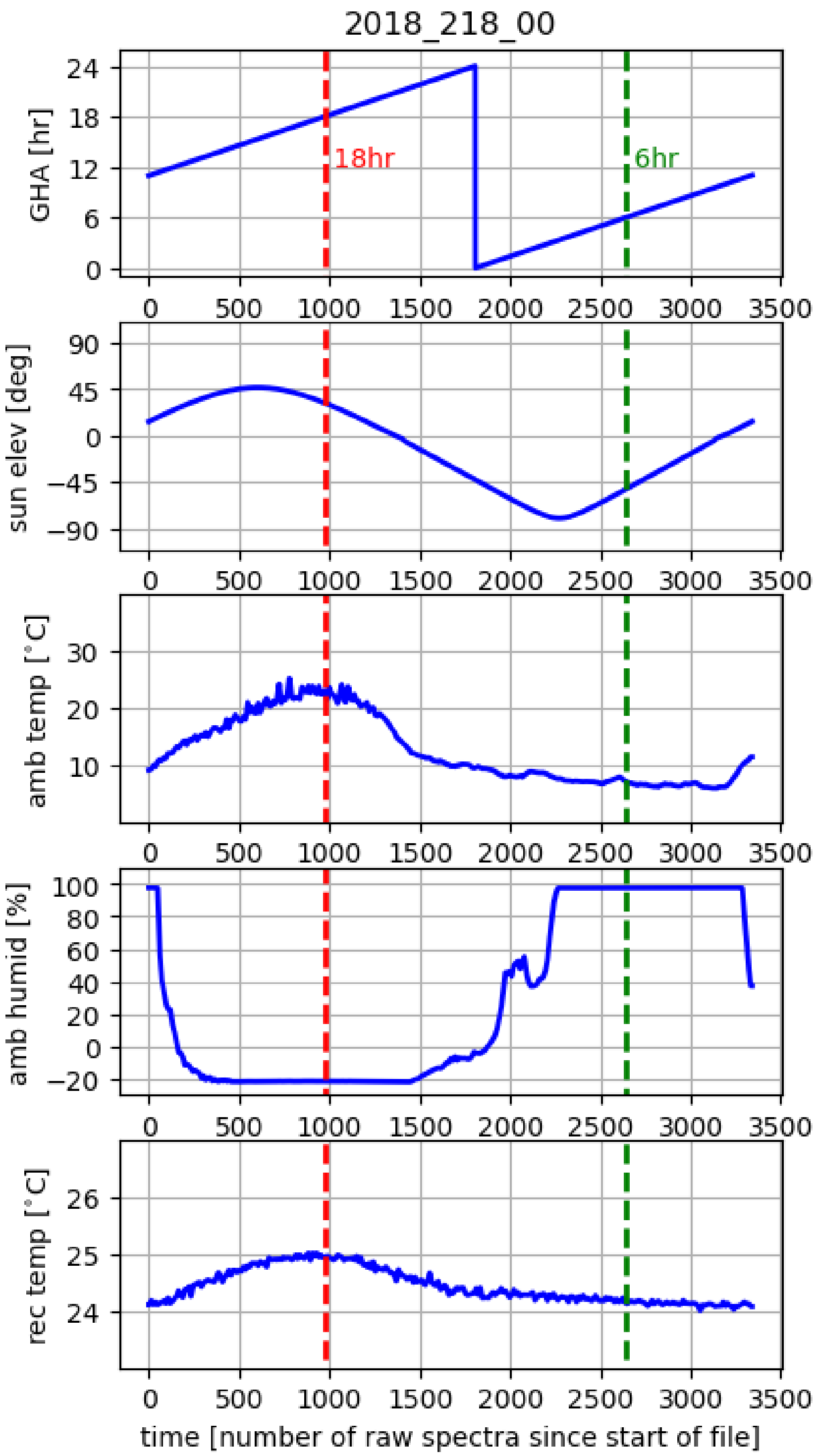

2018_217_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 56:



2018_218_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 57:

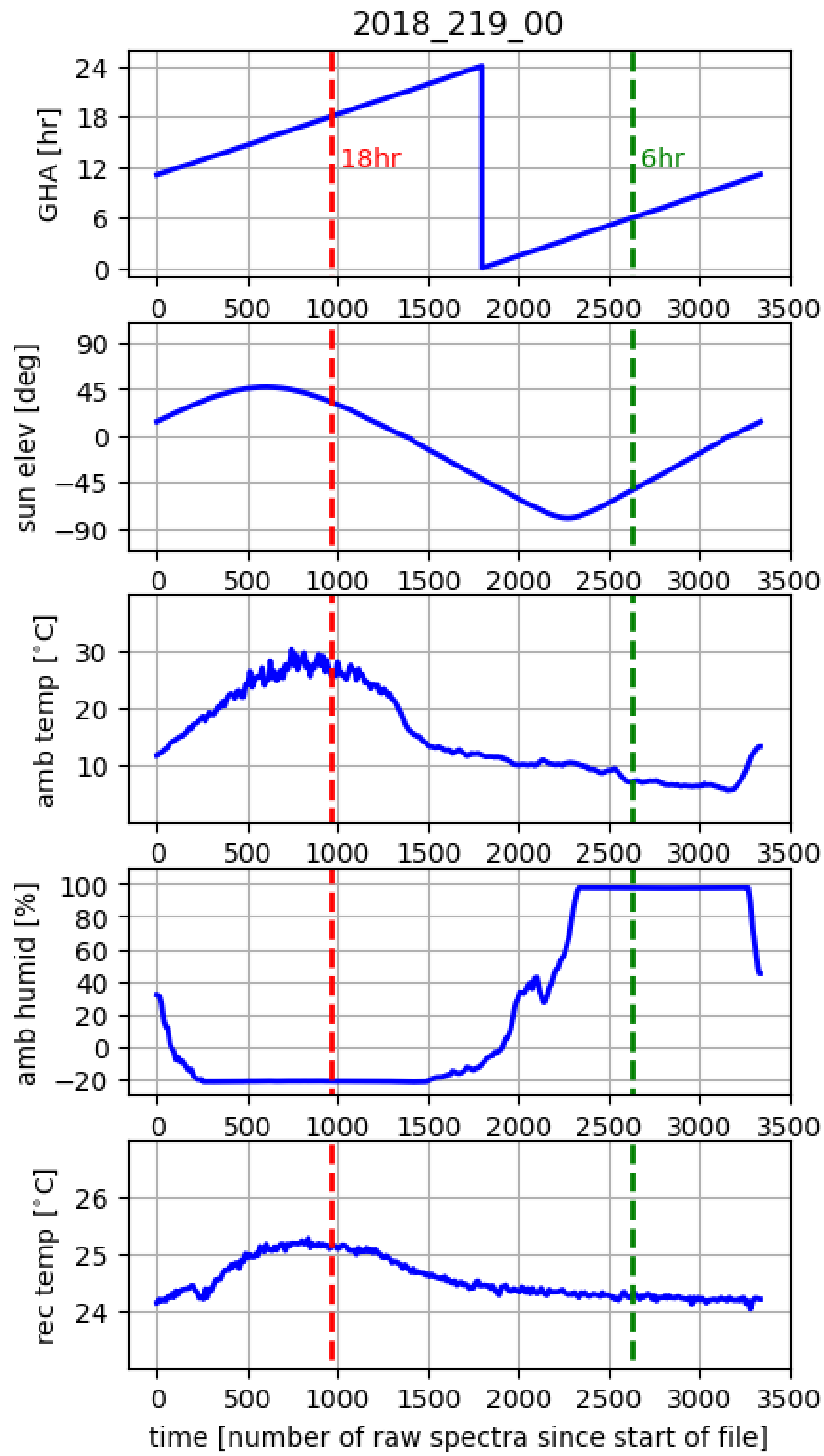

2018_219_00
GHA [hr]
18hr
6hr
sun elev [deg]
amb temp [°C]
amb humid [%]
rec temp [°C]
time [number of raw spectra since start of file]

Figure 58:

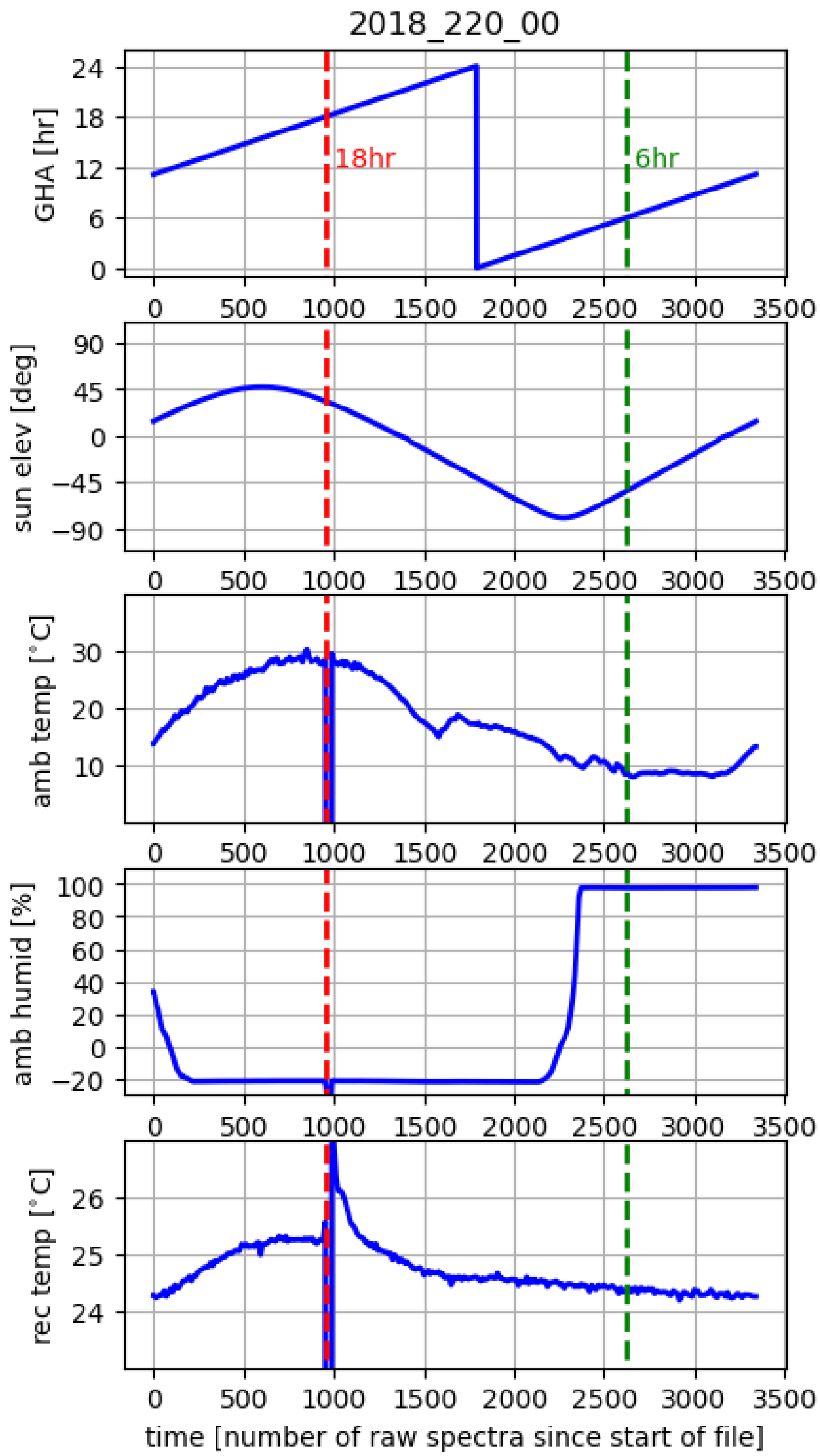

2018_220_00
GHA [hr]
24
18
12
6
0
18hr
6hr
sun elev [deg]
90
45
0
−45
−90
amb temp [°C]
30
20
10
amb humid [%]
100
80
60
40
20
0
−20
rec temp [°C]
26
25
24
0
500
1000
1500
2000
2500
3000
3500
time [number of raw spectra since start of file]

Figure 59: