

# MOSAIC-ACA Flight #05 - Polar 5 - 2020/09/02

## Objectives:

Main objective was a co-located flight with the A-Train satellites north of Svalbard. Second objectives were noseboom, radiation, and microwave radiometer calibration.

## Mission PI P5:

André Ehrlich

<b>Polar 5 Crew</b>	
<b>Mission PI</b>	<b>Mario Mech</b>
<b>Basis Data Acq.</b>	<b>Clemens Gollin</b>
<b>SMART/ Eagle/Hawk</b>	<b>Michael Schäfer</b>
<b>MiRAC / AMALi</b>	<b>Friedhelm Jansen</b>
<b>Microphysics</b>	<b>Valerian Hahn</b>
<b>Optional seat</b>	<b>Martin Gehrmann</b>
<b>Polar 5</b>	
<b>Take off</b>	<b>06:52 UTC</b>
<b>Touch down</b>	<b>12:23 UTC</b>

## Flight times:

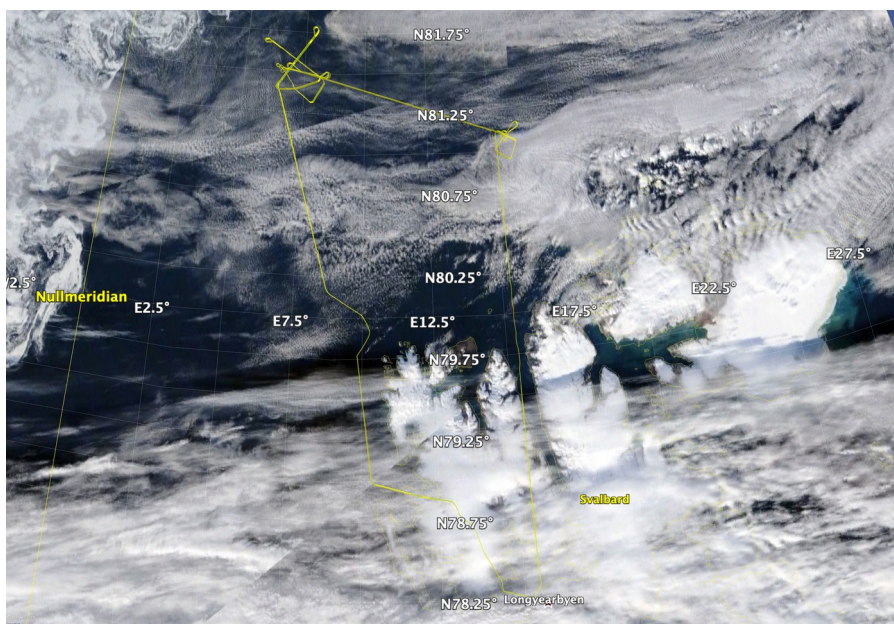


Fig. S5.1: MODIS satellite image of Sept. 2 2020.

## Weather situation as observed during the flight (compare to forecast):

For take off, there were scattered clouds in mid-level predicted that should offer some holes to get through. For the satellite constellation under flight in the North, low- to mid-level clouds with precipitation in the eastern part were

predicted. The day before, the arrival of the frontal system was predicted for 14:00 LT which changed in the forecast of the same day to 17:00 LT. The cloud situation as observed during the flight was very well predicted. The arrival of the front at Longyearbyen airport was around 16:00 LT.

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## **Overview:**

Major target of the flight as meeting the A-Train satellites to the north of Svalbard. Meeting time on swath was 8:21 at W1. After take off we climbed to 10000 ft and stayed at this altitude towards W1. After reaching the open ocean North of Svalbard, a drop sonde has been launched. At W1 we arrived 25 min early. Since there were no cirrus above, we decided to perform a radiation calibration square.

From W1 to W2 we stayed on the path of the satellite in 10000 ft with clouds below with tops at 5000 to 5500 ft. Some of them were connected to precipitation as indicated in the radar, especially in the eastern part of the under flight. Approaching W2, clouds thinned. On the path between W1 and W2, three drop sondes have been launched.

After passing W2, we turned around and made a descent to 200 ft with 1000 ft/min for testing the clouds for the stag pattern reaching the lowest level at W3 (located 10 % of the distance to W1). Once at 200 ft we turned again towards W2 and stayed at 200 ft for 5 mins. Next legs at 1000 and 2000 ft. Since there was no cloud at 3000 and 4000 ft, we climbed to 4200 ft being at clouds base and stayed at this altitude for 5 mins. Last leg at cloud top between 5400 and 5000 ft.

At W3 we climbed again to 10000 ft and started the calibration cross for the nose boom: legs aligned with the wind towards and with and twice perpendicular in opposite directions. In the two northern most positions we could see the ice edge to the North at approx. 82°N.

Heading towards South direction W4. After 20 min we dropped sonde number 5. As we got visual of Svalbard we saw a clear sky area ahead of us. This area we followed for three minutes and dropped a sonde for the radiometer calibration. Afterwards we followed the path to W4.

Between W4 and W5 we were flying over the fjord in Ny-Alesund, overpassing the AWIPEV observatory. Unfortunately, there were clouds in our flight altitude of 10000 ft. Since the cloud top seemed to high to climb above, we decided to stay in and collect the particles around.

After W5 we started the descent to Longyearbyen.

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## **Instrument Status:**

<b>Polar 5</b>
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Basis data acquisition	
Nose Boom	
MiRAC-A	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Sun Photometer	
Polar Nephelometer	
2D-S	
CAPS	
PIP	
Drop Sondes	6 launched, 1 had no GPS

Table S5.1: Instrument status as reported after the flight for all instruments on Polar 5.

Comments:

- Inverter problems in the beginning
- Radar needed 8 restarts of the software
- One drop sonde had no GPS signal
- Hawk did not measure properly

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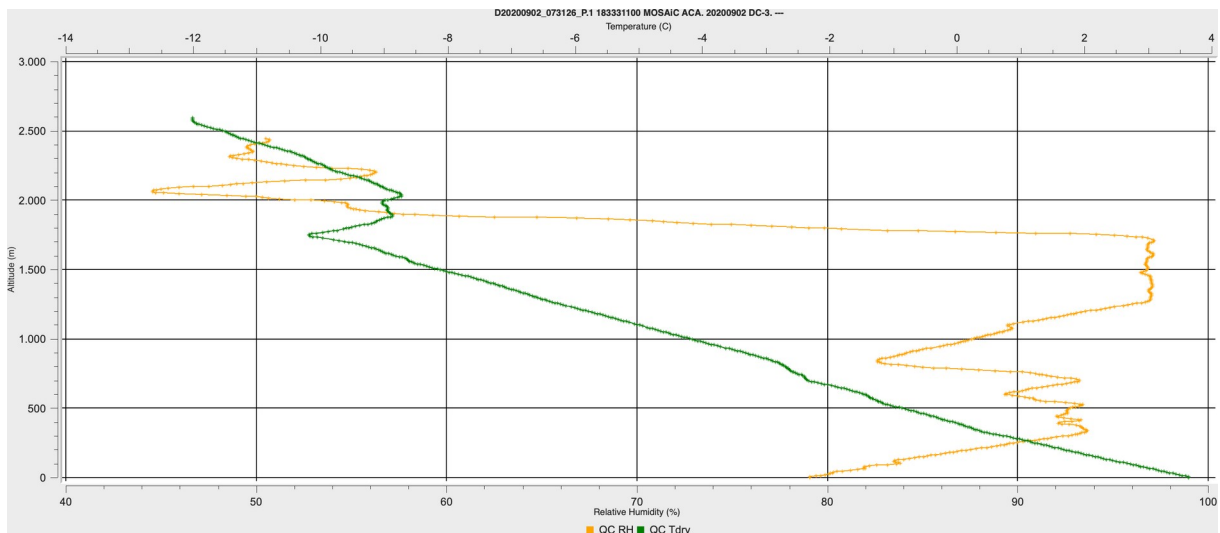
**Detailed Flight Logs:**

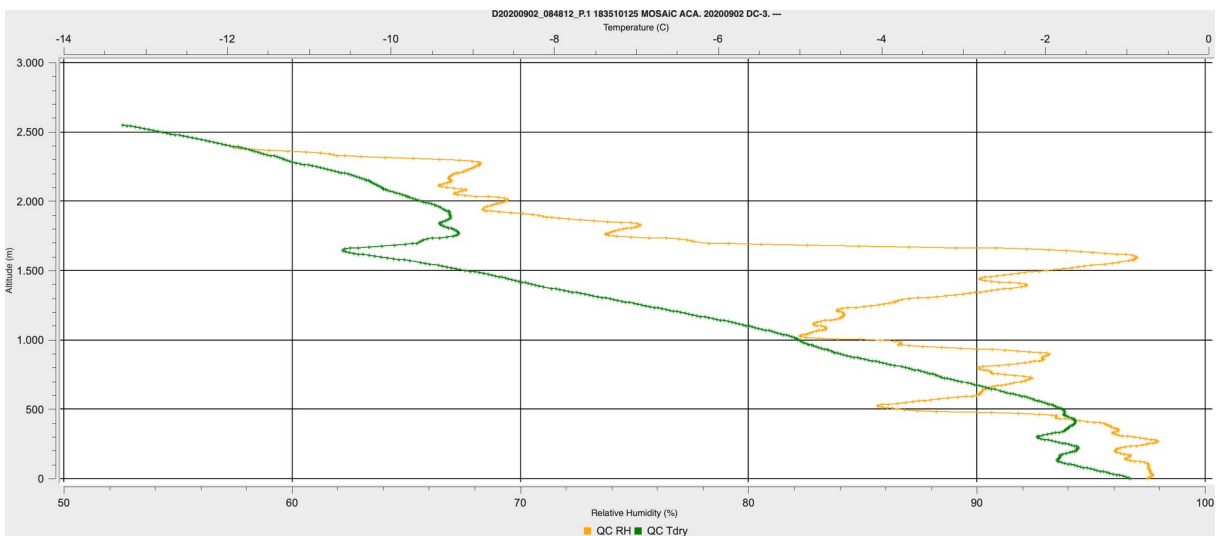
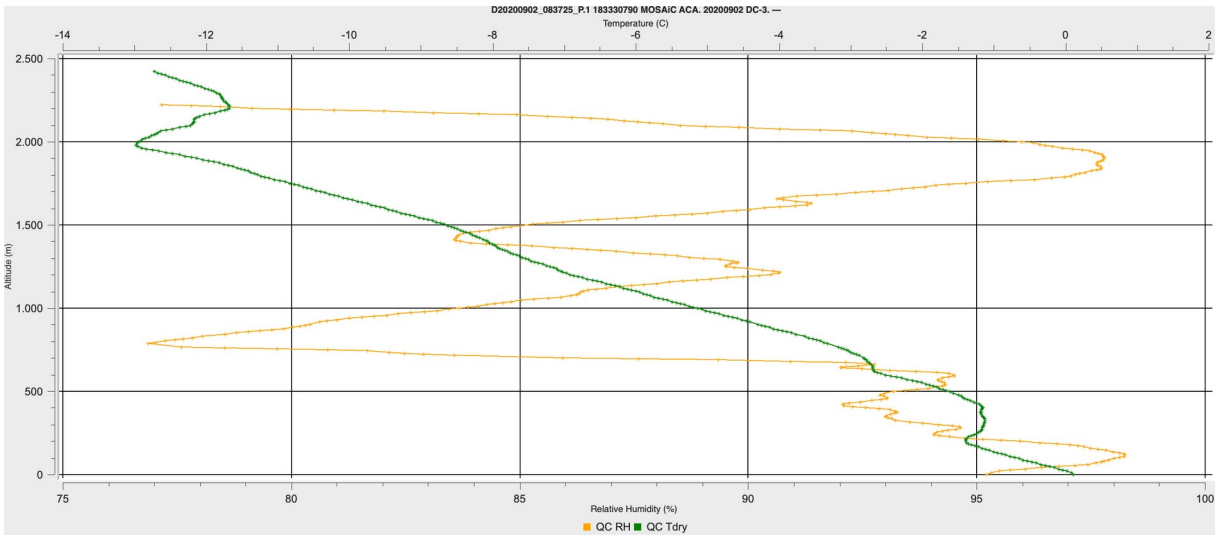
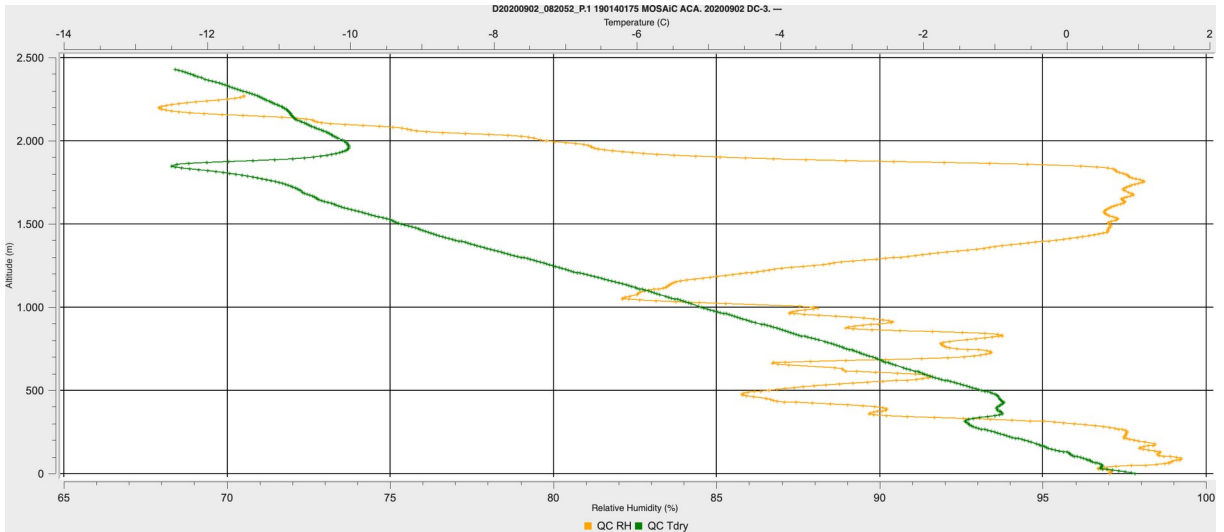
6:52 taxi  
6:55 take off  
7:07 at 10000 ft, clouds above  
7:18 Isfjord ice free  
7:31 DS1 launched  
7:42 precipitation in radar  
7:57 reached W1  
7:58 start of radiation square  
8:08 radiation square done  
8:20 DS2 launched  
8:30 no precipitation anymore  
8:37 DS3 but without GPS  
8:39 in cloud at 10000 ft  
8:42 left cloud  
8:43 clouds to ground  
8:48 DS4  
8:54 W2 → start descend after turn to 200 ft with 1000 ft/min  
8:59 cloud top at 5400 ft  
9:04 leg at 200 ft from W3 to W2  
9:13 leg at 1000 ft  
9:22 leg at 2000 ft  
9:30 leg at 4200 ft in lowest part of cloud

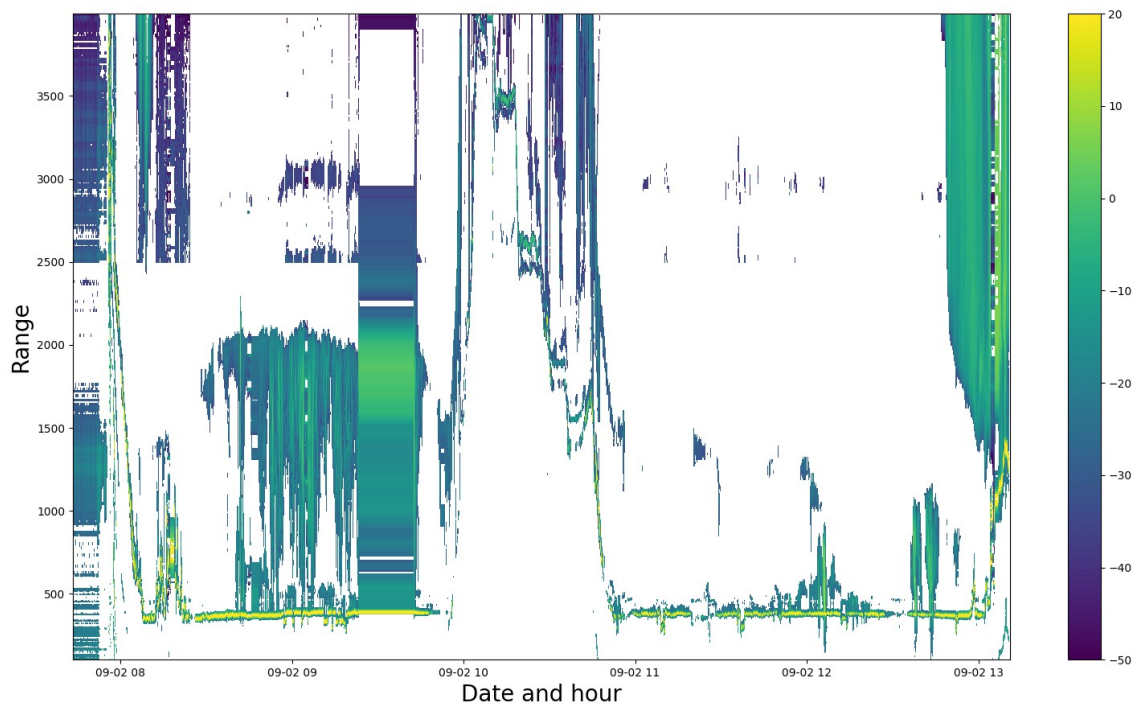
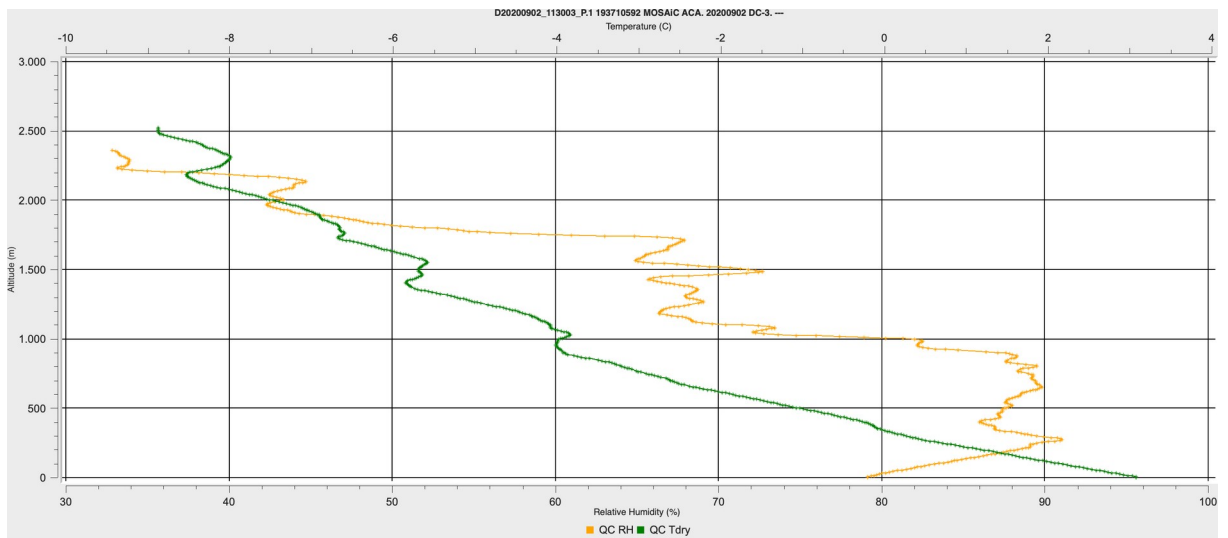
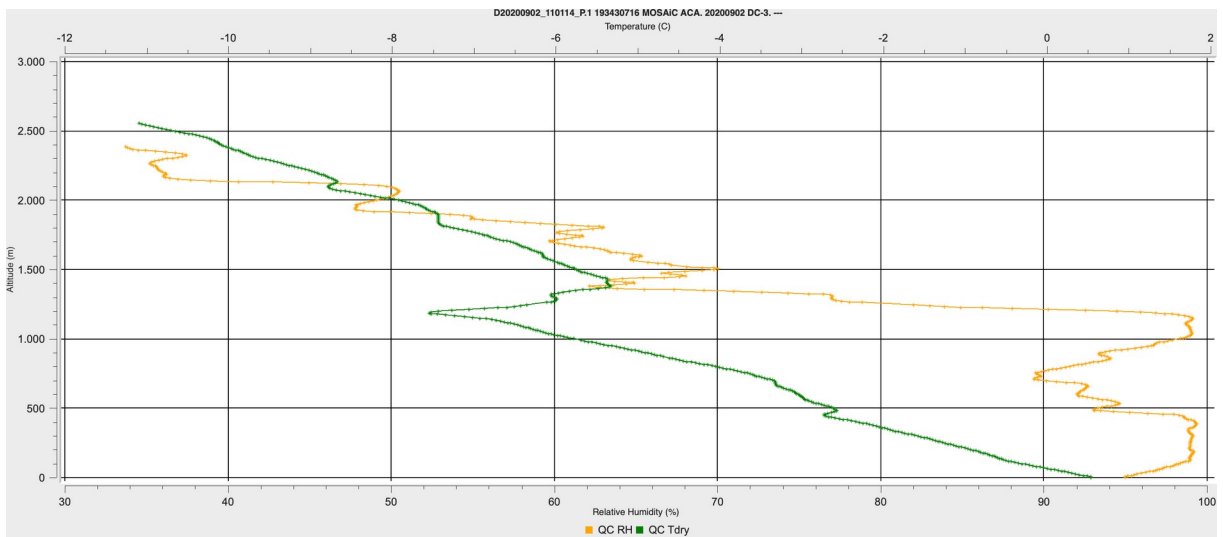
9:39 leg at 5400 ft in upper part of cloud → down to 5200 ft since tops decrease  
 9:44 climb to 10000 ft  
 9:58 starting noseboom calibration against the wind  
 10:08 reverse course to fly with the wind  
 10:11 reverse leg start  
 10:27 starting cross leg  
 10:39 and reverse leg  
 10:47 end noseboom  
 10:53 towards W4 at 10000 ft  
 11:01 DS5  
 11:28 over clear ocean → starting radiometer “calibration”  
 11:29 DS6  
 11:32 end clear sky  
 11:42 clouds in 10000 ft over Ny-Alesund visible  
 11:46 melting layer in 1200 ft  
 11:52 turn at W4 on leg over Ny-Alesund → stay in cloud, since top too high  
 11:59 over AWIPEV  
 12:03 W5 → start descent to Longyearbyen  
 12:23 touch down

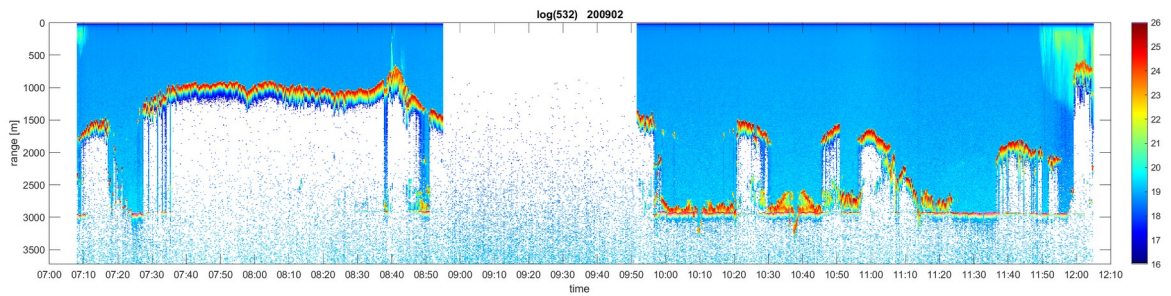
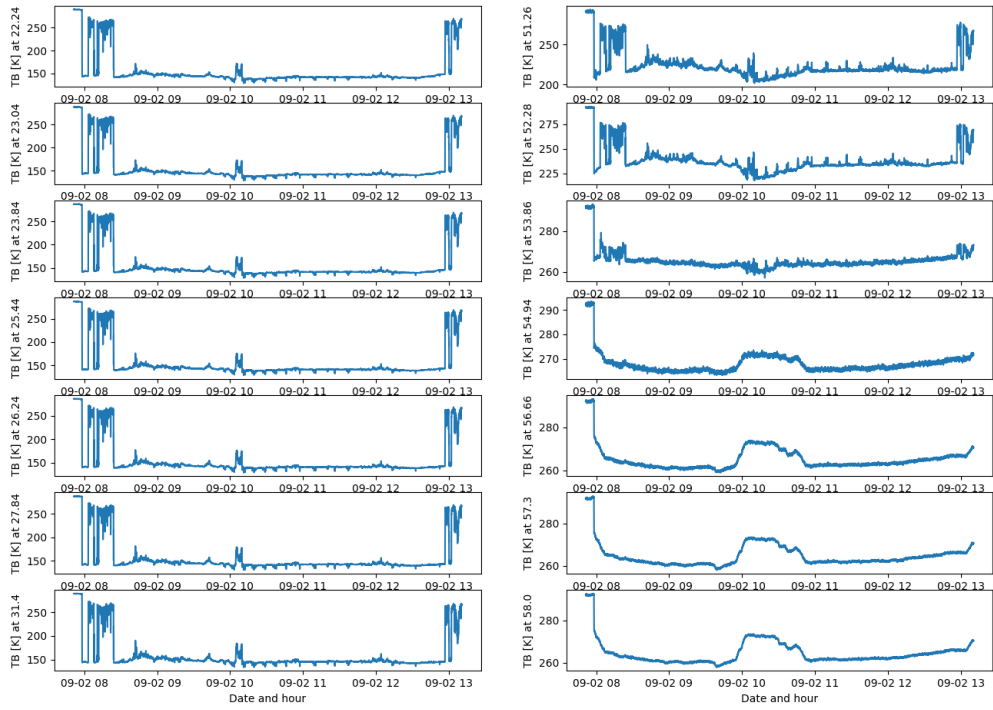
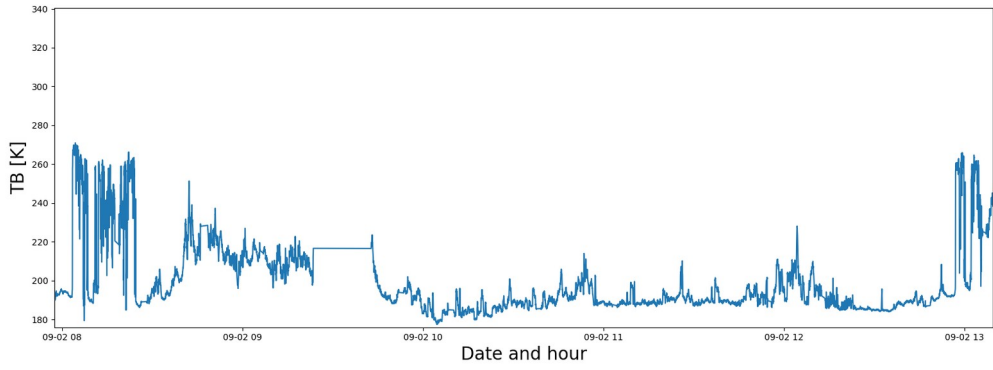
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## Quicklooks:









Quicklook: PMS - DLR 2020-09-02

