ACLOUD Flight #19 – Polar 5 – 170617

Mission PI: Manfred Wendisch

Objectives: Measure cloud properties by in situ and remote sensing techniques above sea ice, in the transition zone between sea ice and open water and over sea. We had mostly too layers, one low-level cloud and another mid-level cloud, which we succeeded to observe from above. Above the aircraft there was no cirrus during almost all of the flight.

Crew:

Polar 5	
PI	Manfred Wendisch
Basis Data Acq.	Lukas Kandora
SMART	Elena Ruiz
Eagle/Hawk	Tobias Donth
Mirac	Mario Mech
Amali	Pavel Krobot

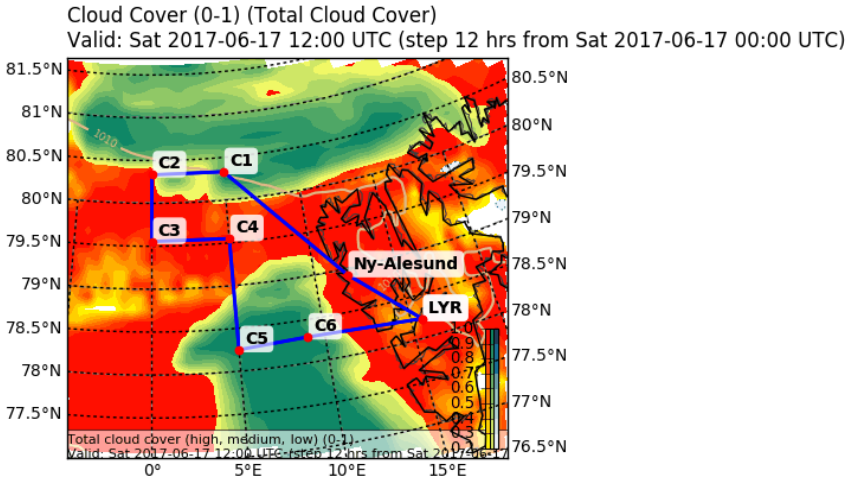
Flight times:

Polar 5	
Take off	09:55 UTC
Touch down	15:25 UTC

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

We had a coordinated flight with both aircraft, P5 and P6. The purpose was to investigate cloud properties developing over sea ice, and to follow their transition to the open sea. The cloud situation was such that we had to fly high above the observed **mid-level** clouds with P5 (we had to use oxygen supply), while P6 sampled the clouds in situ and closely coordinated with P6. The flights went very well, and we collected promising data.

ECMW prediction of clouds—horizontal



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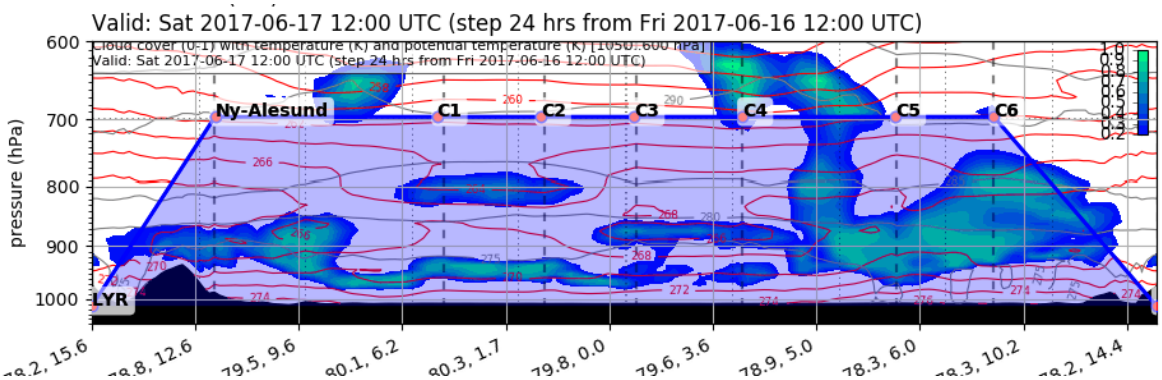
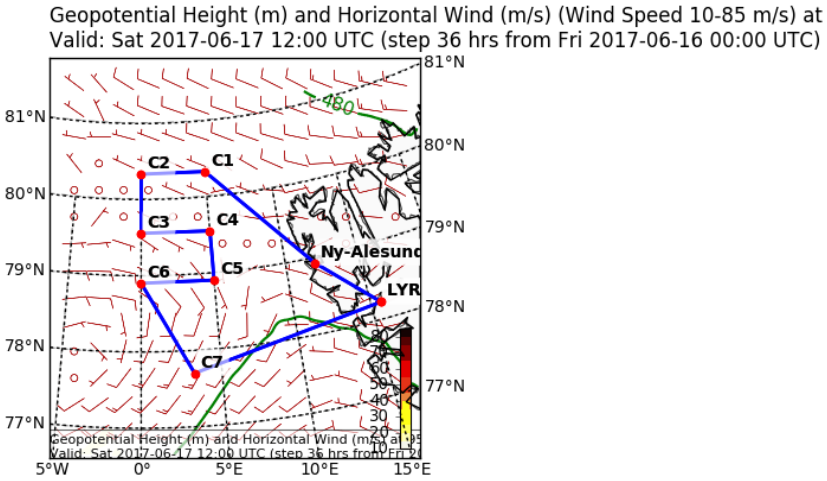
ECMW prediction of clouds—vertical



ECMW prediction of wind 950 hPa



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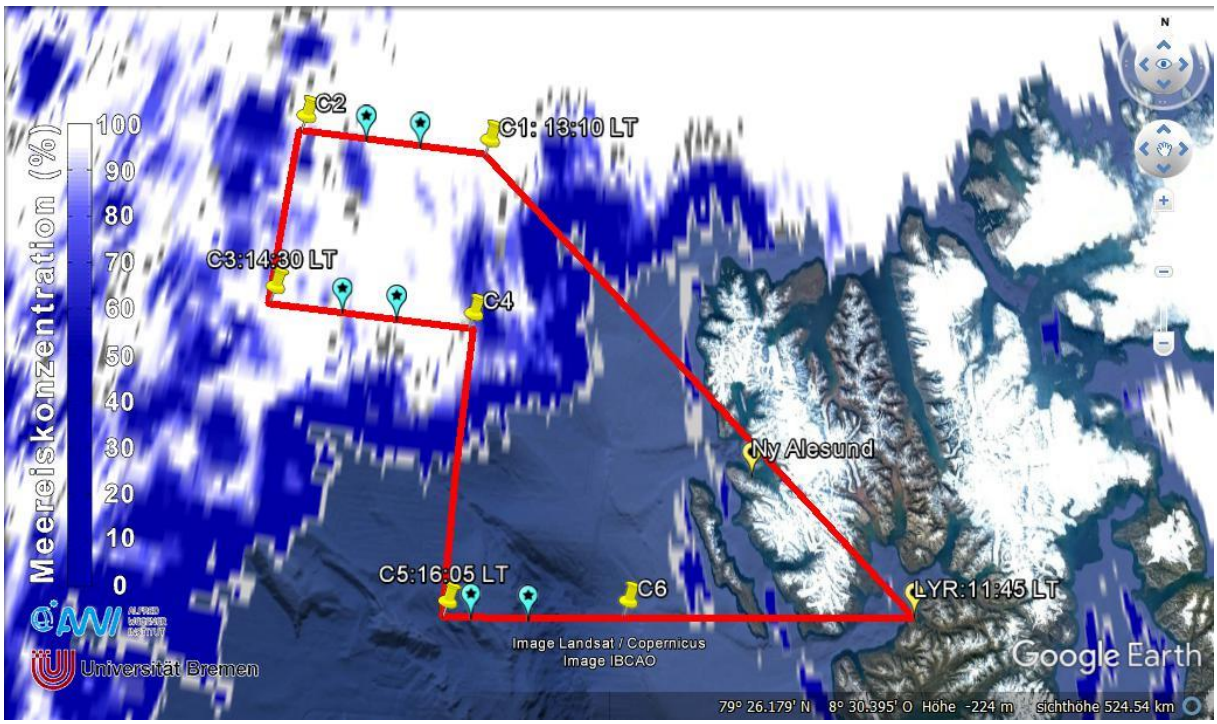
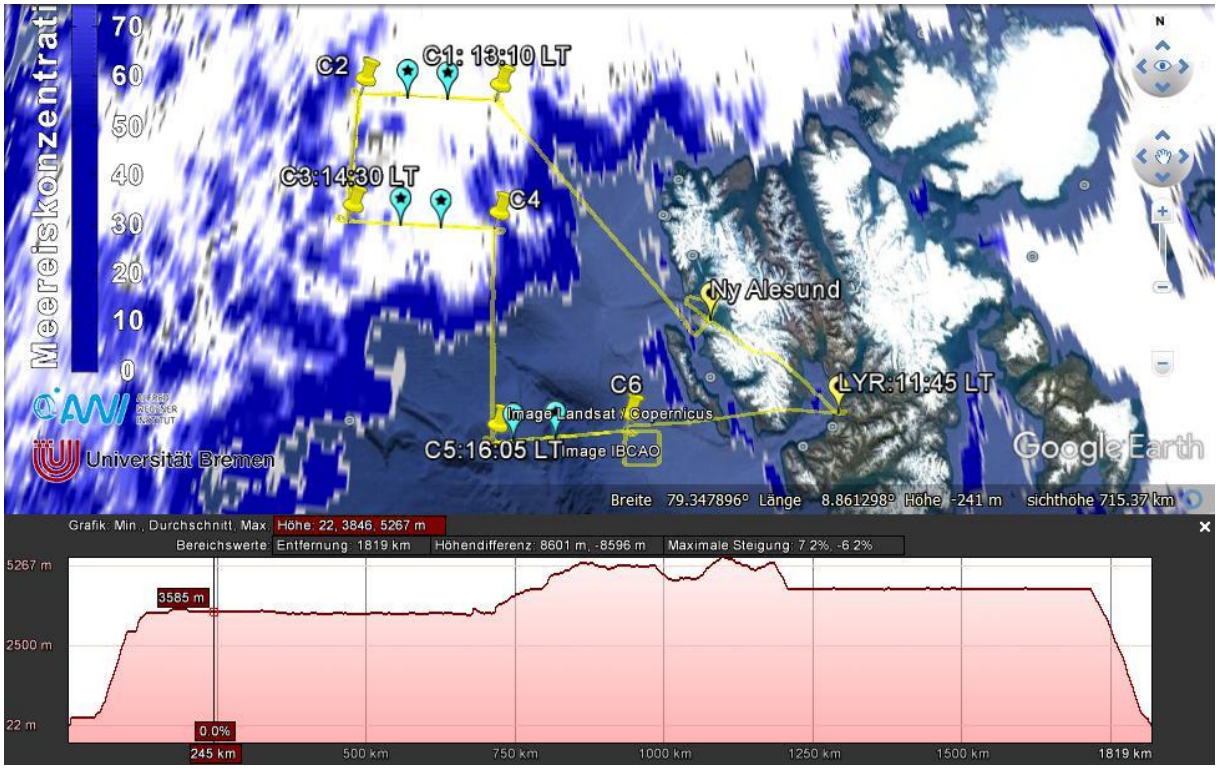
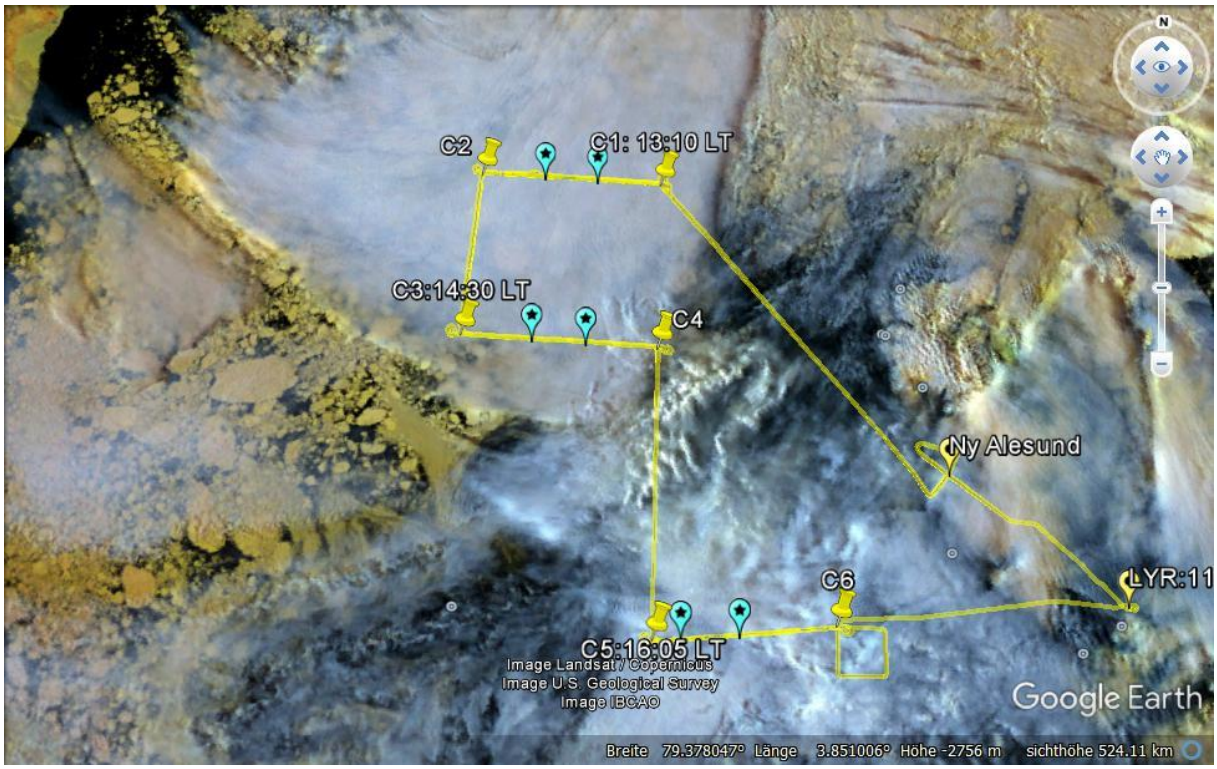
Overview of flight

The plan for the flight is given below. P5 should stay at 10,000 ft all the time. During flight we went up to 17,000 ft because we wanted to get above the cloud. Between C1 and C2, C3 and C4, C5 and C6 we went back and forth (three times) and the P6 sampled the clouds in a collocated way by going back and forth between the green markers.



In reality we flew as follows:





Waypoints:

C1 (13:10 LT)	80° 20' N,	5° 0' E	80.333° N,	5.000° E
C2	80° 20' N,	0° 0' E	80.333° N,	0.000° E
C3 (14:30 LT)	79° 33' N,	0° 0' E	79.550° N,	0.000° E
C4	79° 33' N,	5° 0' E	79.550° N,	5.000° E
C5 (16:05 LT)	78° 15' N,	5° 0' E	78.250° N,	5.000° E
C6	78° 18' N,	9° 0' E	78.300° N,	9.000° E

Detailed Flight Log (all times in UTC)

LYR—NyA—C1 Ascend to 10,000 ft **174 NM @ 160 kn** **65 min**

09:30 Motor on, problems with GPS reported by Lukas

09:52 Taxi

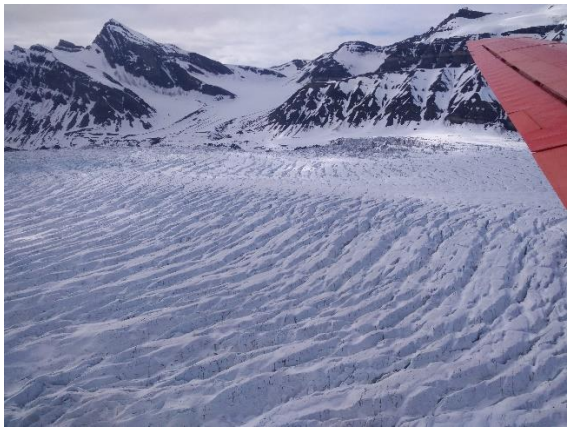
09:55 Take off

Mixed clouds

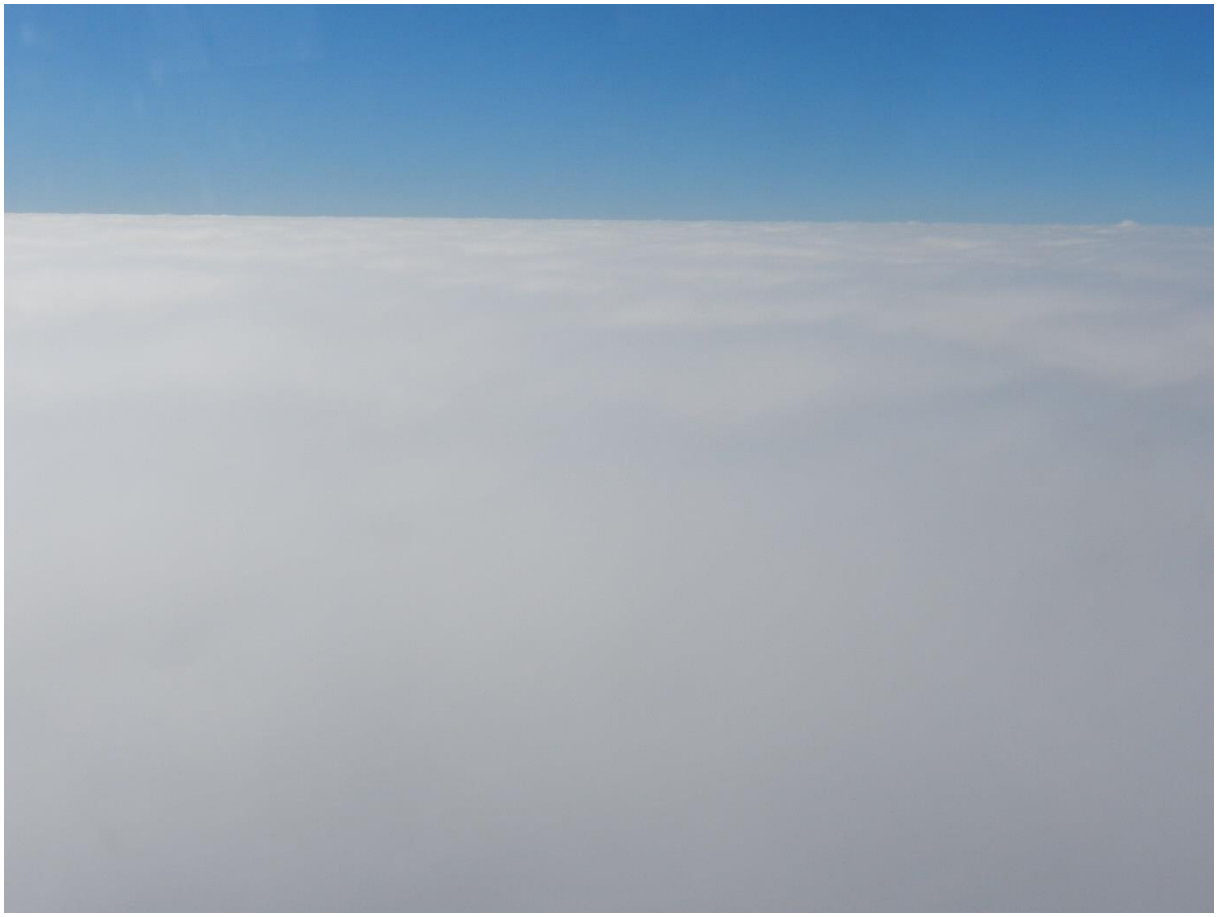
We are heading to the glacier

09:58 We are below a cloud, Wale on left side

10:05 We fly over the glacier



10:13 7000 ft, we ascend further, low-level cloud below, also mid-level cloud
10:16 9000 ft
10:18 10,000 ft
10:22 11,500 ft, we are above a mid-level cloud, no cirrus above
10:24 12,000 ft
10:25 We cross Ny Ålesund and do the cross pattern
10:35 Heading North to C1, 12,200 ft, 150 kn
10:44 Very nice cloud cover below



10:53 Clouds actually change, we cross the ice edge, we still stay at 12,200 ft
11:12 Thick clouds beneath us, still at 12,000 ft
11:20 We reach C1, dropsonde **DS1** launched

C1—C2 3 times, back & forth **50 NM @ 150 kn** **60 min**

All the time a thick cloud below us, no cirrus above, we fly in 12,000 ft

11:19-11:28 First leg: C1 → C2
11:41-12:00 Second leg: C2 → C1
12:02-12:22 Third leg: C1 → C2

C2—C3 **46 NM @ 150 kn** **20 min**

12:25 We climb to 13,000 ft, because we want to be above cloud
12:38 We arrive at C3, drop sonde **DS2**

C3—C4 3 times, back & forth **54 NM @ 150 kn** **60 min**

We go much higher, > 17,000 ft, we use oxygen mask, see glory, we are always 100 m above cloud top (radar)

12:39-12:53	First leg:	C3 → C4
12:55-13:13	Second leg:	C4 → C3
13:15-13:30	Third leg:	C3 → C4

C4—C5	**78 NM @ 150 kn**	**32 min**

13:38 Begin our way to C5

13:42 We cross the ice edge, clouds seem different after crossing the ice edge, we are at 14,500 ft to be 100 m above cloud

13:54 We reach C5 at 14,500 ft

C5—C6	3 times, back & forth	**49 NM @ 150 kn**	**60 min**

13:51-14:08	First leg:	C5 → C6	nice glory

14:10-14:28	Second leg:	C6 → C5	14:23 **DS3** released
14:30-14:44	Third leg:	C5 → C6	14:40 **DS4** released
14:45	We reach C6		

C6—LYR **81 NM @ 160 kn** **30 min**

15:03	**DS5** released
15:08	Start descending
15:25	Touch down
15:28	End taxi

Instrument Status

Polar 5	
Basis data acquisition	
Nose Boom	
MiRAC	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Sun Photometer	
Drop Sondes	5 launched

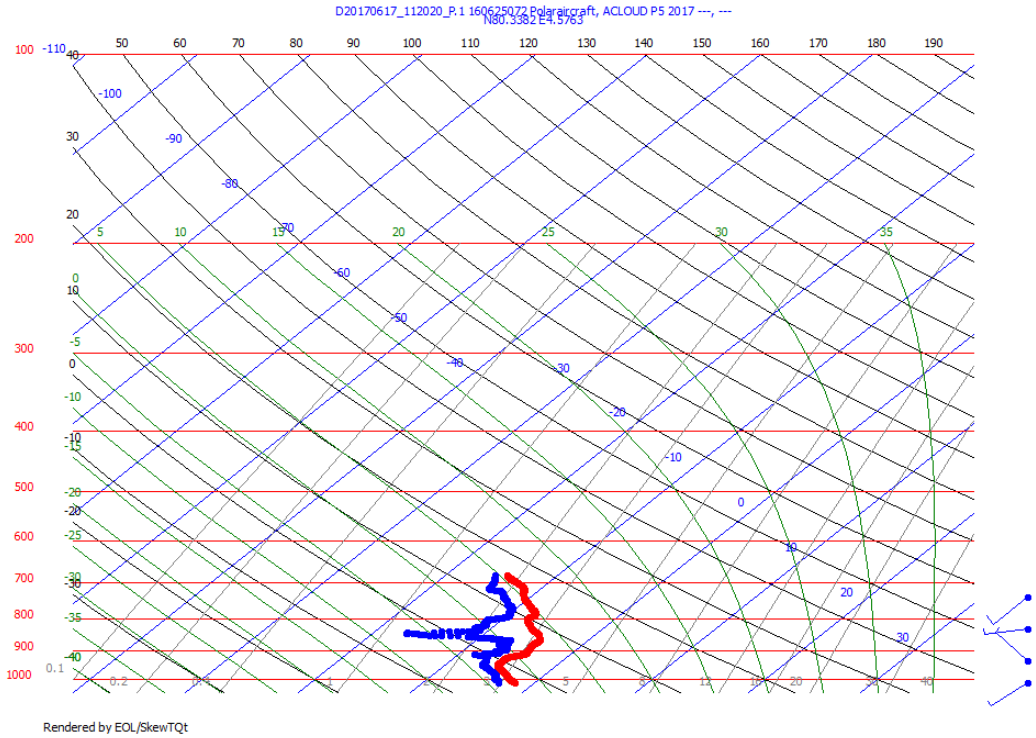
Comments

- Thanks to the crew!

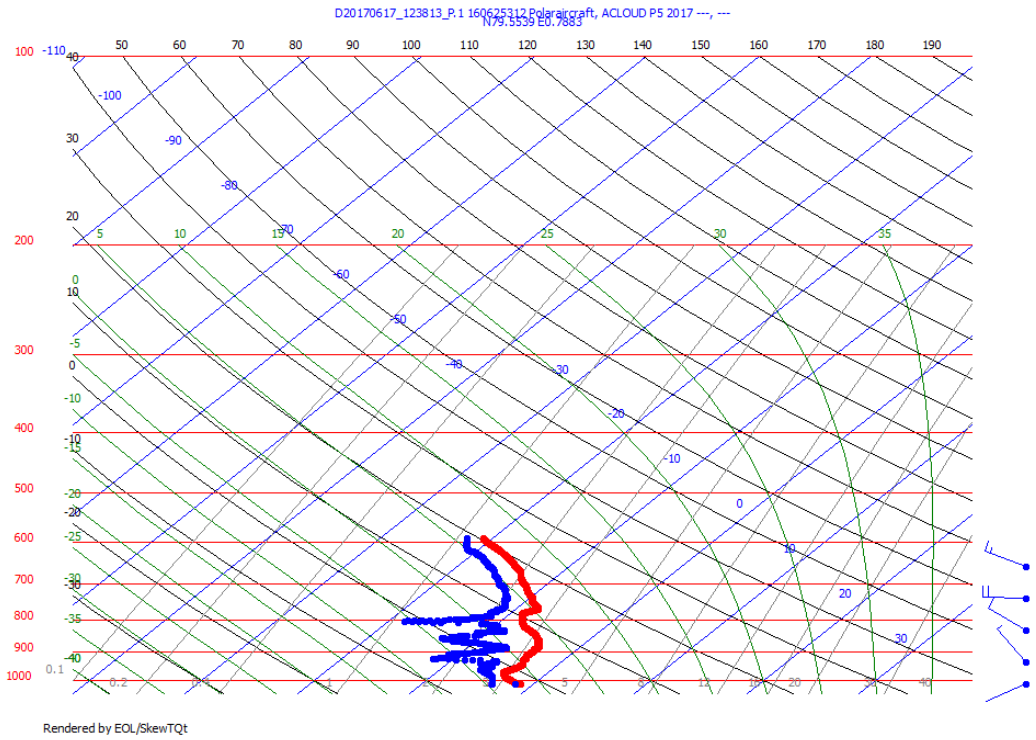
Quicklooks

Drop Sondes

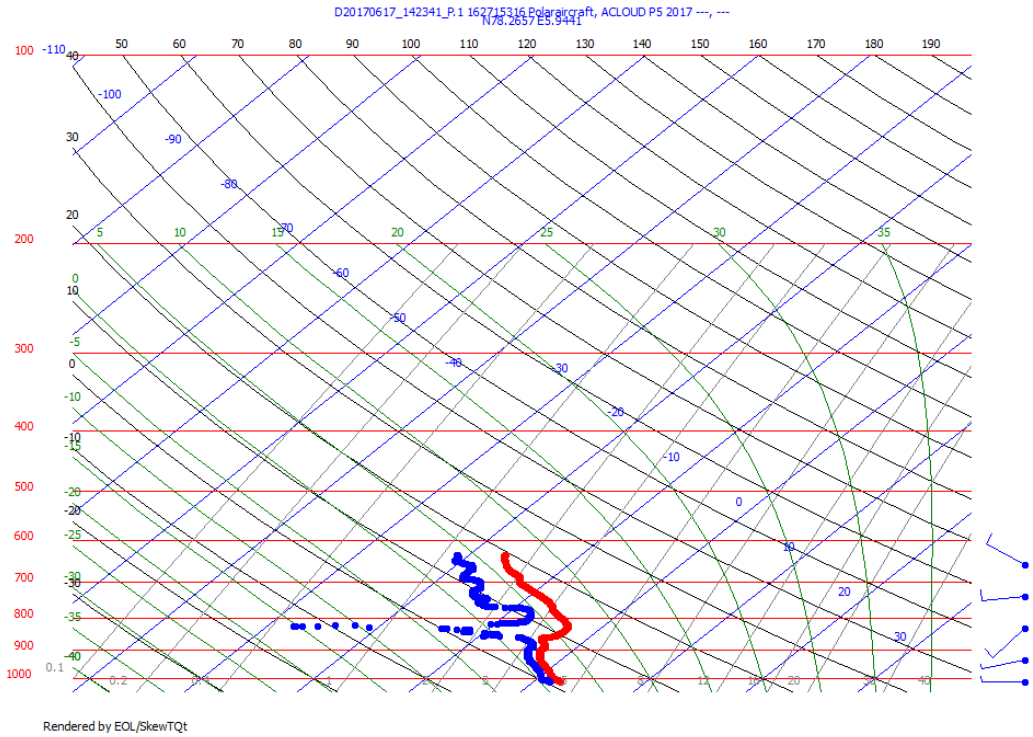
First dropsonde (DS1): 11:20 UTC



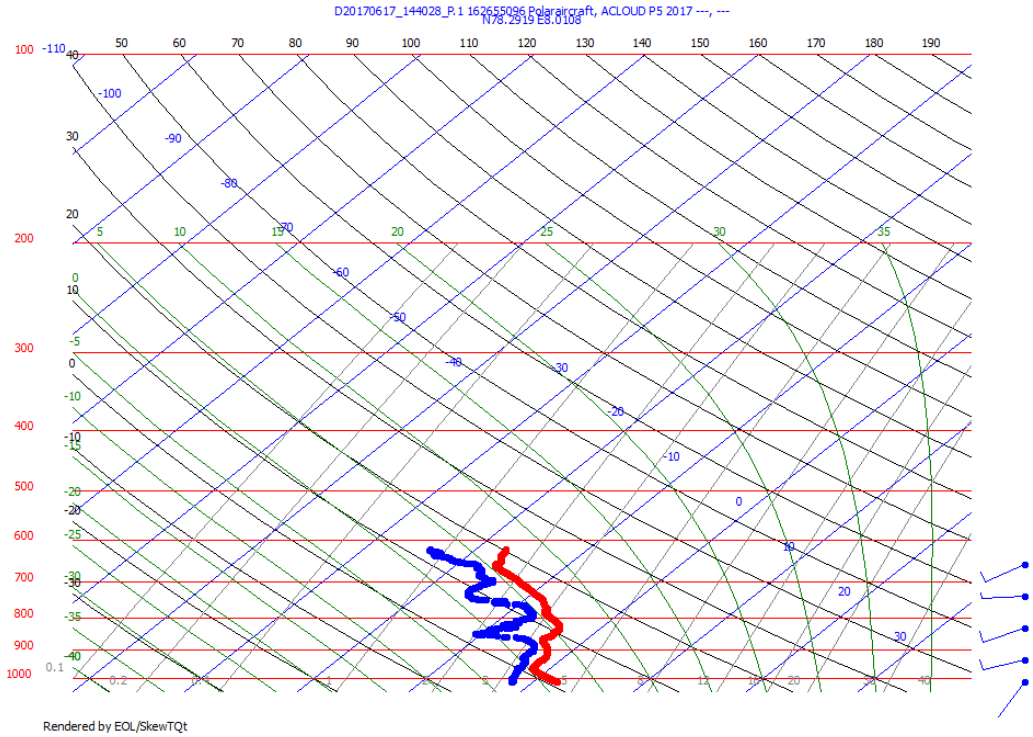
Second dropsonde (DS2): 12:38 UTC



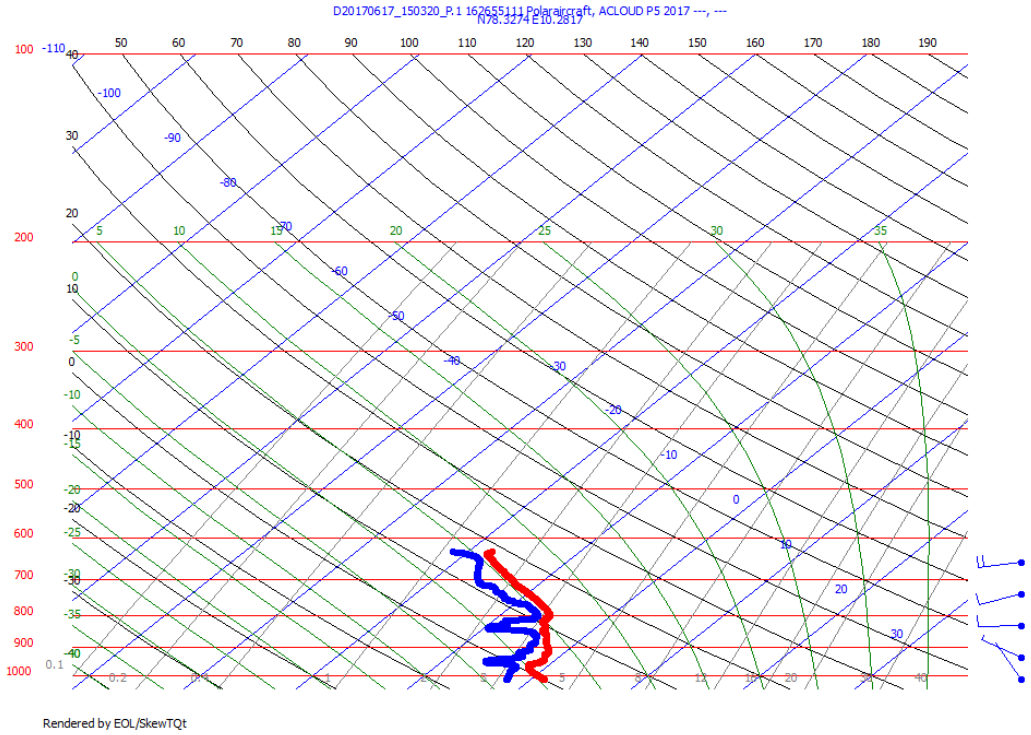
Third dropsonde (DS3): 14:23 UTC



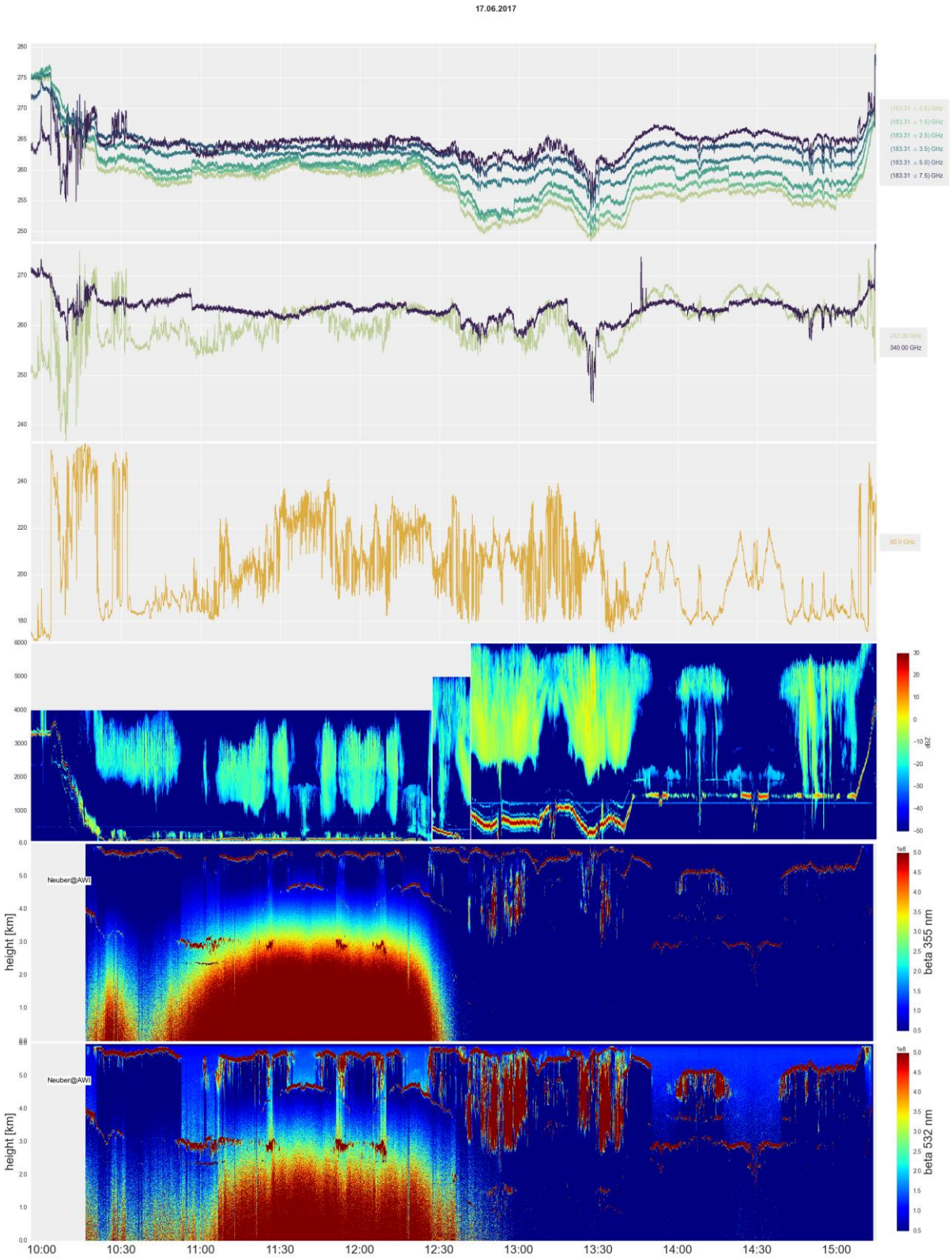
Fourth dropsonde (DS4): 14:40 UTC



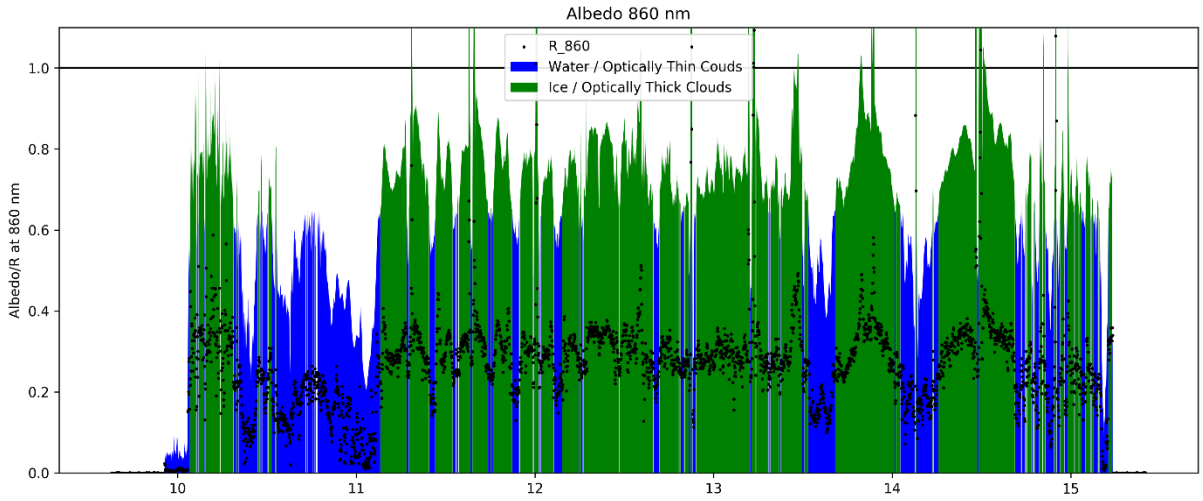
Fifth dropsonde (DS5): 15:03 UTC



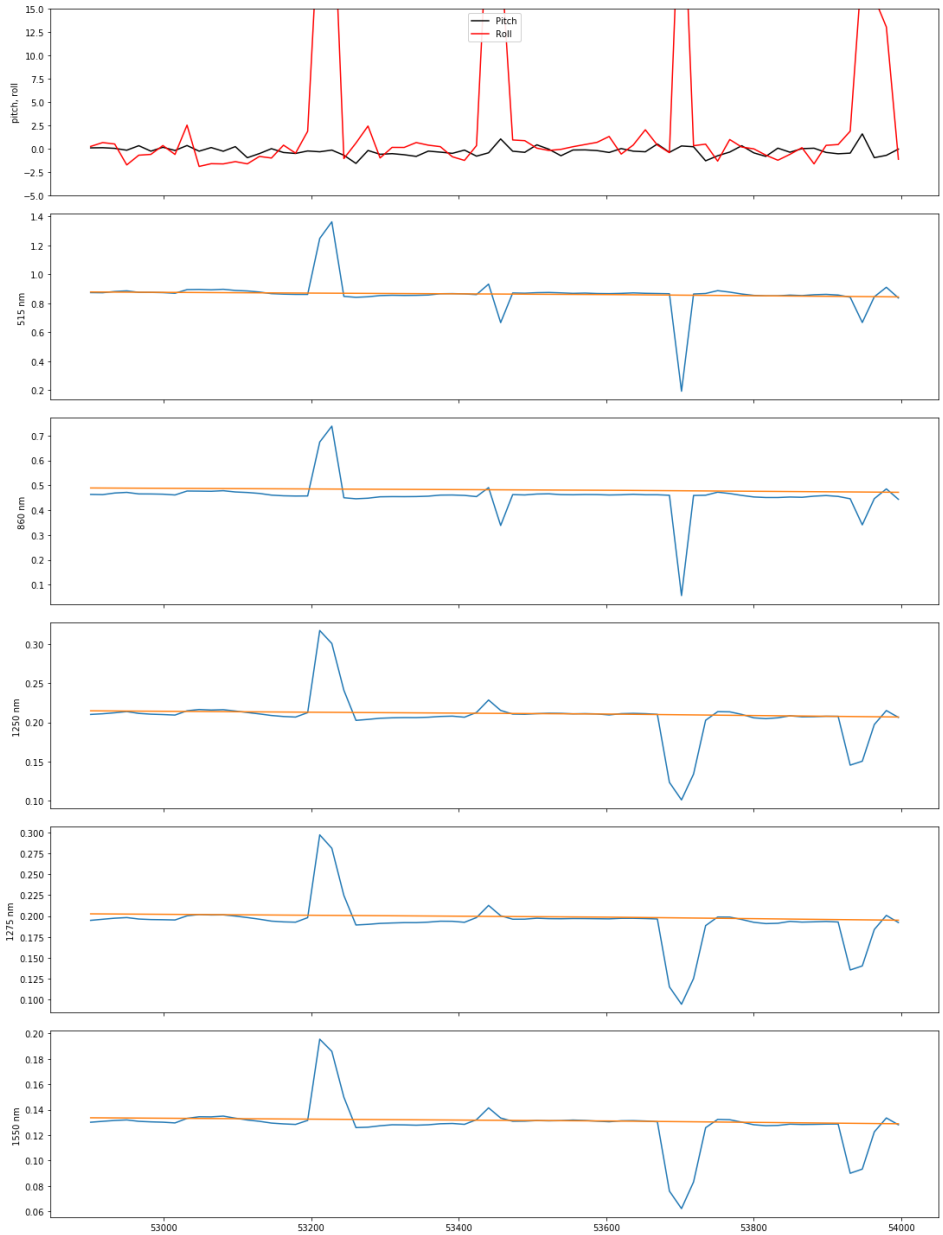
MIRAC & AMALI


17.06.2017
(183.31 ± 1.5) GHz
(183.31 ± 2.5) GHz
(183.31 ± 3.5) GHz
(183.31 ± 5.0) GHz
(183.31 ± 7.5) GHz
340.00 GHz
90.0 GHz
dBZ
Neuber@AWI
height [km]
beta 355 nm
beta 532 nm
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00

SMART

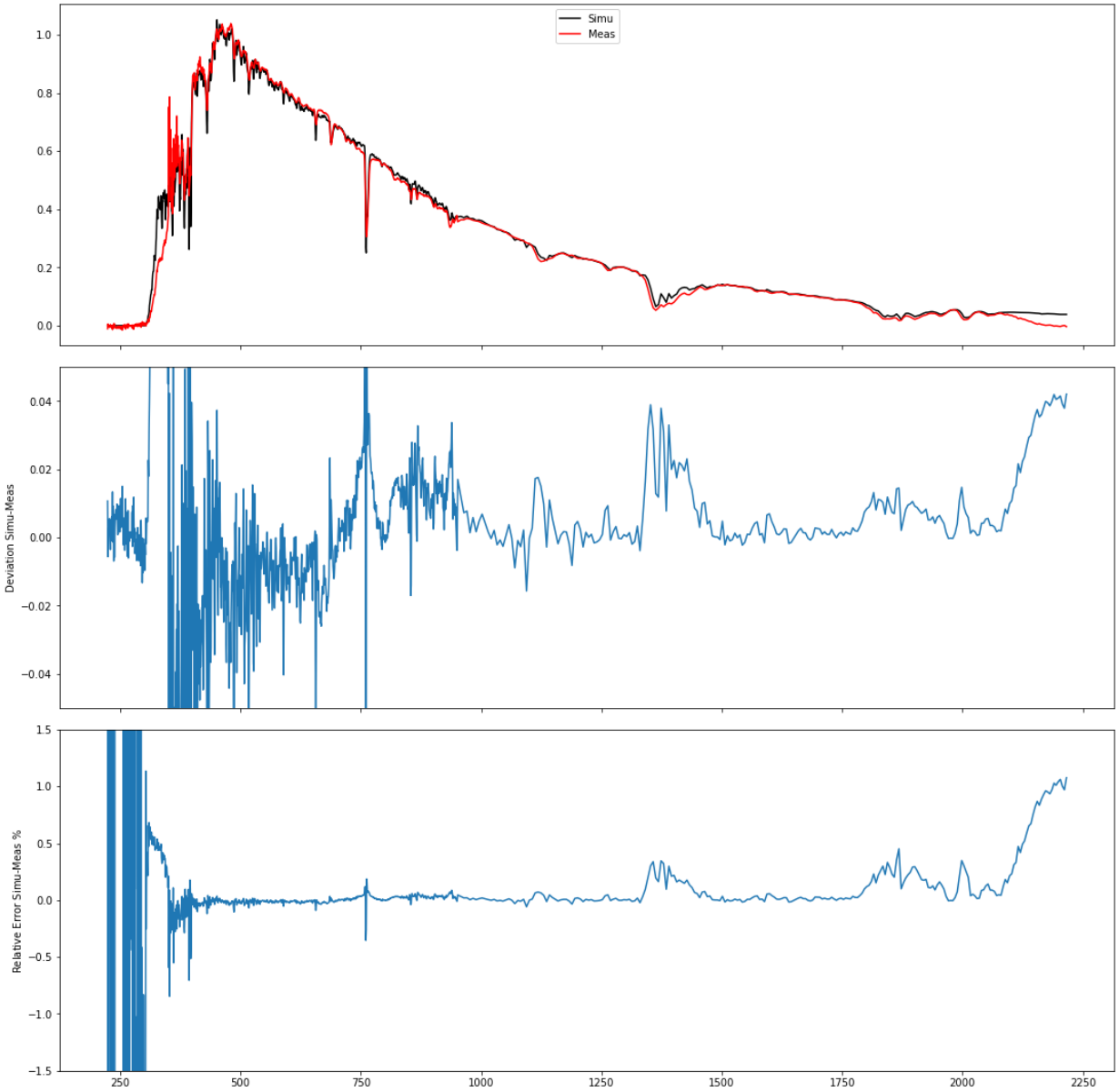


Radiation square: spectral data (including horizontal stabilization), red line is simulation



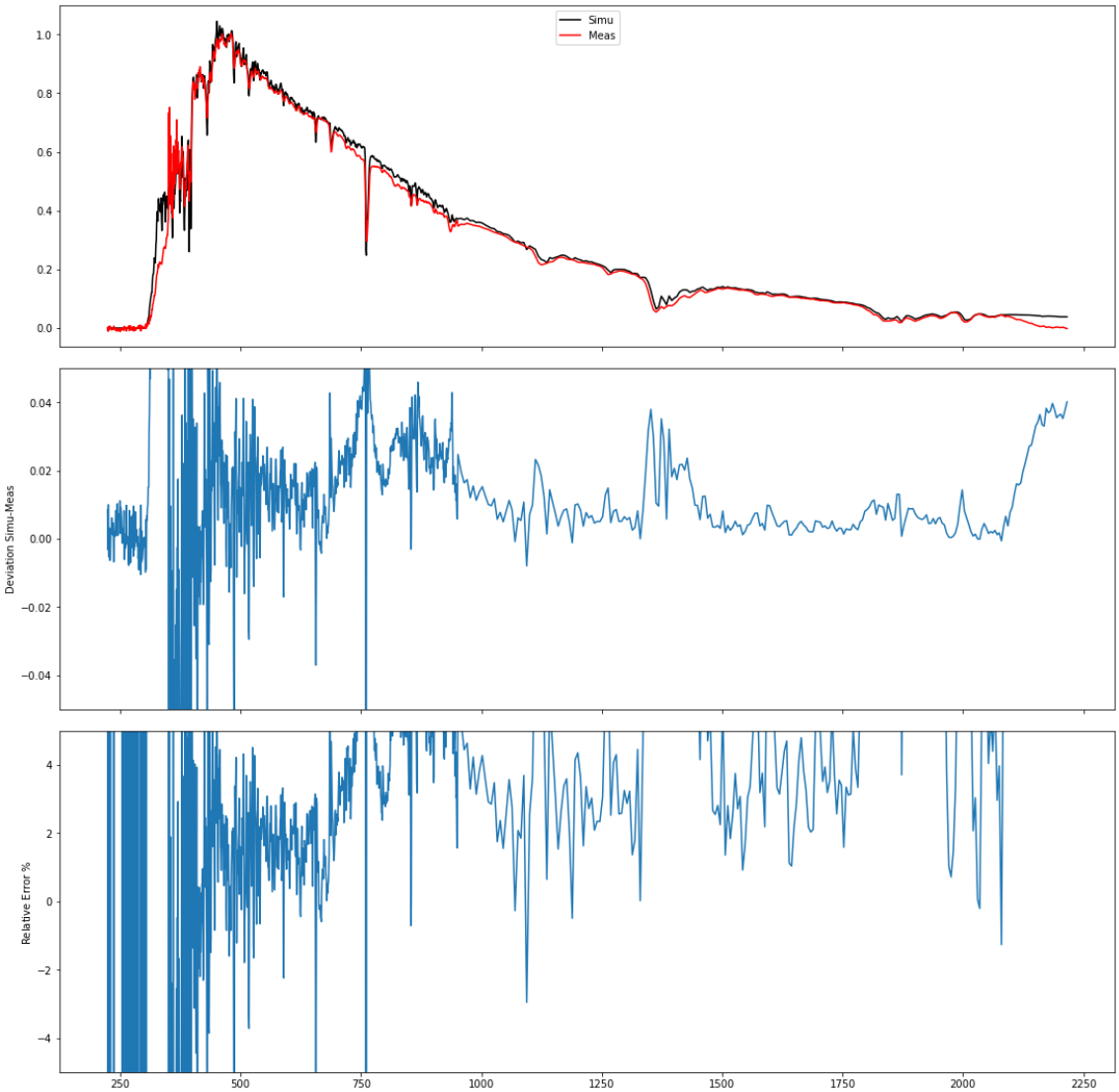
SMART

Spectral comparison, example 1



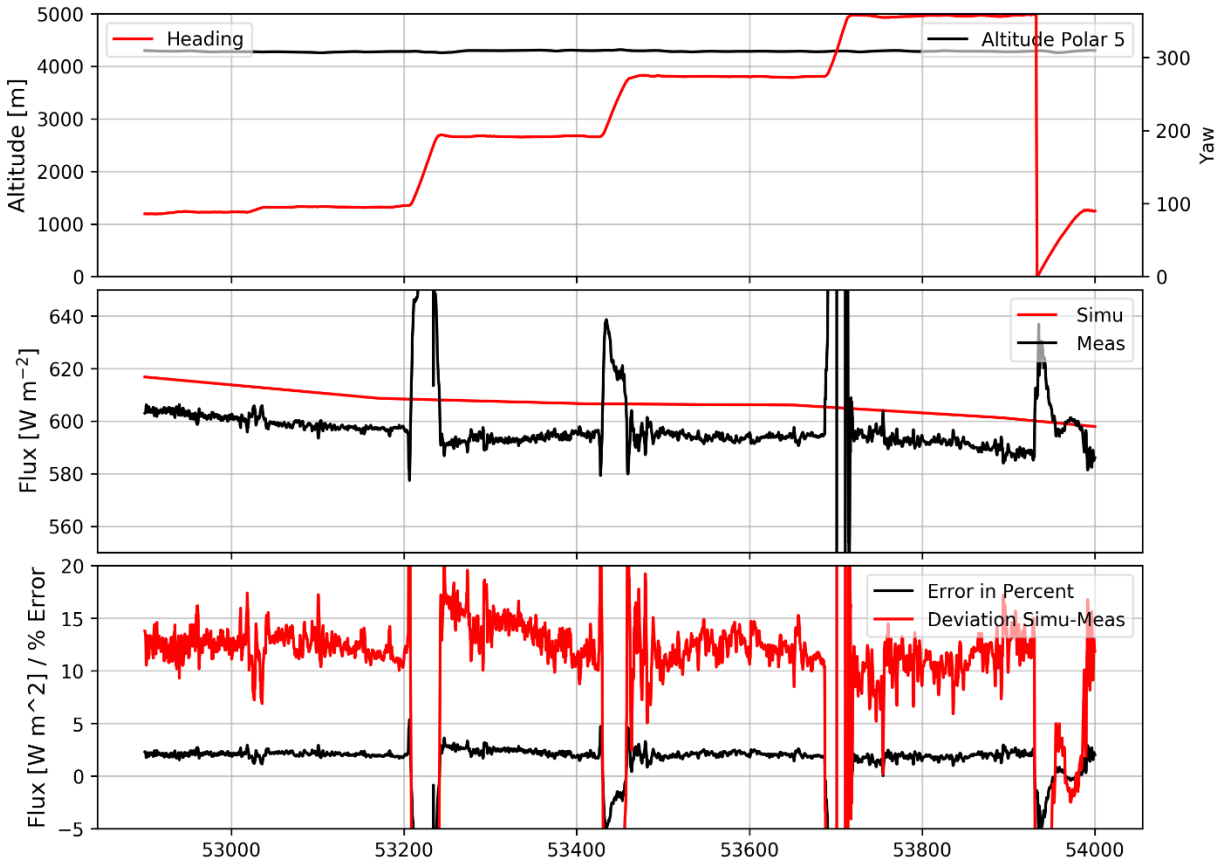
SMART

Spectral comparison, example 2

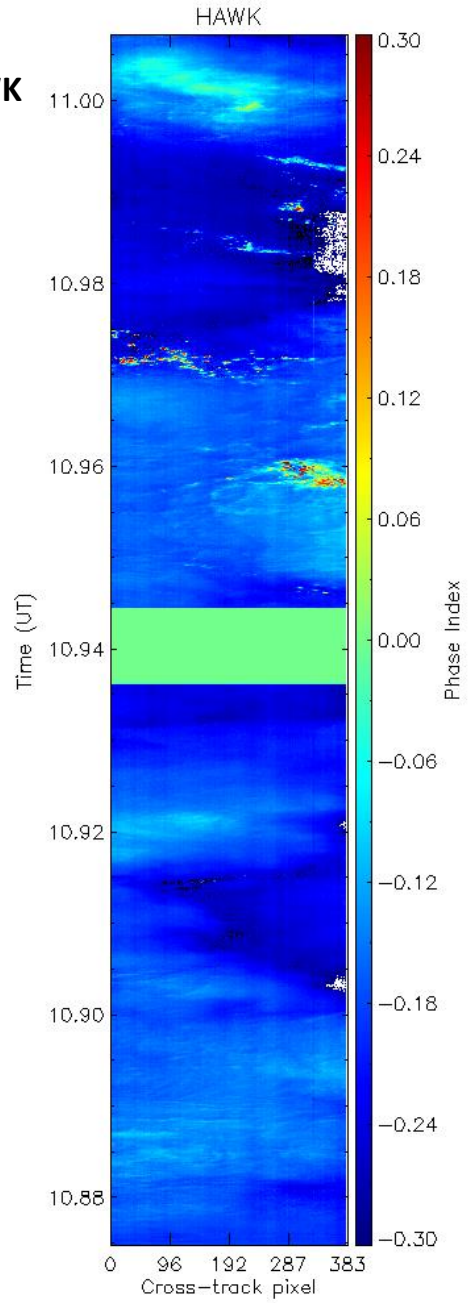


SMART

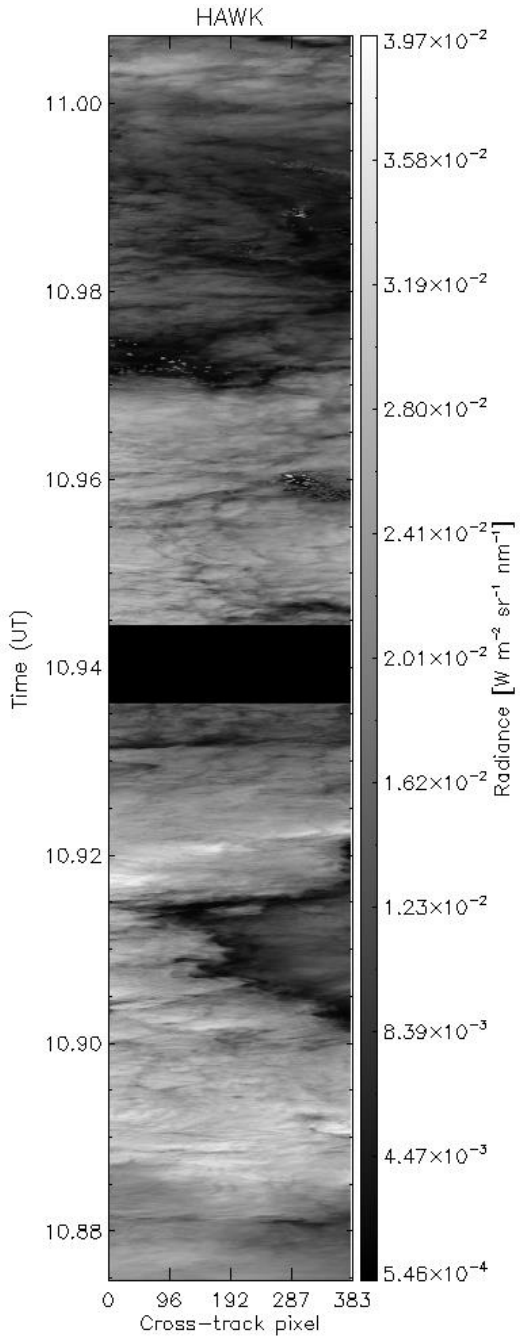
Broadband measurements (during radiation triangle) after pitch and roll correction, including offset correction



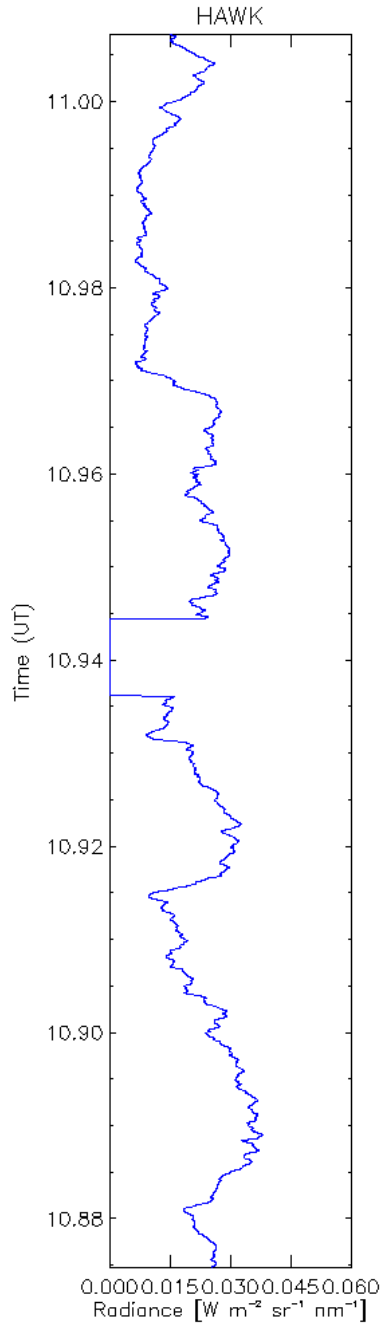
HAWK



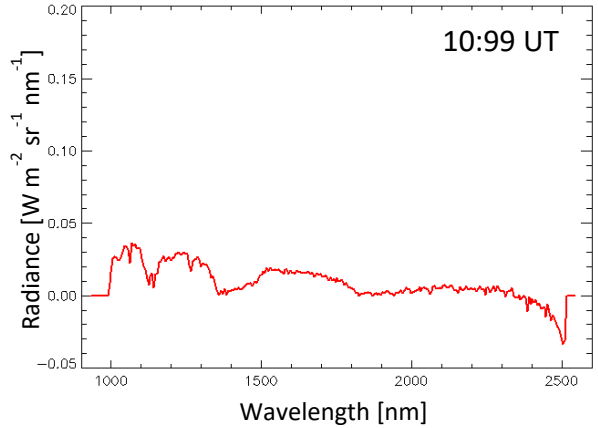
Phase index

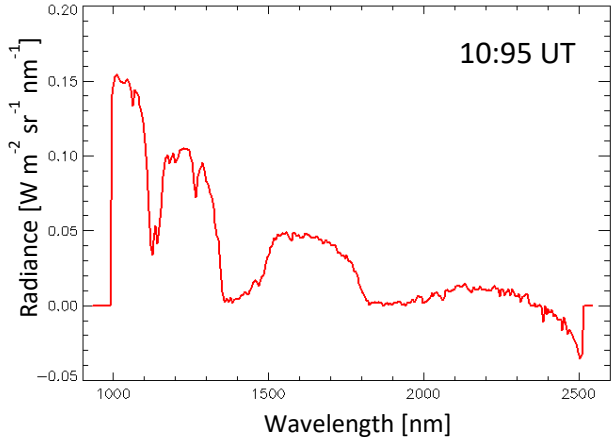


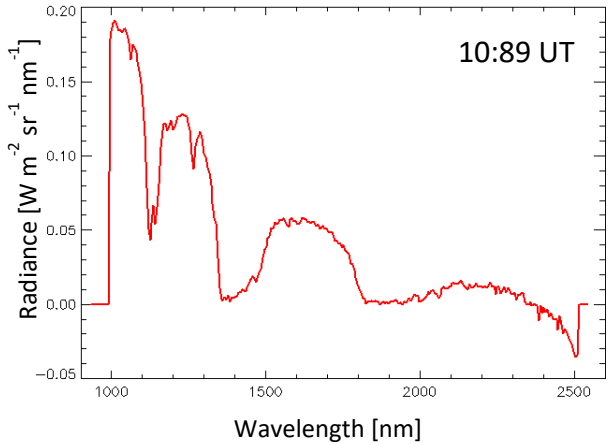
Radiance @ 500 nm



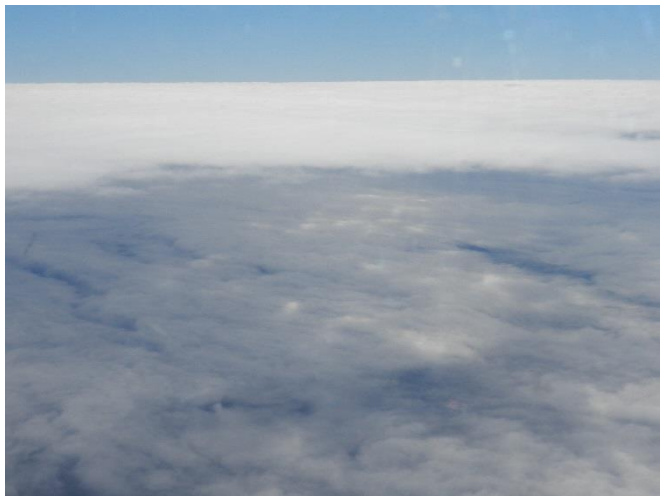
Cross-track averaged along-track radiance

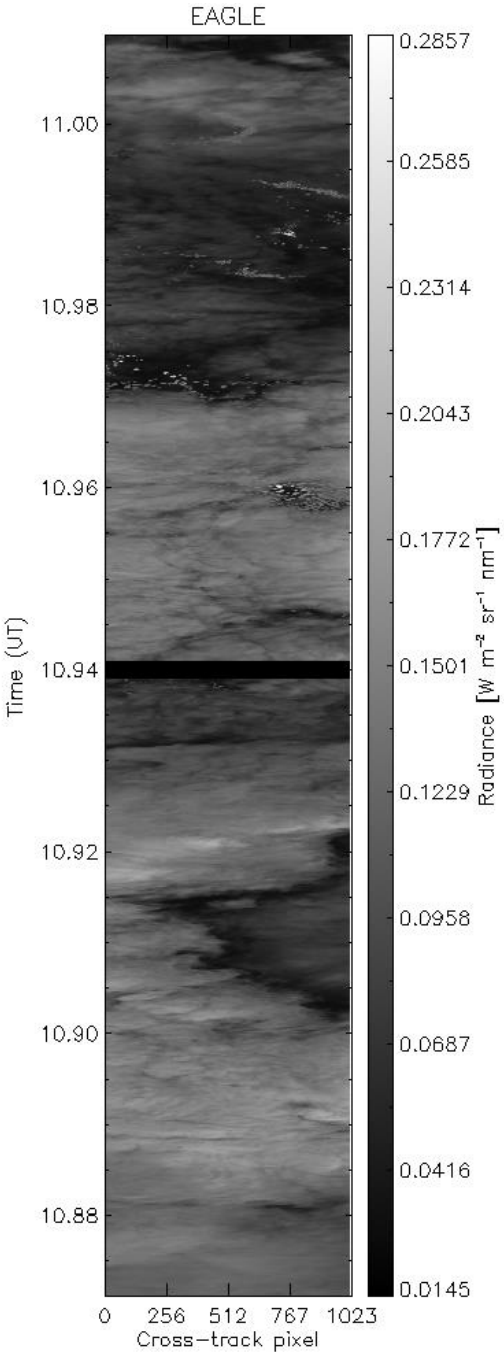




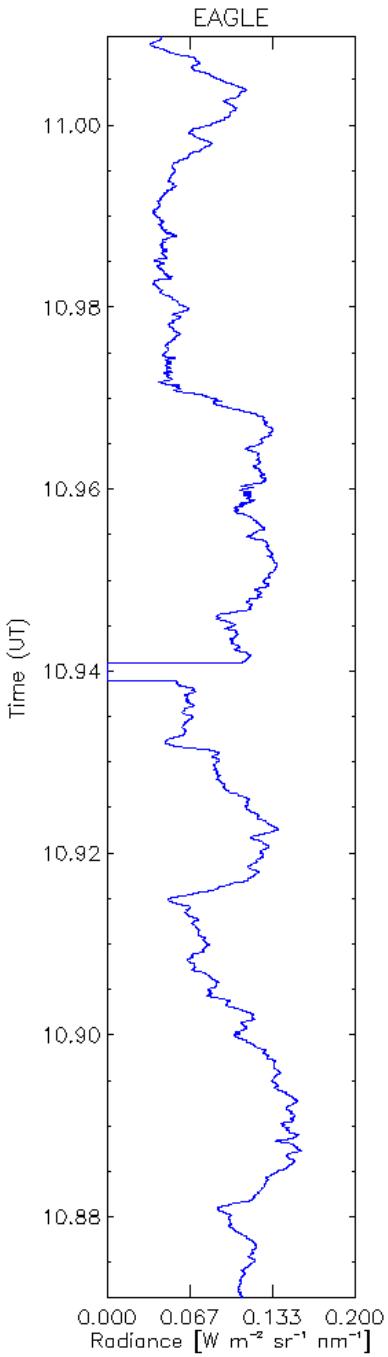


EAGLE





Radiance @ 500 nm



Cross-track averaged along-track radiance