

ACLOUD Flight #05 – Polar 5 – 170525

Mission PI P5: André Ehrlich

Objectives: Remote sensing of clouds in different regimes and different surfaces (sea ice/open ocean) within a weak cold air outbreak.

Crew:

Polar 5	
PI	André Ehrlich
Basis Data Acq.	Christoph Petersen
SMART	Michael Schäfer
Eagle/Hawk	Elena Ruiz
MiRAC	Mario Mech
AMALi	Nomokonova

Flight times:

Polar 5	
Take off	08:18 UTC
Touch down	12:40 UTC

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

The weather situation was very similar as predicted. A low pressure system north east of Svalbard caused a northerly flow of relative cold air masses. This airmass was channeled west of Svalbard. The island itself disturbed the flow and affected the cloud cover. Over Svalbard almost no low level clouds were present. Only tiny cloud even with light precipitation we could observe before take-off over the Isfjorden. The predicted cirrus was widespread over Svalbard but did only affect the measurements in the eastern and north-easterly part. West of the island low level clouds were present with different cloud cover. Higher cloud cover was observed with increasing distance to the sea ice edge. Over sea ice thin cloud layers and cloud streets were generated by the open leads. One cloud field close to waypoint C2 over dense sea ice showed a different characteristics. Here the clouds occurred more dense and homogeneous, with a very smooth cloud top.

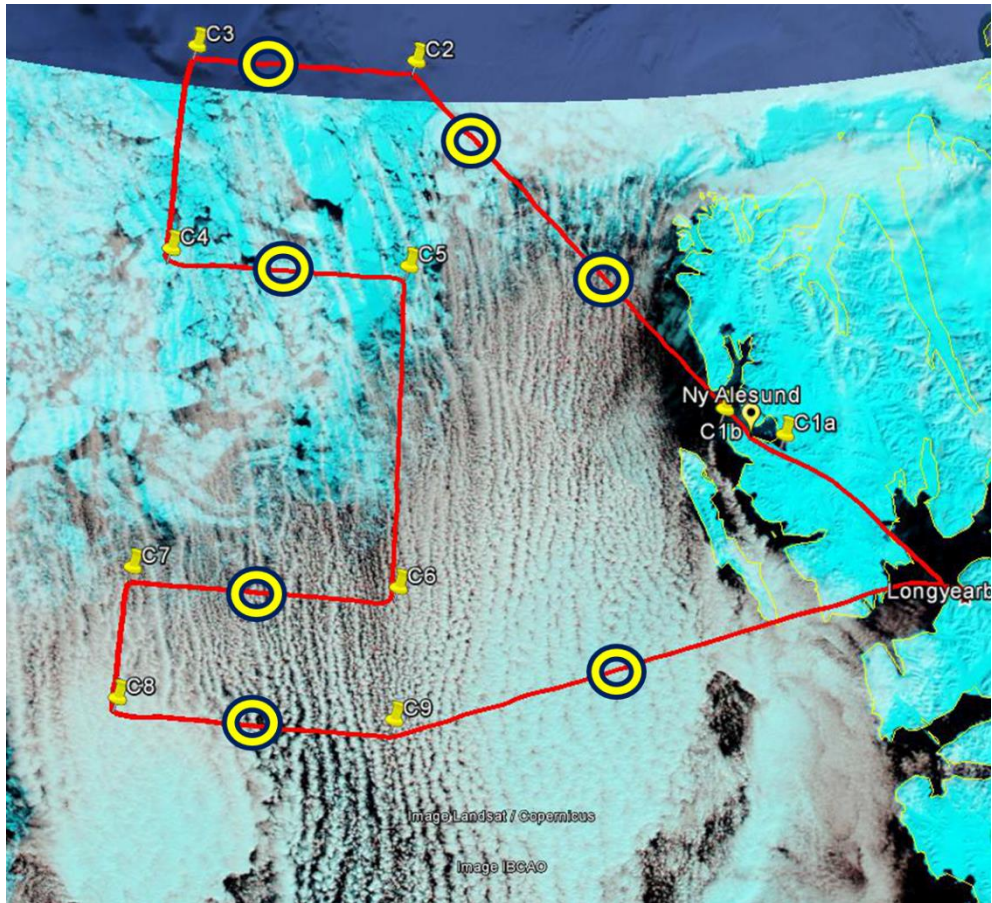
The sea ice edge was not a fixed line, the ice fraction rather decreased continuously from almost close sea ice at 80°N, to packed small broken ice floes to single bands of ice floes at 78°N.

Overview:

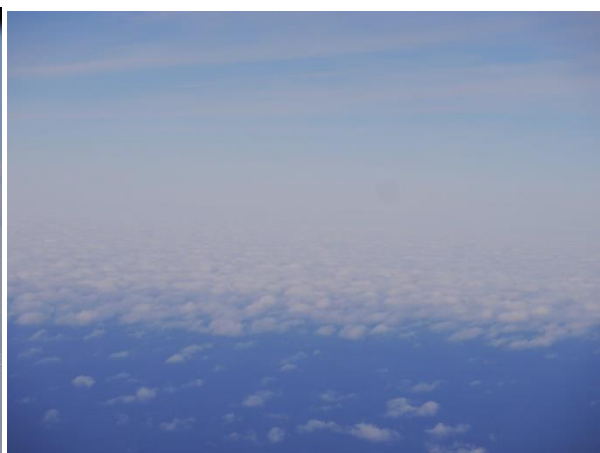
Due to the absence of low level clouds the cross pattern planned for the overflight of Ny Alesund was skipped. Therefore, Polar 5 did fly a first leg in low altitude, 1000 ft above ground, over the glacier Sveabreen. These measurements can be used for surface albedo characterization. Before passing Ny Alesund Polar 5 ascended to 10 000ft and stayed in this level for the entire flight. Half the way to waypoint C2 a drop sonde was launched to test the drop sonde system, which was not operating before. The drop sonde launch succeeded. Therefore, the optional descent and ascend planned

between waypoints C2 and C3 was omitted. Atmosphere profiles were sampled by drop sondes instead. In total 7 drop sondes were launched in different locations. 4 sondes on the east-west legs in different latitudes. And 3 sondes at about 8.5° E also in different latitudes.

Flight track and pattern:



Yellow circles mark the launched drop sondes



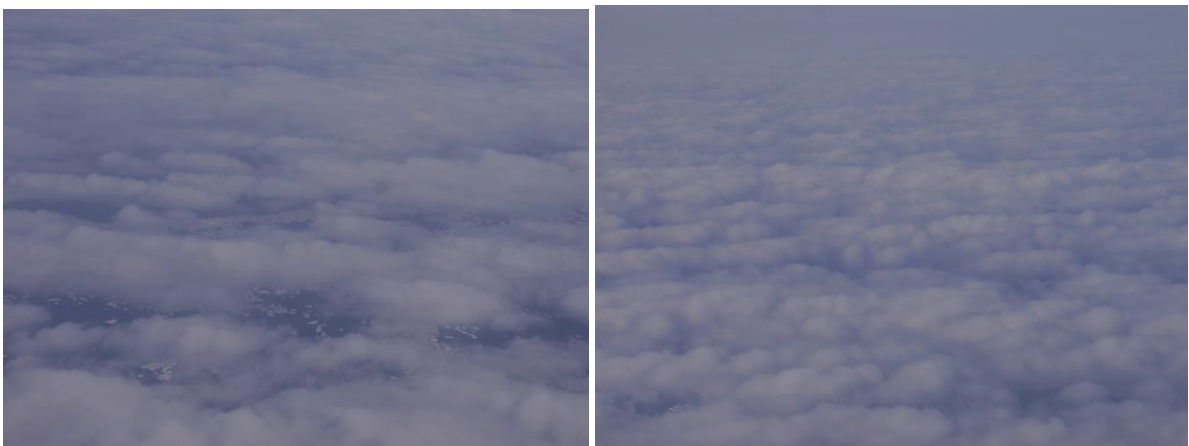
Left (LYR-NyA): Sveabreen Glacier. Right (NyA-C2): Edge of cloud cover west of Svalbard.



Left (NyA-C2): Denser clouds over water. Right (close to C2): Dense clouds over sea ice.



Left (C2-C3): Thin cloud layers and small cloud streets produced by leads. Right (C3-C4): Larger leads produce larger clouds.



Left (C5-C6): Cloud streets become more organized with decreasing sea ice cover. Right (C5-C6 further south): compare to left image.



Left (C6-C9): Dense cloud fields over open water. Right (C6-C7): Cloud tops are oscillating.



Left (C9-LYR): Some larger cloud gaps. Gaps look somehow hazy.

Instrument Status:

Polar 5	
Basis data acquisition	
Nose Boom	
MiRAC	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Sun Photometer	
Drop Sondes	8 launched 1 failed

Comments:

SMART and Eagle/Hawk had only one short stop in the measurements. Eagle suffered little by drop frames what could be avoided by reducing the frame rate. One drop sonde failed, because the connection to the receiver did not work properly.

Detailed Flight Logs (Name of author... more than one is possible):

André Ehrlich (times UTC)

08:17 almost clear sky in low levels with some patchy cumuli, but cirrus above
08:26 above glacier, mountains may affect measurements, some cirrus above
?:?: Start to climb to 10 000ft
08:45 SMART spectro crashed, before some strange values were recorded (higher counts than in clear sky). Restart of the spectrometer box could solve the problem. Failed at the same time Eagle failed... coincidence?
08:49 leaving the island, wide cloud field to the west. No sea ice jet.
08:53 lot of cirrus. I_dw fluctuates quite a lot
09:03 P5 above clouds now
Patchy sea ice north-east
Hazy and cirrus north-east
Cirrus also above
Clear sky to the west
09:09:30 DS #1
09:11 more and more sea ice visible
09:13 cloud top at about 600 m
09:22 clouds become denser
More sea ice
09:26 DS#2
09:30 C2
No cirrus
West of us clouds are less and only patchy
09:37 again some more clouds to the west
Dense sea ice
09:50 C3
Thin low level clouds
Ice cover 90%
No cirrus above
09:55 two thin cloud layers visible in some patches
10:05 sea ice 80%
Some leads are refrozen
Cloud streets over leads
Clouds getting thicker
10:07 C4
70% cloud cover

No cirrus

10:17:30 DS#4 → showing many layers
 Inhomog. low clouds
 Some larger leads

10:19 two cloud layers visible

10:24 more broken ice floes in south

10:26 – 10:36 over cloud streets
 Sea ice only in form of single broken floes densely floating beside each other
 Sea ice concentration further decreasing
 Some precipitation visible by MiRAC

10:41 less and less sea ice
 Clouds sometimes seem to precipitate (MiRAC)

10:44 some cirrus in East, but not in front of the Sun
 Cirrus above → I_dw is fluctuating
 Cirrus not in front of Sun → F_dw stable

10:47 In westerly direction: change in cloud structure visible → photos
 Still some ice floe fields
 No single cloud street anymore visible → structured cloud field

10:54 C6
 Almost no sea ice left
 Dense cloud field

11:05 DS#5 failed

11:08 DS#6 wide cloud field, only some little gaps visible when looking downward
 Loose ice floes 10% ice cover

11:14 20% sea ice cover

11:24 dense cloud fields
 Westerly direction: some convective cloud tops shooting atop the inversion visible

11:?? No cirrus
 Over sea ice??? → Satellite image tells No Sea Ice! Just dense clouds

11:32 Change in cloud structure close ahead visible: dense clouds → structured rolls with gaps

11:40 DS#7 clouds more inhomogeneous, different phases???

11:50 C9 clouds inhomog.
 No sea ice
 No cirrus

11:57 ahead cloud field look homogeneous again
 Otherwise no significant changes

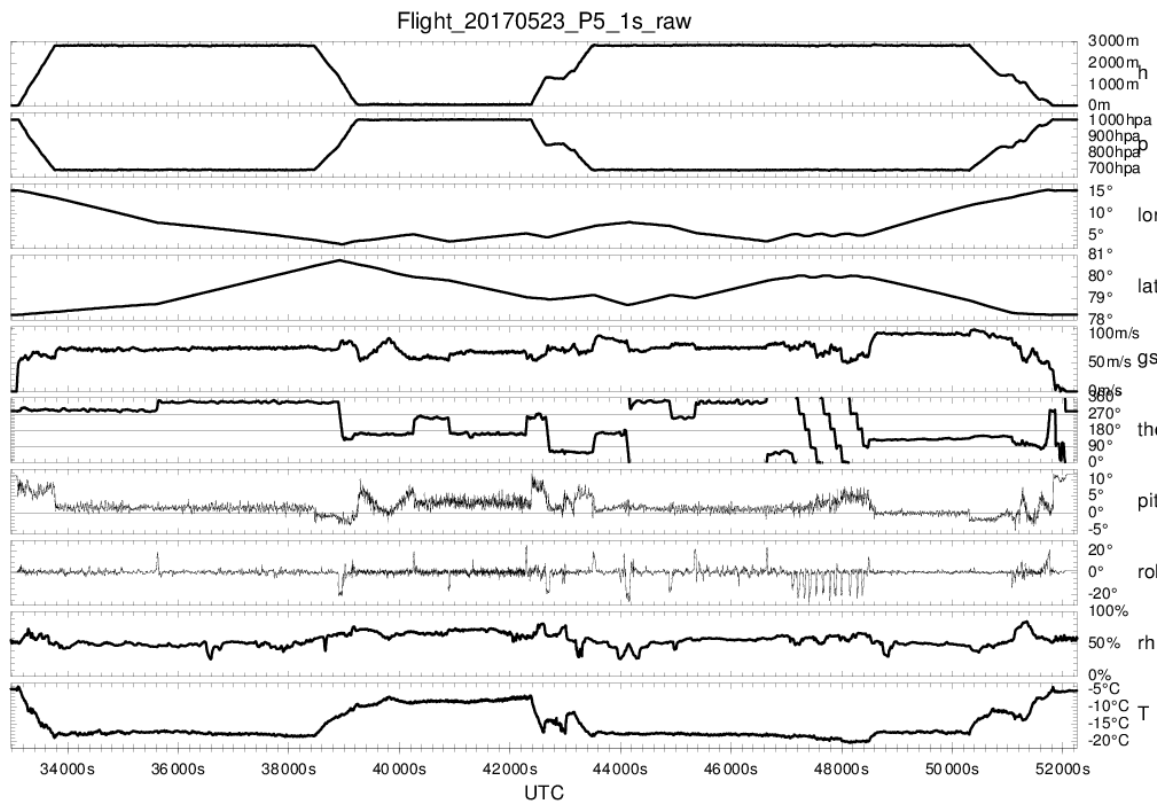
12:09 DS#8 clouds everywhere

12:20 cloud gap generated by Prinz Karls Land

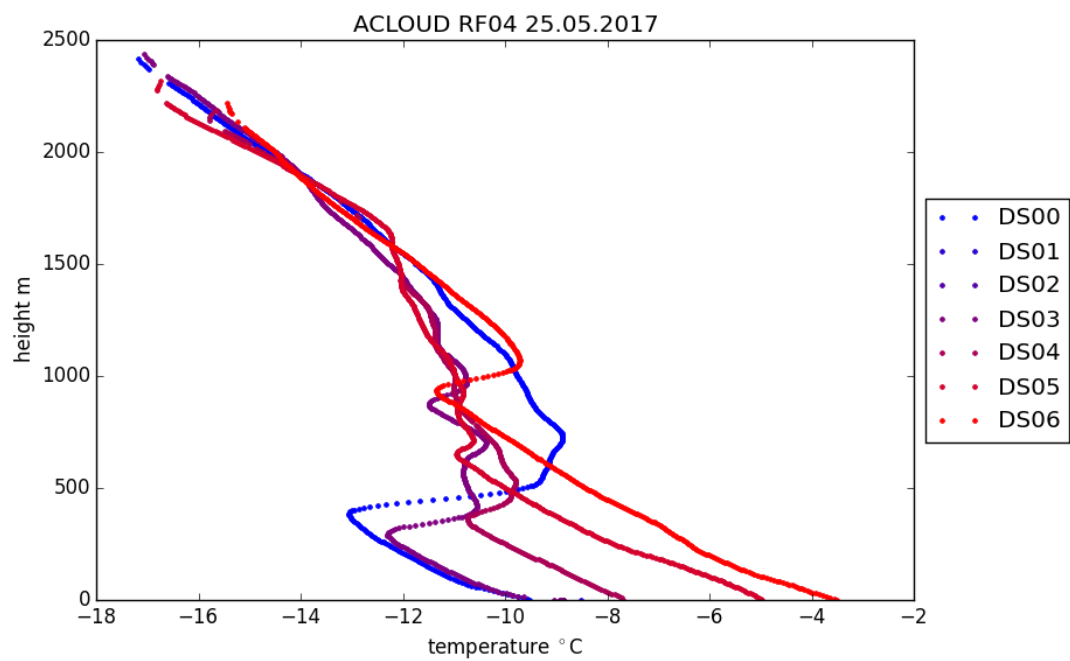
Quicklooks:

One flight overview plot from each instrument would be great. Same plot for all flights would be nice.

If available: Special plots of special events during the flight.

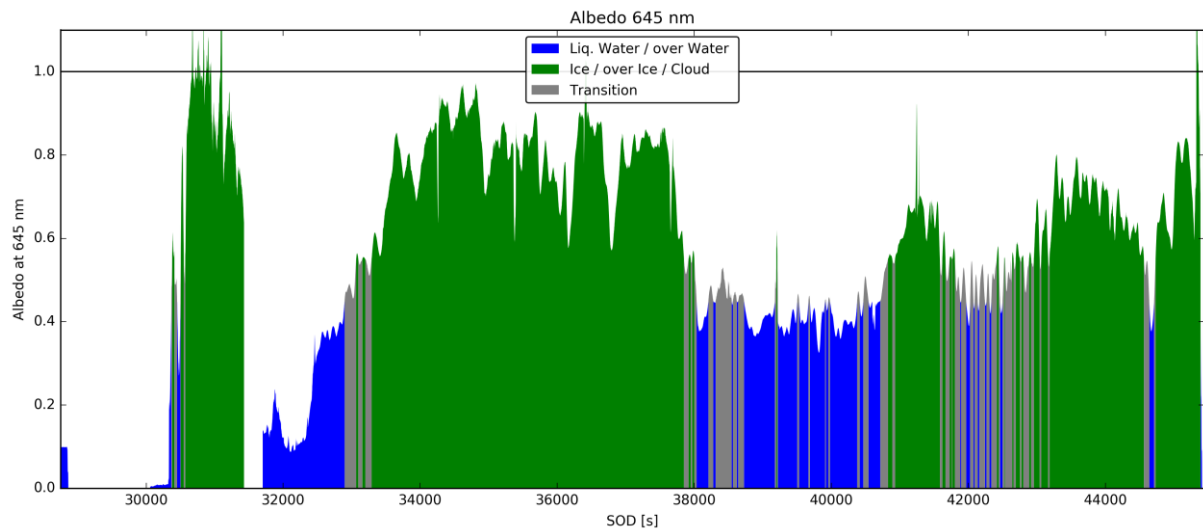


Drop Sonde

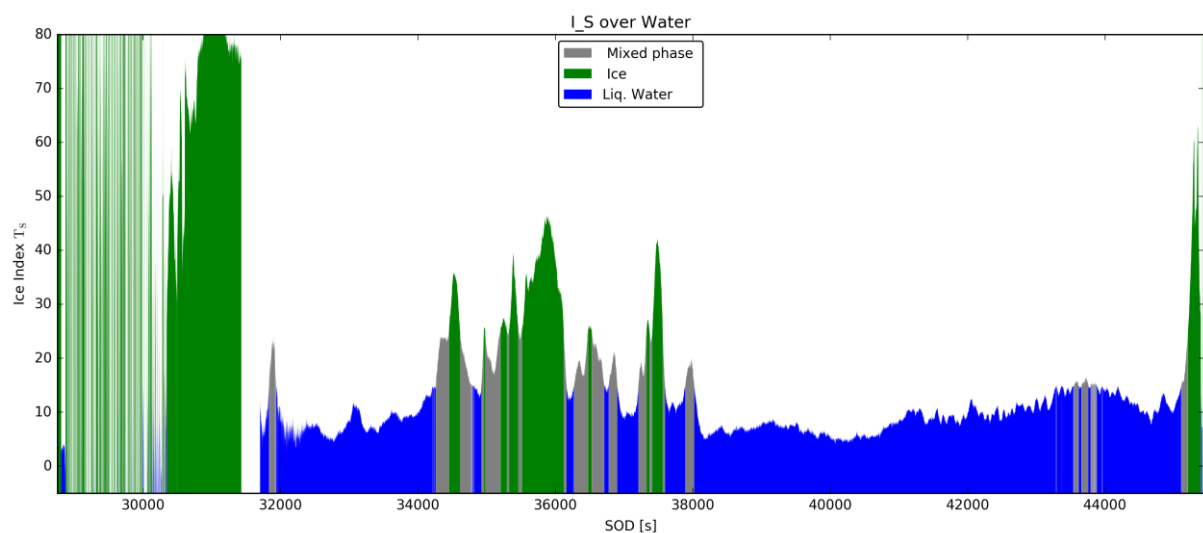


SMART

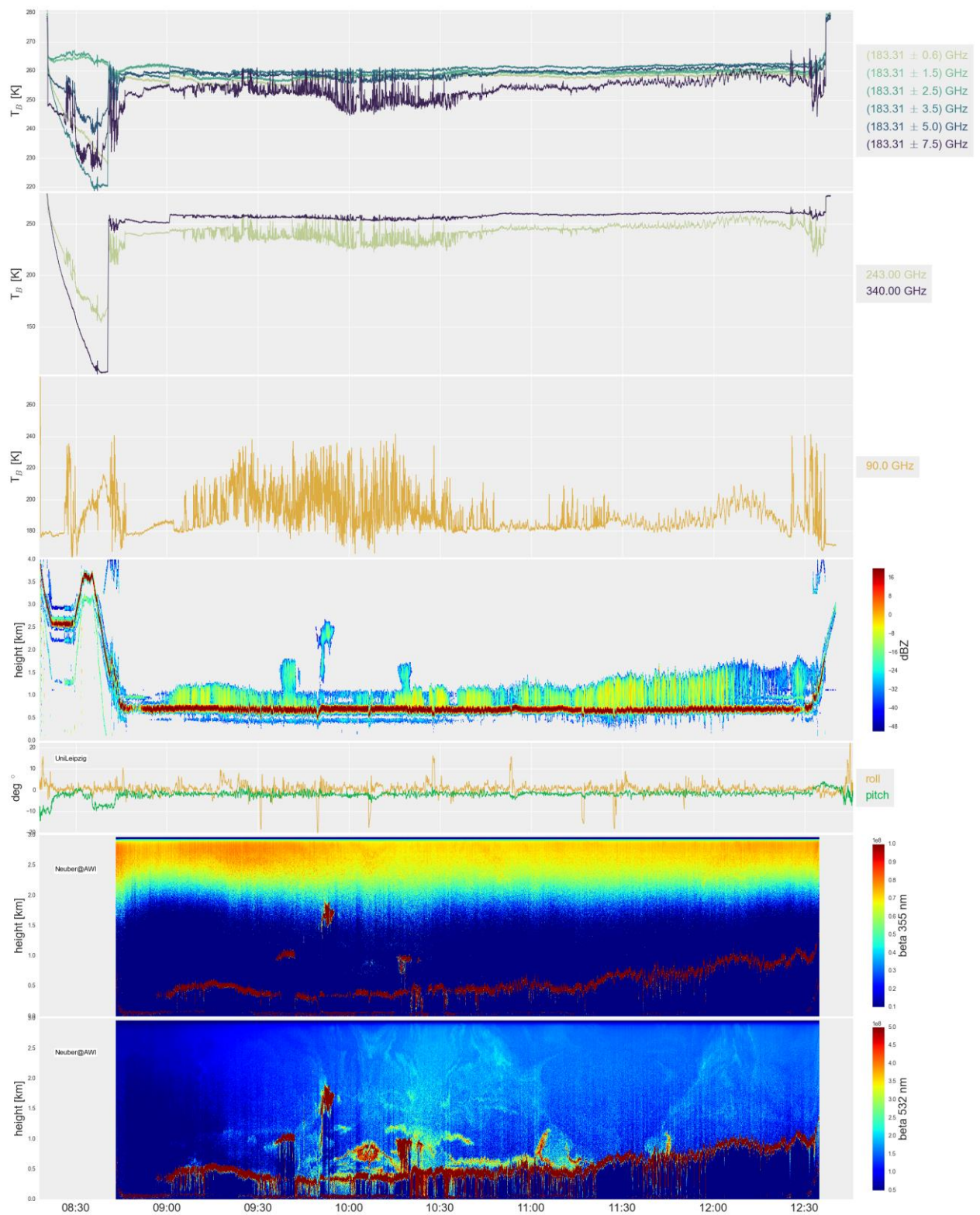
Albedo at 645 nm wavelength along the flight. Over sea ice the albedo in flight level measured above clouds is significantly enhanced. Sea ice is still “visible” below clouds. Later in the flight > 40000 sek, the high albedo is only the result of thicker clouds. No sea ice was observed in these areas.



Cloud phase index calculated from spectral albedo. The thresholds are selected for clouds above open water. Most parts are identified as liquid water clouds. High values are likely caused by sea ice below the clouds.



MiRAC & AMALI



Eagle/Hawk

Eagle data availability

