

HALO-(AC)³ – 2022/04/01 – Polar5 research flight 09

Objectives:

Intensiv measurements of cold air outbreak and the characteristics of the lower atmosphere when flying perpendicular to cloud streets from ocean to ice and back on several legs.

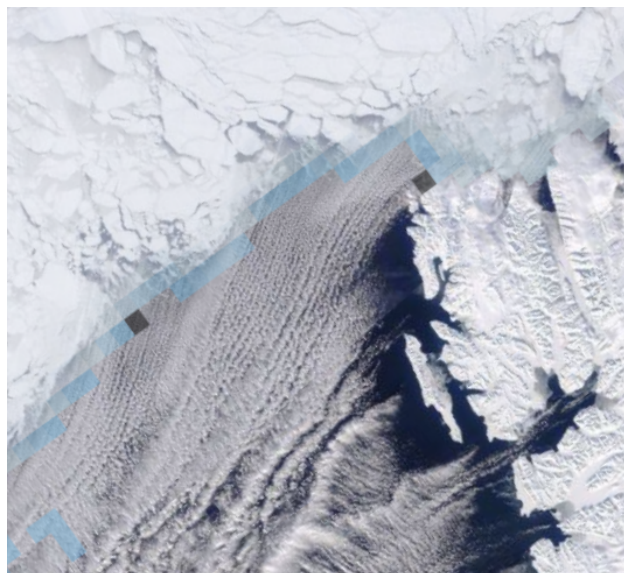
Meet with Polar 6 and HALO on the intensive measurement leg.

Polar 5 Crew	
Mission PI	Mario Mech
Basis Data Acq.	Cristian Sans Coll
SMART/ Eagle/Hawk	Hanno Müller
MiRAC / AMALi	Sabrina Schnitt
Dropsondes	Bjorn Stevens
Pilot	James Steward
1st officer	Noah Hladiak

Mission PI P5:

Mario Mech mario.mech@uni-koeln.de

Polar 5	
Take off	09:08 UTC
Touch down	14:20 UTC
Flight time	05:12



MODIS RGB composite satellite image and sea ice fraction observed by the Advanced Microwave Scanning Radiometer (AMSR2) (screenshot from NASA worldview) for the measurements region on 1 April 2022.

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

The weather situation was dominated by a strong low pressure system above Siberia and another small low pressure system southwest of Svalbard. This constellation resulted in a pronounced cold air outbreak especially over the Northern Fram Strait and a convergent flow west of Svalbard.

Overview:

Several perpendicular overflights over cloud streets in the Fram Strait over open ocean and the sea ice. This should have been done in combination with P6 and HALO. The collocation worked out perfectly. Clouds over sea ice were not present, contradictory to the prediction by the models, but as expected. Therefore, only one leg back and forth has been conducted over the sea ice. The saved flight time has been spent on an additional, although shorter, leg over the higher clouds in the West.

The orientation of the ice edge and the down ice flow over the open ocean allowed the sampling of cloud streets in different stages of their formation process - the more Easterly the more mature, and therefore more convective and precipitating, the cloud streets were.

As in the days before, the lee effect induced by Svalbard caused cloud free areas over NyA and West of the Island.

Instrument Status:

Polar 5	
Basis data acquisition	
Nose Boom	
MiRAC-A	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Drosondes	18

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

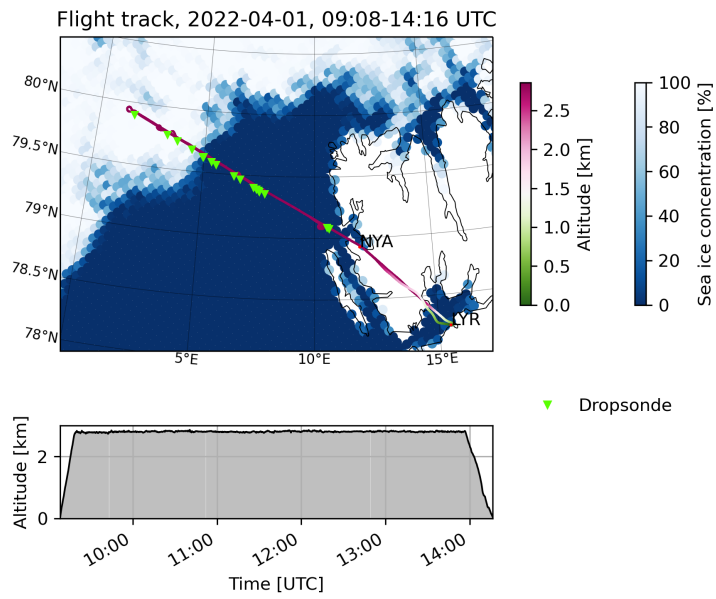
Comments: Noseboom was only partly working like the days before.

Detailed Flight Logs:

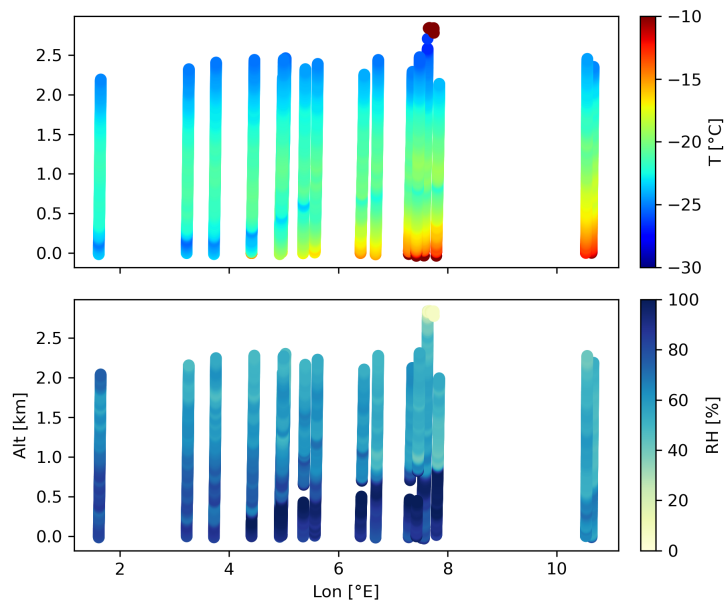
09:08 take off
09:19 10000 ft

09:25 lidar on
09:34 over NYA
09:40 DS1
09:42 holding pattern
09:45 holding pattern
09:48 speed up to get closer to P6
09:52 184 kt ground speed
09:55 first clouds in radar
10:00 DS2 at W1
10:00 GS 134 kt 1 nm behind P6
10:06 slowing down to 105 kt indicated air speed
10:13 over MIZ
10:15 DS3 launched at the cloud edge close to see ice edge
10:21 all 3 aircraft on top of each other
10:37 DS4 launched just over a lead
10:38 W2 procedure turn
10:57 Upwind to the left we see, that clouds start at ice edge
11:02 DS5 launched at ice edge
11:16 DS6
11:17 procedure turn at W1
11:28 DS7 in clouds
11:31 noseboom not working properly
11:42 DS8 launched
11:50 earlier turn to go East
11:55 DS9 launched
12:06 cloud bow to the North visible - liquid in clouds
12:09 DS10 launched
12:20 turn at W1
12:24 DS11
12:40 DS12
12:50 Western turn
12:53 DS13
13:03 DS14
13:17 DS15
13:17 turn to a short 5 min leg
13:25 turn to last leg to W1
13:28 DS16
13:35 DS17
13:36 speed up to 180kt
13:37 cloud bow to the North
13:47 DS18
13:53 lidar off
14:20 touch down

Quicklooks:

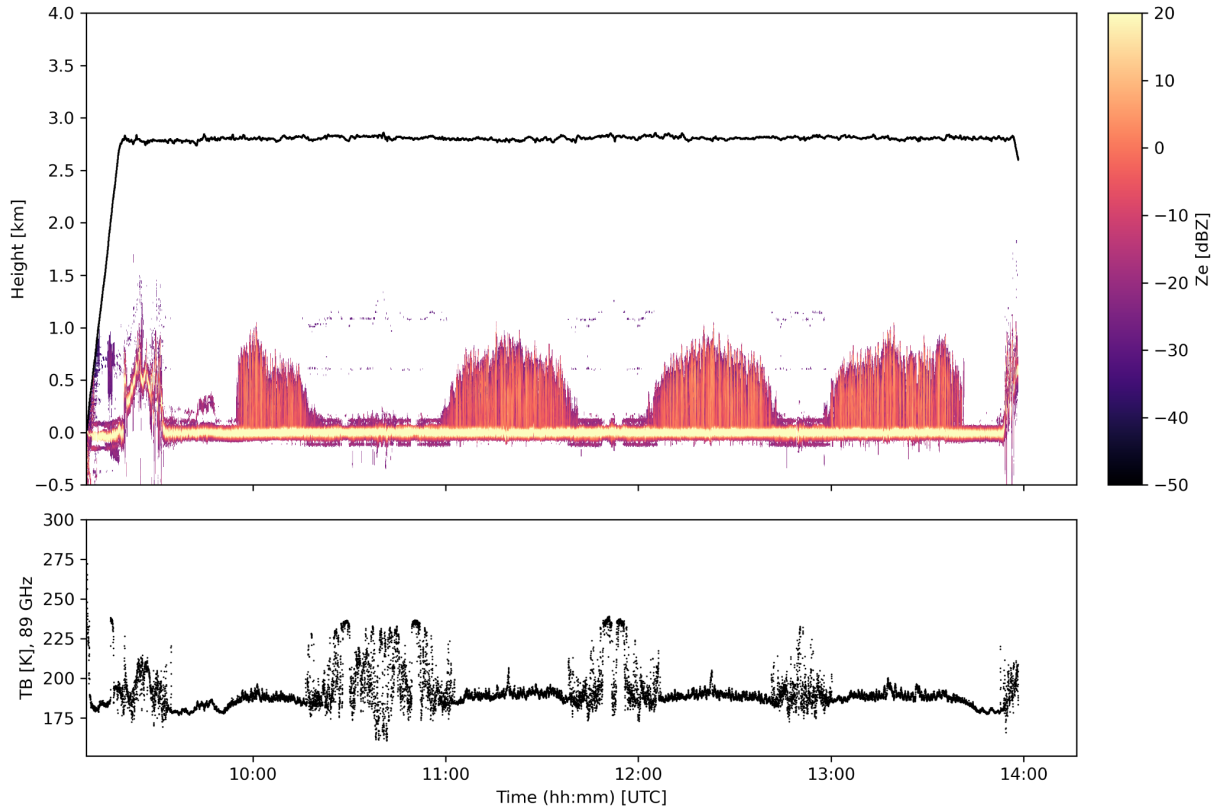


Flight track including sea ice coverage, dropsonde location and flight altitude.



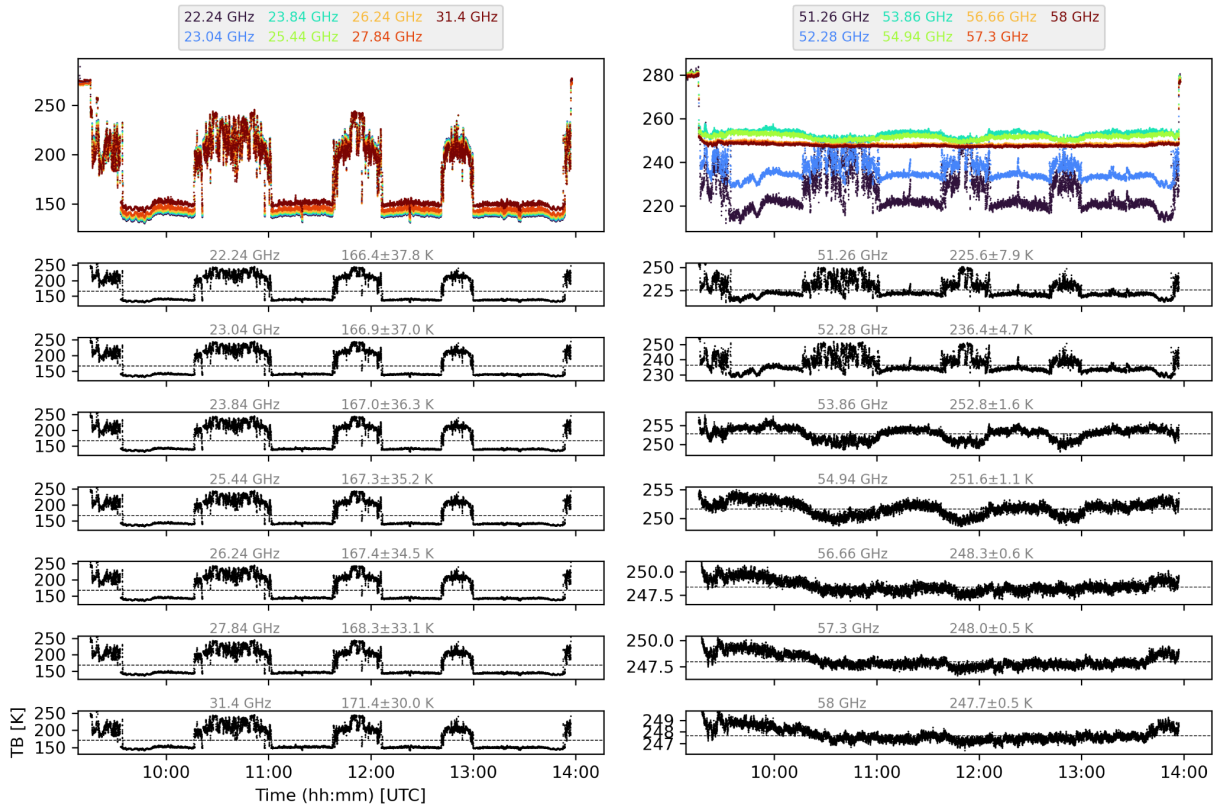
Dropsondes along longitude for all legs.

MiRAC-A, 2022-04-01, 09:08-14:16 UTC

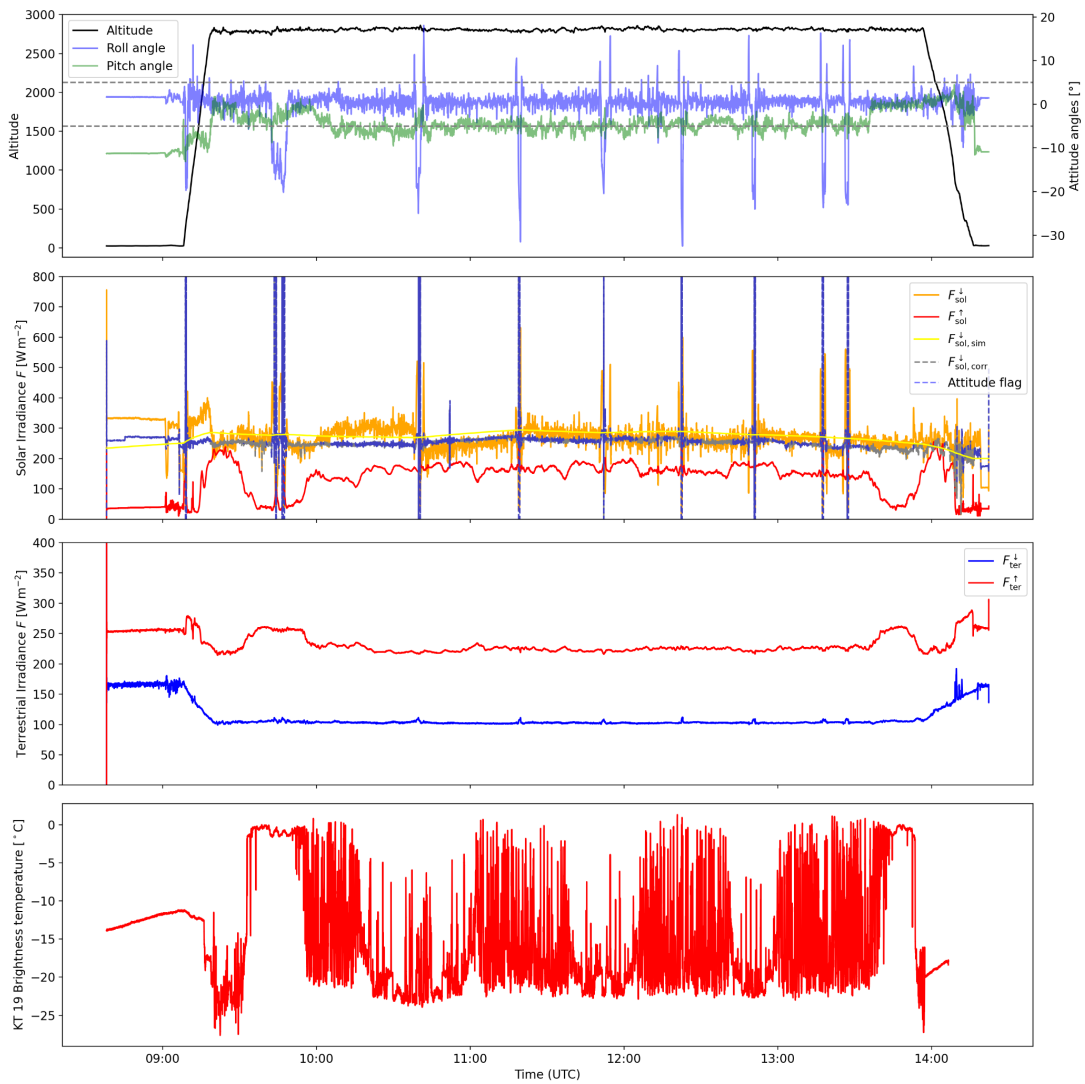


MiRAC radar reflectivity and 89 GHz brightness temperatures.

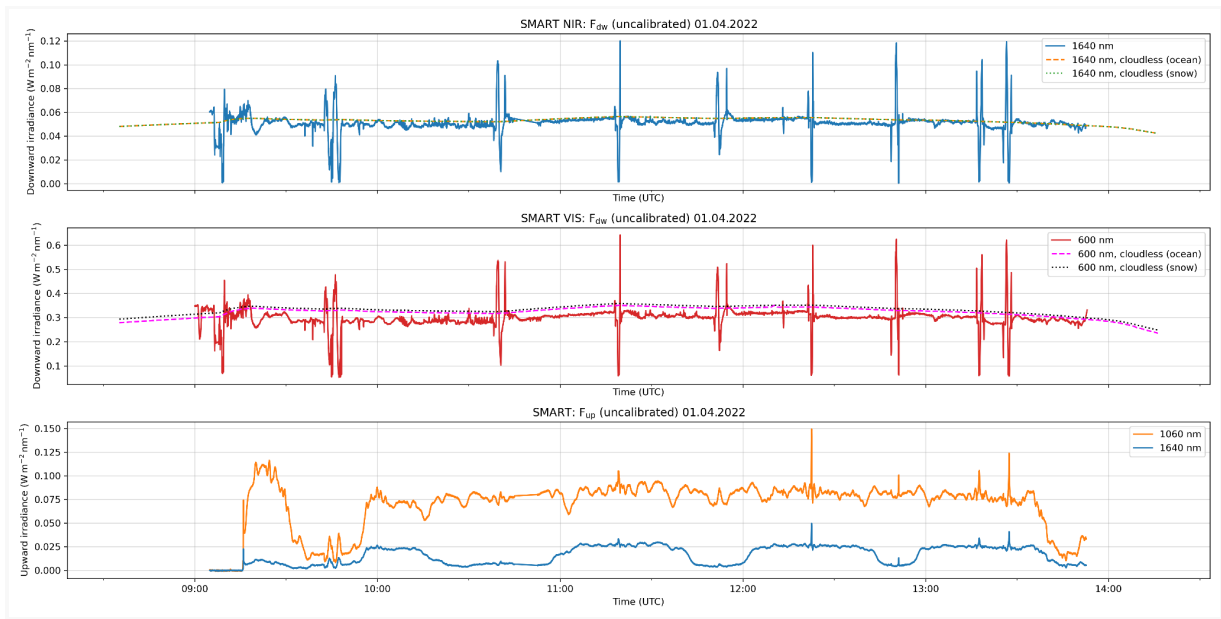
HATPRO, 2022-04-01, 09:08-14:16 UTC



HATPRO brightness temperature observations at 22GHz water vapor channels (left) and oxygen band at 58 GHz (right).



Broadband radiation measurements and KT19.



SMART spectral radiances.

Nikon camera can be found on the [wiki](#).