HALO-(AC)^3 – 2022/03/20 – Polar5 research flight 01

Objectives:

Collocation of Polar 5 and Polar 6 (and HALO) to probe and sense clouds over sea ice and the open ocean North-West of Svalbard.

Polar 5 Crew	
Mission PI	Mario Mech
Basis Data Acq.	Maximilian Stöhr
SMART/ Eagle/Hawk	Evelyn Jäkel
MiRAC / AMALi	Imke Schirmacher
Dropsondes	Sabrina Schnitt
Optional seat	Cristina Sans Coll
Pilot	James Steward
1st officer	Noah Hladiak

Mission PI P5:

Mario Mech mario.mech@uni-koeln.de

Polar 5	
Take off	11:25 UTC
Touch down	15:37 UTC
Flight time	04:12

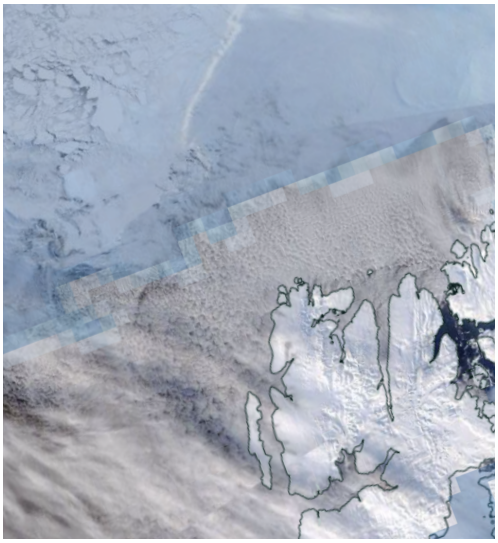


Fig. S5.1: MODIS RGB composite satellite image and sea ice fraction observed by the Advanced Microwave Scanning Radiometer (AMSR2) (screenshot from NASA worldview).

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

The weather situation was dominated by a changing influence from a low pressure system east of Svalbard in the morning to a pronounced low pressure system south of Framstrait. A dissolving trough from the former low crossed the northern part of the island, resulting in weak flow conditions above Longyearbyen. This flow situation transported warm air from west of Scandinavia to the north and was accompanied by low-level clouds in the Framstrait.

During flight, the clouds over the sea ice were not present as predicted by the model. Closer to sea ice they appeared again with increasing clouds tops towards the water. Over open ocean, the expected strato cumulus cloud layer with precipitation underneath has been observed.

Overview:

The plan was a collocated flight with the Polar 6 (and HALO) aircraft to collect insitu cloud particles in and aerosols below and above clouds. While doing that Polar 5 flies above and performs remote sensing measurements from 10000 ft and launches dropsondes. At first, two legs over ice parallel to the ice edge were flown followed by two over open ocean.

On the North-Western most leg over ice, no clouds were present. On the second one closer to the ice edge, we were over clouds in the second half. Most likely this was over broken sea ice.

The collocation between Polar 5 and 6 worked pretty well on the two legs parallel to the ice edge and on the one perpendicular to it.

Detailed:

After take off in Longyearbyen, mid-level clouds had to be penetrated during the climb to flight altitude. During climb the track has been set to Ny-Alesund which we did not directly overpass, but more in the center of the fjord and along the one. After the NYA the heading was towards WP2 where we slowed down and headed more or less after a short right turn straight towards the ice edge with decreased speed.

Once at the Northernmost point we started the first over ice leg after a short left turn. At the end of the le, noseboom calibration leg has been included with 120 kn TAS 7 mins in each direction. At the end of the noseboom calibration a long turn has been made to head towards the second leg. The long turn has been necessary to gain some time for two successive drop sondes at the corners. The second leg has been flown alone without Polar 6.

At the end of the second ice leg we headed Southeast and reached the open ocean to perform ocean legs. On the way South, an almost perfect collocation could be achieved as well as on the first ocean leg. At the end Polar 5 turned South for another leg over open ocean.

When finished with the patterns heading has been set to NYA and back to Longyearbyen after the overpass.

Instrument Status:

Polar 5	
Basis data acquisition	
Nose Boom	
MiRAC-A	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Dropsondes	12

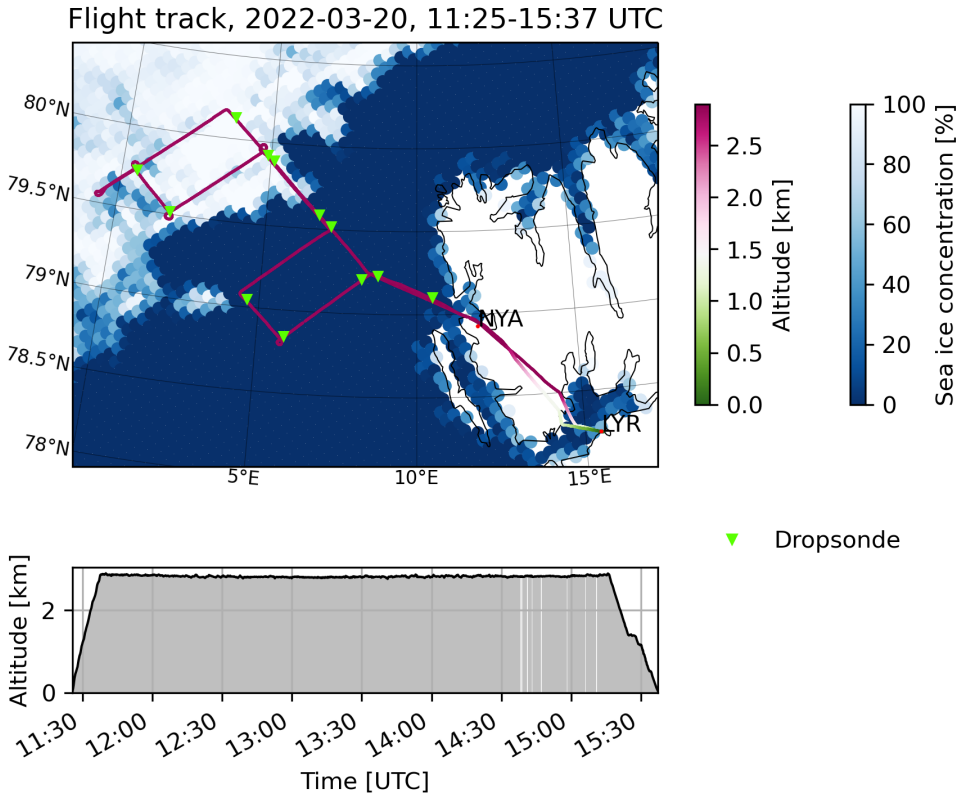
Table S5.1: Instrument status as reported after the flight for all instruments on Polar 5.

Comments: Short interruption in connection to HATPRO.

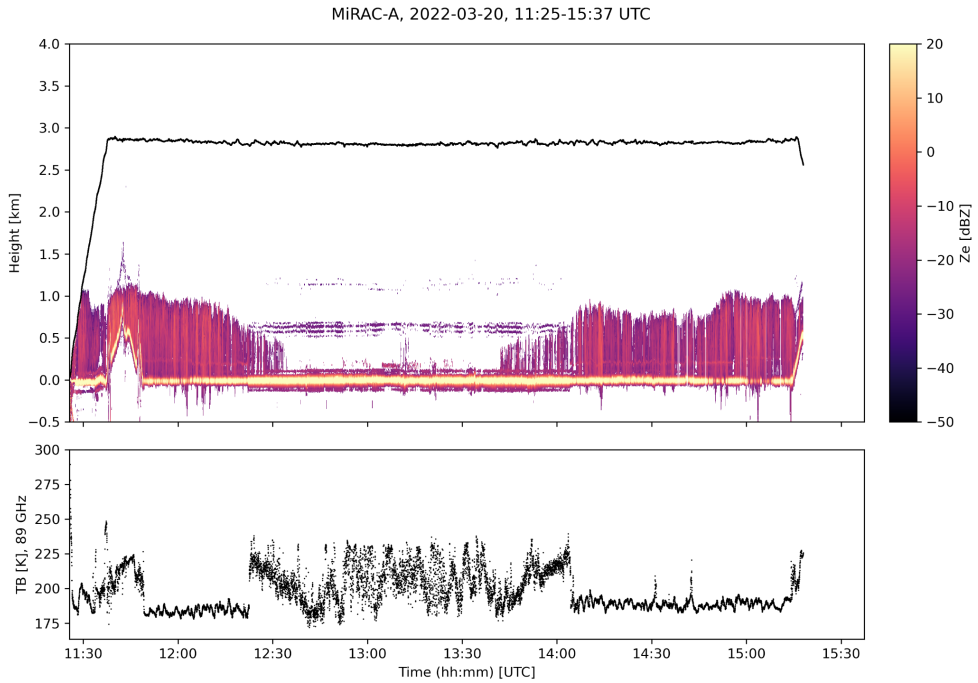
Detailed Flight Logs:

Detailed flight logs will follow after the flight segmentation has been performed. The final document will be updated in the wiki.

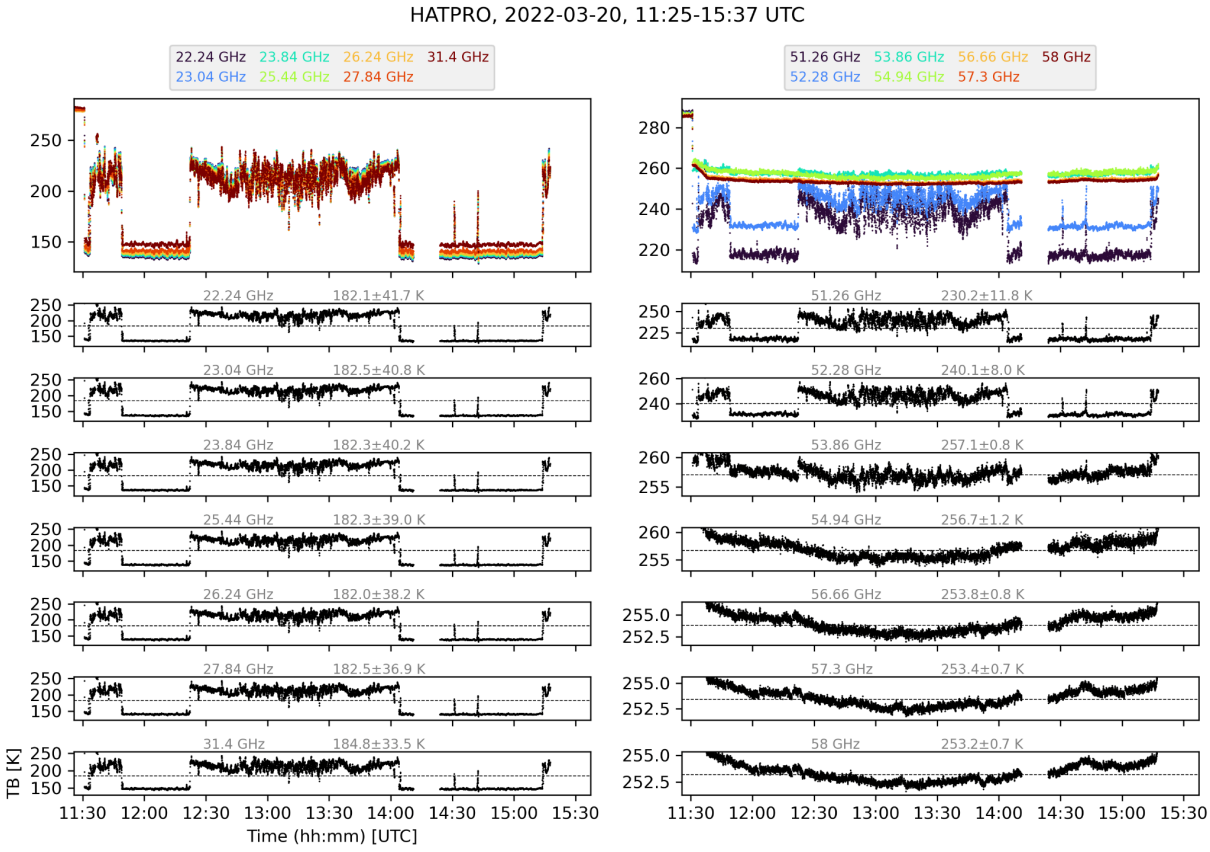
Quicklooks:



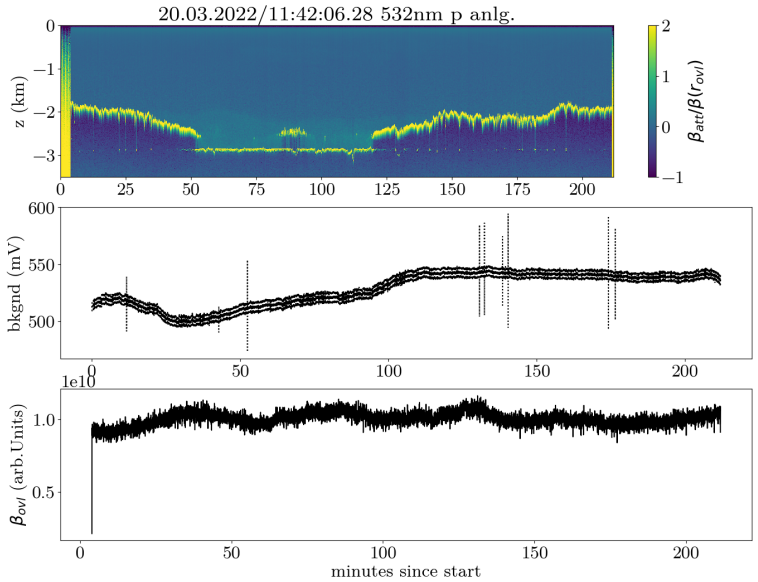
Flight track including sea ice coverage, dropsonde location and flight altitude.



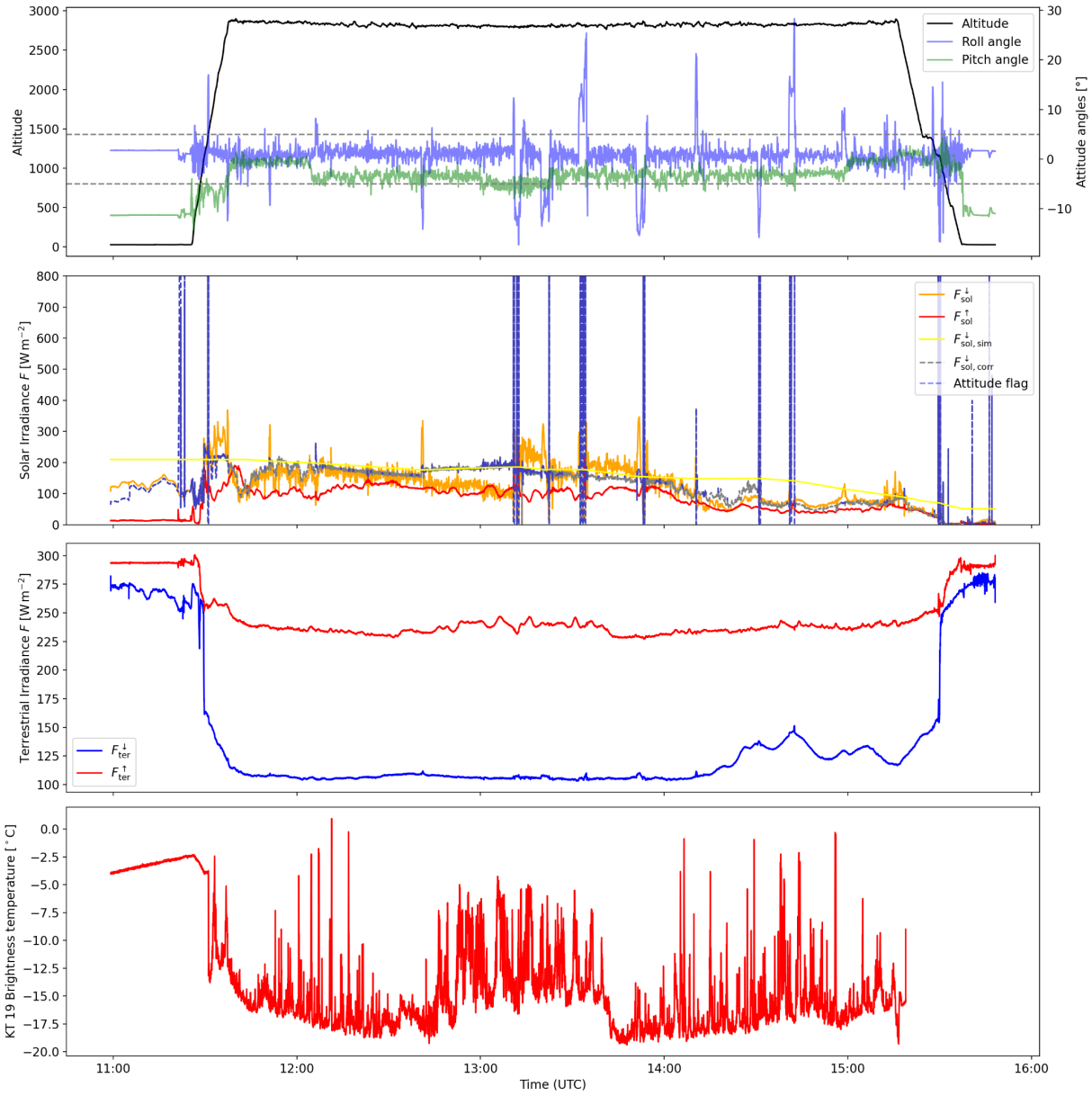
MiRAC radar reflectivity and 89 GHz brightness temperatures.



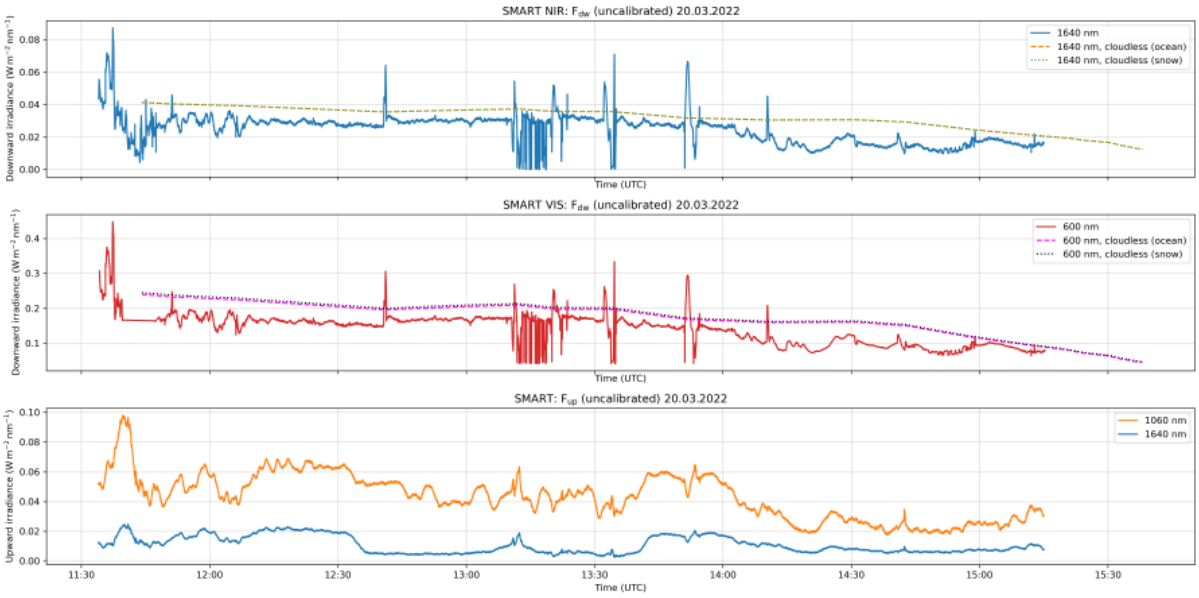
HATPRO brightness temperature observations at 22GHz water vapor channels (left) and oxygen band at 58 GHz (right).



AMALi attenuated backscattering coefficient at 532nm parallel channel.



Broadband radiation measurements and KT19.



SMART spectral radiances.