Flight Report

HALO-AC3_HALO_20220321_RF08

Cold Air Outbreak 1—Day 2

Objectives:

- Second consecutive flights looking still at the initial phase of a cold air outbreak (CAO1)
- Analyzing the development of cloudiness related to the cold air outbreak by performing legs parallel to the position of the ice edge starting over sea ice and moving south
- Coordinating with in-situ measurements by the FAAM on the last long leg
- Investigation of the strong precipitation connected to the Shapiro-Keyser cyclone along the western coast of Svalbard
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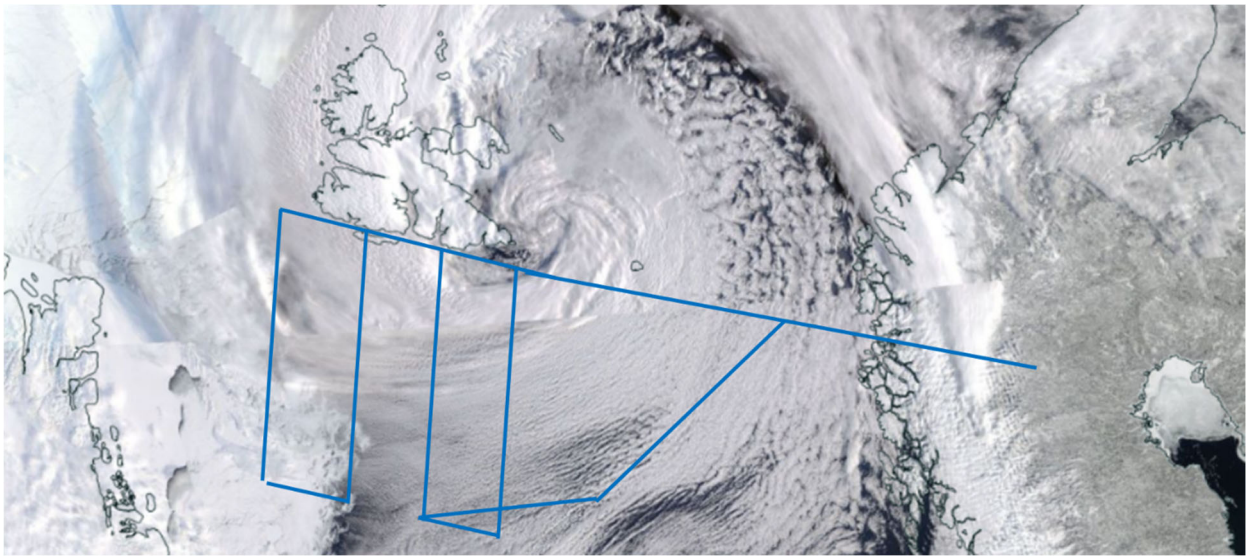


https://worldview.earthdata.nasa.gov/

Mission PI HALO:

HALO Crew	
Mission PI	Susanne Crewell
HAMP	Andreas Walbröl
WALES	Georgis Dekoutsidis
SMART/VELOX	Johannes Röttenbacher
specMACS	Veronika Pörtge
Dropsondes	Marlen Brückner
Camera	Melanie Lauer
Pilots	Marc Puskeiler Michael Grossrubatscher
Engineer	Thomas Leder

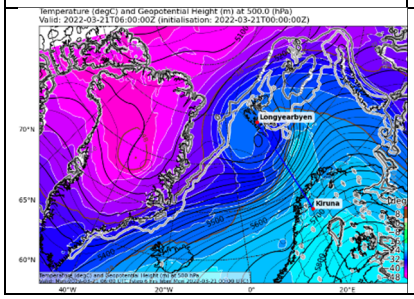
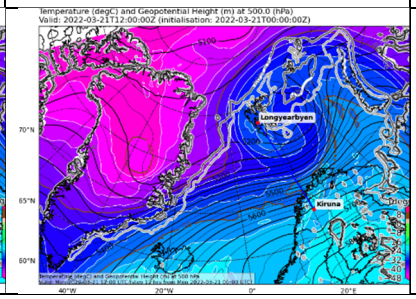
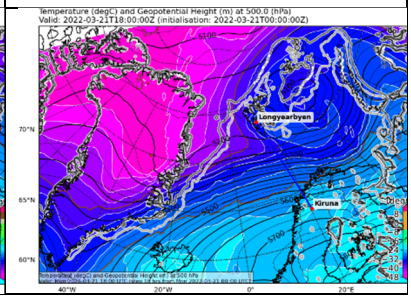
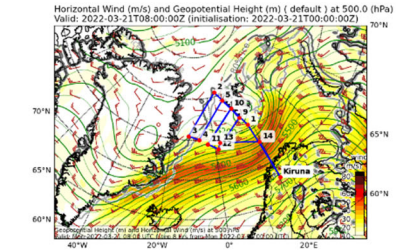
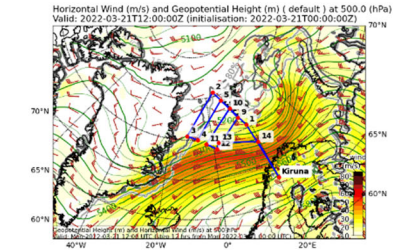
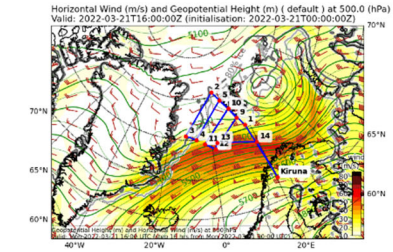
Flight times:

HALO	
Take off	08:47 UTC
Touch down	17:44 UTC

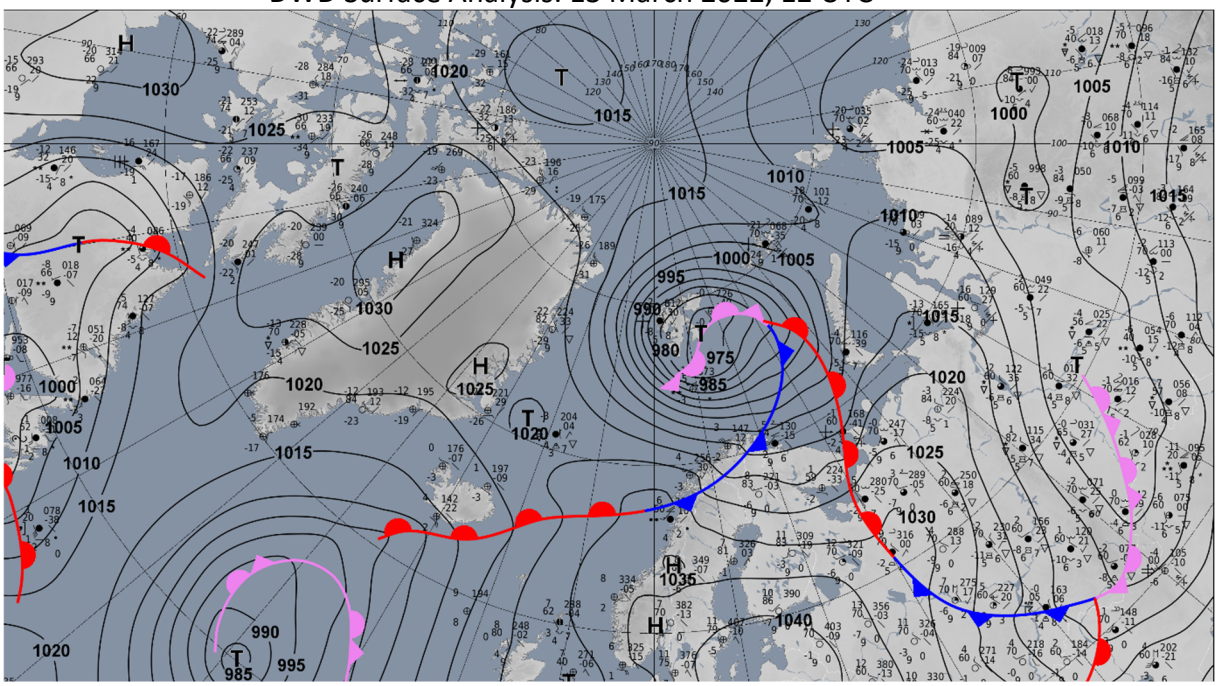
Weather situation during the flight:

A trough over Greenland steered cold air from the North into the Fram Strait. Cold Air Outbreak (CAO) conditions especially over southern Fram Strait with large area of only low-level clouds were expected (see Marine CAO index). A strong low pressure system southeast of Svalbard (Shapiro-Keyser cyclone) brought snowfall and and multilayered clouds to the Svalbard region. During the time of the flight the ridge northward of Kiruna intensified and the eastern position of the trough over Greenland slightly moved towards the east with a tongue developing around 75 N associated with a zonal flow a 500 hPa (see below).

500 hPa Geopotential and Temperature and WInds, ECMWF analysis, 21 March 2022

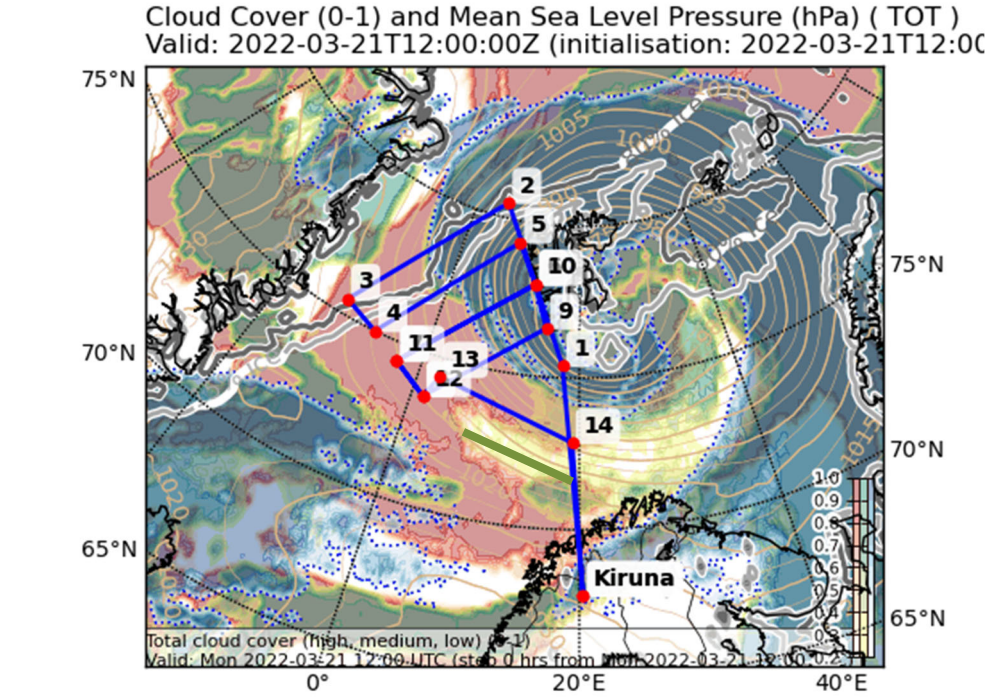
06 UTC	12 UTC	18 UTC
		
		

DWD Surface Analysis: 13 March 2022, 12 UTC



Overview of flight:

The flight pattern first intended to characterize the cloud and precipitation system associated with the Shapiro-Keyser cyclone. For this purpose a leg parallel to the west coast of Svalbard up to the highest northern point at 80.5 N (waypoint 2) was made. As clouds were slightly higher than forecasted (see below) we changed from flight level 370 to 390 ft at 10:25 UTC and stayed at that height for the rest of the flight. We then flew on the exact same leg as on the day before throughout the marginal sea ice zone over strongly broken sea ice for about 45 min. Parallel legs were flown further south over the open ocean to observe cloud development. The forth length was the most southern one and we repeated the third leg again (waypoint 6-> 7 equal to waypoints 10->12. At the end of the flight we adjusted the pattern such that we could fly the same track as the FAAM (green line) about 30 min later than them.



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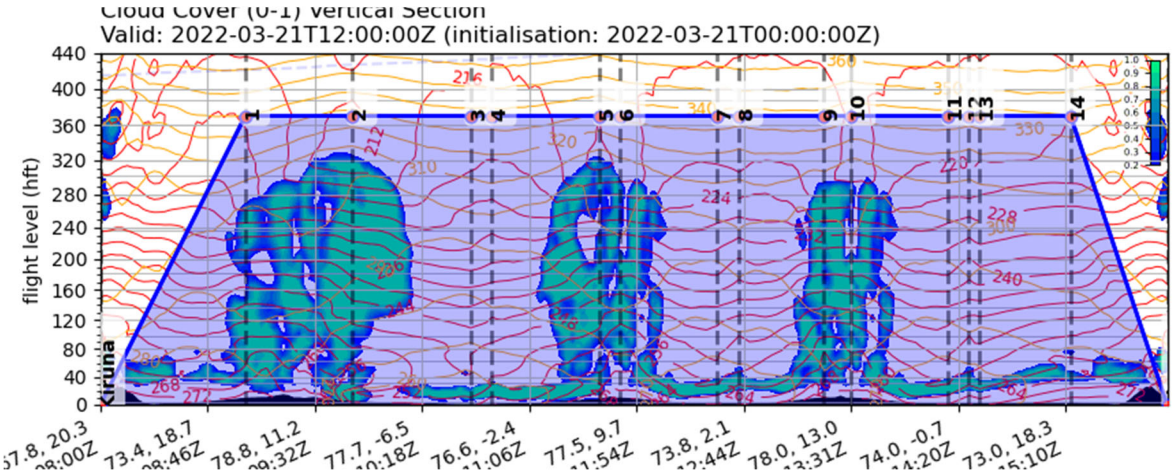
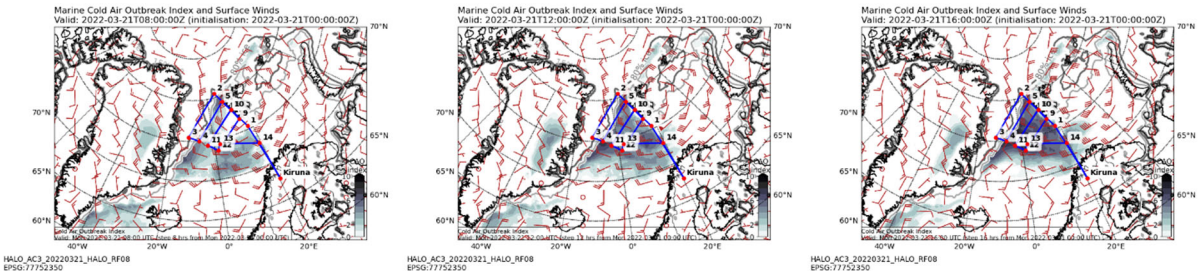
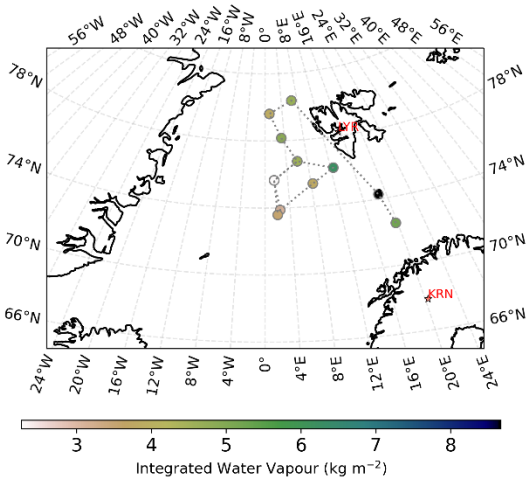
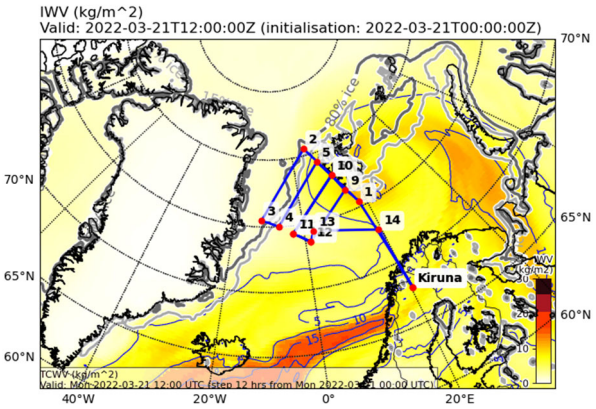
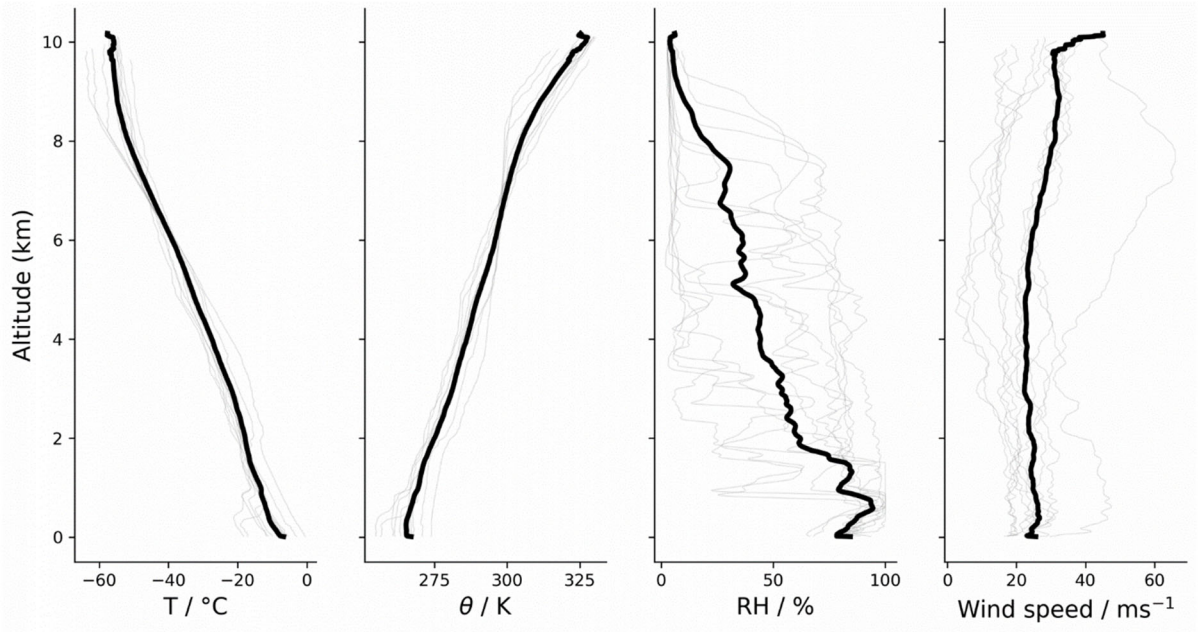


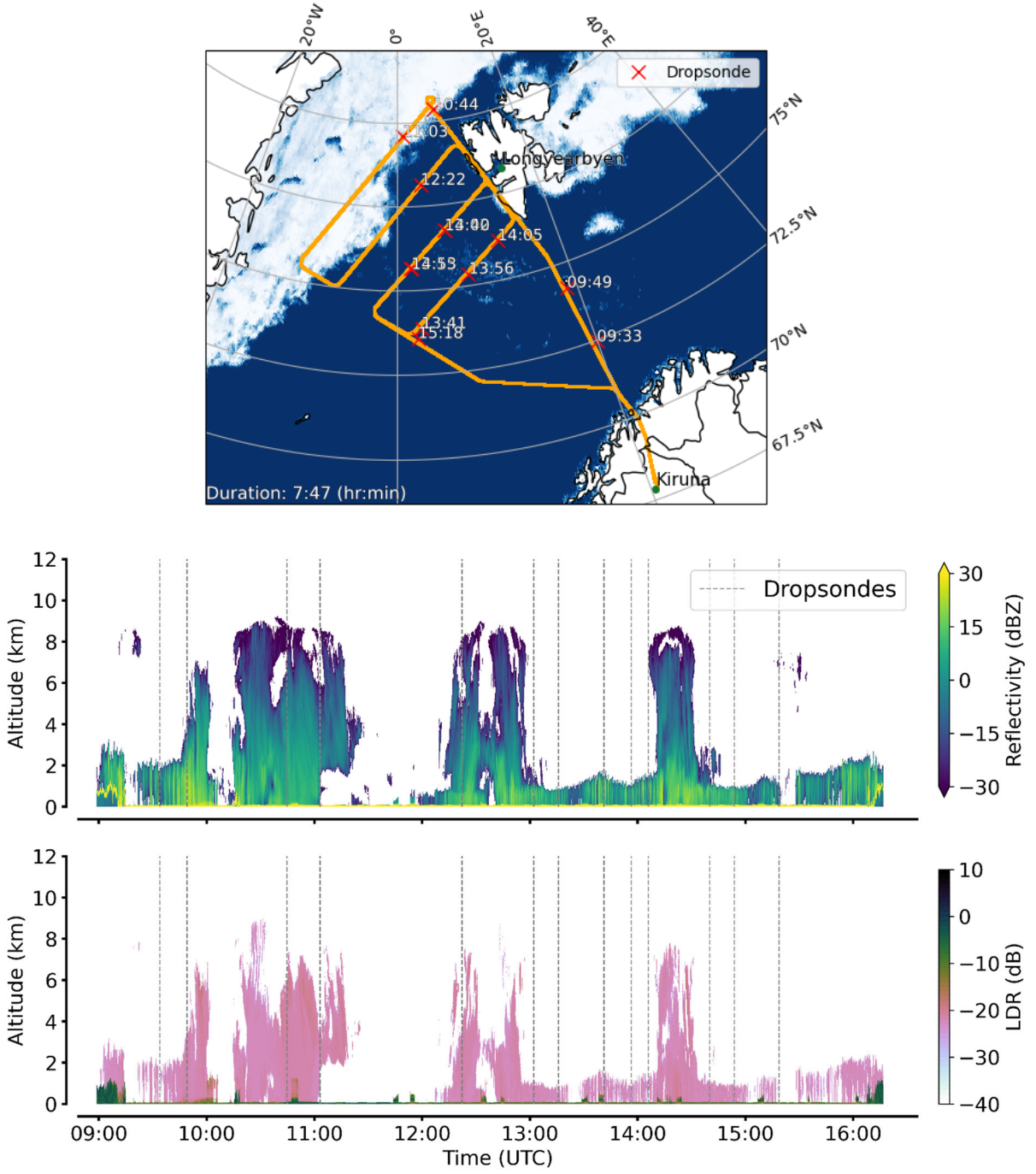
The MCAO (see below) intensified during the flight and the dropsondes reveal the different airmasses encountered during the flight. In total 13 drop sondes were launched. In the North West they show rather low intergrated water vapor (IWV) characteristic for the cold air with shallow inversions and low level clouds below 1 km. Getting further into the East inversion height and IWV increased.











Instrument status Table 1: Instrument status as reported after the flight for all instruments on HALO.

HALO	
BAHAMAS	
BACARDI	
HAMP Radar	
HAMP Radiometer	
WALES	
SMART	
VELOX	
specMACS	
Dropsondes	

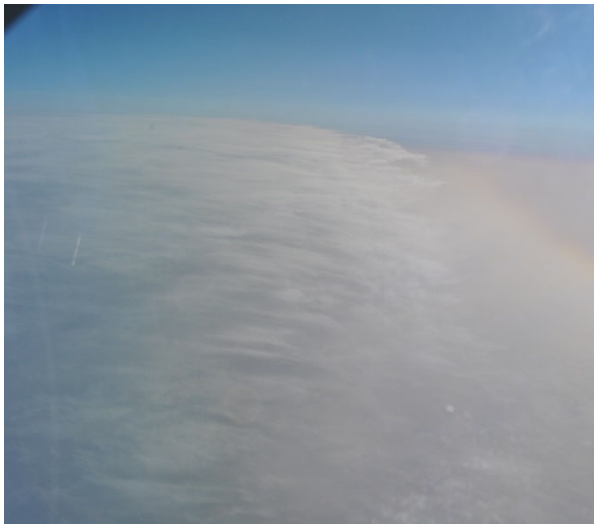
Flight Impressions (start 8 UTC)

10:08 reached flight level 370 – initially cirrus above but diminishing to the north

9:34 Broken low level cloud field gets closed when first drop sonde was launched

9:51 high clouds appearing on the way to Svalbard, radar starts seeing precip

10:23 thickest clouds over Longyearbergen, getting thinner after Ny Alesund



11:17 on sea ice leg one can see the edge of the cyclone high cloud system

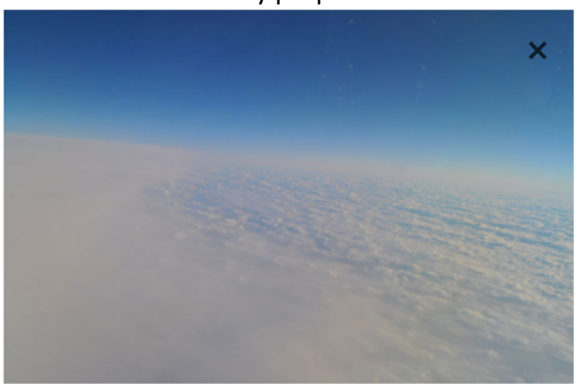
11:31 sea ice freezing again, first clouds can be seen over ocean

11:48 Cloud streets get formed south of the ice edge

11:53 Clouds and broken sea ice

13:1o nice low level clouds –some lien structure visible but not directly perpendicular

14:06 cloud streets in a nearly completely covered cloud field, angle maybe 70 deg



14:31 transition from Cyclone to low level clouds only visible

14:49 contrail; Sc are becoming more convective now, second layer

15:38 Now the clouds are more mixed again – high, low, mid-level….

16: still low cloud field but breaks up more and more – but “wall” in front
16:10 after turn could see glory

16:19 Dropsonde likely into clear sky

16:23 can see virga below clouds

16:45 landing

Thanks to the team!