

# HALO-(AC)<sup>3</sup> – 2022/03/14 – HALO research flight #04

## Objectives:

To retrieve the moist air mass advected into the central Arctic over the past days close to the North Pole and assess cloud properties and the thermodynamic state of the air mass at this stage of its transformation. Secondary: Coordinate with a Metop-B satellite overpass.

## Mission PI HALO:

Felix Pithan

HALO Crew	
Mission PI	Felix Pithan
HAMP	Davide Ori
WALES	Georgios Dekoutsidis
SMART/VELOX	Johannes Röttenbacher
specMACS	Veronika Pörtge
Dro sondes	Marlen Brückner
Optional	Andreas Walbröl
Pilots	Michael Grossrubatscher Marc Puskeiler
Engineer	Thomas Leder

## Flight times:

HALO	
Take off	08:45 UTC
Touch down	17:19 UTC

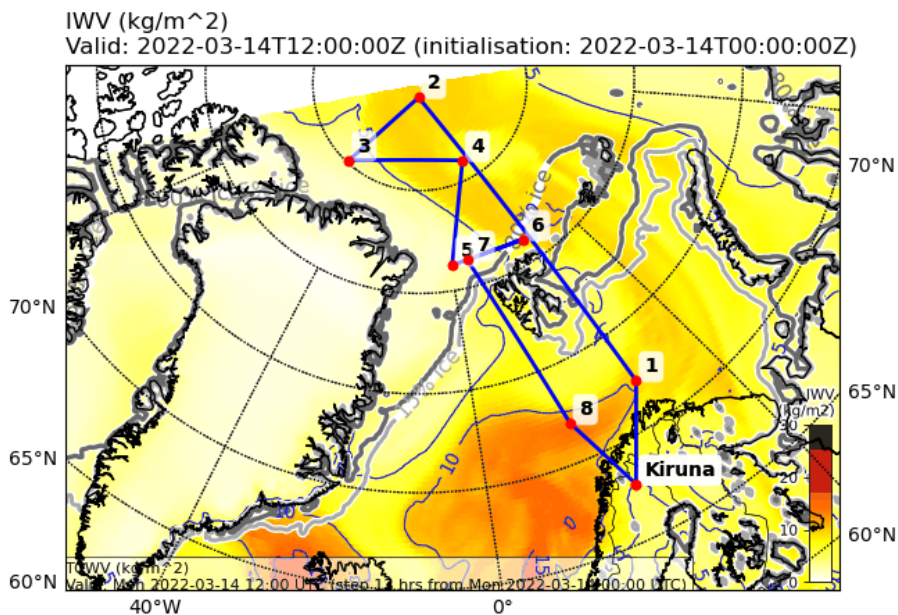
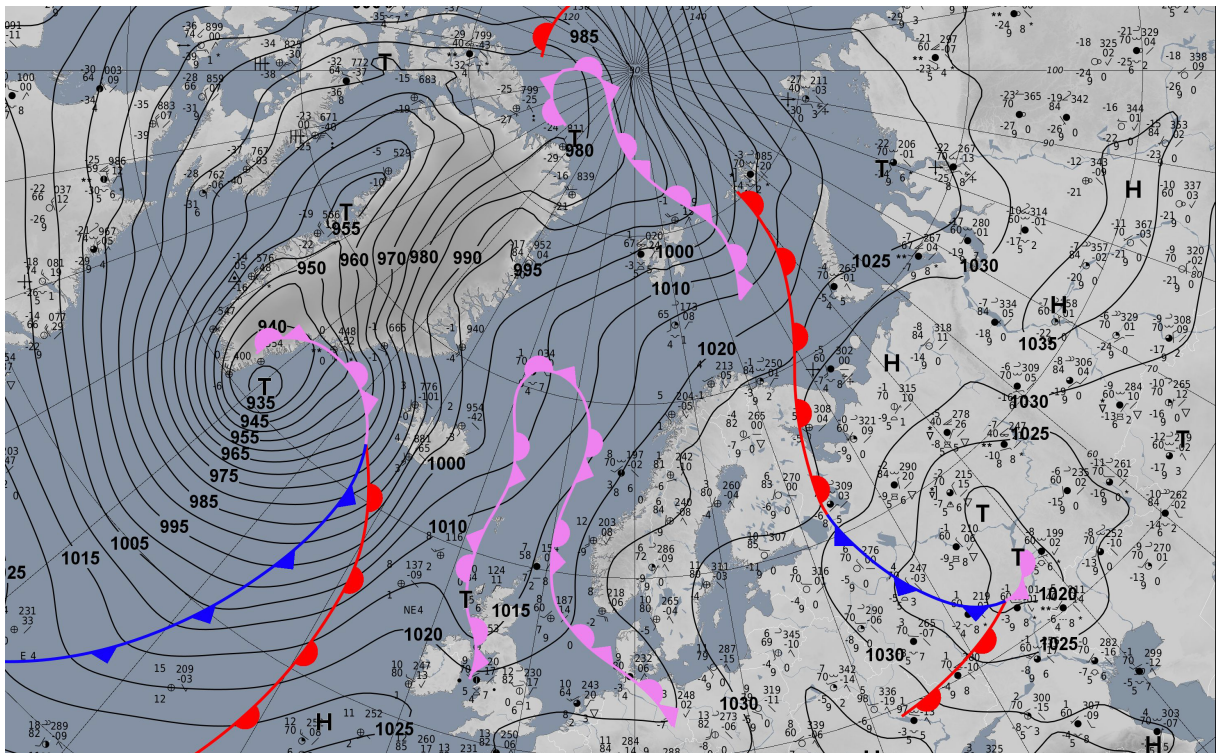


Fig. 1: Planned flight path overlaid on IWP from ECMWF forecast.

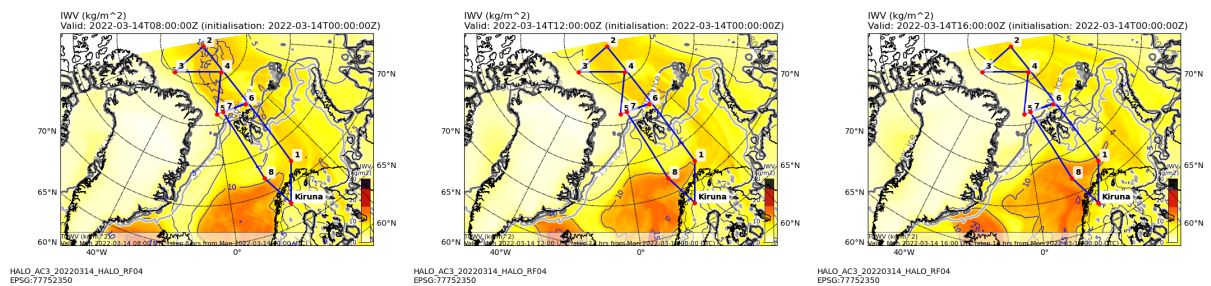
## Weather situation as observed during the flight (compare to forecast):

The forecast suggested that a filament of moist air should be stretching from east of Svalbard (in Russian airspace) towards the pole north of Svalbard, with drier air and less high clouds to the west of that, i.e. towards Greenland. Clouds were supposed to break up just north of Svalbard for a portion of the leg 5-6-7 coordinated with the satellite overpass. From waypoint 7 back to Kiruna, forecasts suggested the presence of a moister air mass associated with high clouds in the afternoon.

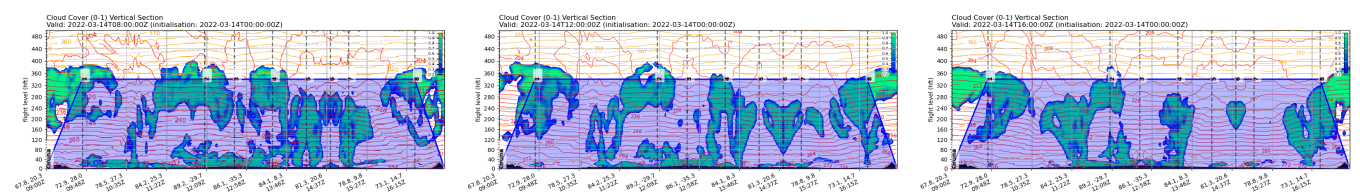
The general air-mass properties matched the forecast well, but high clouds reached higher and over a larger portion of the track than the forecast had suggested during flight planning. No cloud-free areas were encountered on the leg 5-6-7.

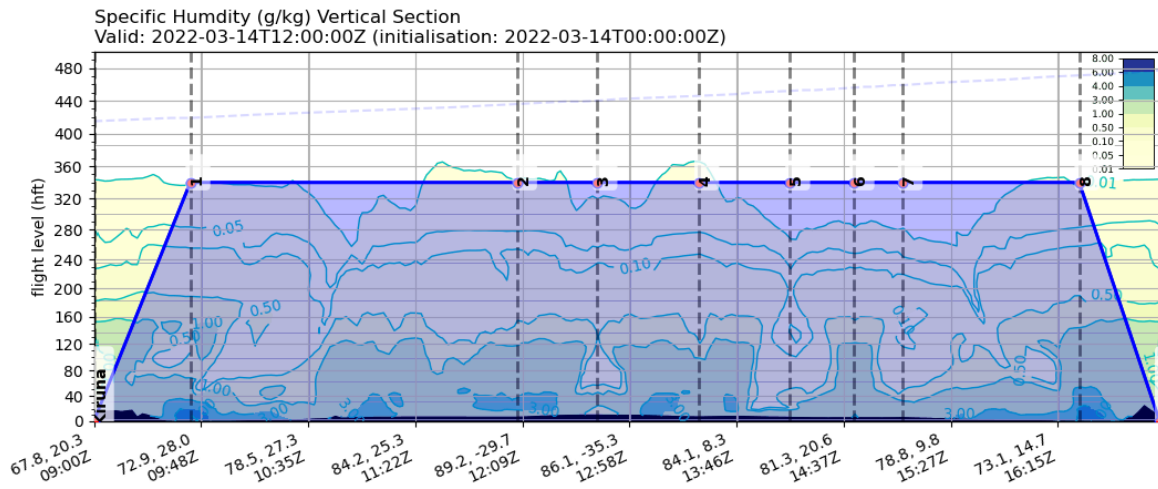


DWD surface analysis Monday, 2022-03-14 12 UTC

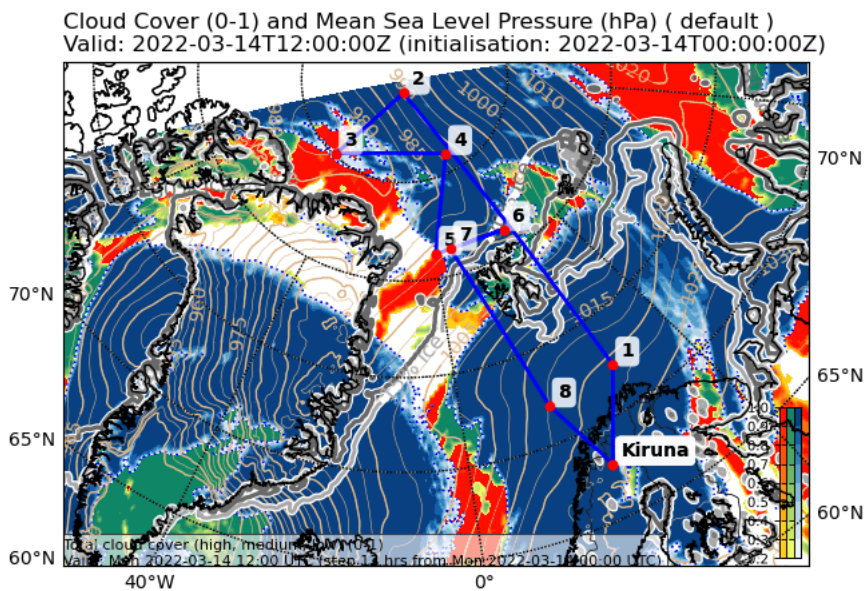


## ECMWF IWW





ECMWF q sideview



HALO\_AC3\_20220314\_HALO\_RF04  
EPSG:77752350

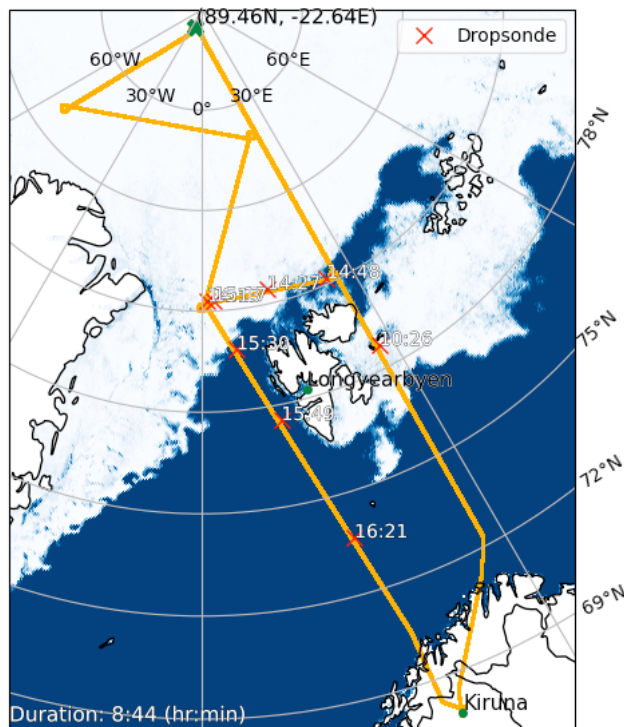
## Overview:

The flight primarily aimed to retrieve the moist air mass advected into the Arctic during the previous day(s), including measurements of the same air parcels that had been encountered by HALO\_RF03 on the previous day to obtain a quasi-Lagrangian view of their evolution. This was limited by airspace boundaries to the East and airspace boundary and reach to the west (where the air mass was advected across the pole towards Alaska).

A secondary aim was to coordinate with a MetOp-B satellite overpass just north of Svalbard.

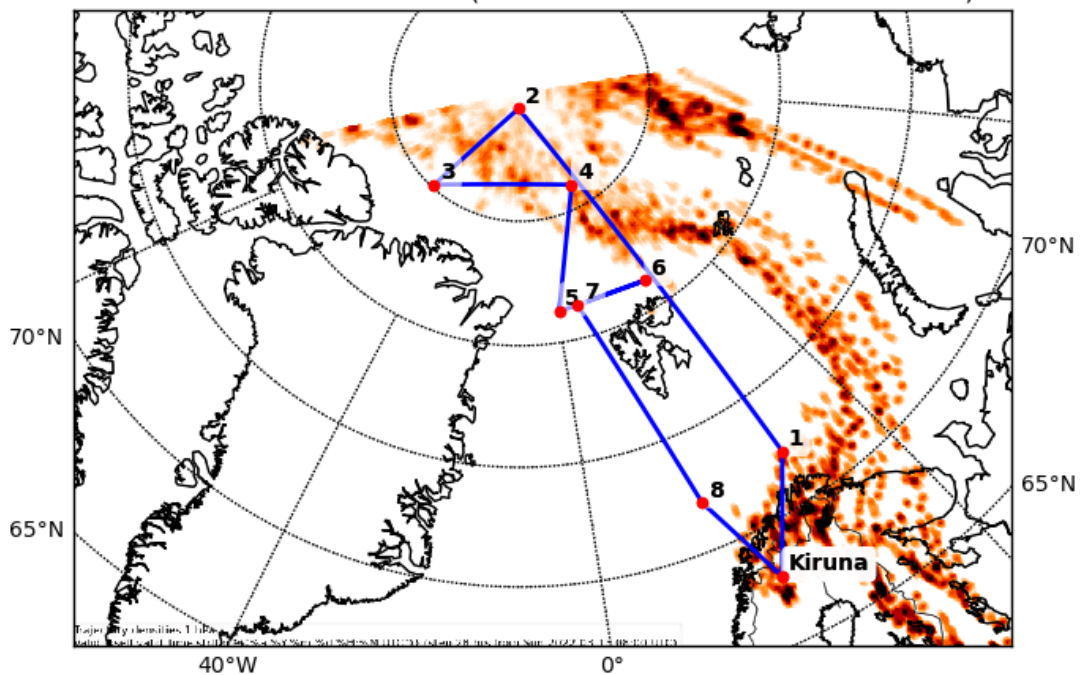


The flight generally fulfilled its aims, the flight altitude had to be raised in-flight to obtain better condition for the Lidar due to the presence of more and higher cirrus clouds than anticipated.



Flight track and successful dropsonde launches. An additional successful dropsonde was launched at nearly the same location as the 14:27 dropsonde at 15:03.

Trajectory density (arb.u.) at 1.0 (hPa)  
Valid: 2022-03-14T12:00:00Z (initialisation: 2022-03-13T08:00:00Z)



HALO\_AC3\_20220314\_HALO\_RF04  
EPSG:77752350

Location of air parcels surveyed during RF03 according to trajectory calculations.



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**Instrument Status:**

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

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

SMART: stabilization issues

specMACS: VNIR shutter malfunction, thus no VNIR data. Additionally two small interruptions leading to data gaps < 10 min.

Dropsondes: sonde 2 did not work, sonde 5 only reported winds, no T and RH.

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**Detailed Flight Logs:**

08:45 takeoff

08:57 Going through clouds (thin) or already above clouds

09:00 Cirrus outside, CTT -20

09:03 reached flight level 340

09:16 still Cirrus outside, thin clouds below, ground visible

09:22 Cirrus outside, probably flying through it, CTT down to -35

09:28 Still in cloud top

09:42 cirrus now and then and low level clouds

09:54 up to flight level 360 to get above clouds and improve lidar signal

Scattered clouds underneath, view of sea ice and parts of Svalbard

11:43 in Cirrus at FL380

11:44 passing geographic north pole

11:50 most northerly point

12:01 Sun back over the horizon

12:04 Roll manouever because of switch of navigations systems

12:51 after turn towards WP 4, up to flight level 410 to get above cirrus in the moist airmass to the East.

high clouds to the left, lower clouds to the right

13:20 procedure turn

13:25 no high clouds visible

13:33 stripey cirrus below

14:01 no clouds below, clear view of sea ice

14:02 Sc to the left, no clouds to the right

14:09 Sc below

14:19 No cirrus below us, still Sc

14:24 Reached Cirrus border

14:30 VELOX CTT -40

15:21 additional dropsonde launched just after passing the ice edge

15:41 No more cirrus for quite some time already, still somewhat broken Sc |

15:55 Cirrus clouds below us

16:04 Roll manouever to try and unlock the SMART stabilization

16:23 RADAR, raining on the ground, melting layer little over 3km

17:19 touch down



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**Quicklooks:**

