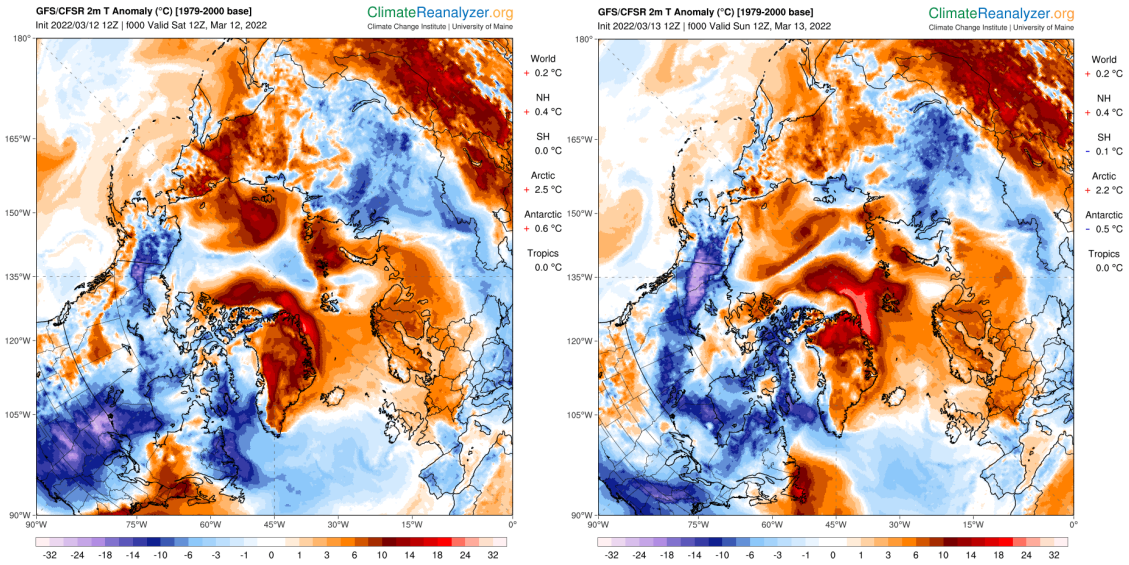
Flight Report

HALO-AC3_HALO_20220312_RF02

Warm Air Intrusion 1—Day 2

Objectives:

- Second of three consecutive flights looking at the same Warm Air Intrusion 1 (WAI1)
- Compared to the previous day the exceptional warming even intensified and spread across the sea ice into the the Fram Strait towards the Pole
- To investigate surface-atmosphere interaction cross sections over the warm intrusion covered the transition between open ocean and sea ice



https://climatereanalyzer.org/wx/fcst/?mdl_id=gfs&dm_id=arc-lea&wm_id=t2anom

Mission PI HALO:

HALO Crew	
Mission PI	Susanne Crewell
HAMP	Lutz Hirsch
WALES	Silke Gross
SMART/VELOX	Michael Schäfer
specMACS	Maximilian Ringel
Dropsondes	Benjamin Kirbus
Camera	Sebastian Schmidt
Pilots	Marc Puskeiler Michael Grossrubatscher
Engineer	Thomas Leder

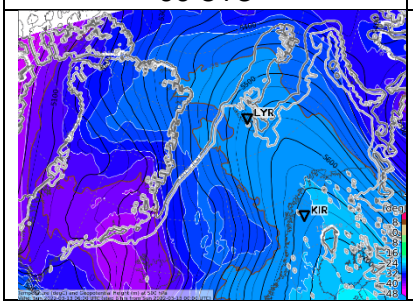
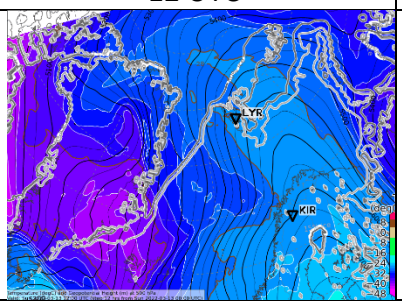
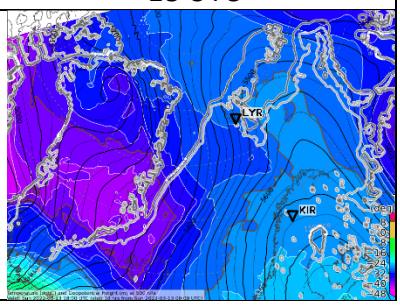
Flight times:

HALO	
Take off	08:22 UTC
Touch down	16:44 UTC

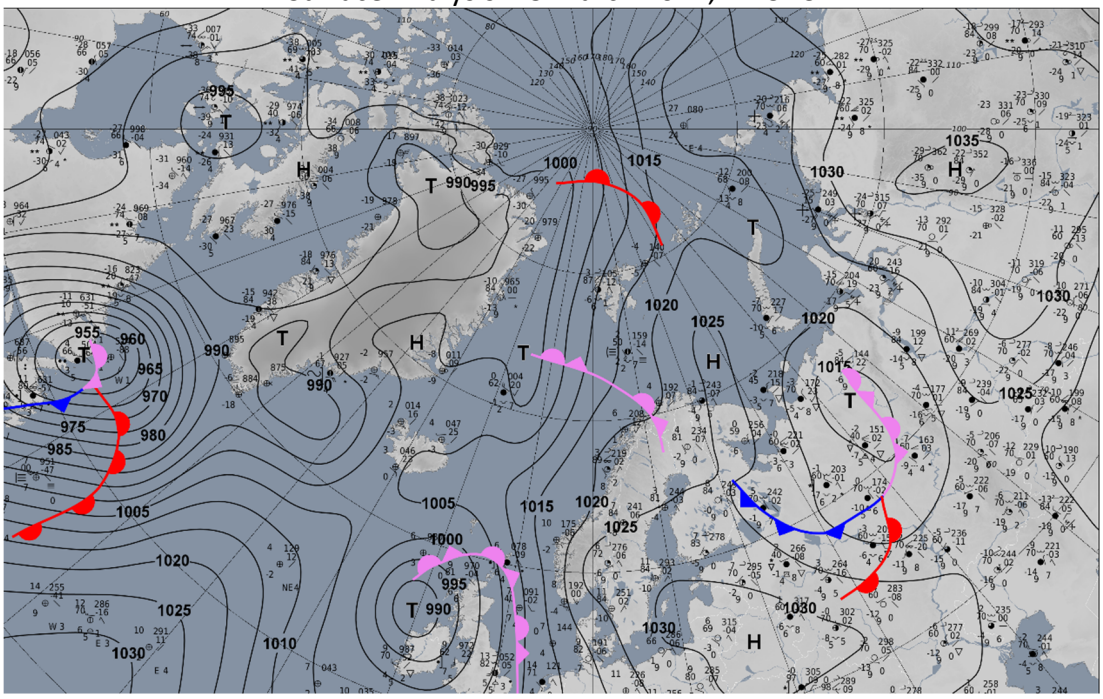
Weather situation during the flight:

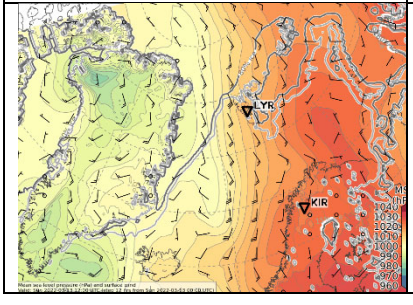
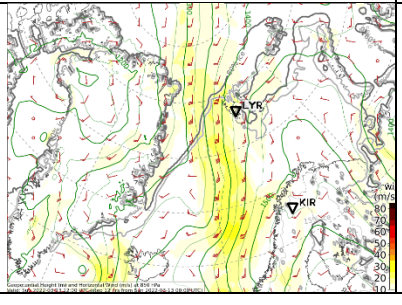
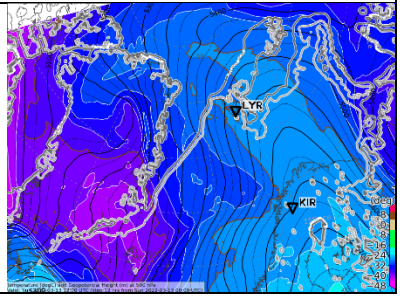
The strong ridge from yesterday with a north-westerly axis was still pronounced in the morning and slightly tilted its axis even further to the north during the day. This lead to a steady flow from the south at all altitudes (500 hPa, 850 hPa, sea level) bringing moist air directly from Mediterranean into the Arctic. The warm front marking the progress of the warm and moist airmass reached about 86 N at 12 UTC as evident in the surface analysis.

500 hPa Geopotential and Temperature, ECMWF analysis, 13 March 2022

06 UTC	12 UTC	18 UTC
		

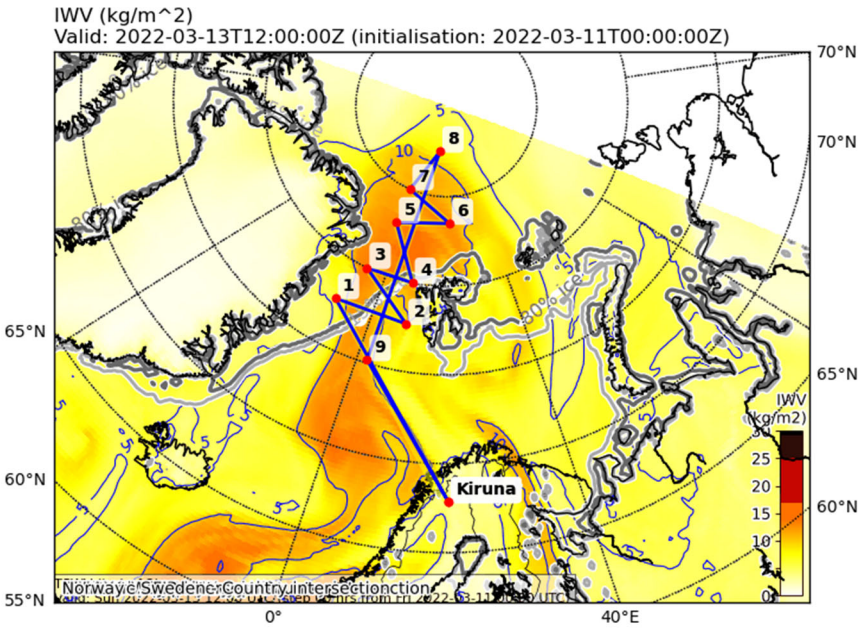
DWD Surface Analysis: 13 March 2022, 12 UTC

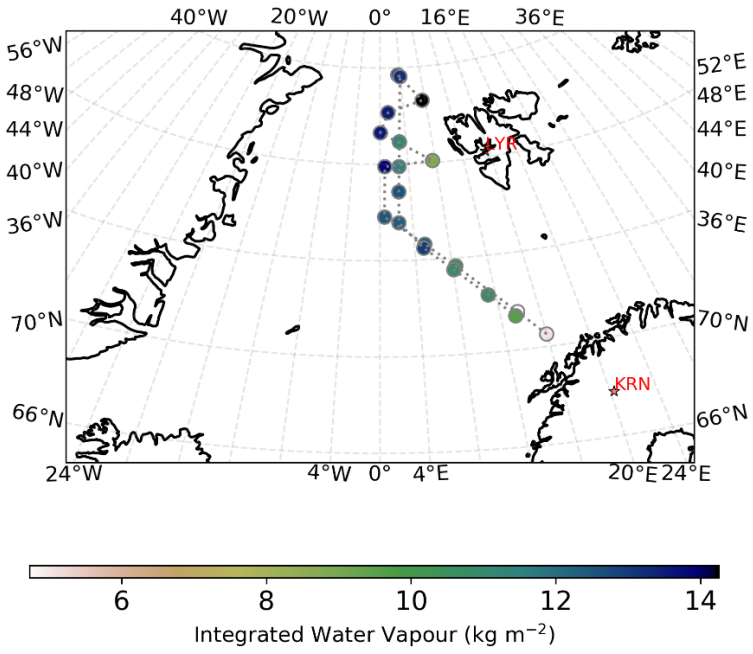


850 hPa Geopotential and Wind	Sea Level Pressure and Wind	500 hPa Geopotential and Temperature,
		

Overview of flight:

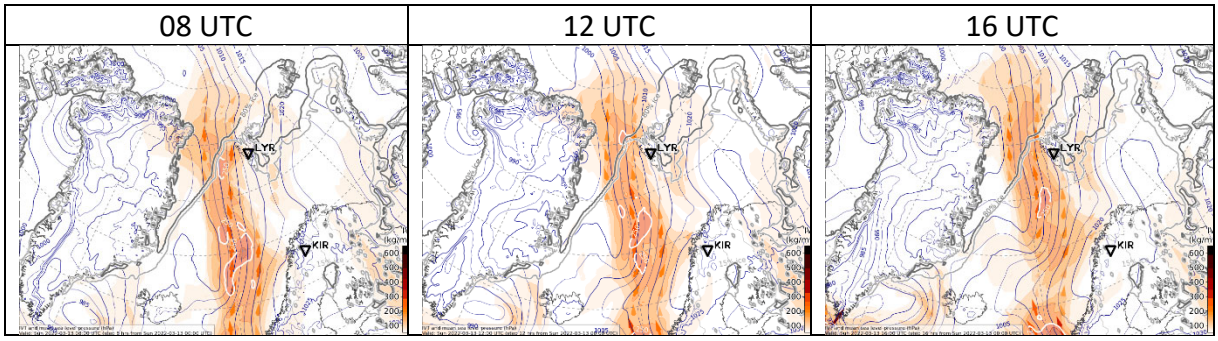
The flight pattern aimed to characterize the strong warm air intrusion with straight northward flow of humid air and associated clouds and precipitation The flight started directly from Kiruna with a transect through the moist tongue at around 75 N covering the sea ice edge and continued northward with in total 7 transects of the moist air mass. Three transects passed the sea ice edge (grey lines in figure below) contrasting conditions above water and ice. 24 drop sondes were released (2 did not work) showing the increase in water vapor with latitude (see positions of dropsondes below by Geet). The flight started at FL410 (about 12.5 km) and after 2.5 hours we climbed slightly higher to FL 430 as high clouds disturbed the lidar measurements.



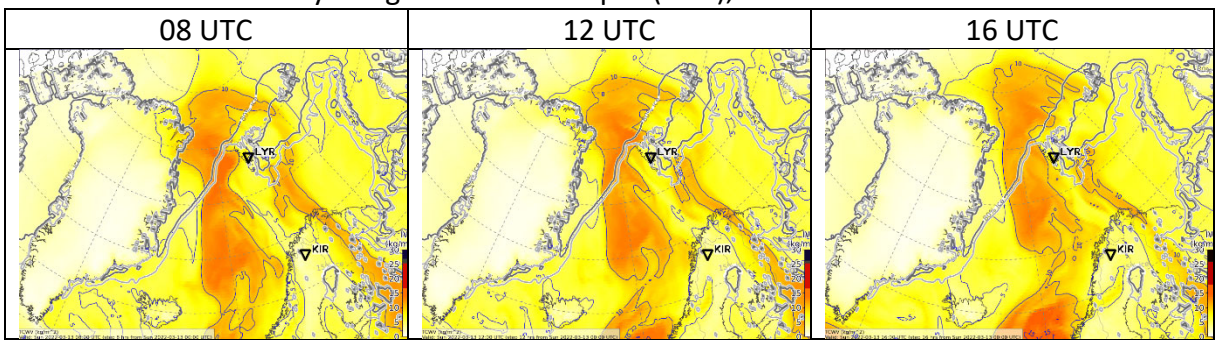


The vertically integrated water vapor and transport fields are also shown in their successive order throughout the flight (8, 12, 16 UTC). Clouds in multiple levels were observed with overlying cirrus most of the time as also seen by ECMWF analysis and with the radar shown below.

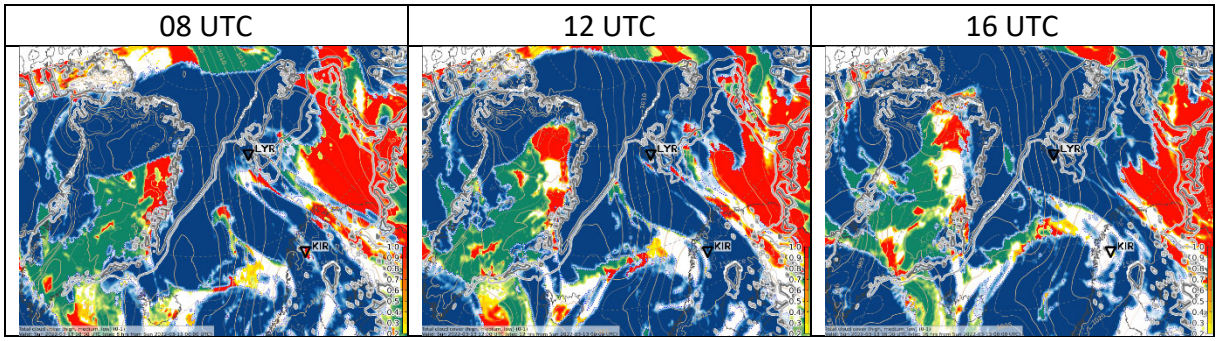
Vertically Integrated Water Vapor Transport (IVT), 12 March 2022

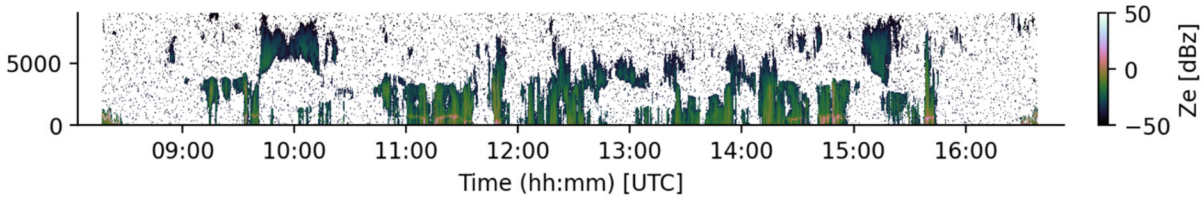


Vertically Integrated Water Vapor (IWV), 12 March 2022



Cloud Cover and Sea Level Pressure, 12 March 2022



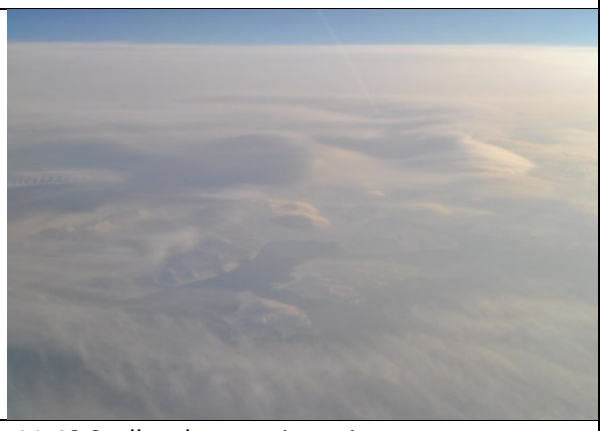


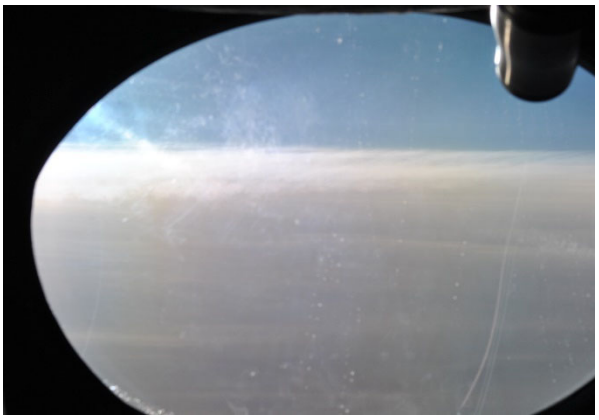
Instrument status

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.

Flight Impressions (start 8 UTC)

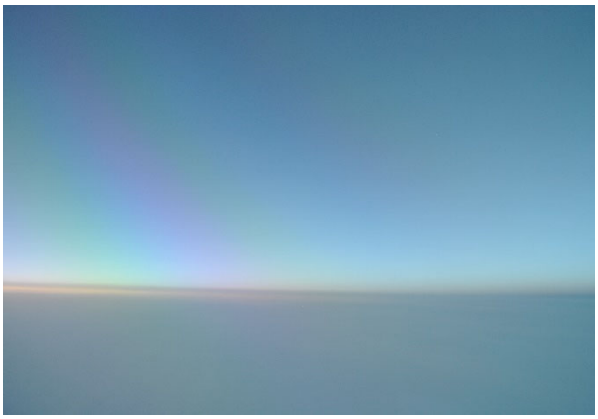
	
8:16 view across Norwegian border	9:36:03 after crossing water vapor max
	
10:36 around turn, interesting multi-layer structure with shadows, 2 Sc + Alto-clouds	11:40 Svalbard comes into view – open ocean with waves; some whitecaps + ice



12:49 Clouds at flight level, above Sc layer below, nothing in between

13:15 getting dark at WP7 (85 N)

13:37 extensive Sc below, with almost completely transparent high-level cloud above, and smoke layer well visible



13:40 looks like northern lights + sun re-appearing + smoke layer concentrating near the pole

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

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

16:30 Norwegian coast
17:00 landing

Thanks to the team!