

Flight Report

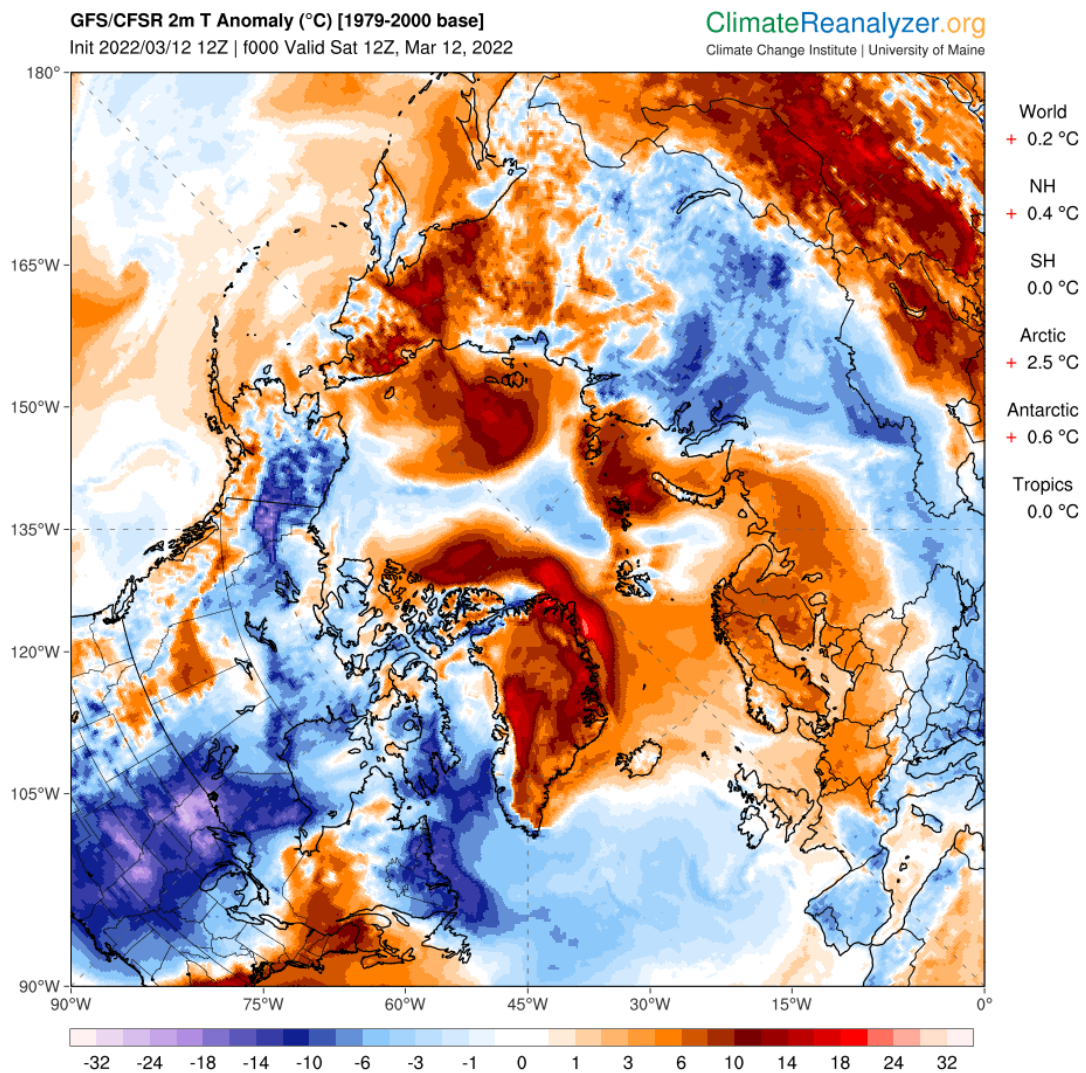
HALO-AC3_HALO_20220312_RF02

Warm Air Intrusion 1—Day 1

Objectives:

- First real science flight during HALO-(AC)³
- First of three consecutive flights looking at the same Warm Air Intrusion 1 (WAI1)
- This WAI1 considers a truly extreme event, see figure below (2-m temperature anomaly fields).
- We aim to follow it on its way northward through the Fram Strait.

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



Mission PI HALO:

HALO Crew	
Mission PI	Manfred Wendisch
HAMP	Martin Hagen
WALES	Georgios Dekoutsidis
SMART/VELOX	Johannes Röttenbacher
specMACS	Veronika Pörtge
Drosondes	Henning Dorff
Camera	Vera Schemann
Pilots	Marc Puskeiler Michael Grossrubatscher
Engineer	Sebastian Gerstner

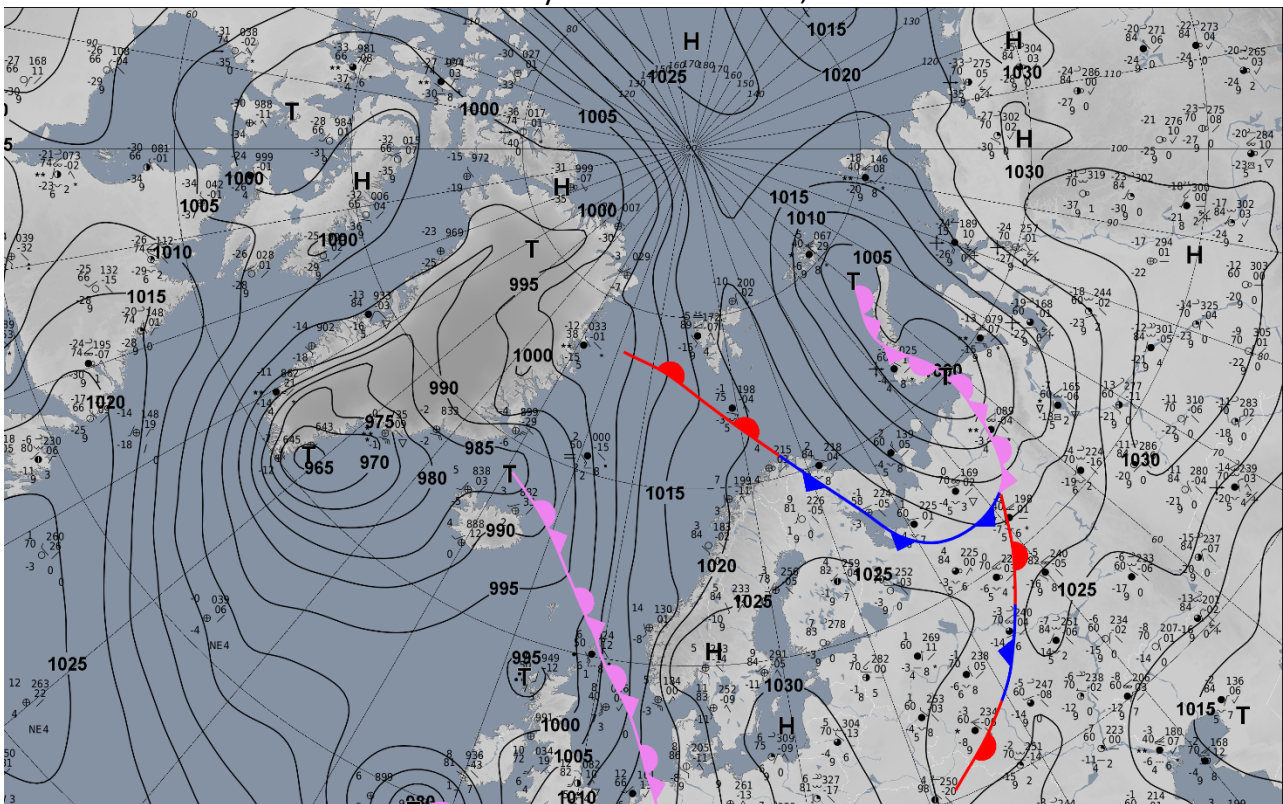
Flight times:

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

Weather situation during the flight:

At all altitudes (500 hPa, 850 hPa, sea level) a strong ridge with a north-westerly axis blocks zonal winds. Supported by a steering low between Iceland and Greenland on its western flank a strong northerly flow transports warm and humid air into the Fram Strait. This northern wind pattern is obvious from the ground to high altitudes, see the maps below.

Surface Analysis: 12 March 2022, 12 UTC

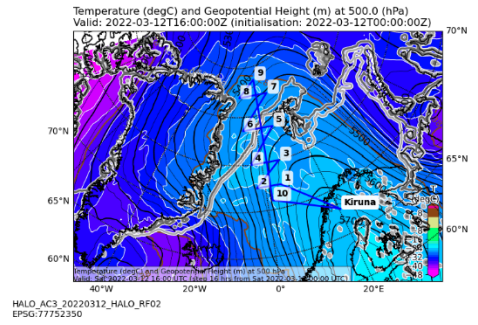
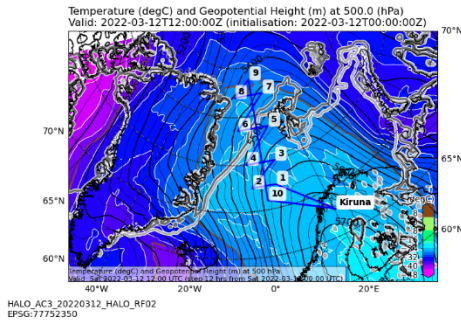
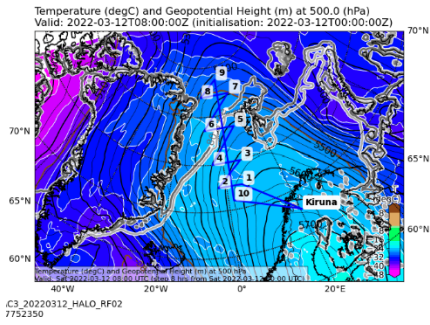


500 hPa Geopotential and Temperature, 12 March 2022

08 UTC

12 UTC

16 UTC

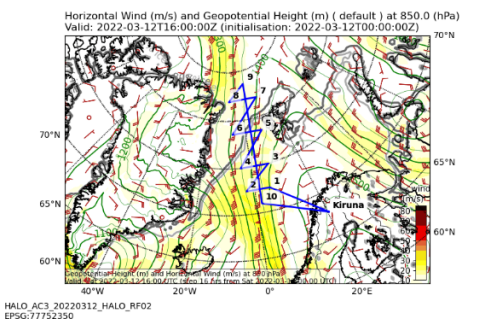
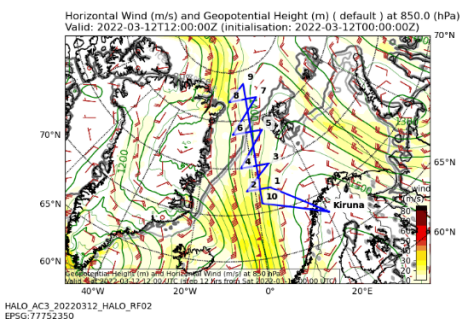
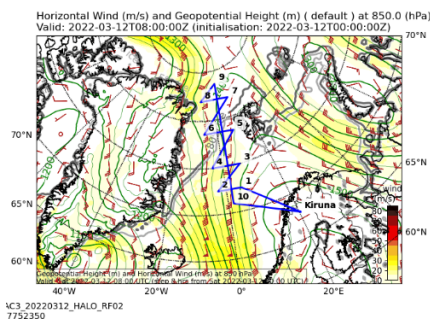


850 hPa Geopotential and Wind, 12 March 2022

08 UTC

12 UTC

16 UTC

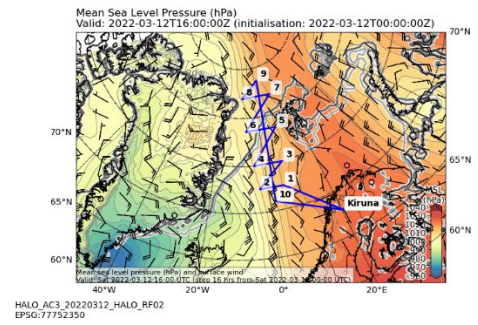
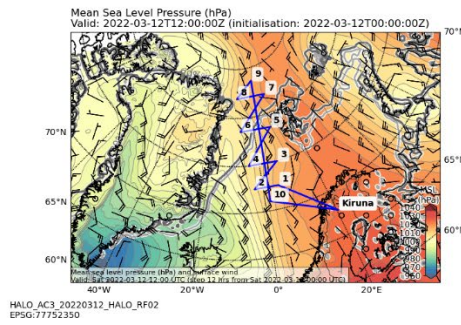
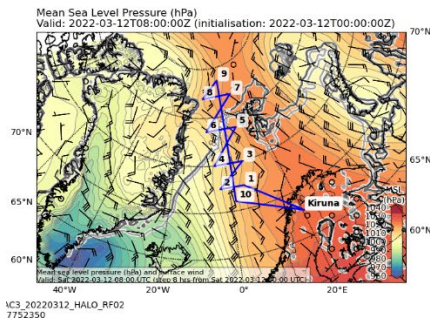


Sea Level Pressure and Wind, 12 March 2022

08 UTC

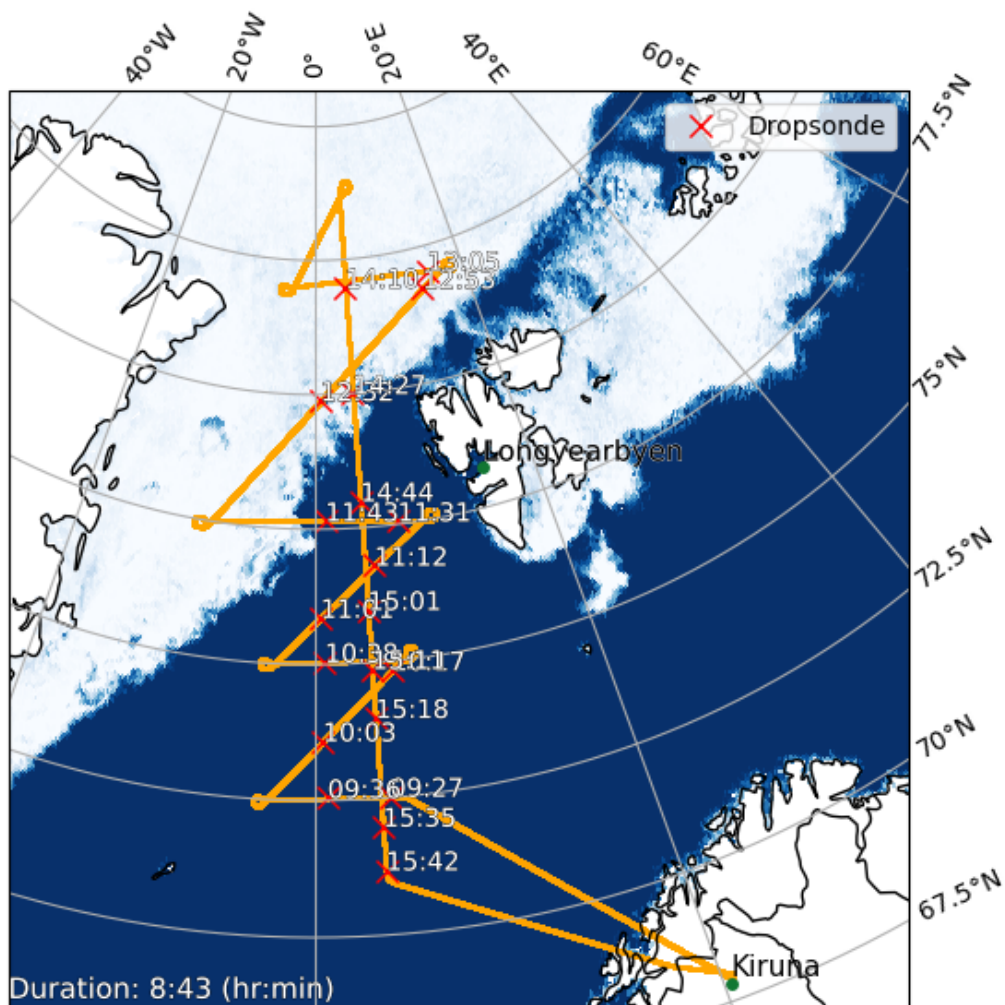
12 UTC

16 UTC



Overview of flight:

To characterize the northward-flowing humid and warm air mass, the pattern illustrated below was flown (in white the sea ice is depicted). It aims to cover the northerly water vapor transport, the variability in water vapor concentration and the north-south temperature gradient. 19 Drop sondes were released (positions marked by red crosses including times in UTC in the figure below). The track includes paths parallel to the sea ice edge over open ocean and sea ice, as well as a track perpendicular to the ice edge. Most of the flight took place in altitudes higher than flight level FL410 (about 12.5 km).



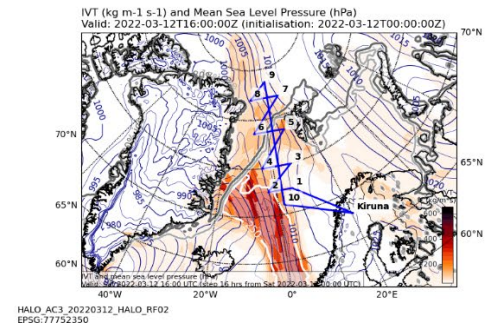
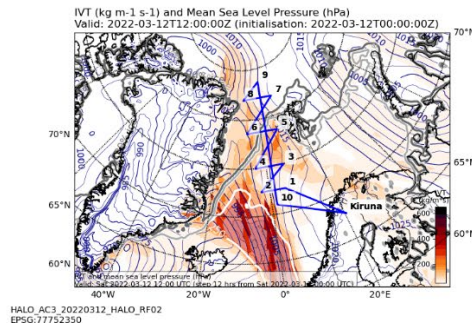
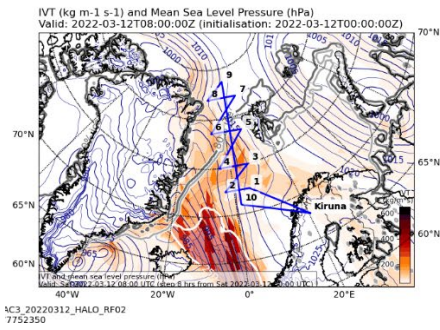
Clouds in different levels were observed, see the following maps below. The vertically integrated water vapor and transport fields are also shown in their successive order throughout the flight (8, 12, 16 UTC). The blue line indicates the flight path.

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

08 UTC

12 UTC

16 UTC

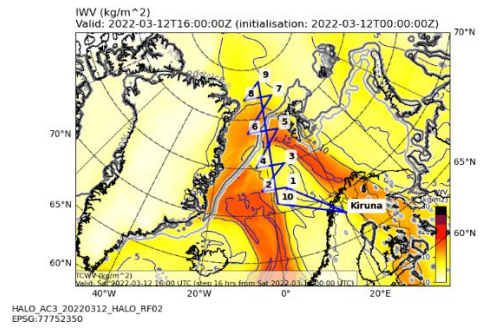
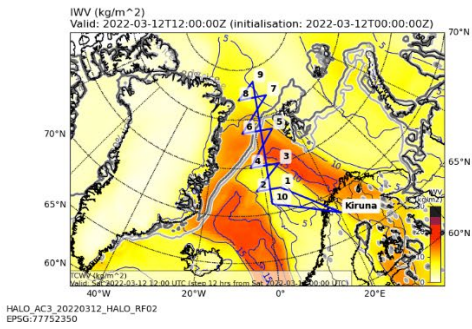
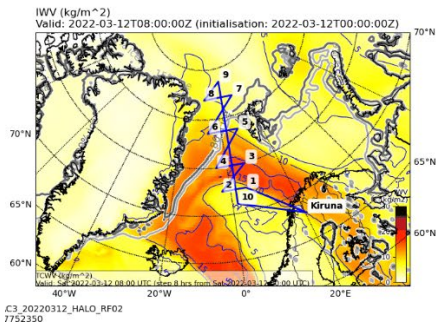


Vertically Integrated Water Vapor (IWV), 12 March 2022

08 UTC

12 UTC

16 UTC

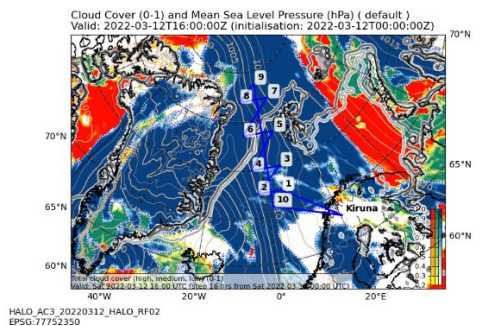
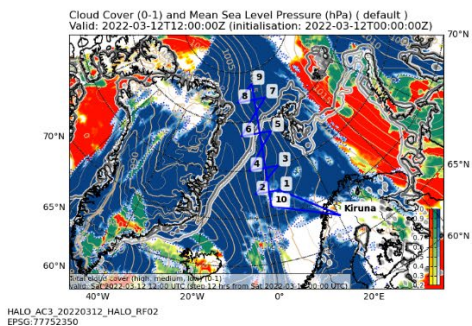
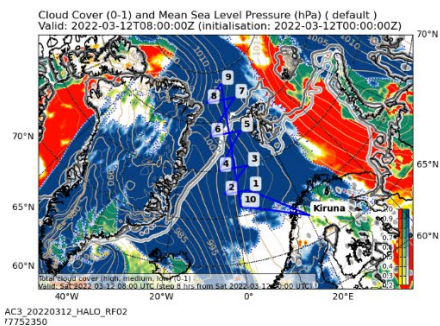


Cloud Cover and Sea Level Pressure, 12 March 2022

08 UTC

12 UTC

16 UTC



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 Logs (all times in UTC)

- 08:08 Engine on
- 08:15 Taxi
- 08:22 Take off
Only low clouds, cloud-free above
- 08:31 We climb, FL230
- 08:34 FL300, almost cloud-free



08:37 Reaching FL320, we stay at this altitude for a while, later on we climb slowly
 08:40 FL350, awesome view
 08:45 We are reaching the sea
 08:50 FL405, 12 km, -66°C
 08:53 FL410m 12.2 km, -67 °C
 09:00 We obtain permission to drop sondes as we like
 We are in Iridium with Planet all the time
 09:11 We are well above the clouds currently
 09:21 For lidar, the clouds are already too high, we cannot climb higher at the moment, Halo with
 its fuel is still too heavy. A pity, high cirrus, only little or no low clouds
 09:24 Reaching WP1
09:27 DS01 (DS ... Drop Sonde Release)
09:36 DS02
 Many clouds, mostly high stuff, but with low optical thickness
 09:45 Reaching WP2
 09:51 End of turn, we need about 6 minutes for the turn
 Nice Sc clouds beneath, we see our own contrail after the turn



10:03 DS03
 We still stay at FL410, 12 km, -70 °C
10:17 DS04
 10:20 Reaching WP3, start turning curve
 Nice clouds with precipitation
 10:26 End of curve, WP3
 So far clear sky above flight level
10:38 DS05
 10:46 WP4, start curve
 10:52 end curve, WP4
 Unstable iridium



11:01 DS06

11:02 We start climbing another 2000 feet



11:08 FL430 from now on

11:12 DS07

11:21 WP5, start curve

11:27 end curve, WP5

11:28 we are just below the tropopause

11:31 DS08

11:37 thin but high clouds

11:43 DS09

12:02 Many clouds, mostly below of us

12:03 WP6, start curve

12:09 end curve, WP6

12:22 thick clouds below



12:24 We are just below the tropopause, and the cloud top is more or less in our flight altitude

12:32 DS10

Nice clouds below

12:51 Sea ice can be seen through optically thin cloud layer

12:53 DS11

12:57 WP7, start curve

13:03 End curve, WP7

13:05 DS12 released earlier than planned, because of ATC restrictions

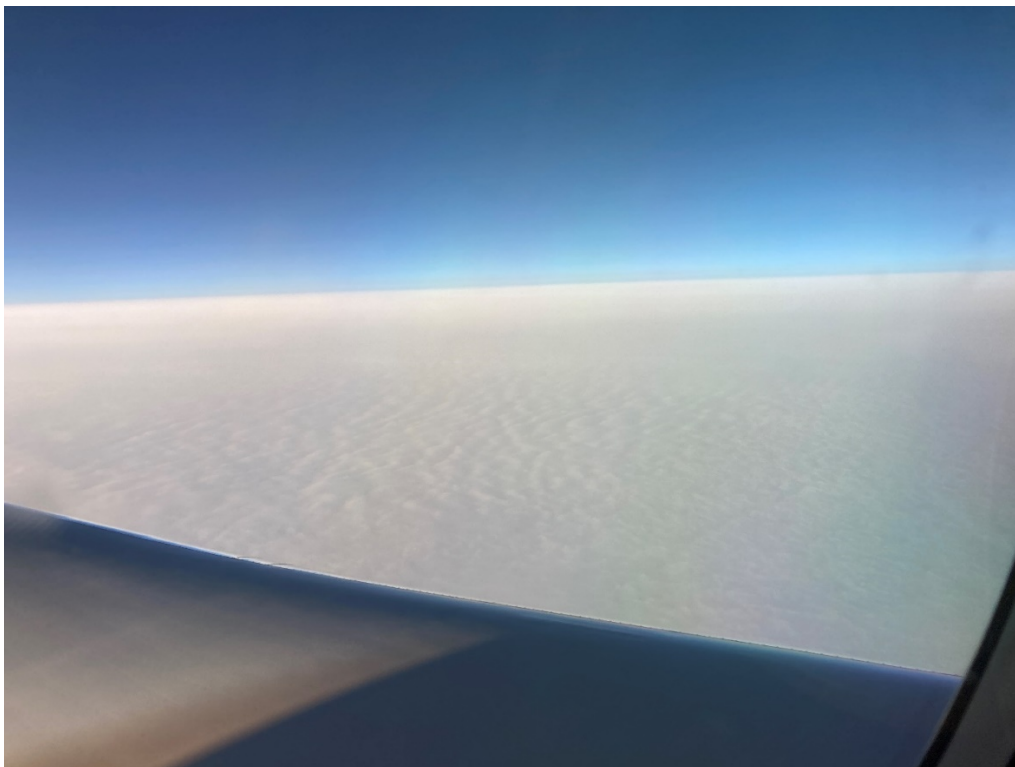
We can partly see the surface

Mostly cirrus now

A thin cirrus above flight level, major cirrus to in flight level

13:29 WP8, start curve

13:35 End curve, WP8



13:36 Climbing to FL450, about 500 meters above cloud top
Cloud top at 12.5 km, corresponding to the lidar data from Georgios

13:42 Reaching FL450

13:48 WP9, start curve

13:55 end curve, WP9

45 minutes lost due to curves during entire flight

14:10 DS13

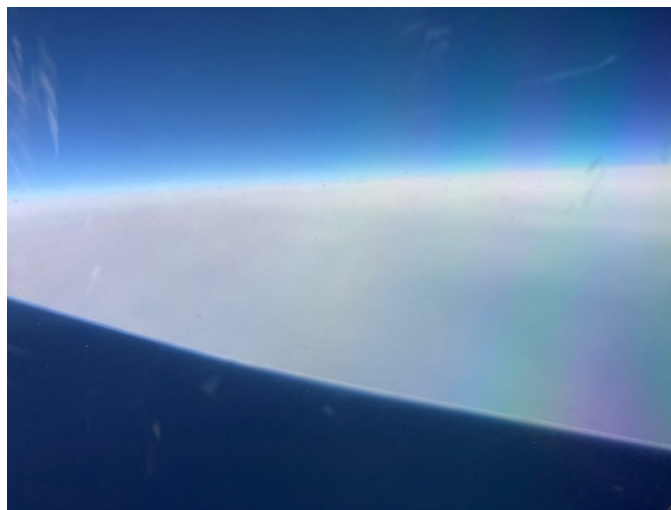
14:27 DS14

14:44 DS15

15:01 DS16

15:18 DS17

15:35 DS18



15:42 DS19

16:16 Start descending

16:44 Landing

Thanks to the team!

