

HALO-(AC)³ – 2022/03/28 – Polar6 research flight RF05

Objectives:

RF05 with Polar 6 covered 3 topics: (1) the intensive probing of the evolution of a moderate oceanic cold air outbreak event southwest in the lee of Svalbard, (2) coordinated P5 underpasses on three flight legs and (3) two HALO underpasses. These topics motivated the selection of the flight route.

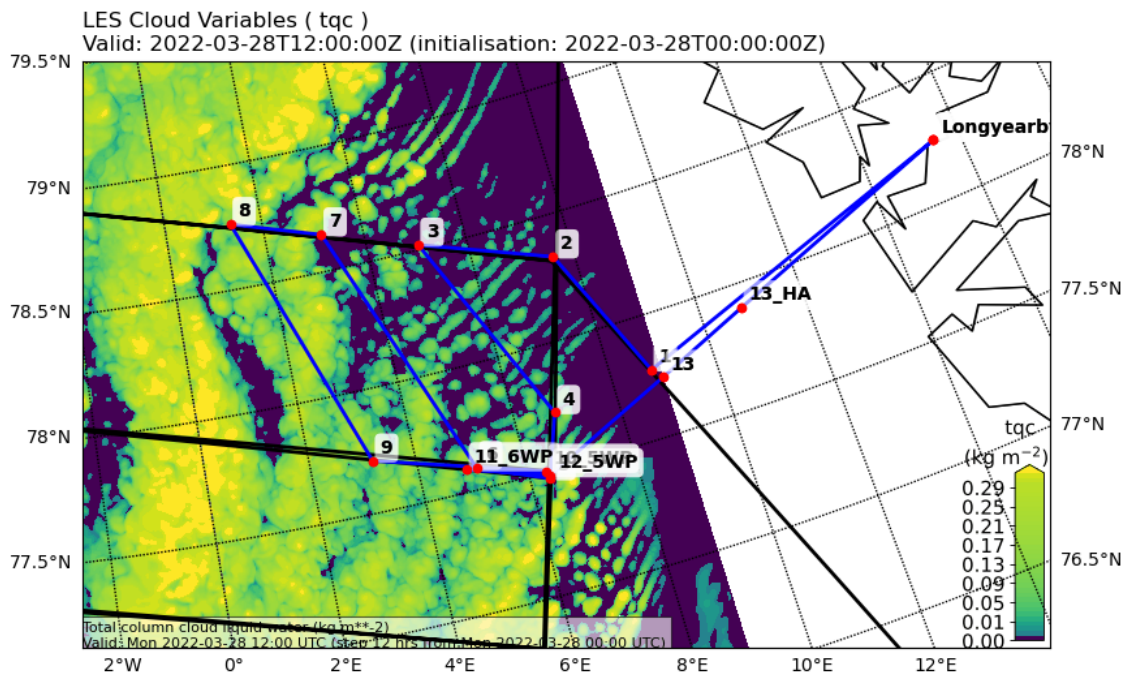
Mission PI P6:

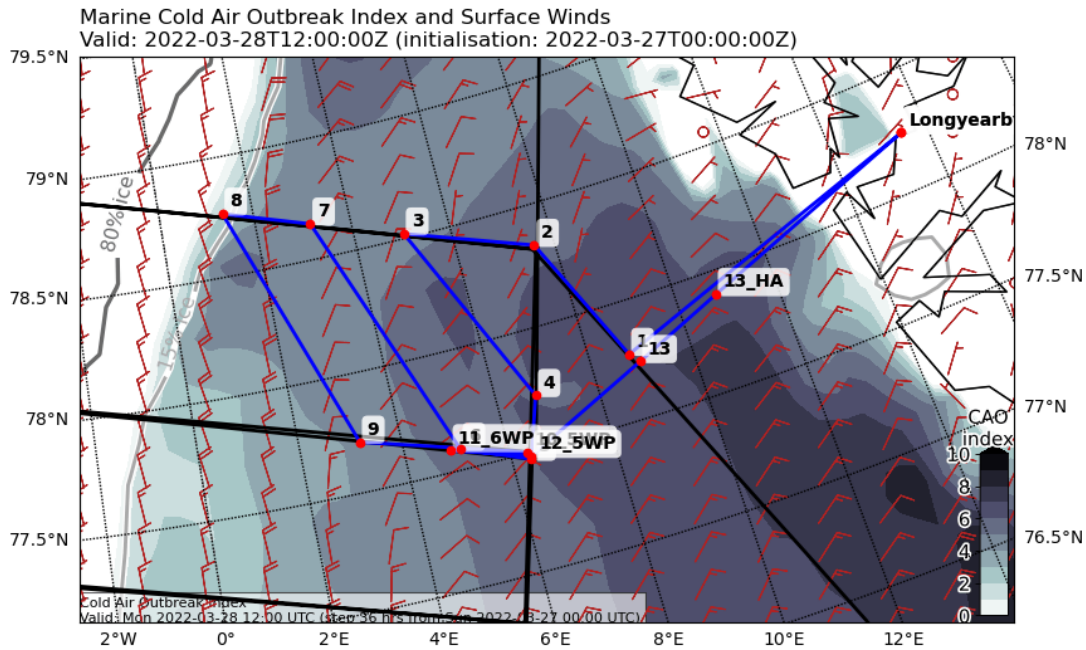
Christiane Voigt (Christiane.Voigt@dlr.de)

Polar 6 Crew	
Mission PI	Christiane Voigt
Basis Data Acq.	Maximilian Stöhr
CVI	Sarah Grawe
ALABAMA/Trace gas	Hans Christian Clemen
Microphysics	Johannes Lucke
HERA/Aerosol	Bruno Wetzel

Flight times:

Polar 6	
Take off	11:28 UTC
Touch down	16:18 UTC





P6 planned flight track, cloud cover and CAO index for Monday 12 UTC from ECMWF

Cloud situation observed during the flight:

West of Svalbard, shallow clouds evolved from the Longyearbyen fjord. Broken clouds and sometimes closed cloud layers were probed with the P6 over extended times between 700ft up to 4500ft. In the northern part, shallow convective cloud tops extended to 4500 ft out of the cloud layer with a cloud top at 4000 ft. At times precipitation and snow was encountered by the P6. At the below cloud legs at 600ft or 200ft, the open ocean was visible without ice cover.

Overview:

The original plan, a collocated flight together with Polar5 and HALO was postponed, due to a navigation instrument repair at P6 and some problems with P5. Therefore, the takeoff was delayed and both aircraft took off about 2,5 and 3 h later after repair of the navigation instrument at P6. This still enabled simultaneous measurements with P5, P6 and HALO.

After take-off at 11:28 UTC, ascent to FL5000 and the transfer to WP2 above clouds. A slow descent was performed through the clouds from WP1 to WP2 followed by a flight leg below clouds and a slow ascent into the clouds. HALO performed an overpass between flight leg 2 and 3 when the P5 was probing within the clouds. Clouds were probed at 1000, 2000, 3000 ft and the cloud top ranged near 4000 ft with some convective cloud tops extending to 4500ft. Between WP 3 and 4, the 230 V Inverter failed and led to the failure of many instruments onboard. As the cloud probes, the CVI and the trace gases were working on 28 V, we took the decision to continue the flight with less instrumentation operating. HALO was met a second time. Two good staged profiles through the clouds (closed or

broken cloud decks) were performed with delta altitudes of 200 ft, 3 min during descend and 500 ft, 3 min during ascent at altitudes between 800 and 4000 ft. The P5 took of later caught up and performed coordinated measurement above P6 between FL6-7 and 8-9, with the P5 often probing clouds. Between WP10, 11,12 al below cloud leg was performed to collect sea spray INPs at 200ft. Then a climb to 14000 feet (with oxygen) and a 5 min flight leg at 14000 feet was performed for the trace gases, when also an enhance INP or aerosol layer was observed. Finally, P6 performed a slow descent profile from 14000 ft to LYB at a descent rate of 500ft /min.

Instrument Status:

Polar 6	
Basis data acquisition	
Nose Boom	
CVI	
ALABAMA	
Trace gas	
Aerosol	
HERA	
Polar nephelometer	
2D-S	
CCP	
PIP	
BCPD	

Table S5.1: Instrument status as reported after the flight for all instruments on Polar 6.

Comments: Due to the 230 V inverter break down near WP3, some instruments lost connection and are marked in yellow, instruments with a complete data loss are indicated in red. The trace gas instruments recorded GPS and flight trac data throughout he flight, which will help for data evaluation and flight data were also recorded by P6.

Foto Flight Logs (Time in UTC):

Note: Flight has been delayed by 2,5 h due to the repair of the navigation system.

11:58 crossing some clouds right after T.O.



12:43



13:59



13:59



14:01



14:02



14:26



15:03



15:03

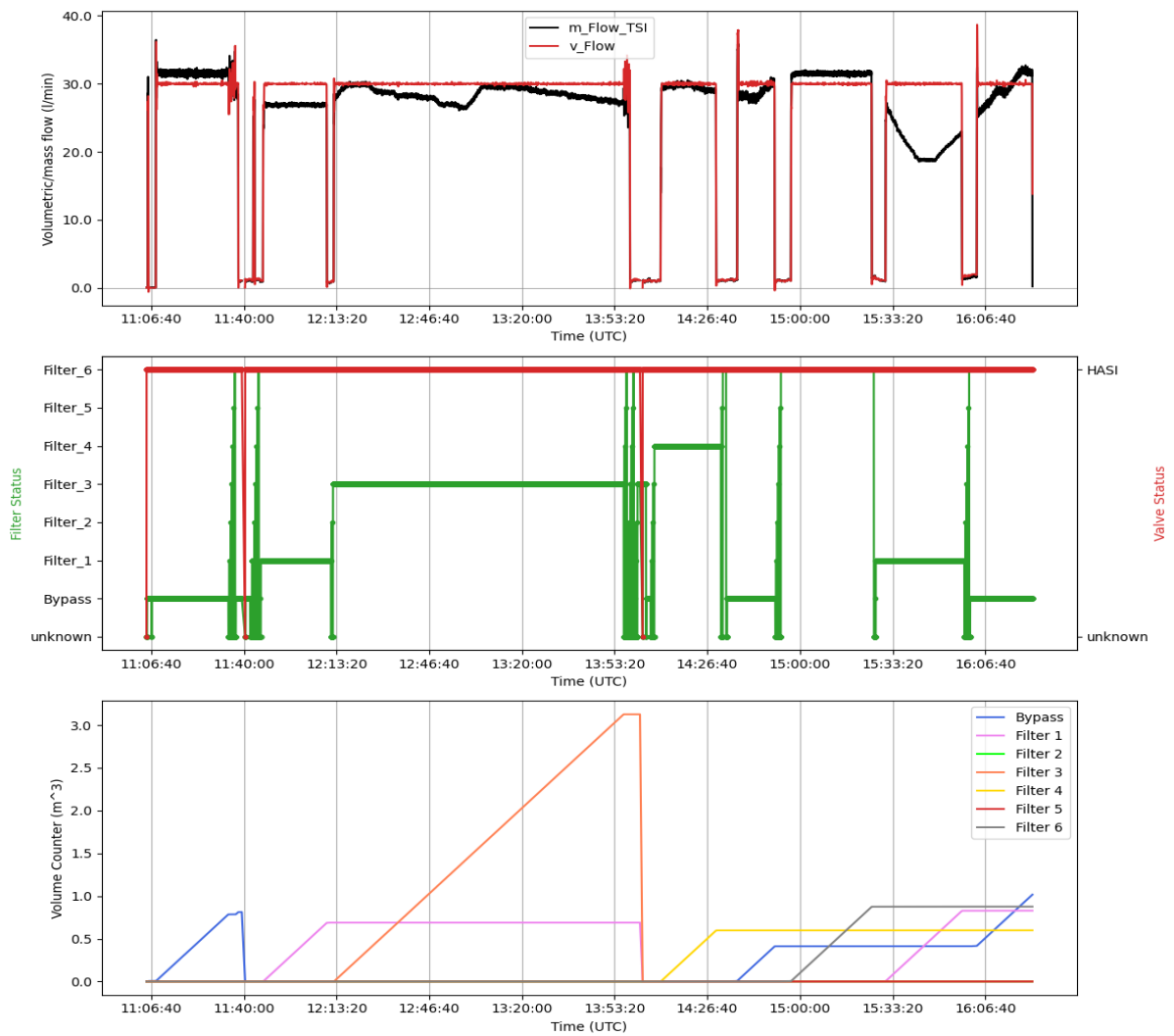


15:07

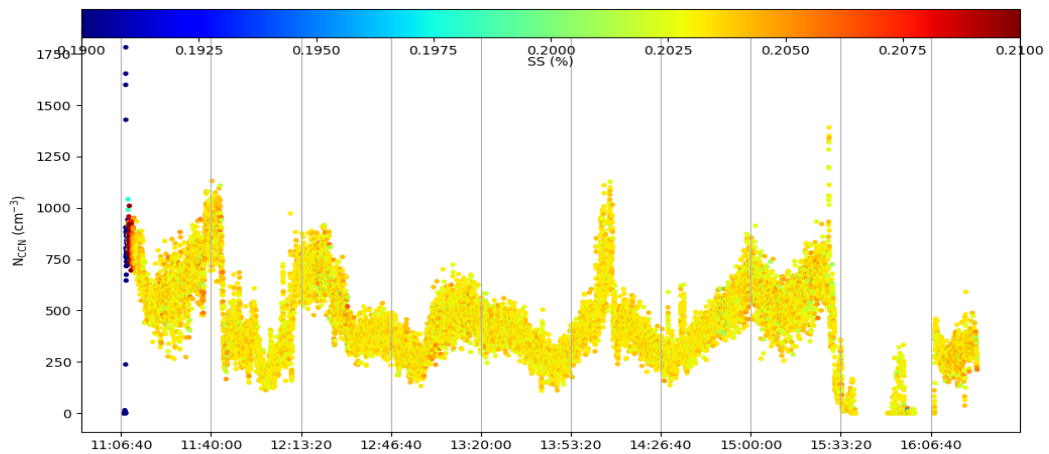


Quicklooks:

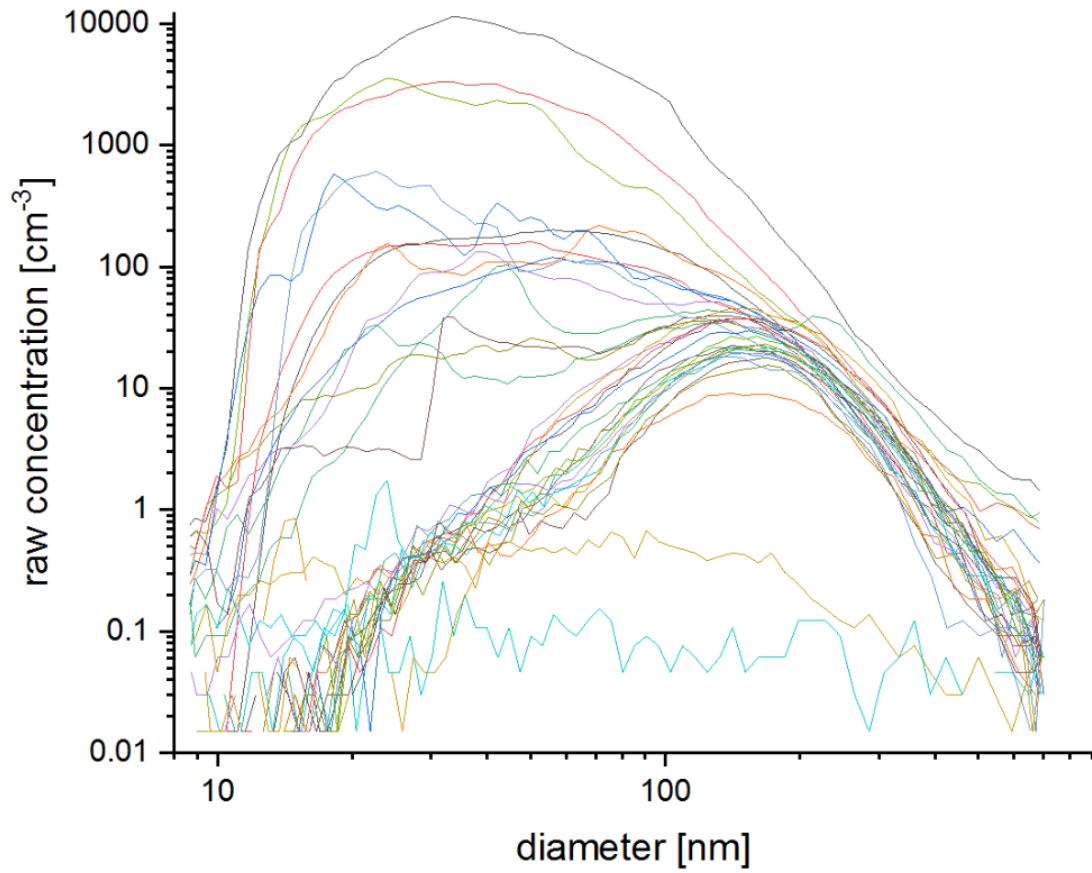
HERA



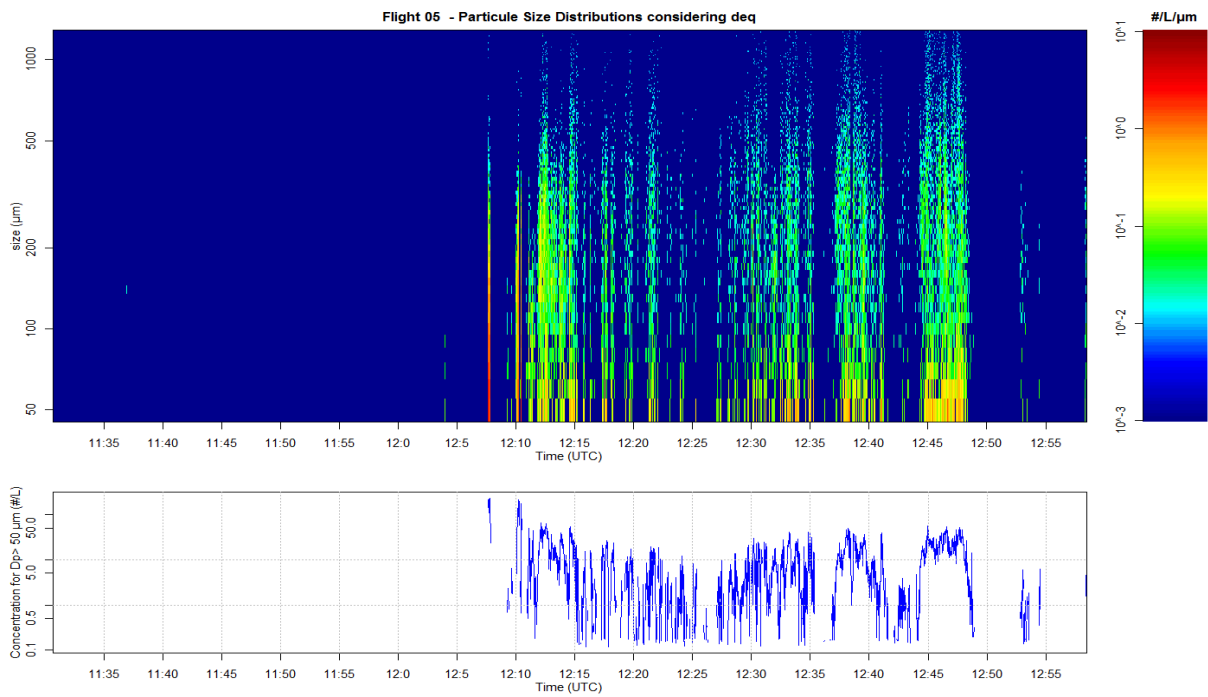
mCCNC



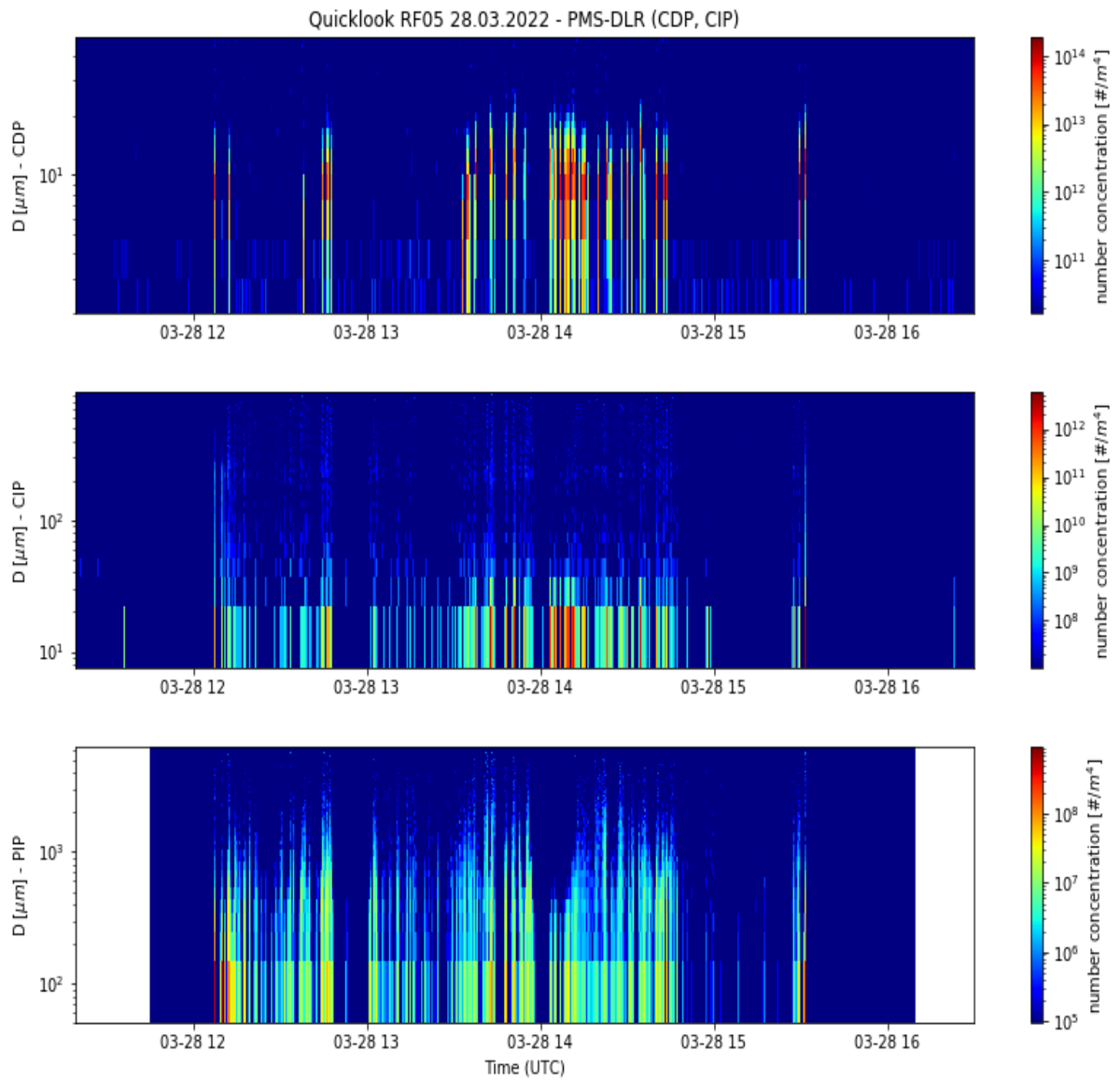
SMPS



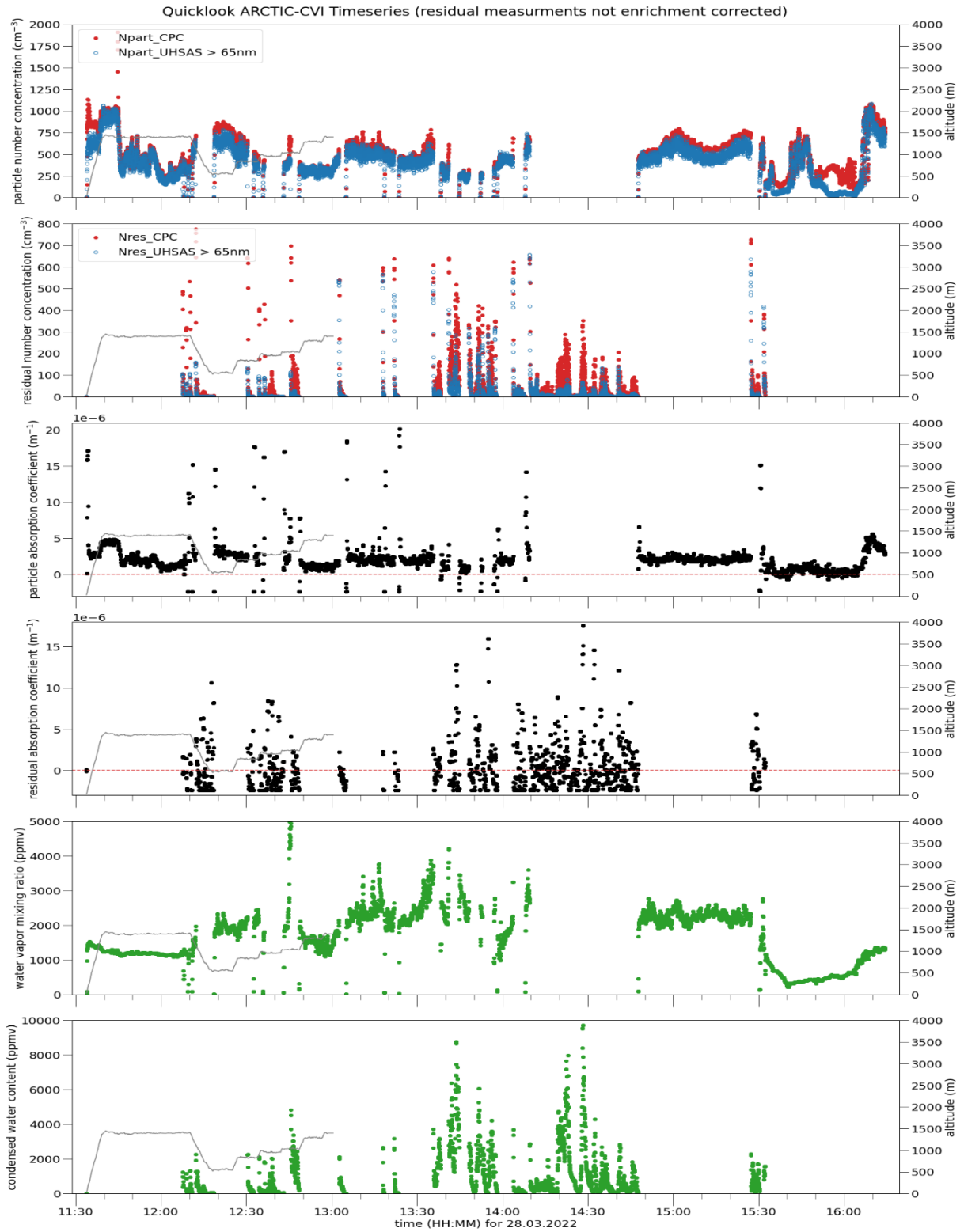
PMS-LaMP



PMS - DLR



CVI



Additional flight planning information

Flight plan

LYR – W1 ascend to FL 50: 1000ft/min, 5 min FL50 then descend to FL20 **44 min**

W1 ↔ W7 staggered patterns, 7 min each (120kn, 500ft/min)

1 leg below cloud, 2-3 legs in cloud (e.g. FL 30, 40, 50) one leg above cloud

(e.g. FL60), slow descent through clouds, then restart, all turns short turns **1h32 min**

W7 ↔ W8 convergence zone FL50 in clouds **11 min**

W8 ↔ W9 slow descent through clouds, staggered patterns,

7 min legs (e.g. FL 40, 30, 20) in cloud and below cloud **33 min**

W9 ↔ W10 saw tooth ascent /descent through cloud (500ft/min, 120km) **22 min**

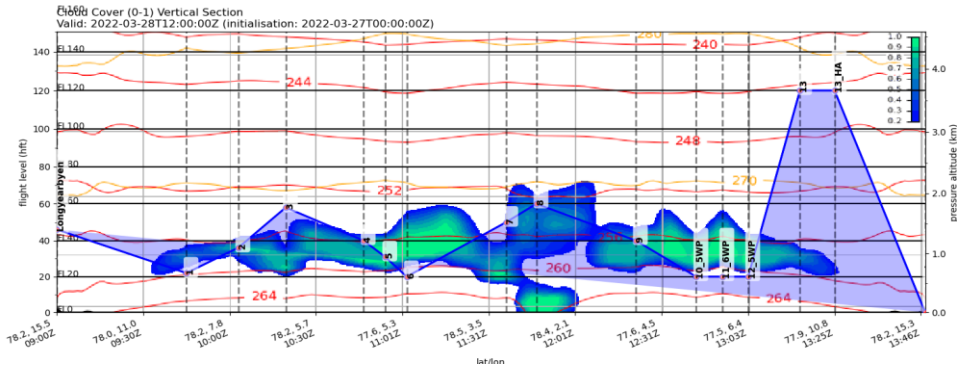
W10 ↔ W12 below cloud leg, aerosol, turbulence: FL20, 120kn **20 min**

W12 ↔ W13HA ascent through cloud to FL120, stay FL120, 140 kn for high latitude leg 500 ft/min in cloud, 1000 ft/min above cloud 140 kn **22min**

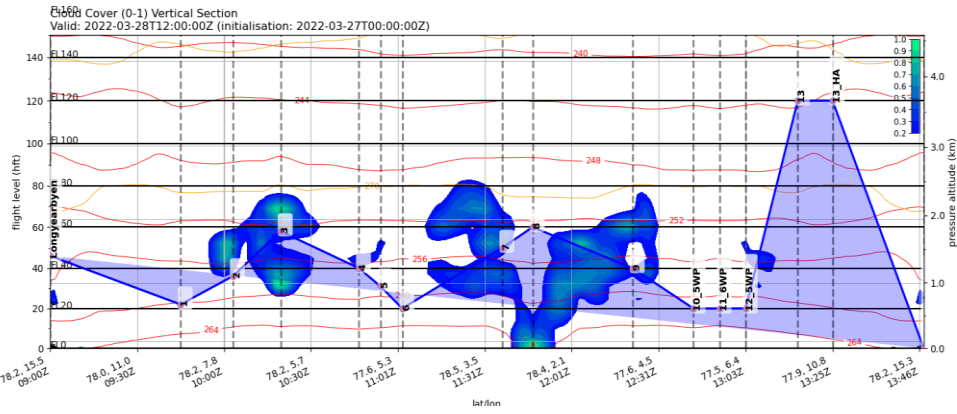
W13HA ↔ LYR slow descent **21 min**

Total: **4 hr 46 min**

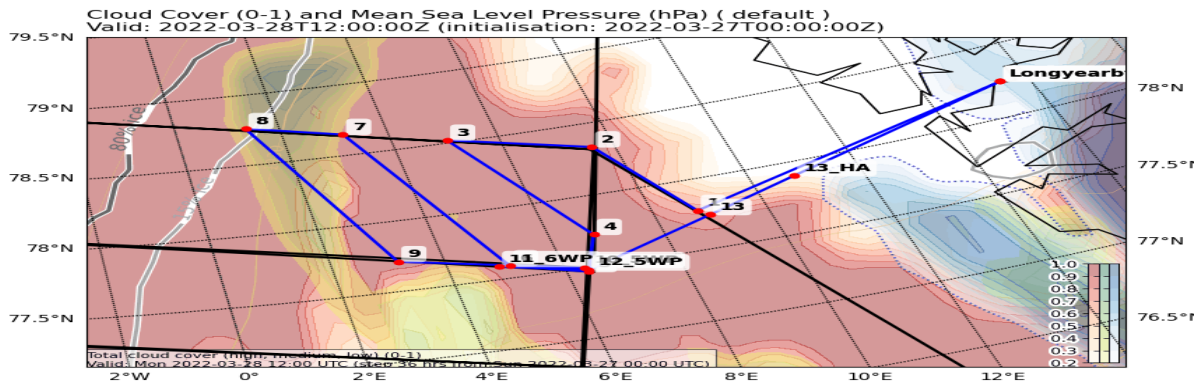
ECMWF



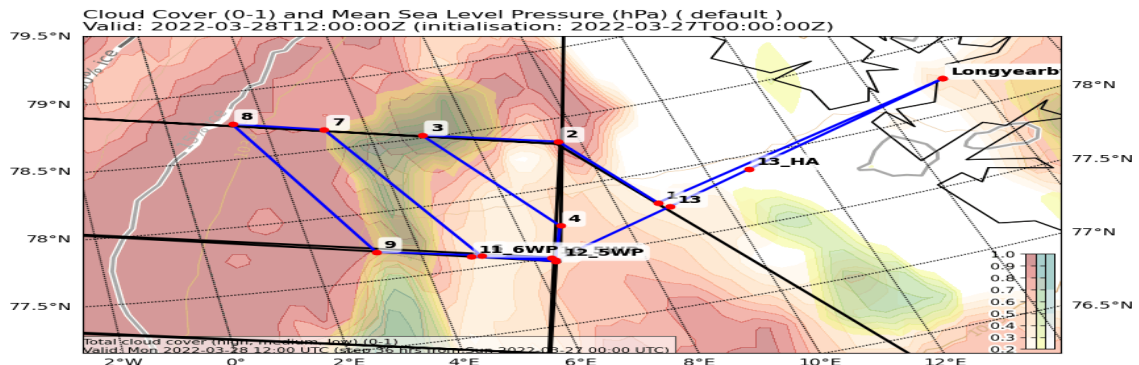
ICON



ECMWF



ICON



WINDY

