HALO-(AC)³ – 2022/04/04 – Polar6 research flight #09

Objectives:

Collocated flight with Polar 5 and partly with HALO, probing cloud and aerosol over cold air outbreak region and over sea ice (if possible), aerosol below and above cloud. We chose to meet HALO not on the "golden leg" but one leg further to the south in order to have a better cloud situation. The goal of P6 was to remain in the clouds but close below cloud top when meeting HALO (last leg).

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Mission PI P6:

Johannes Schneider

Polar 6 Crew	
Mission PI	Johannes Schneider
AWI	Maximilian Stöhr
CVI	Jonas Schaefer
ALABAMA/Trace gas	Philipp Joppe
PMS	Elena de la Torre Castro
Aerosol/HERA	Sarah Grawe

Flight times:

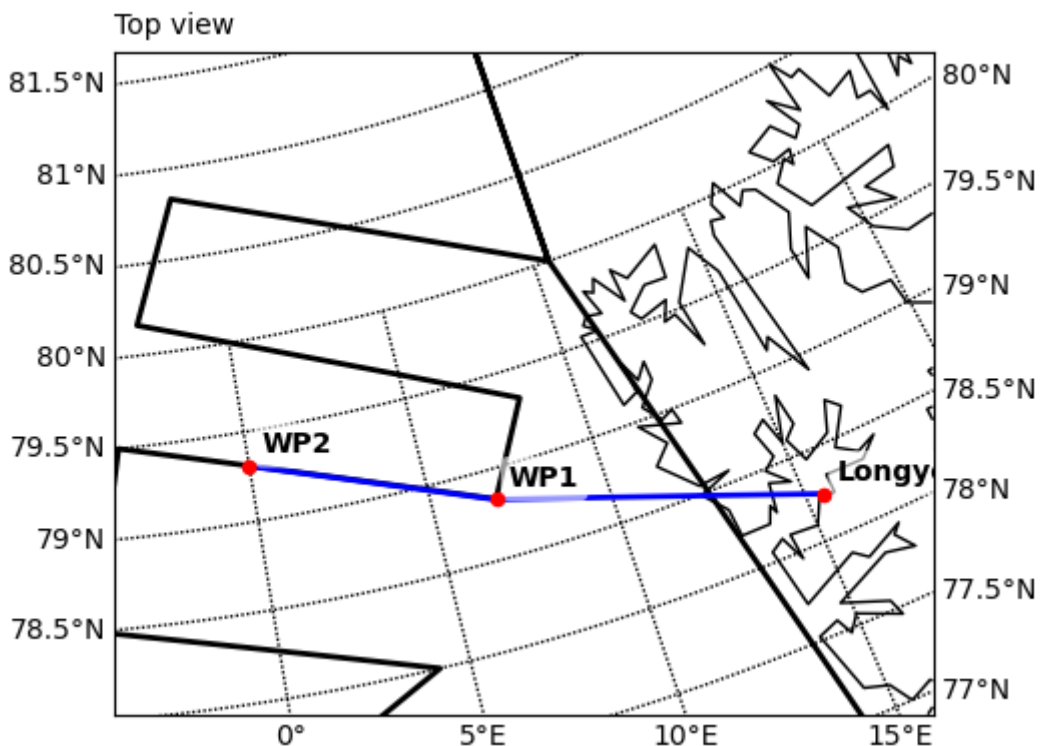| Polar 6	
Take off	09:59 UTC
Touch down	14:19 UTC

Fig. 1. Flight plan. The HALO Flight plan is marked in black. The waypoints for Polar 5 and Polar 6 were identical.

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

The forecast matched very well to the observed situation. The forecasted clouds stopped at the sea ice edge just as observed. We had therefore mover waypoint 2 further to the East than the HALO waypoint and followed this plan also during the flight.
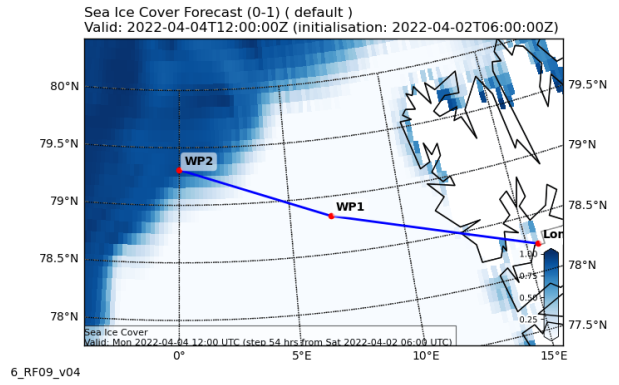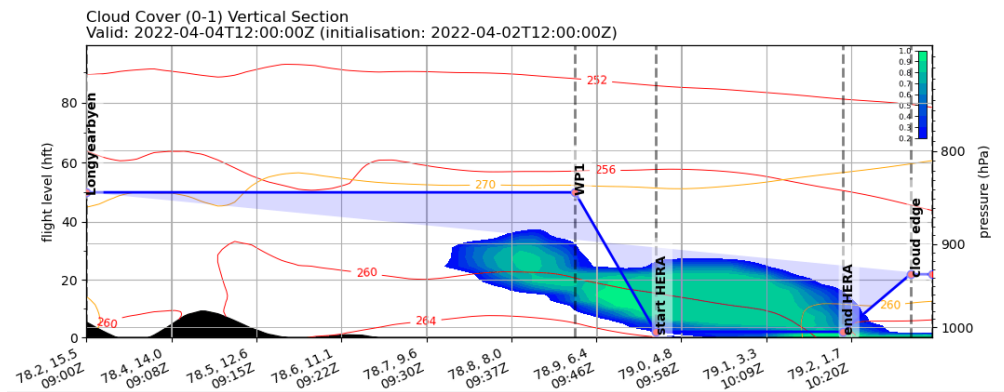


Fig. 1. Sea ice forecast along with flight plan.

Fig. 1. Side view of cloud forecast with sampling strategy for first cloud leg.

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Overview:

As on most days, no clouds were present over sea ice. The flight strategy was to fly perpendicular to the sea ice edge below, in, above, and again in the clouds. This worked out well, at least over the open water where clouds were present. The collocation with Polar 5 worked very well, Polar 5 simply followed the speed of Polar 6. Cloud top heights were announced by Polar 5. The meeting with HALO was at 13:16, HALO flying westbound, P5 and P6 eastbound. The trace gas profile was conducted at the end of the flight.

Flight pattern:

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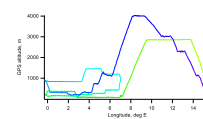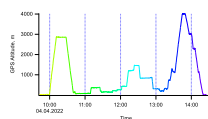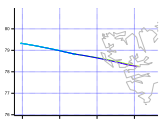
Instrument Status:

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

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

No instrument problems were reported.

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Detailed Flight Logs:

10:00   Take off
        Planet doesn't work at first, only after some re-try
        FL100, slow don to wait for P5
        Some clouds below, aerosol layer visible
        Start descent at WP1, coordination w/ P5

Picture 10:32: View on cloud from above

10:41   100 m (GPS altitude)
        Turn to wait for P5
        Descent to 68 m (200 ft)
10:44   start 200 ft leg

10:51   clouds, Counterflow on
         Very thin clouds → CF off
         (no cloud, mostly snow)
10:55   light snow

Picture 10:56

10:58   Counterflow on
11:04   Sea smoke
11:09   climb: 1000 ft cloud top, 1200 ft cloud-free (continue 14 min)
11:14   cloud disappeared, marginal ice zone

Picture 11:15

11:16   solid ice

Picture 11:17

11:25	WP2
	Turn and descend to 500 ft
11:39	cloud starts: 7 min at 500 ft in cloud (lower cloud edge, open water visible)
11:47	700 ft
11:54	900 ft
12:01	cloud disappears
	1550 ft to WP1
12:10	WP1, climb to 4300 ft

Picture 12:19

12:20	above clouds (go higher to avoid clouds)
12:26	still above clouds
12:31	3500 ft
12:33	probably crossed aerosol layer
12:36	3000 ft
12:43	cloud gone, over ice
12:51	WP2, turn, descend to 1000 ft, seems to work
	Pilots try to maintain P6 close to cloud top but inside cloud

Picture 13:03. Cloud directly in front of P6

13:16   HALO and P5 above P6
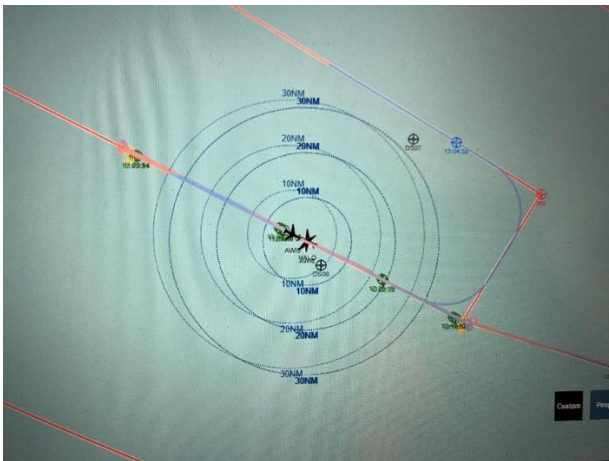
Picture: 13:16:06, meeting point of all three aircraft.

13:20   climb
13:32   start climb to 14000
13:44   14000 ft
13:39   start descend to 10000 ft
14:03   8000 ft (4 min)
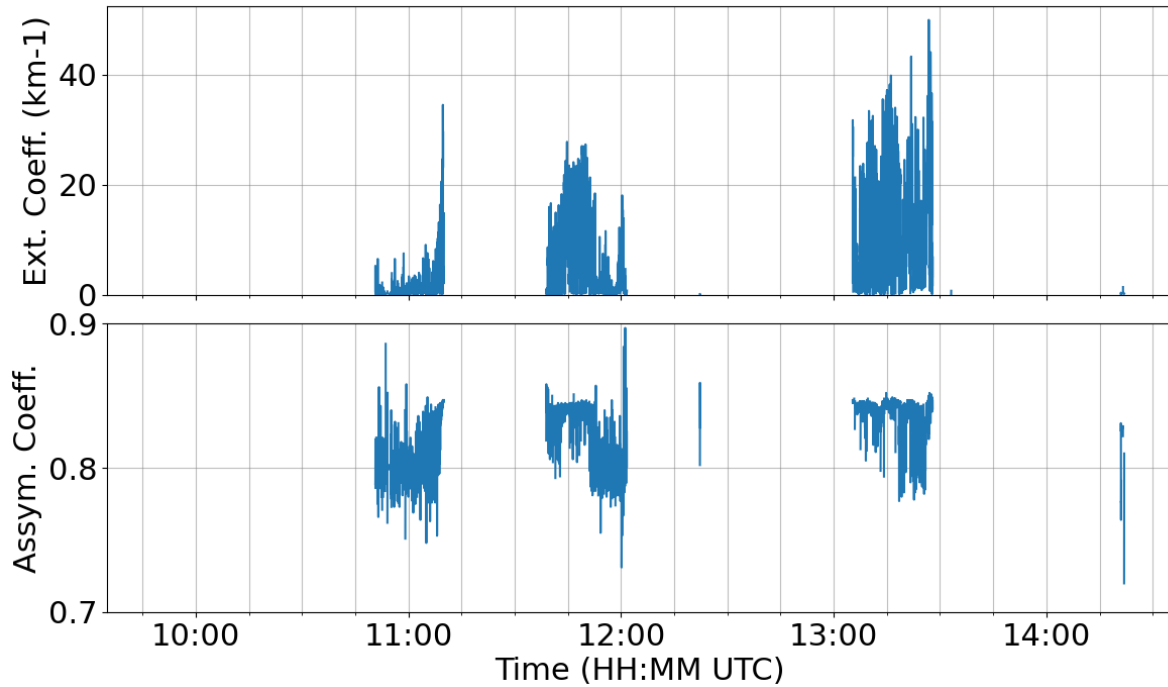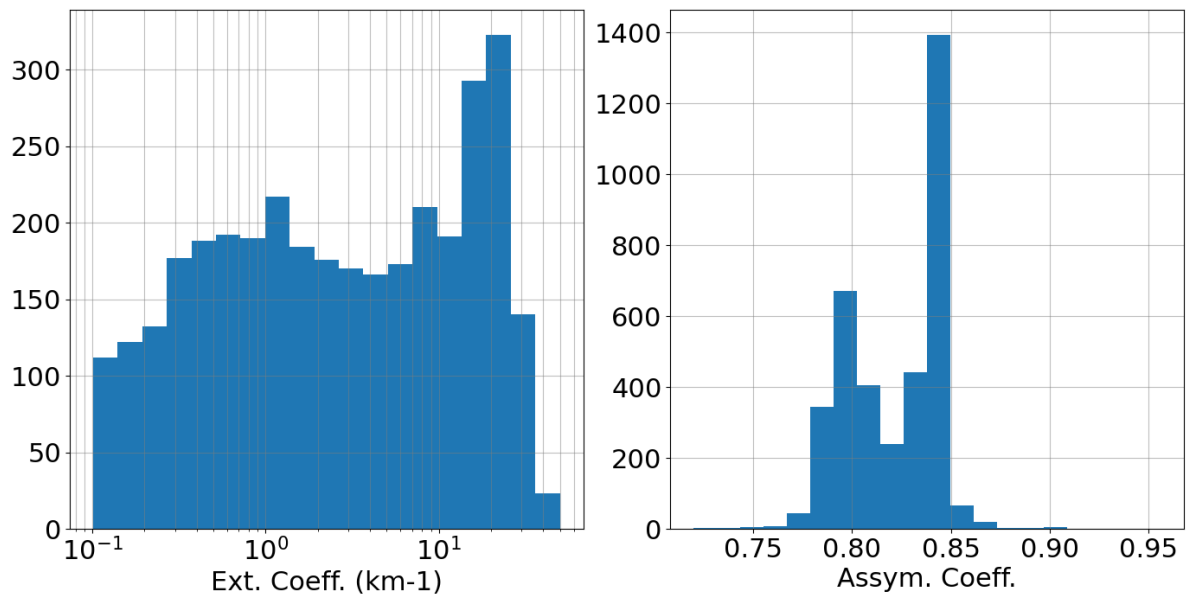14:06   approach LYR

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Quicklooks:

2DS:

P
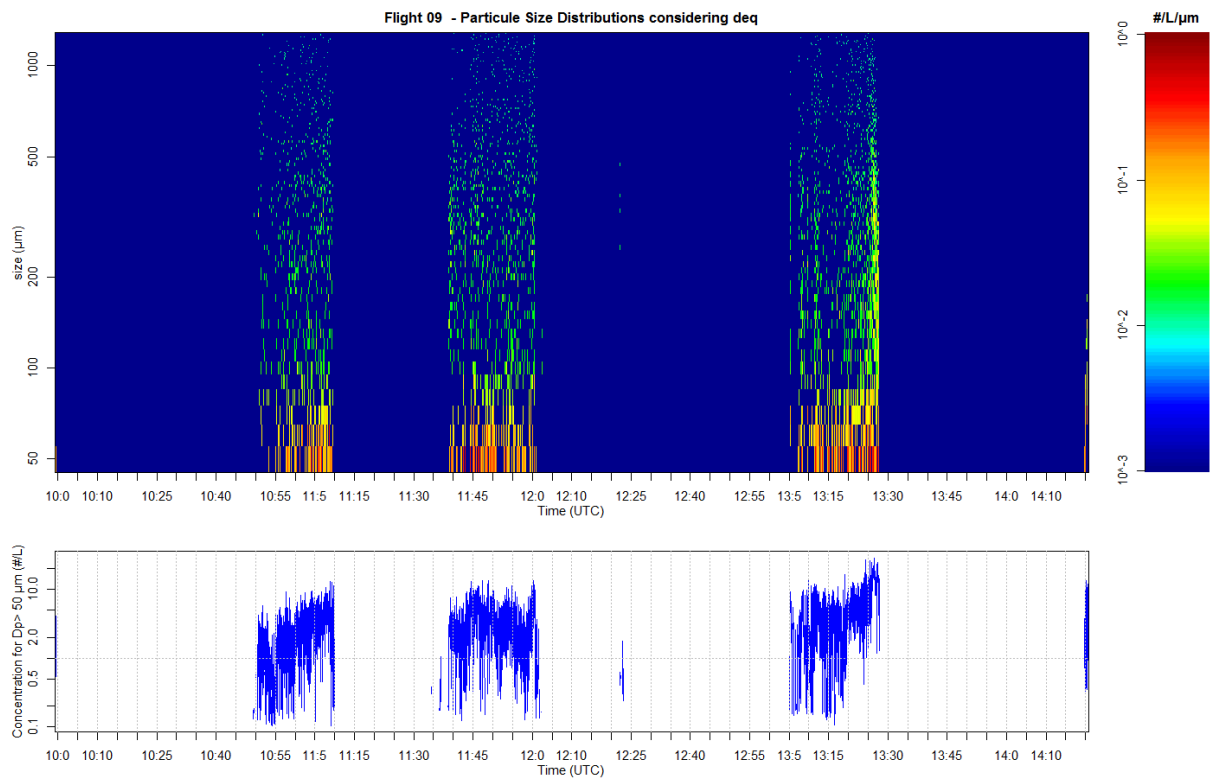
Polar Nephelometer Timeseries - Polar 6 - preliminary data
RF09 - 220404

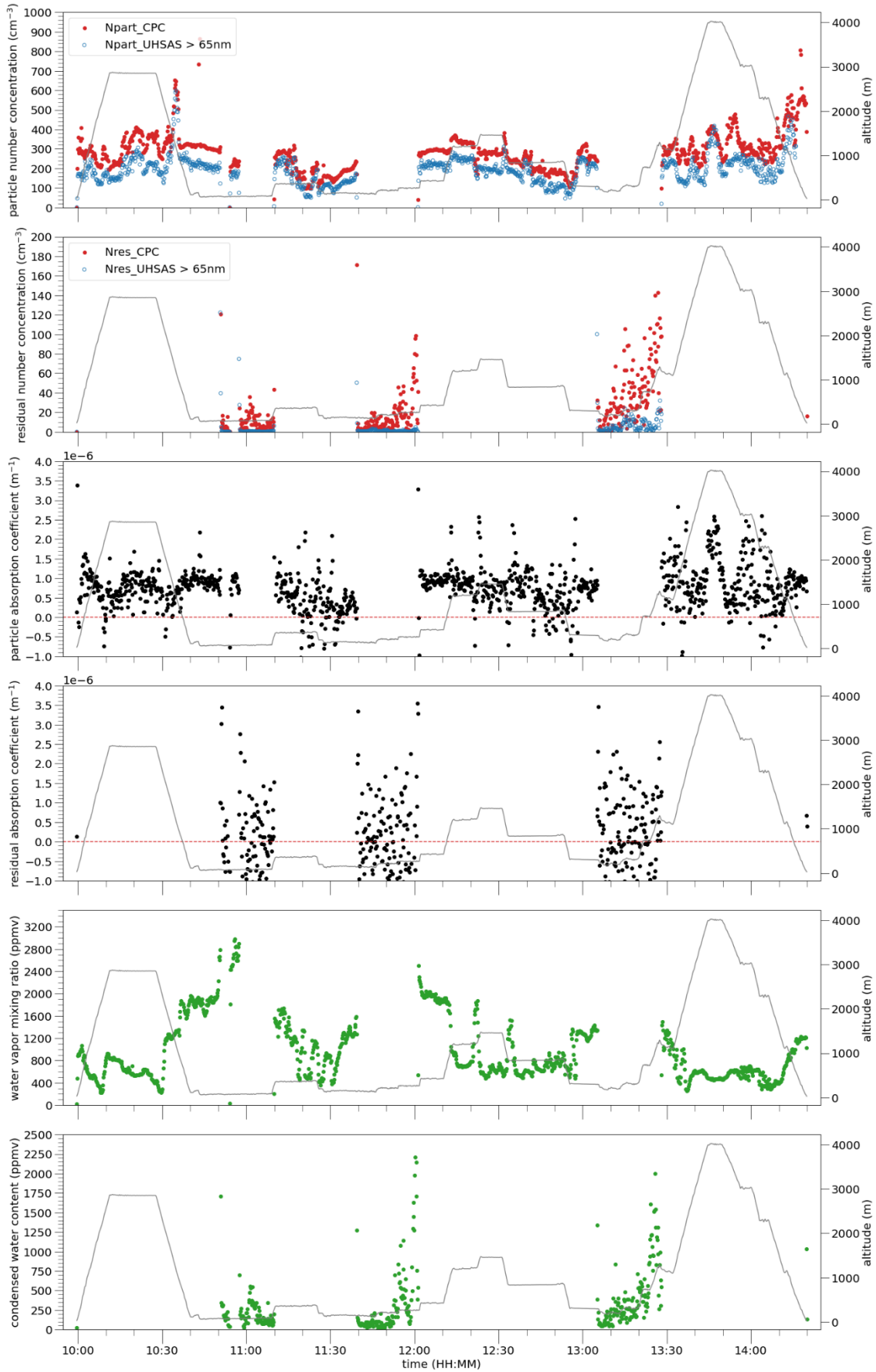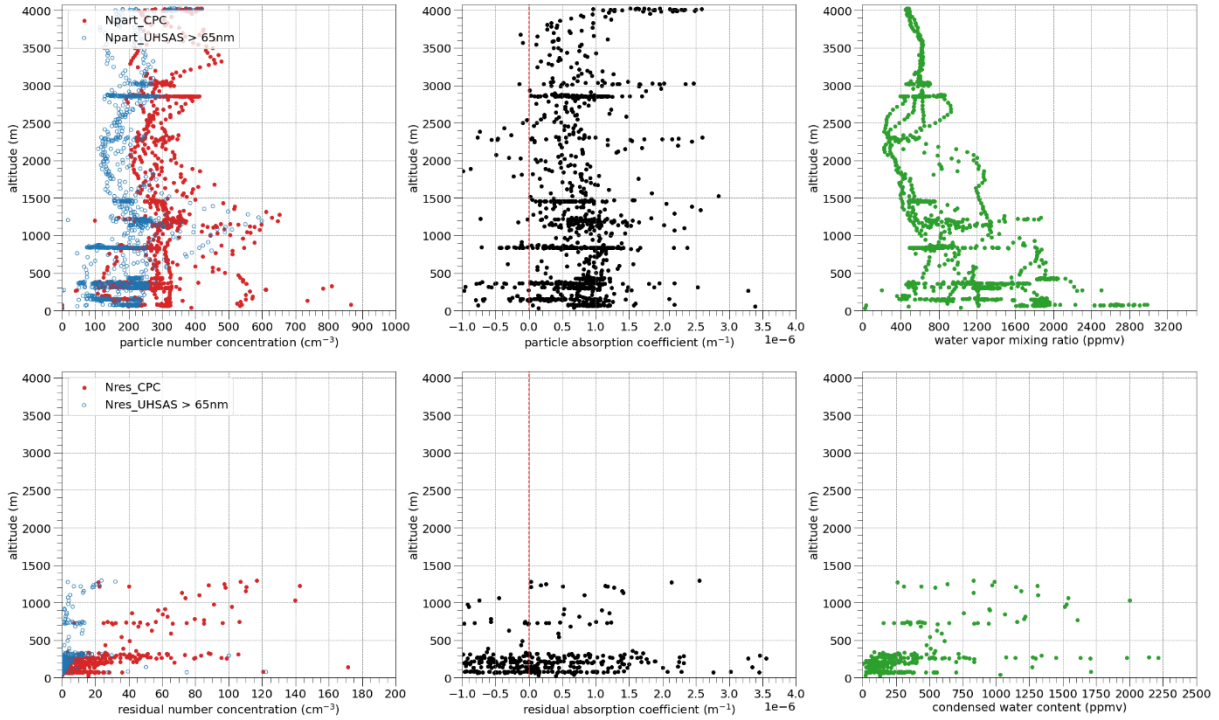Polar Nephelometer Histogram - Polar 6 - preliminary data
RF09 - 220404

CVI:

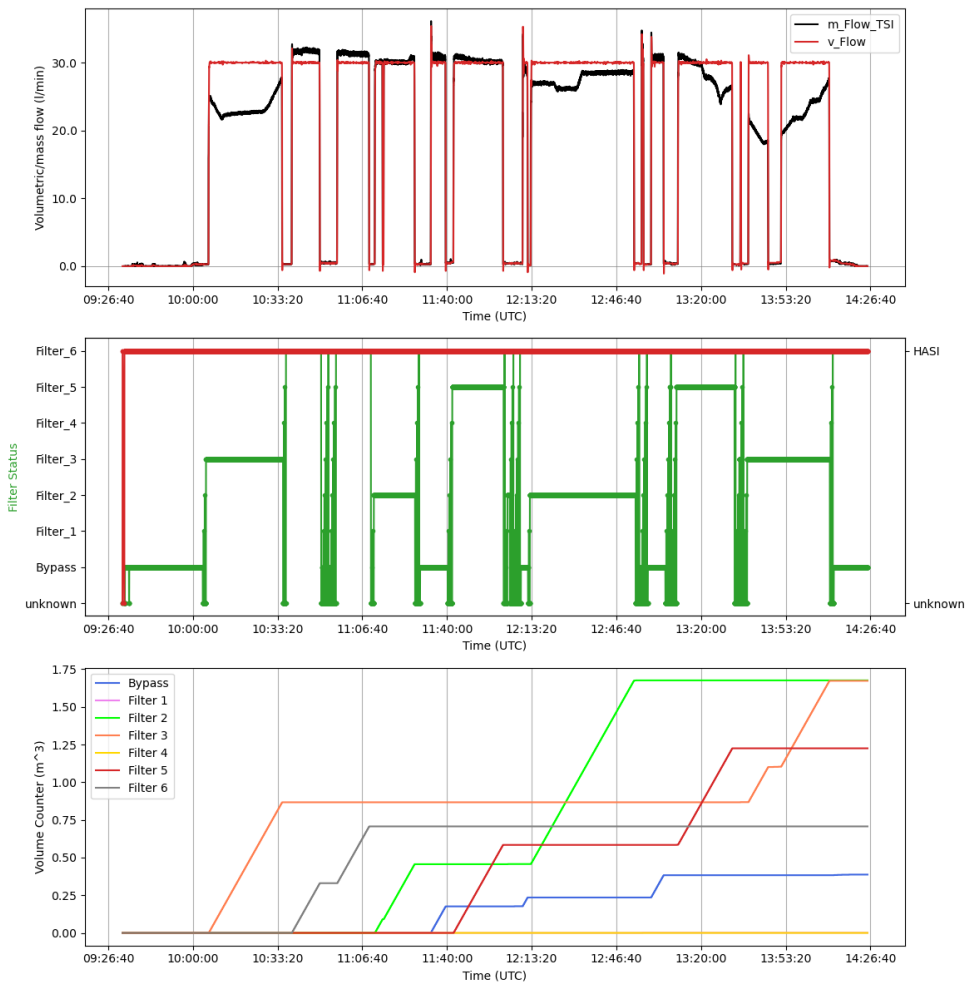
Quicklook ARCTIC-CVI Timeseries from 04.04.2022
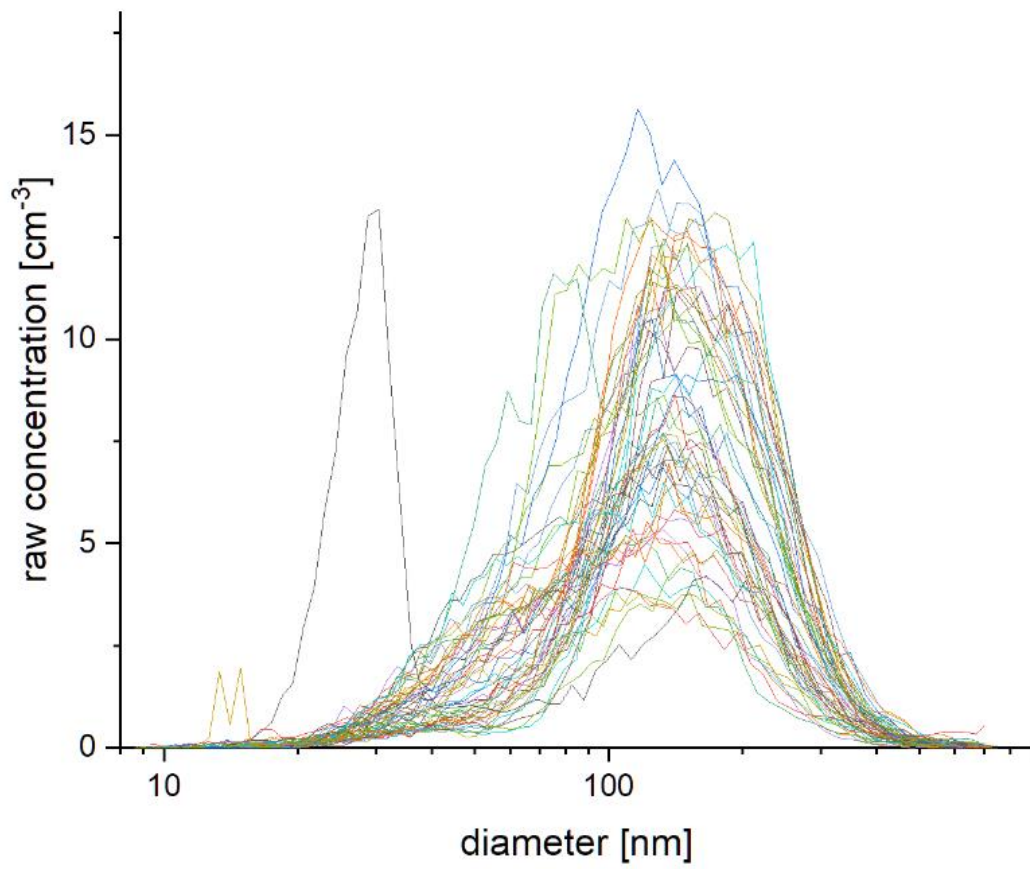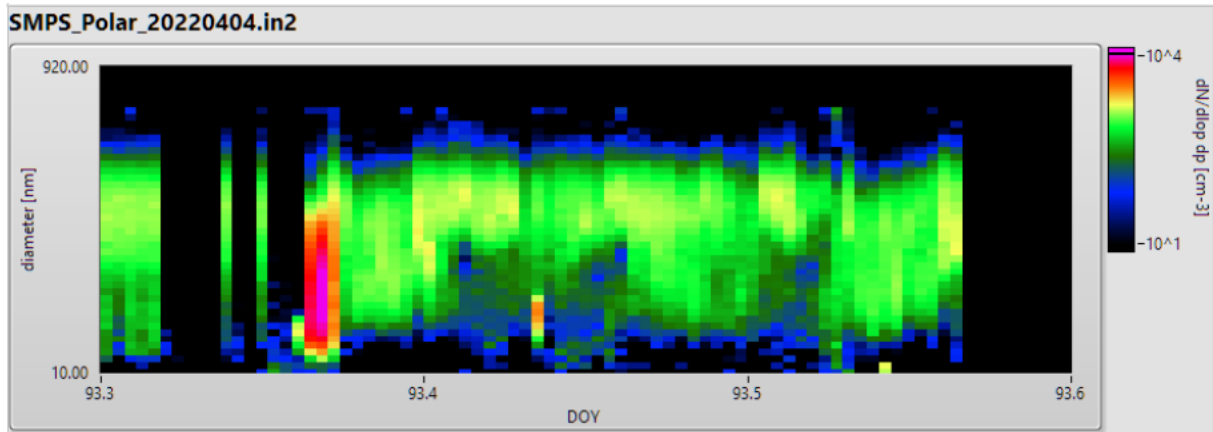10 second mean (residual measurments not enrichment corrected)

Quicklook ARCTIC-CVI Vertical Profil from 04.04.2022
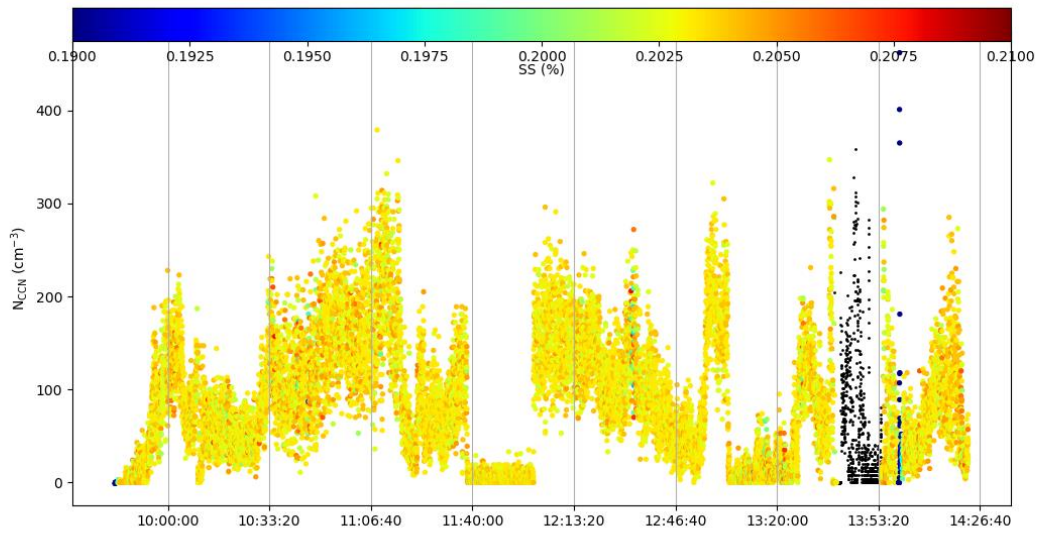10 second mean (residual measurments not enrichment corrected)

HERA:

SMPS:

CCNC:

ALABAMA: