

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).

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 |

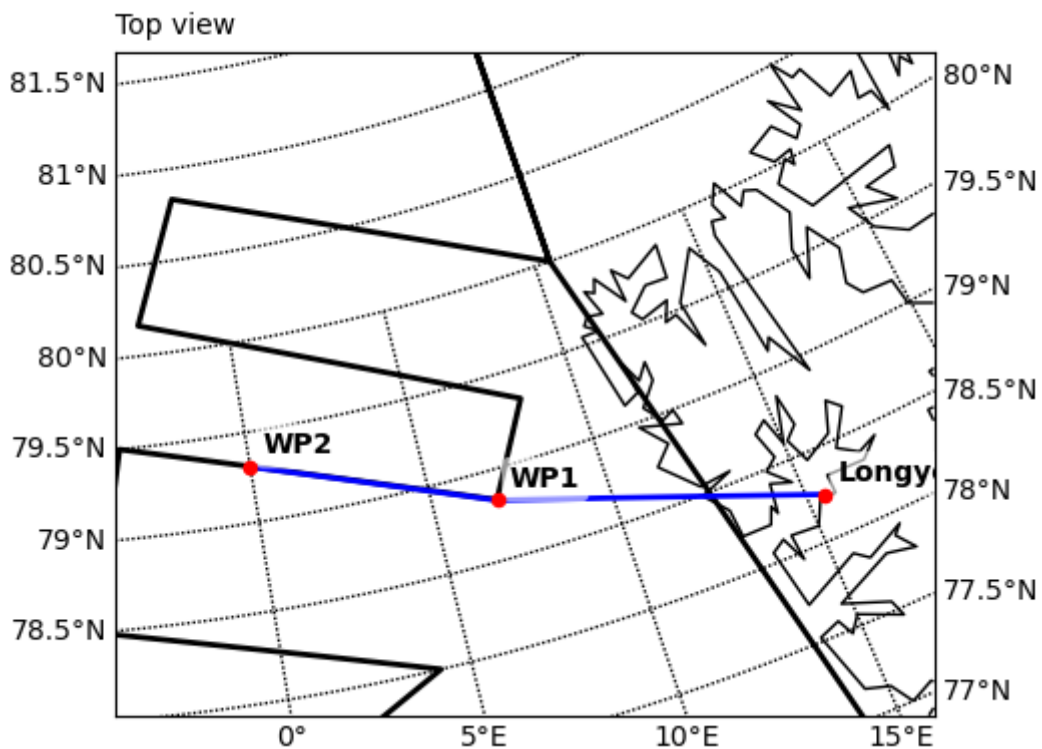


Fig. 1. Flight plan. The HALO Flight plan is marked in black. The waypoints for Polar 5 and Polar 6 were identical.

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 moved waypoint 2 further to the East than the HALO waypoint and followed this plan also during the flight.

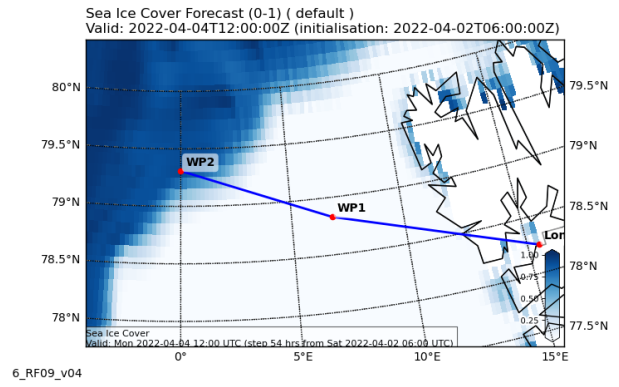


Fig. 1. Sea ice forecast along with flight plan.

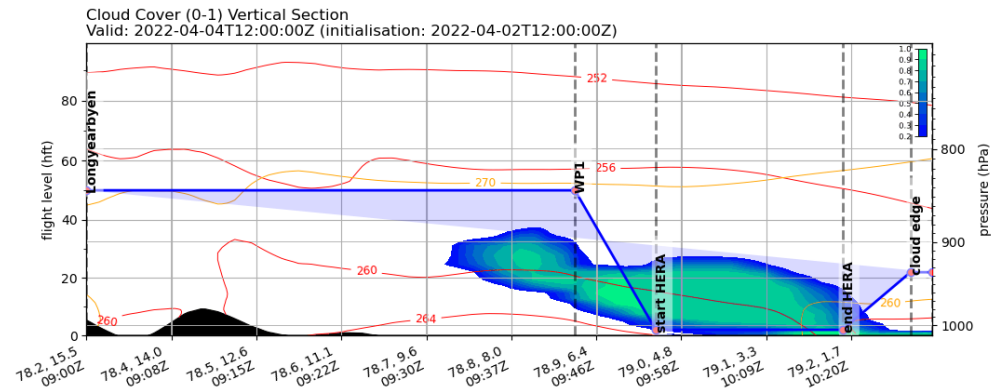
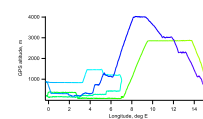
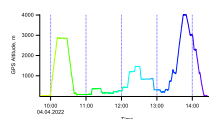
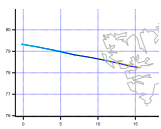


Fig. 1. Side view of cloud forecast with sampling strategy for first cloud leg.

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:



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.

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

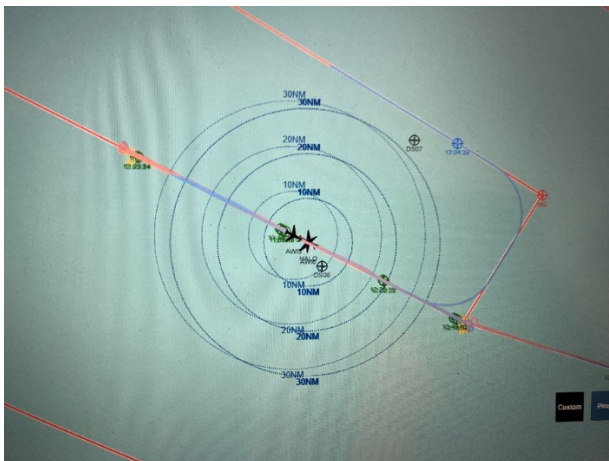
12:51 WP2, turn, descend to 1000 ft, seems to work

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

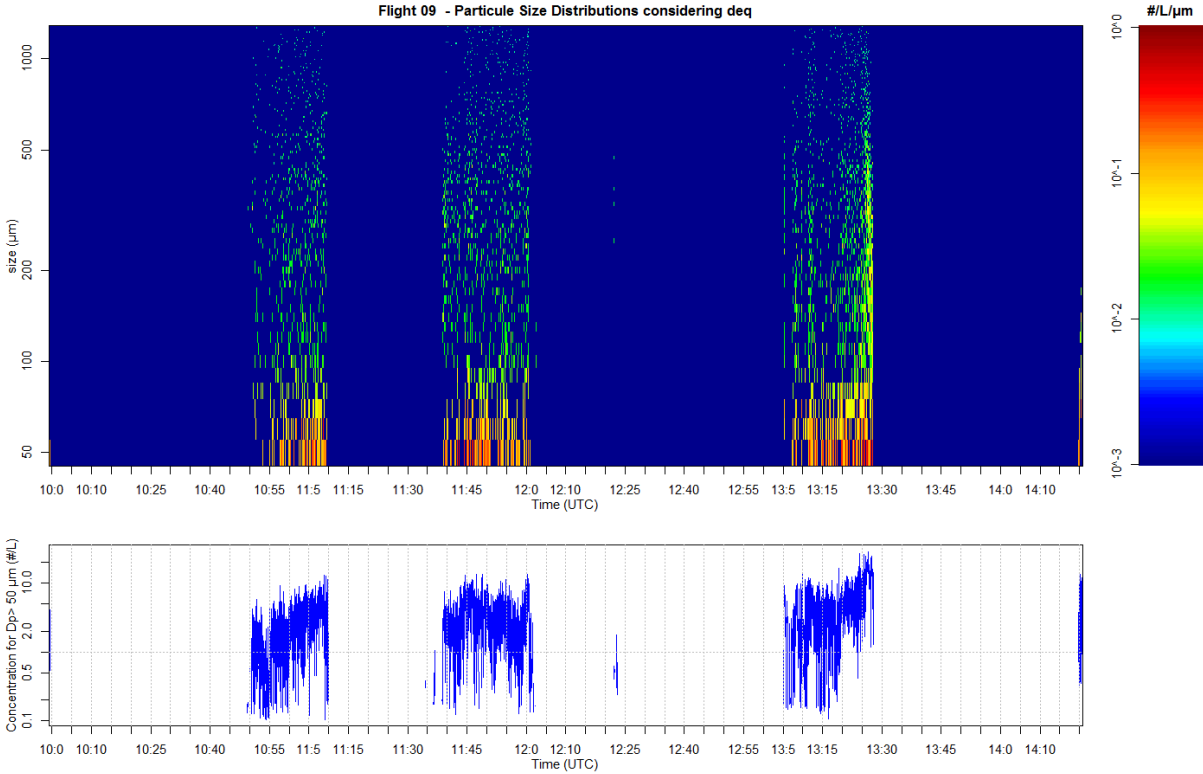
13:39 start descend to 10000 ft

14:03 8000 ft (4 min)

14:06 approach LYR

Quicklooks:

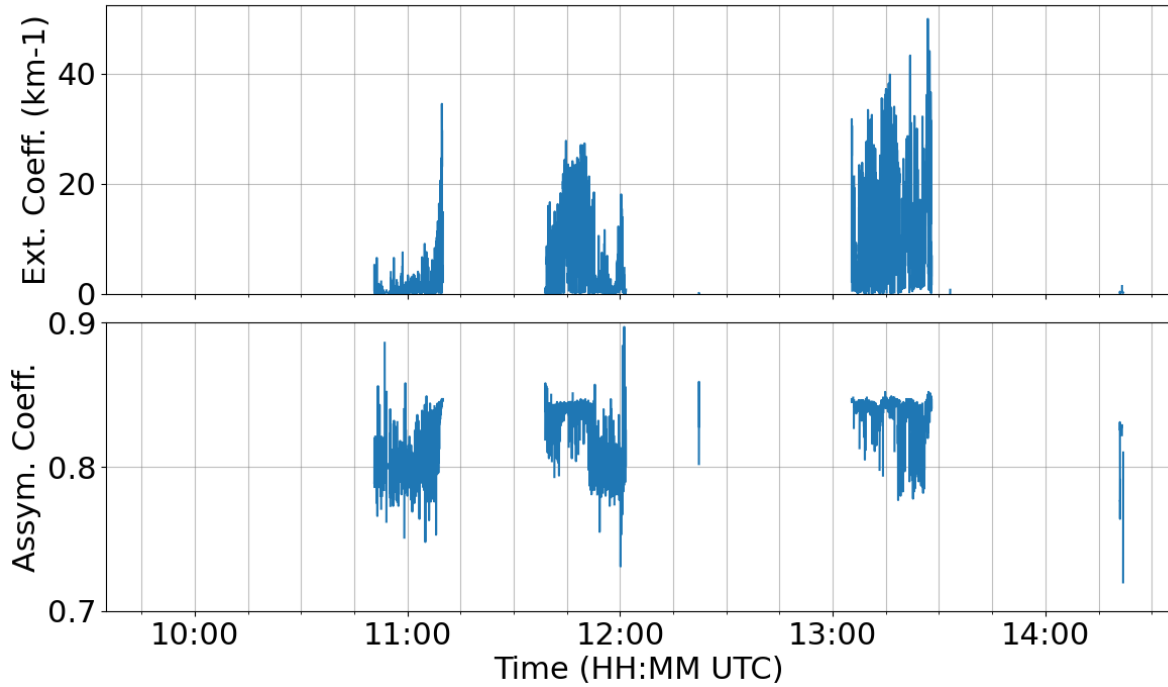
2DS:



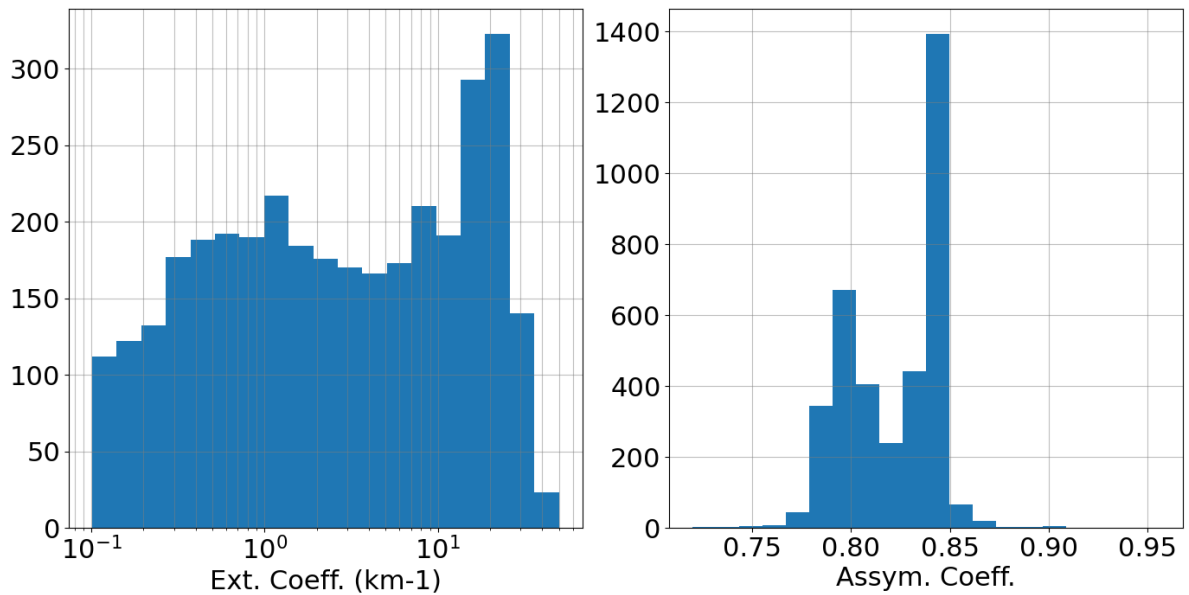
P

olar Nephelometer:

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

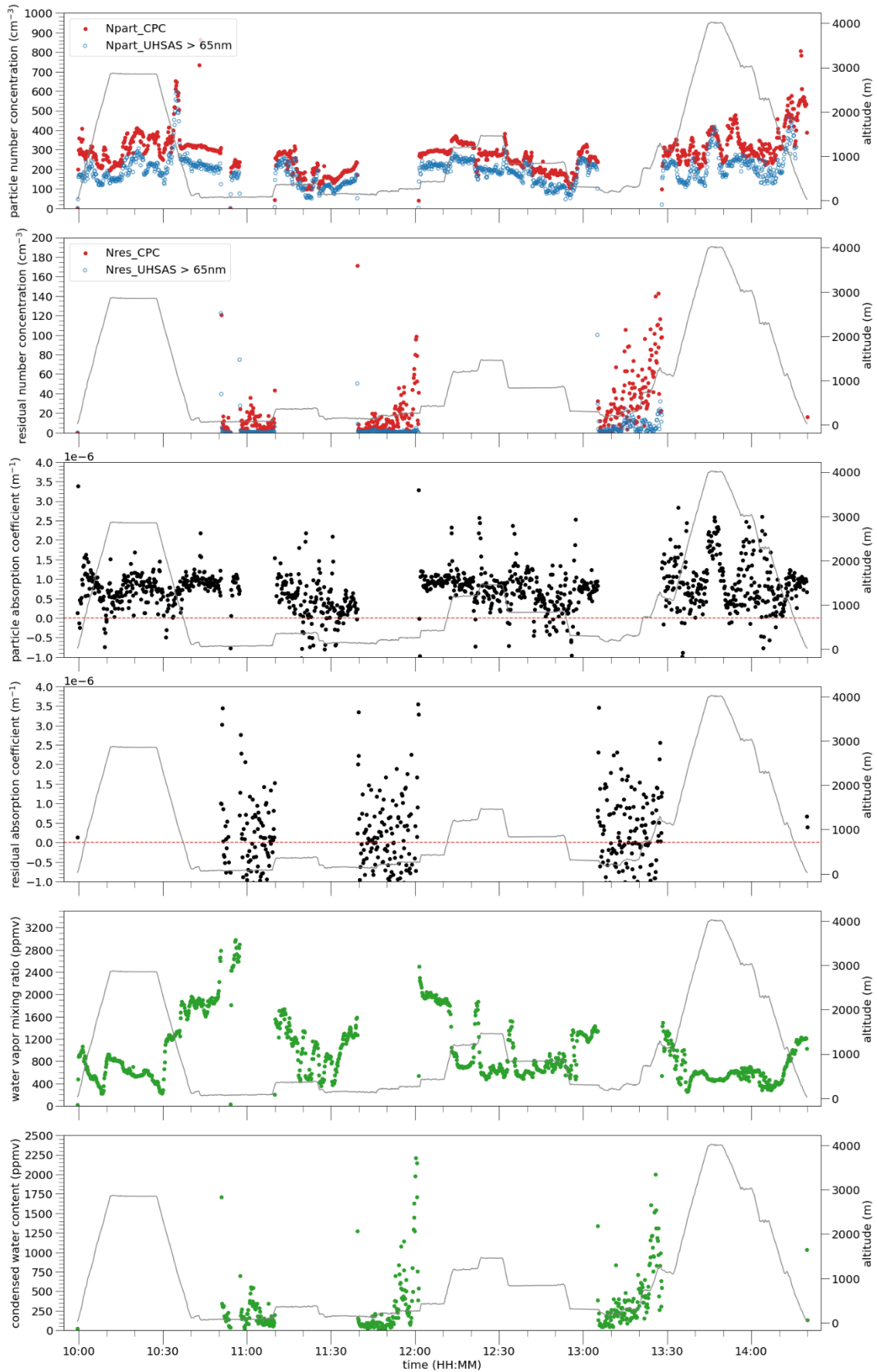


Polar Nephelometer Histogram - Polar 6 - preliminary data RF09 - 220404

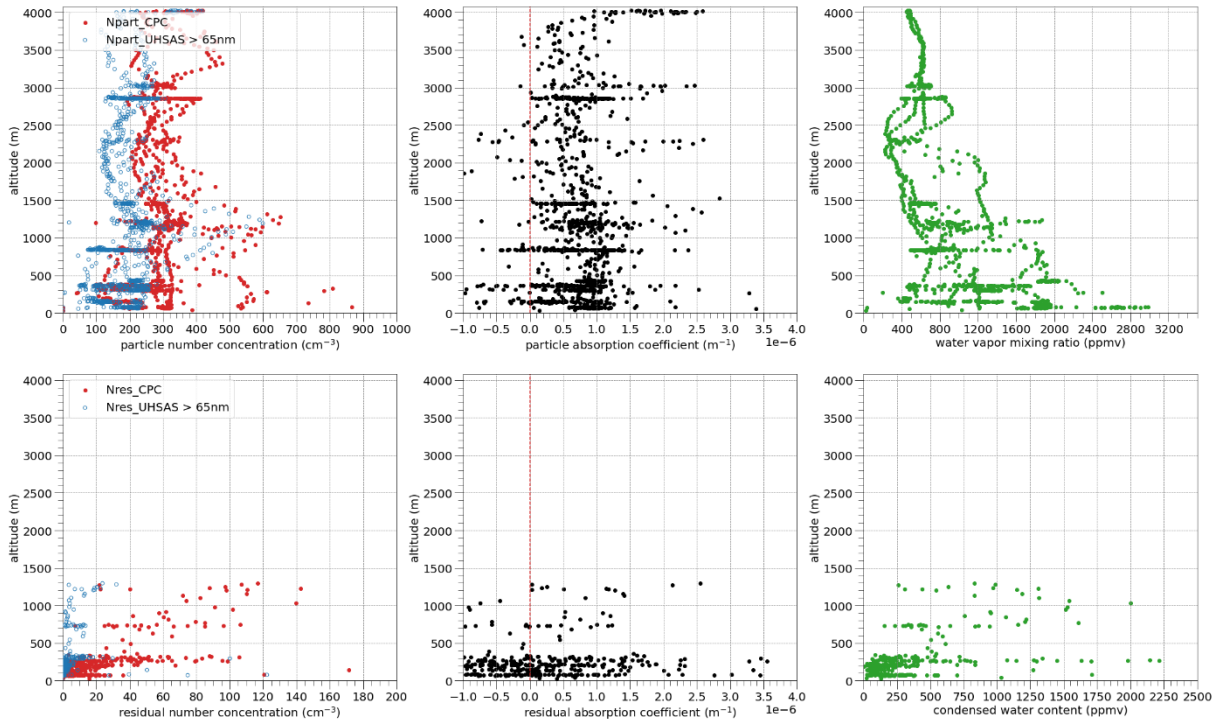


CVI:

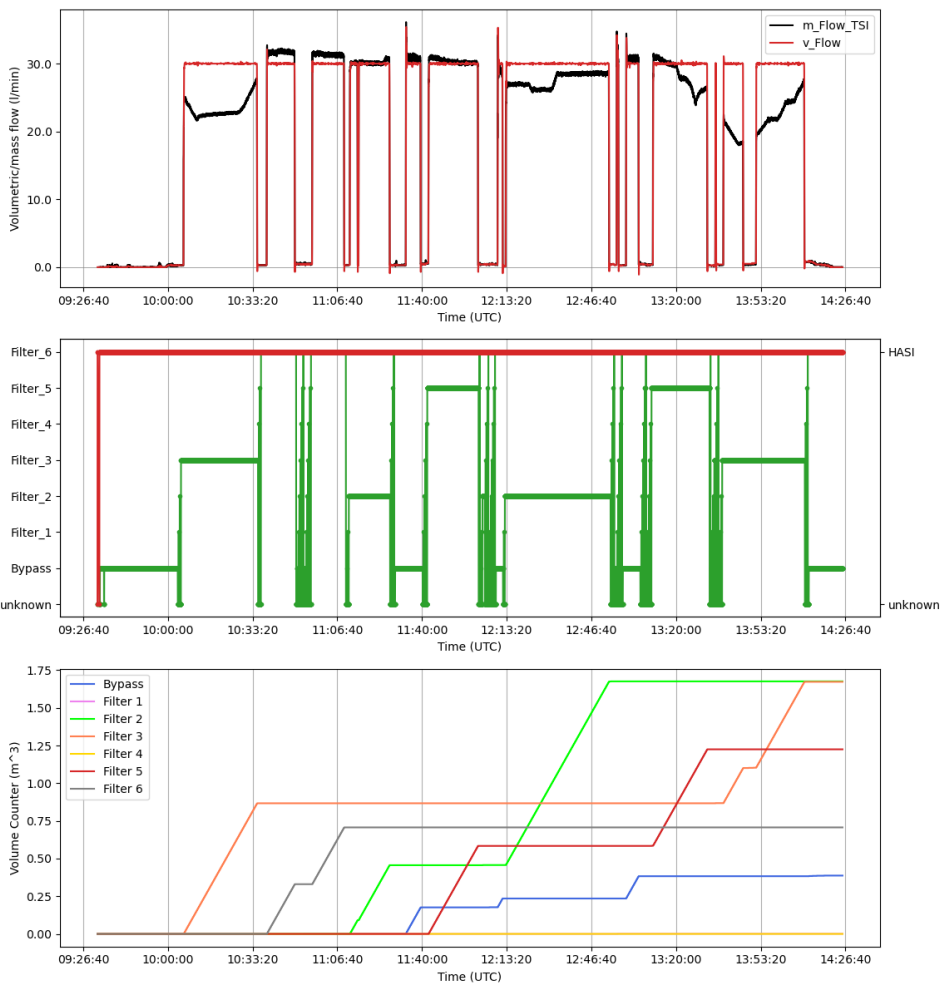
Quicklook ARCTIC-CVI Timeseries from 04.04.2022
10 second mean (residual measurements not enrichment corrected)



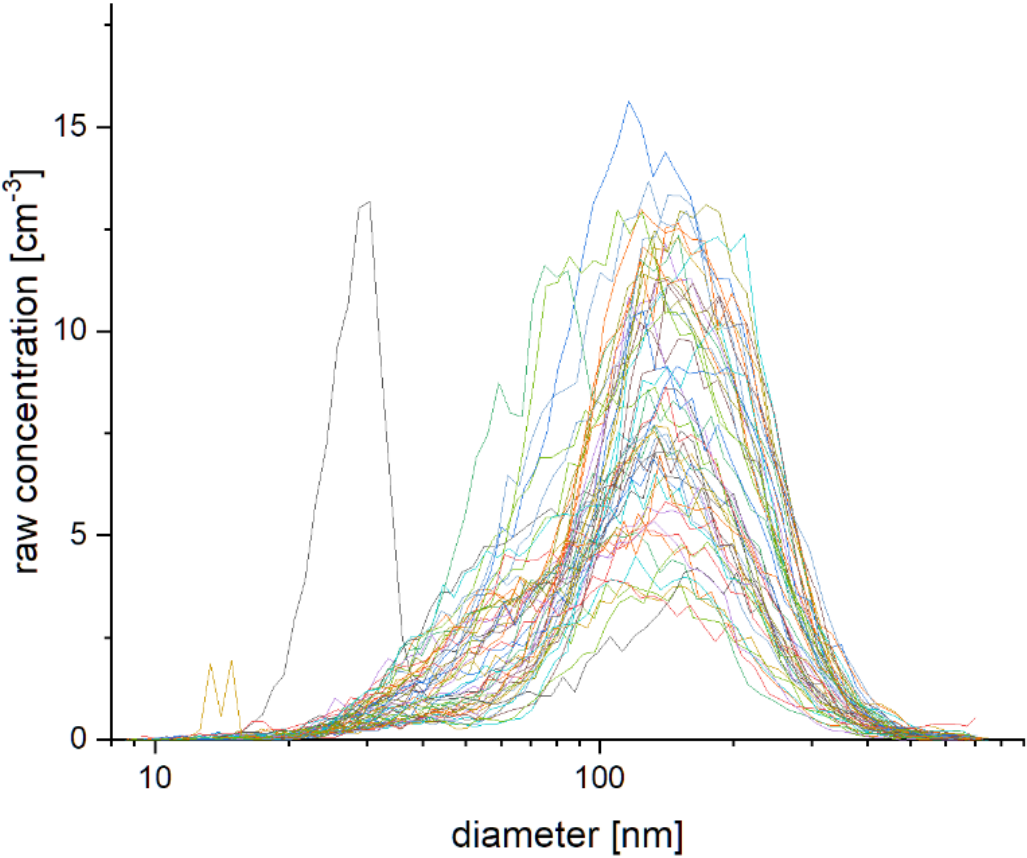
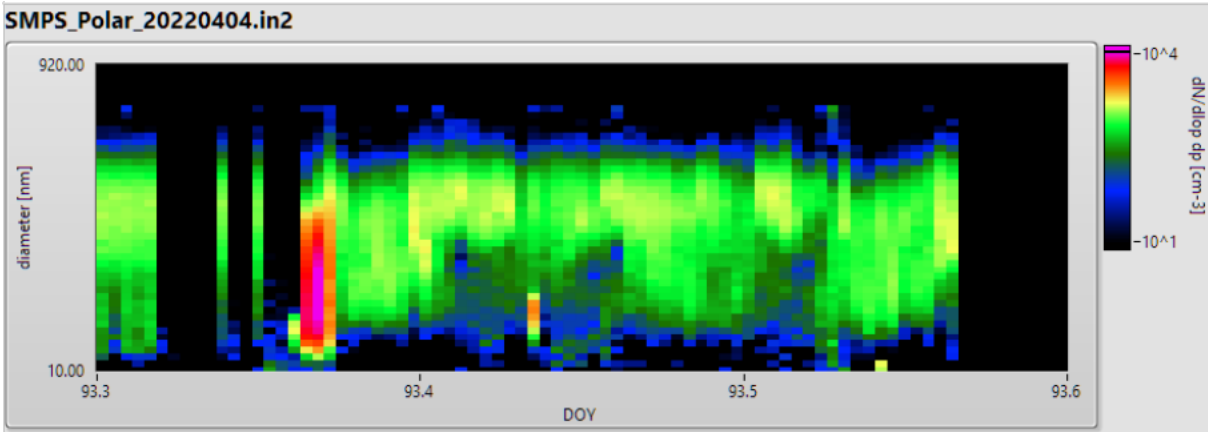
Quicklook ARCTIC-CVI Vertical Profile from 04.04.2022
10 second mean (residual measurements not enrichment corrected)



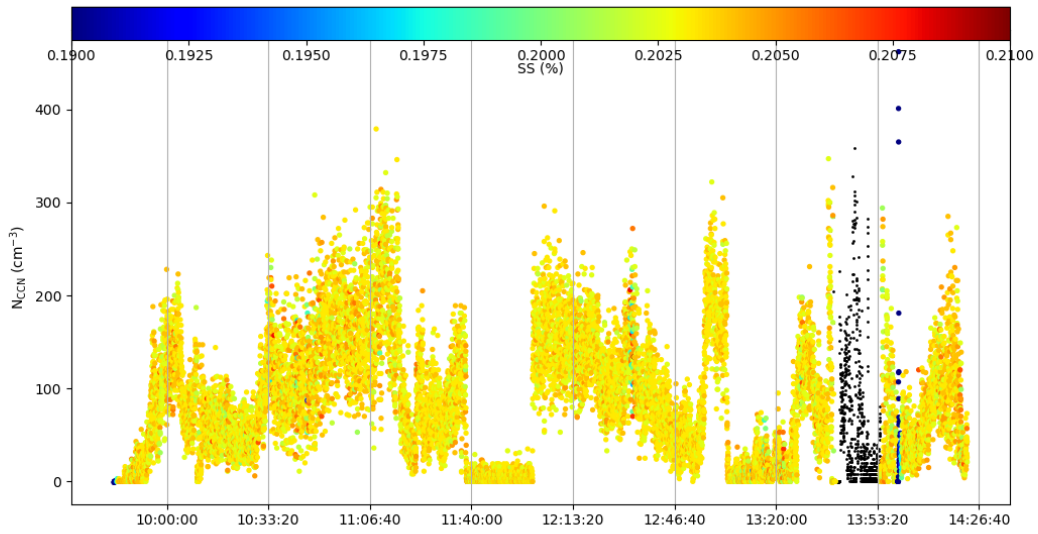
HERA:



SMPS:



CCNC:



ALABAMA:

