

HALO-(AC)³ – 2022/04/08 – Polar6 research flight #11

Objectives:

Probing clouds in the vicinity of the polar low over Fram Strait. Coordinated flight with HALO, but no collocation. Probing cloud and aerosol over sea ice, aerosol below and above cloud, “radiation square”, trace gas profile

Mission PI P6:

Johannes Schneider

Polar 6 Crew	
Mission PI	Johannes Schneider
AWI	Dennis Ludwig
CVI	Bruno Wetzel
ALABAMA/Trace gas	Philipp Joppe
PMS	Elena de la Torre Castro
Aerosol/HERA	Jonas Schaefer

Flight times:

Polar 6	
Take off	09:40 UTC
Touch down	14:55 UTC

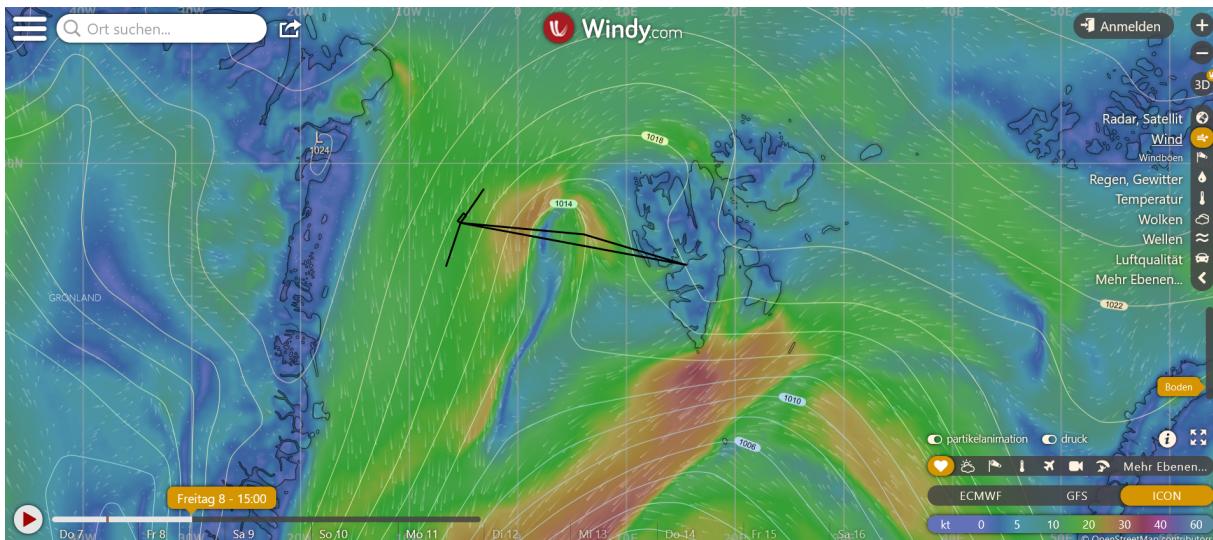


Fig. 1: ICON forecast showing wind fields and isobars along with the planned flight track.

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

The satellite picture of 08.04.2022, 5:00 am, (Fig 2) shows the position of the polar low and the approximate flight track. The position of the low was more southern than the ICON forecast. We managed to cross the clouds north of the polar low both on the westward and the eastward leg.

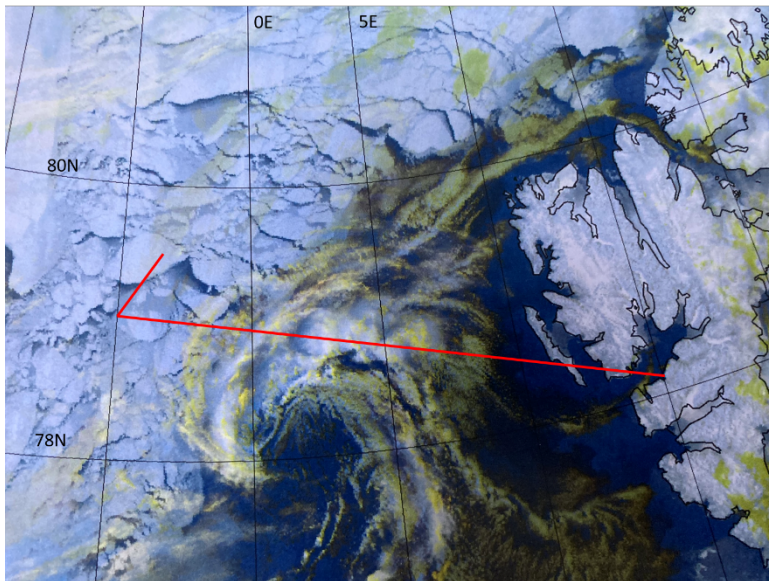


Fig 2. Satellite picture of 08.04.2022, 5:00 am

Over the sea ice, very thin clouds (haze) was observed. The position of the racetrack pattern was adapted according to the information of the PMS probes along the first track.

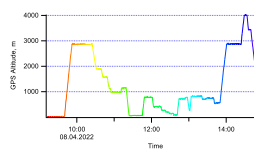
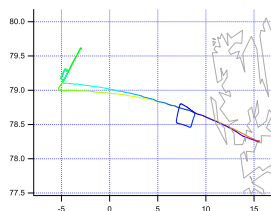
Overview:

Strategy: Cross the area of the polar low, sample clouds at different altitudes, over sea ice do low leg below clouds, then ascend above, then conduct racetrack in the cloud. On the return again cloud sampling in the polar low, then a “radiation square” and the trace profile at end of flight.

Joint flight day with HALO, but no exact collocation possible as HALO took off very early. But sampling in the same area. No Polar 5 flight on this day due to illness of one pilot.

In general the pattern worked quite well, we sampled clouds on the vicinity of the polar low, and over sea ice, although the clouds over the sea ice were very thin.

Flight pattern:



Instrument Status:

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

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

Polar Nephelometer was not working properly during RF11.

Detailed Flight Logs:

- 09:40 Take off
Planet not working until 09:58
- 10:01 clear sky above, on the track to WP1
- 10:09 some broken clouds below
- 10:18 6 min to WP1
- 10:24 WP1, descend (600 ft/min) to get into the cloud, slow down to 120 kn



Picture 10:31, close to polar low

- 10:32 6600 ft, try to hit clouds, many convective cells
- 10:39 descent further
- 10:40 clouds above stop here
- 10:41 5500 ft, through clouds
- 10:43 clear spot w/o clouds, open water below
- 10:46 cloud
- 10:49 5000 ft to stay in cloud, some height variations, then 4500 ft
- 10 52 3900 ft
- 10:53 marginal ice zone starts
- 10:56 clouds are getting thinner

- 10:58 above ice, thin clouds are still around
- 11:00 open lead
- 11:04 another open lead
- 11:09 11 min to WP2, climb a little to stay in cloud
- 11:11 clouds are thin, but Elena says she sees signal all the time
- 11:17 out of cloud
- 11:19 WP2, turn and descend to 200 ft, direction WP3
(bumpy)



Picture 11:55

- 11:26 ice with open leads (many open leads)
- 11:28 low level haze/cloud
- 11:36 8 min to WP3
- 11:40 (counterflow off: aerosol measurement in thin cloud)
- 11:44 WP3, turn and climb, try above cloud, but hard to define -> 2800 ft
- 11:58 3 min to WO7



Picture 11:58

- 12:01 WO7, start racetrack (moved it to NE because haze was thicker here on first leg)
First level: 1500 ft -> still above
- 12:15 2nd racetrack: first half 1000 ft second half 700 ft
- 12:23 second half 700 ft
- 12:28 3rd racetrack: first half 500 ft (bumpy)



Picture 12:29

- 12:35 second half 300 ft
- 12:41 WP7, way back to WP1, chasing clouds again
- 12:46 still over sea ice but in clouds, 2500 ft
- 12:54 climb to 2800 ft
- 12:55 snowflakes
- 12:57 between layers, chose lower layer, descend to 1000 ft, but still above, can't go lower
- 13:01 climb
- 13:03 MIZ



Picture 13:03

- 13:04 in cloud (800 m GPS)
- 13:07 cloud gone, next in approx. 10 miles



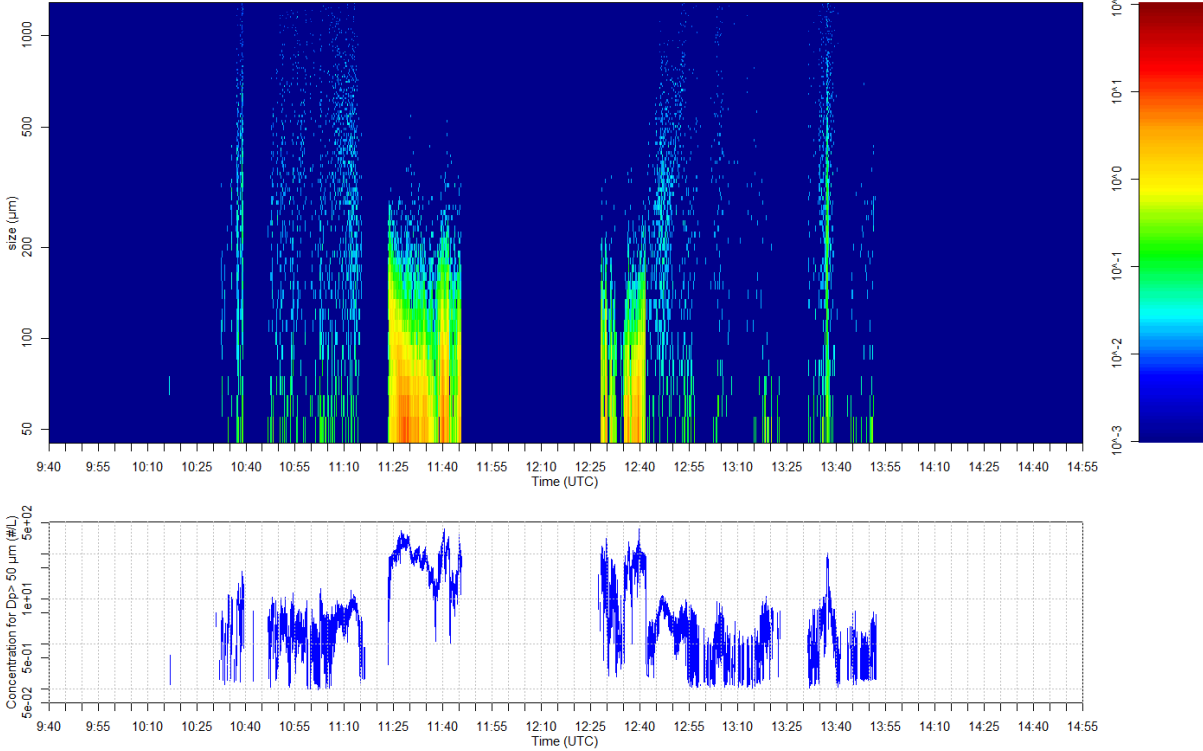
Picture 13:08

- 13:13 open water
 - 13:15 through the cloud associated with the polar low (liquid)
 - 13:23 clouds stop, we remain at level (GPS 700 m)
 - 13:32 next cloud (more ice)
 - 13:50 WP1, stop cloud sampling, climb to 10000 ft, 160 kn
 - 14:02 start "radiation square"
 - 14:07 turn
 - 14:13 turn
 - 14:18 turn
 - 14:24 climb to 14000 ft
 - 14:28 level at 14000 ft
 - 14:33 descend to 2000 ft
 - 14:36 level at 12000 ft
 - 14:39 descend to LYR
 - 14:55 landing
-

Quicklooks:

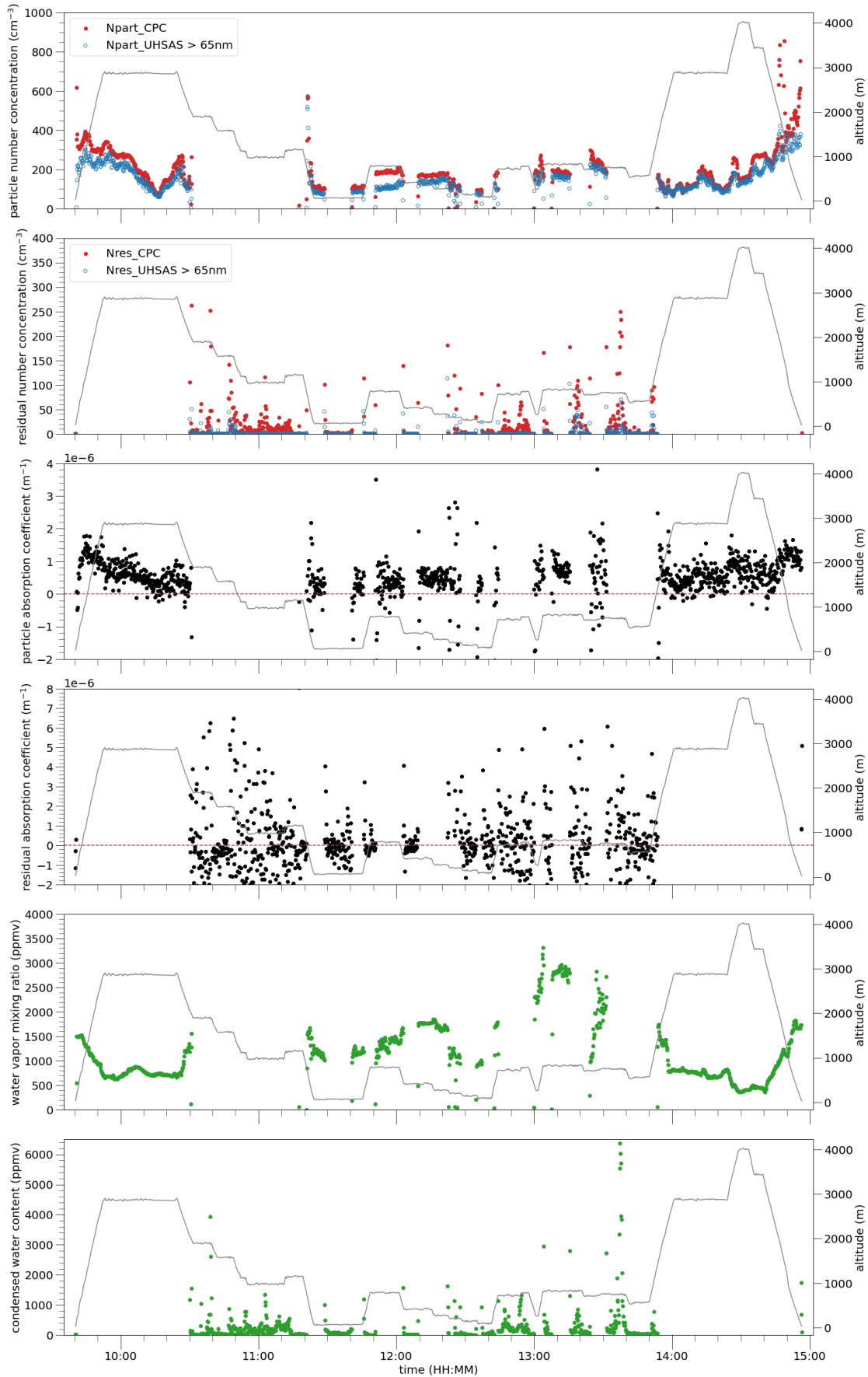
2DS

Flight 11 - Particle Size Distributions considering deq

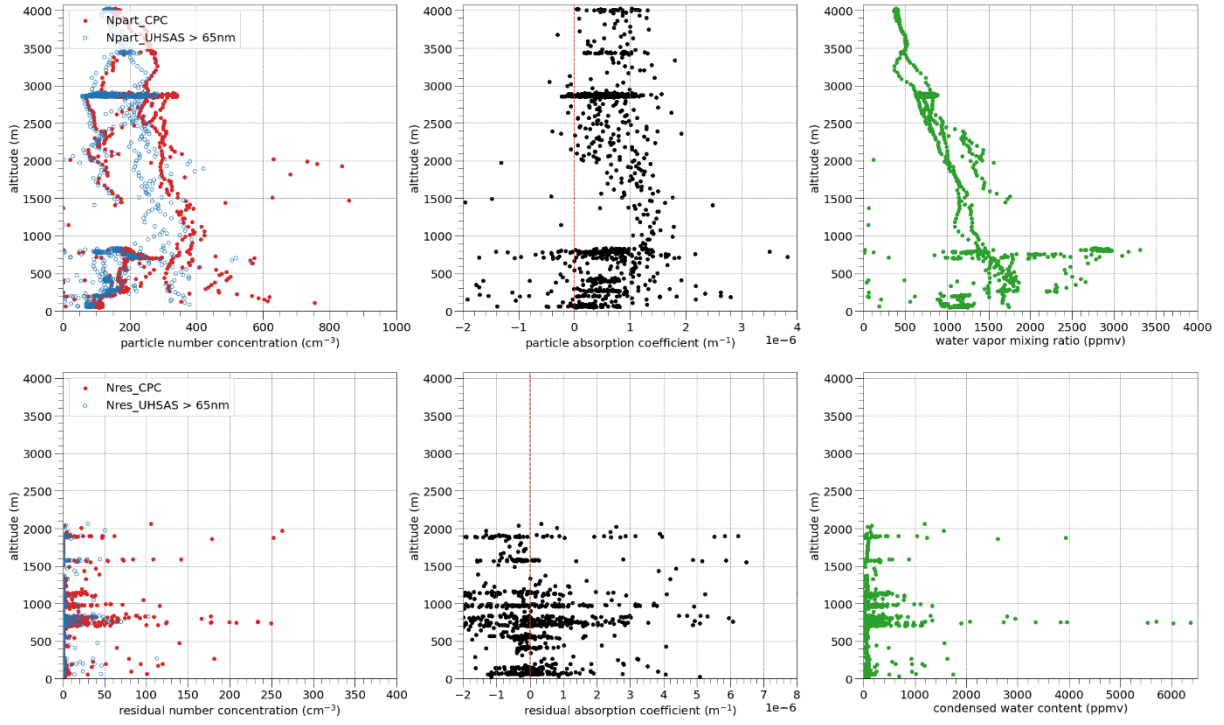


CVI

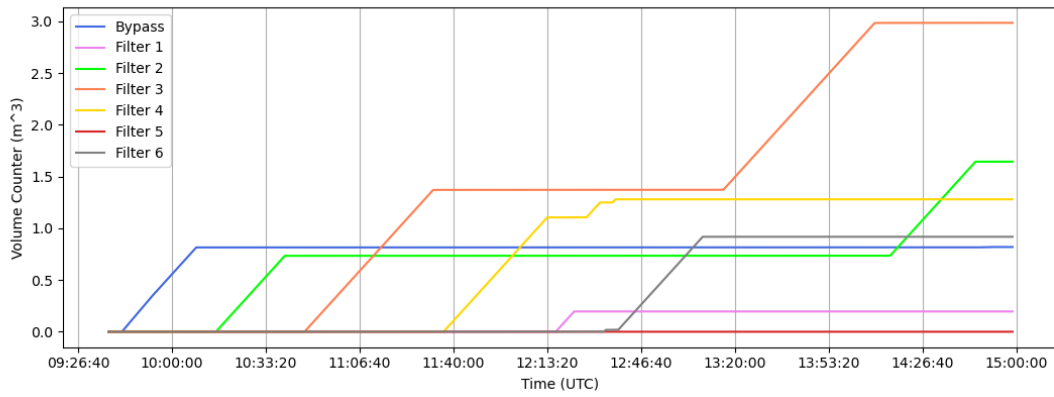
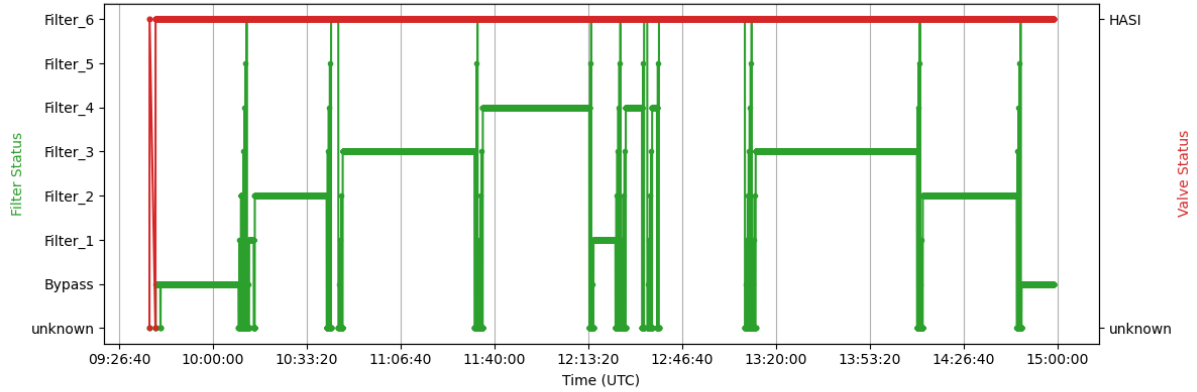
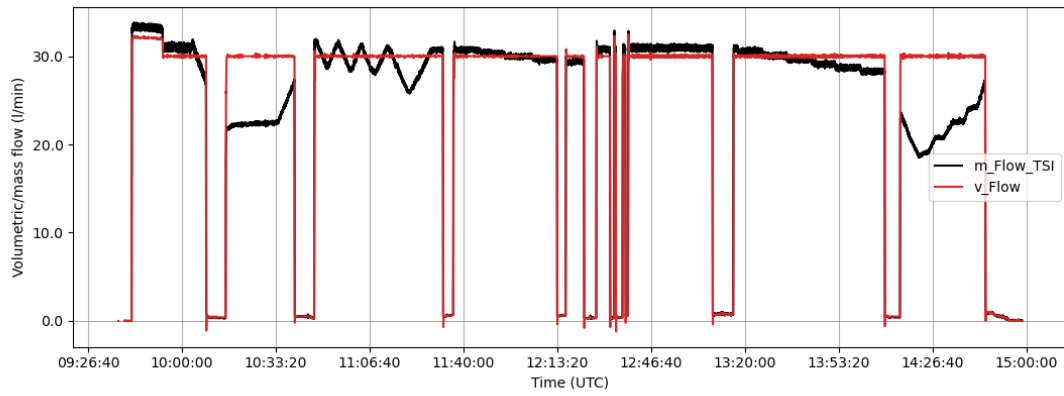
Quicklook ARCTIC-CVI Timeseries from 08.04.2022
10 second mean (residual measurements not enrichment corrected)



Quicklook ARCTIC-CVI Vertical Profile from 08.04.2022
10 second mean (residual measurements not enrichment corrected)

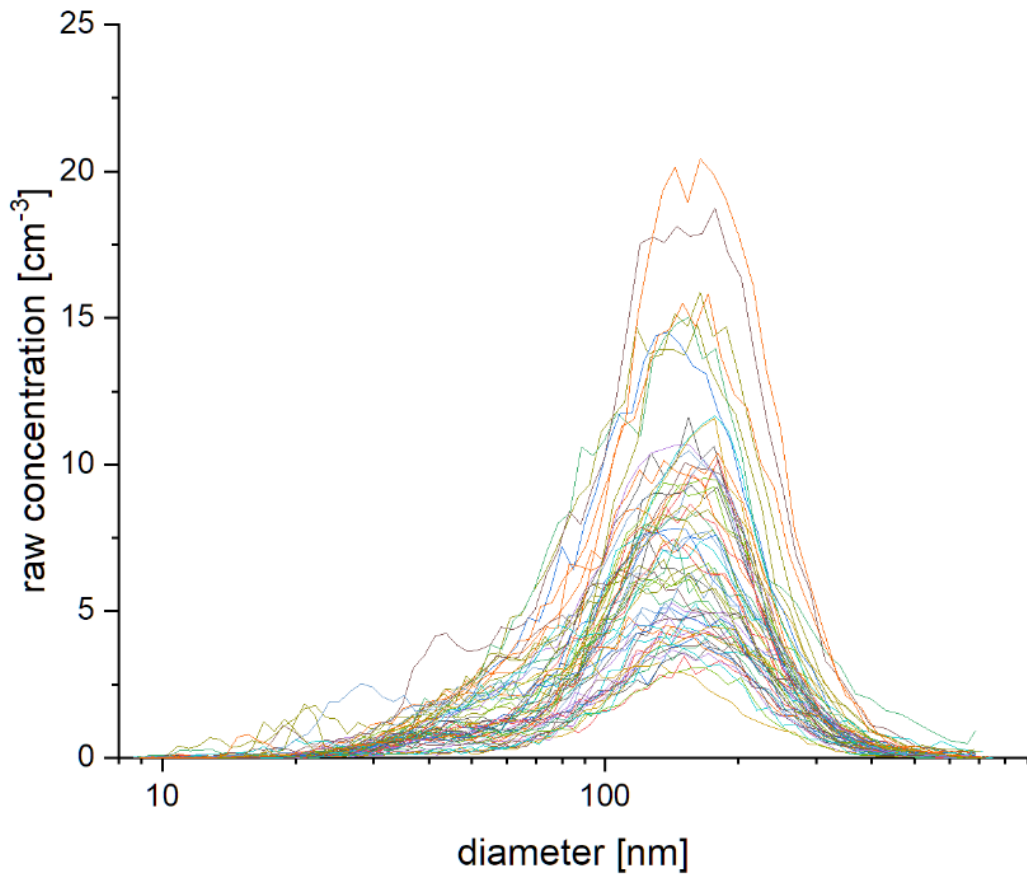
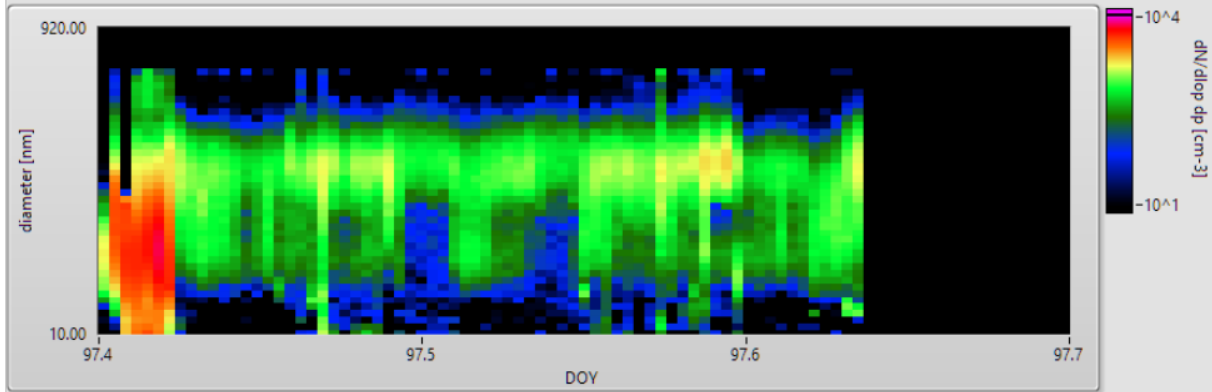


HERA



SMPS

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CCNC

