

HALO-(AC)³ – 2022/03/29 – Polar5 research flight #07

Objectives:

Boundary layer study over sea ice and open ocean during a coldair outbreak. Flight coordinated with Polar 6 and HALO.

Mission PI P5: Christof Lüpkes christof.luepkes@awi.de

Flight times:

Polar 5 Crew	
Mission PI	Christof Lüpkes
Basis Data Acq.	Cristina Sans Coll
SMART/ Eagle/Hawk	Evelyn Jäkel
MiRAC / AMALi	Nils Risse, Sabrina Schnitt
Drosondes	Janosch Michaelis

Polar 5	
Take off	11:55 UTC
Touch down	17:05 UTC

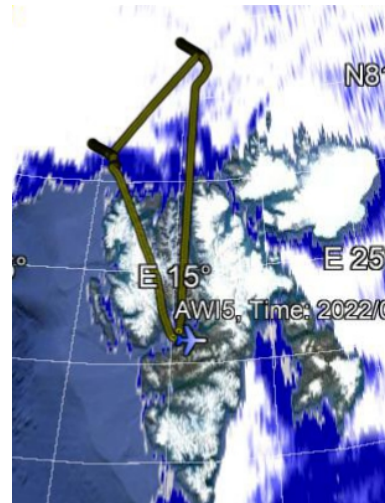
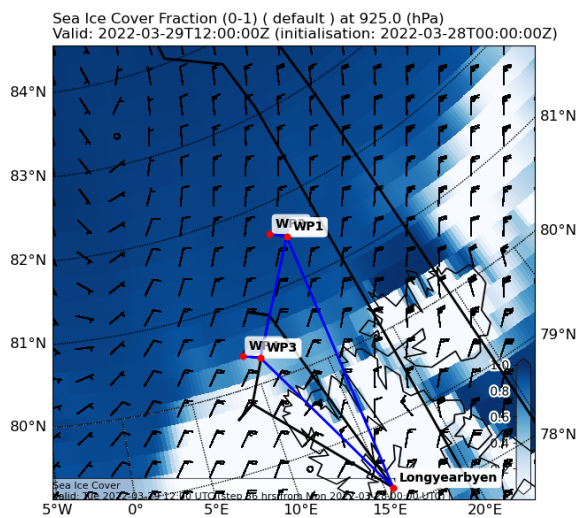


Fig. 1: Left: Flight track over sea ice of 1 April 2022. The observed sea ice cover during the flight was very similar, especially also with respect to the sea ice edge and the position of the southern stack close to it. Right: Predicted wind field and planned flight tracks of Polar 5 (blue), Polar 6 (black lines near Polar 5 track) and of HALO (upper two black lines). Halo flew a circle north of the domain shown here.



Fig.2: Height profile of flight.

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

Forecast Maps:

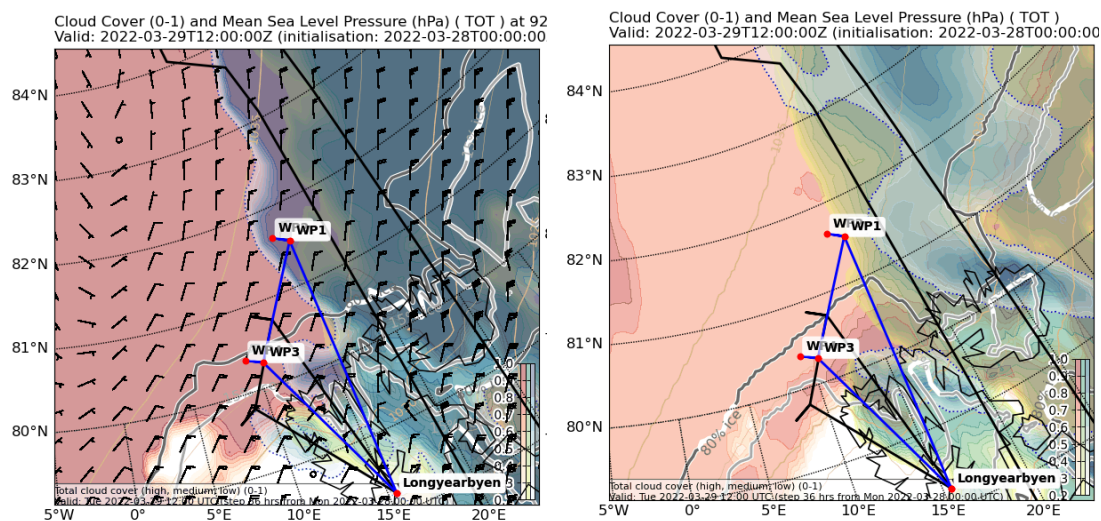


Fig 2: Top views of predicted wind at 925 hPa (left) and total cloud cover (ECMWF, left; ICON, right) (blue: high clouds, green: middle, red: low).

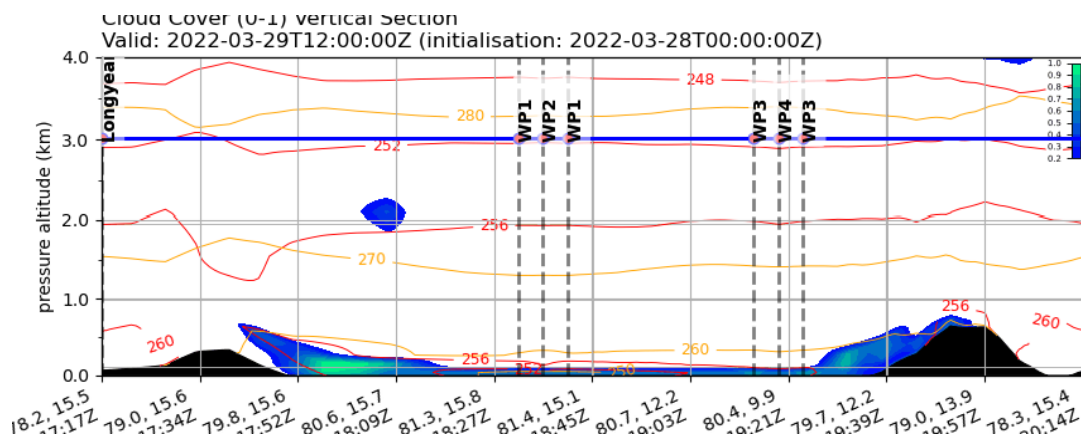
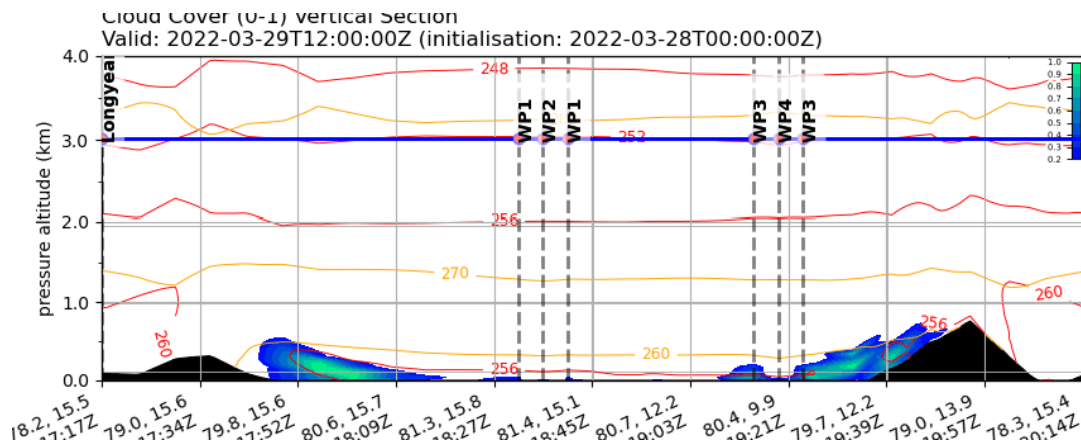


Fig. 3: Side views of clouds. 24 hour prediction of ECMWF (top) and ICON (bottom) for flight day 12 Z.

The observed wind field agreed well with the prediction. ECMWF and ICON showed similarities but also discrepancies for the predicted cloud fields. Northeast of WP1 ECMW predicted more clouds than ICON but only very few mid-level clouds were seen from the aircraft in the Northeast. Along the track between WP1 and WP3 no clouds were observed over sea ice except sea smoke from leads. Cloud streets (8/8) occurred south of the sea ice edge over the open ocean and over the partly ice covered Whaler’s Bay polynya north of Svalbard. Tops seemed to be below 500 m (estimated from the aircraft).

Overview:

The goal of the flight was to measure the boundary layer development along the track WP1, WP4. The latter waypoint was close to the sea ice edge (on the northern side). Polar 6 extended this pattern to the South.

Major notes: Dynamic pressure of the basic meteorology was working the first time during the campaign. Dynamic pressure differed from the noseboom values.

Instrument Status:

Polar 5	
Basis data acquisition	
Nose Boom	unclear
MiRAC-A	
MiRAC-P	
AMALi	
SMART	
Eagle/Hawk	
Sun Photometer	
Drop Sondes	

Table S5.1: Instrument status as reported after the flight for all instruments on Polar 5.

Detailed Flight Logs:

→ Four dropsondes between the northern coast of Svalbard and WP1 from 10.000 ft. The first was released at the southern end of the Whaler's bay polynya, the next one in the middle, and another one at its northern end. Another one followed before WP1 was reached. Finally, after the southern stack was flown, a drop sonde was released not far from WP4.



Fig: 4 Over Whaler's Bay polynya. Cloud streets were more dense over the center of the polynya. Right: Northern end of the polynya, where clouds started to develop.

→ sea ice conditions: Closed pack ice was observed at WP1 and along the stack WP1→WP2. The sea ice had many new ridges. Leads were all overfrozen, a large one was observed shortly before we arrived at WP1.



Fig. 5: Between WP1 and WP2



Fig 6: Left, near WP3: open water with drifting floes. The open water occurred, however, only over a small part of the leg (2 km) close to WP3. Further to WP4, the right hand figure was typical showing drifting floes of high concentration. Convective clouds start to form over the ice edge.

Leg heights between WP1 and WP2: Legs 1 and 2: 200 ft, leg 3: 400 ft, leg 4: 600 ft, leg 5: 800 ft, leg 6; 1000 ft,

after leg 6, we turned to South, and a leg was flown at 1400 ft, light haze was visible in this height.

Then we went down to 200 ft, then up to 6000 ft, down to 200 ft, clearly more turbulence on this low-level leg to WP3.

Stack WP3→WP4→WP3 :

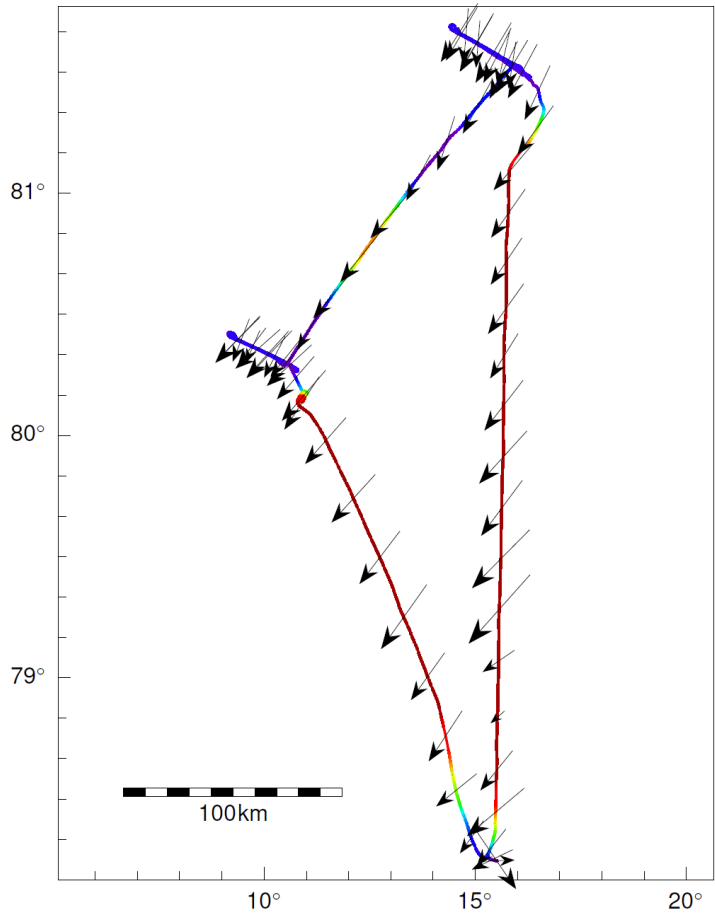
leg 1 200 ft much open water in east part, less in the west, ice floes separated partly by open water from each other

leg 2 200 ft, leg 3 400 ft, leg 4 600 ft only weak turbulence pon this leg, leg 5 800 ft, leg 6 1000 ft temp to 200 and then 10.000 ft an wolkenkante, also ostende des legs über viel wasser

16:32 UTC sideslip flown for the noseboom.

Quicklooks:

20220329_P5_10



Wind, obtained from noseboom

