COMPEX-EC Flight RF01 – Polar 5 – 2025/04/04

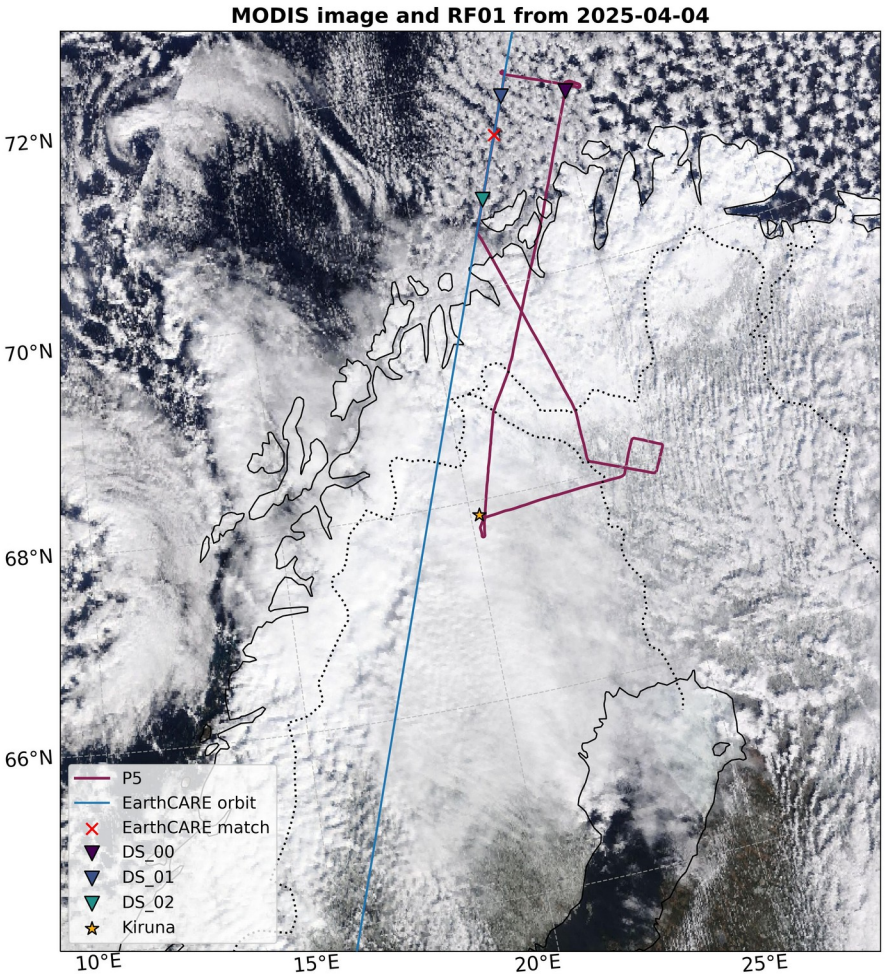
Pilot	**Kyle McLenaghan**
1st Officer	**Bailey Pegels**

Mission PI	**Mario Mech**
Basis Data	**Eduard Gebhard**
SMART/ Eagle/Hawk	**Joshua Müller**
MiRAC-A / HATPRO	**Lars van Gelder**
AMALi	**Marcus Klingebiel**
Dropsondes	**Lena Burder**

Flight times:

Take off	**11:03 UTC**
Touch down	**16:02 UTC**

Objectives: EarthCARE underflight - MSI leg - Pallas overflight - radiation square

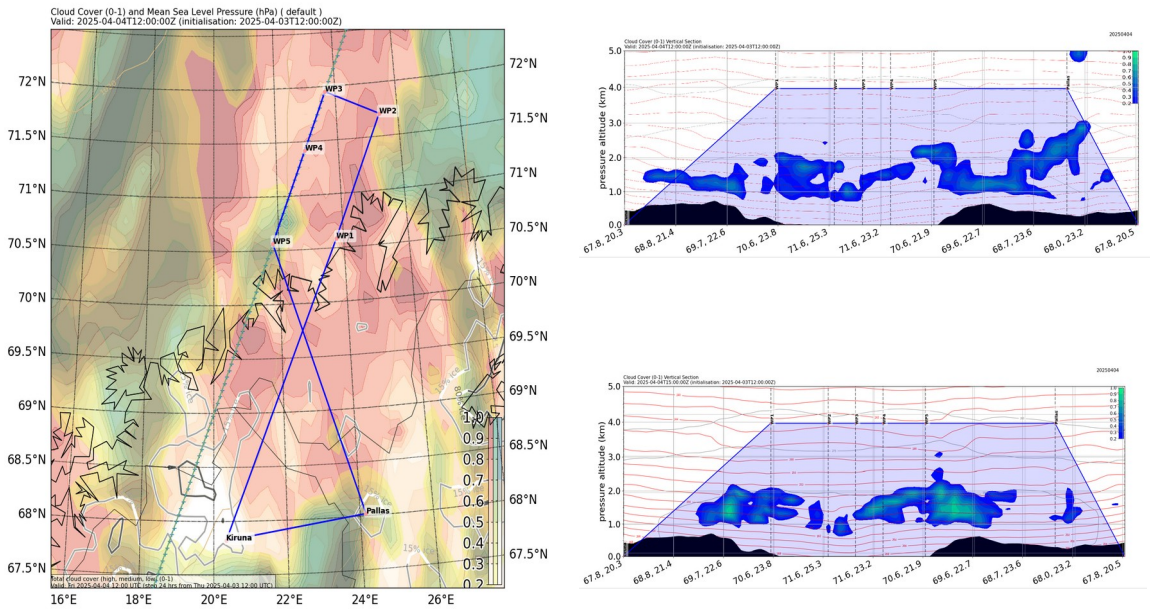


Flight and satellite track and dropsonde locations over MODIS RGB composite satellite image for RF01 on 4.4.2025.

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

The weather situation at RF01 fulfilled the expectations that the weather models had been predicting for a few days. On Thursday (3 April 2025), a low pressure system with a core pressure of 990 hPa moved from west to east over northern Scandinavia and ensured the supply of cold Arctic air masses to the south. Following the passage of the low pressure system, there was therefore low geopotential over the observed area on Friday. The air masses at 850 hPa were -16 °C to -18 °C. It was therefore to be expected that typical clouds of a cold-air outbreak would be found in the area north of Kiruna over the Norwegian/Barent Sea.
The cloud forecast of the models was fairly accurate, as cloud top heights of around 2 km could be observed in the area of the EarthCARE satellite track.

Overview:



Forecast for the flight time issued by ICON on 3.4.2025 12UTC. Left: total cloud cover of low-, mid-, and high-level clouds for 4.4.2025 12 UTC. Right: cross section at 12UTC (top) and 15UTC (bottom).

EarthCARE meet up is planned North of the Norwegian coast on the descending orbit. On the way up a MSI leg will be included. Depending on the cloud situation over Pallas Cloudnet station, an overpass will be included.

During filing in the flight plan, pilots realized that specific border crossing points have to be taken. Therefore, no straight lines to WP1 and between WP5 and Pallas can not be flown and little detours have to be taken. But even with the detour, we were too early at WP2 and had to include holding pattern. Satellite meeting and radiation square over Pallas, that we decided to do instead of a cross pattern, worked quite well.

Instrument Status:

Polar 5	
Basis data acquisition	
MiRAC-A	
HATPRO	
AMALi	
SMART	
Eagle/Hawk	
Dropsondes	3/5

Instrument status as reported after the flight for all instruments on Polar 5.

Comments:

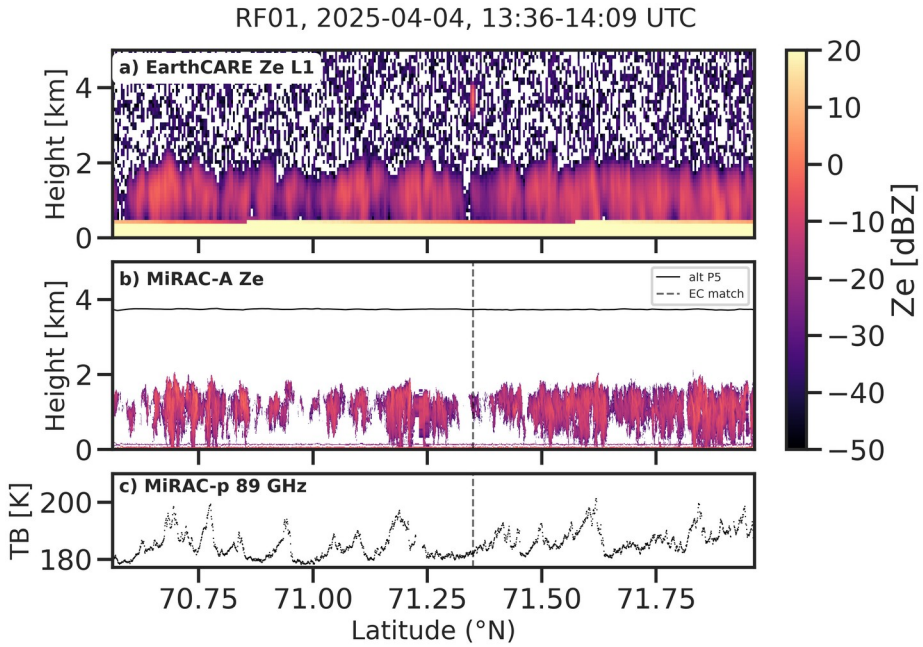
- Two out of the five dropsondes did not get any gps signal.
- EAGLE: The instrument needed several restarts during the flight, but was most of the time operable. The GPS-timestamp was not functioning during most of the flight.
- HAWK: The instrument was operable for most of the time with some minor data losses due to freezing of the software.
- SMART: The instrument operable for most of the time, with one restart needed in the second half of the flight.

Detailed flight logs:

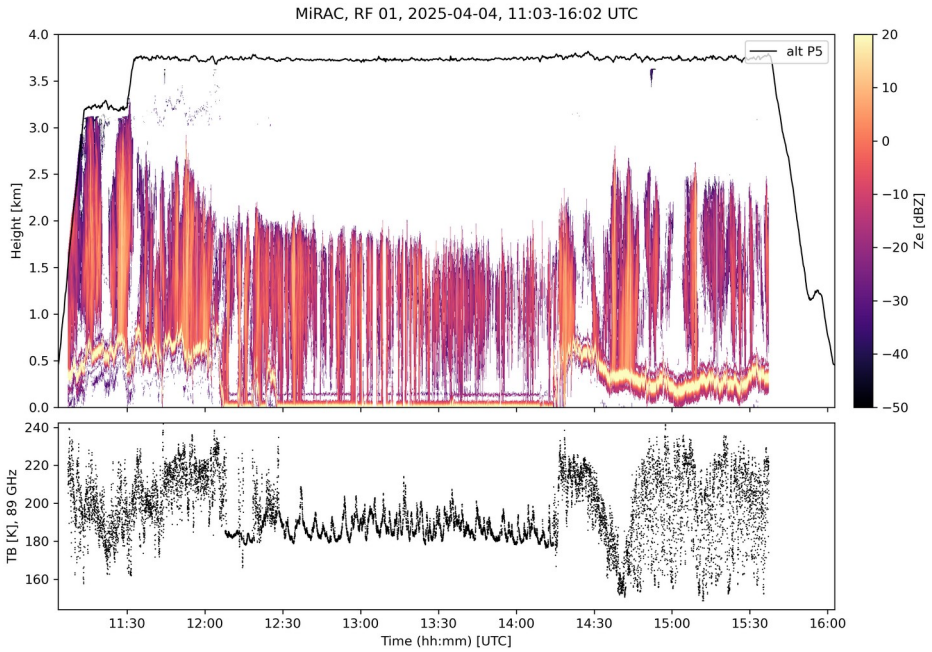
11:03 Take off
11:05 2900ft clouds
11:07 Roller doors open
11:12 Cloud top at 9600ft
11:14 10500ft
11:28 11000ft just at cloud top
11:32 13000ft survey altitude
11:43 Slow down to survey speed
12:24 WP1 at 138kts
12:34 Switch on AMALi
12:51 Dropsonde but without GPS -> not in intake catalog
12:55 DS1
12:57 WP2 -> holding pattern
13:33 WP2 -> long turn
13:36 WP2
13:38 157kts GS due to strong tail winds
13:40 DS2 on EarthCARE track

13:53 Dropsonde stopped at 889 hPa -> not in intake catalog
14:02 DS3
14:09 WP5 -> heading for border crossing point
14:11 AMALi off at 221kts GS
14:50 Border crossing to Finland
14:57 Pallas -> radiation square
15:20 Passing over Pallas Cloudnet station
15:31 Roller door closed
16:02 Landing

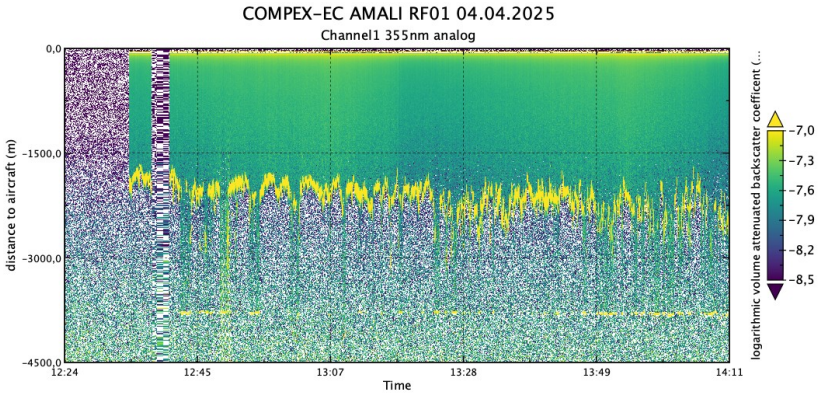
Quicklooks:



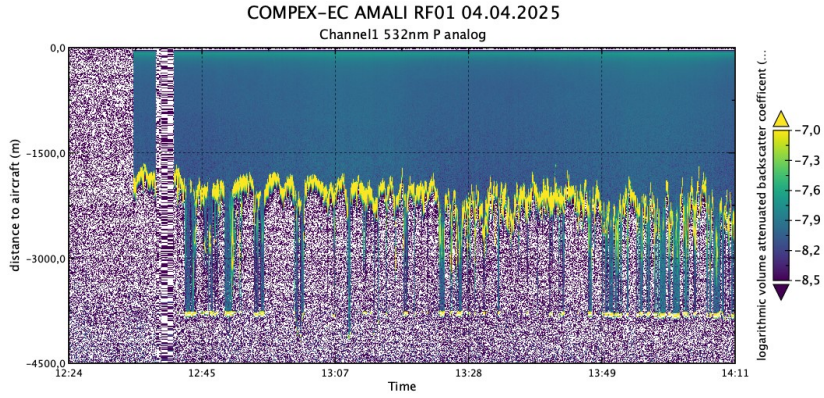
Comparison between EarthCARE Ze and MiRAC-A Ze together with the passive channel at 89 GHz for the direct overpass section.



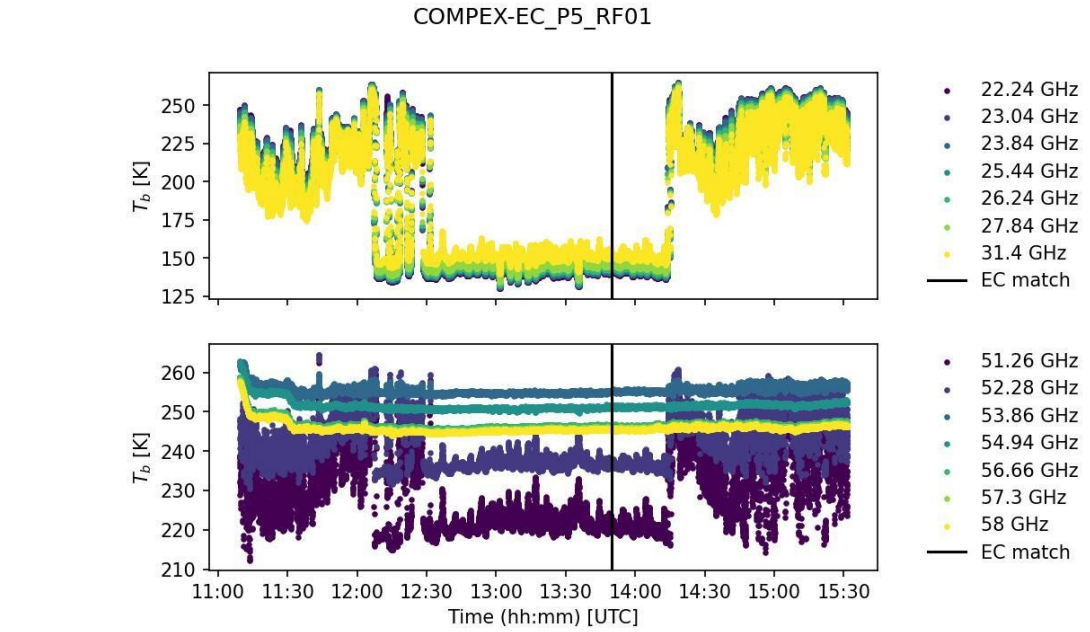
MiRAC-A radar reflectivity and 89 GHz passive channel for the whole flight.



355 nm analog for the whole flight.

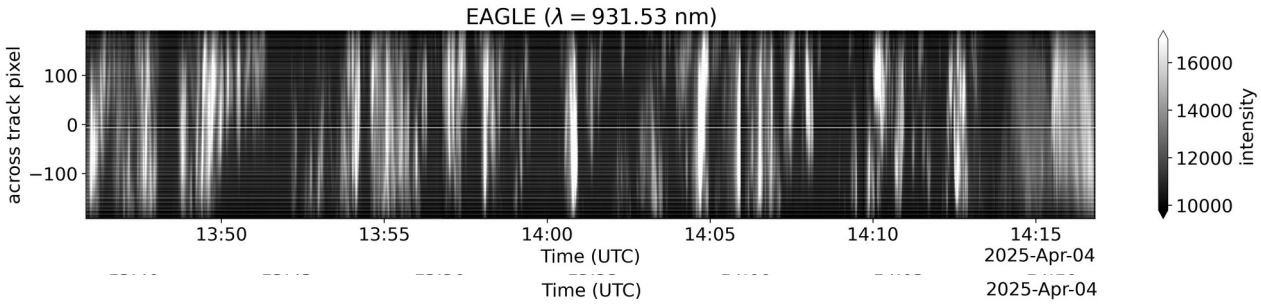


532 nm parallel analog for the whole flight.

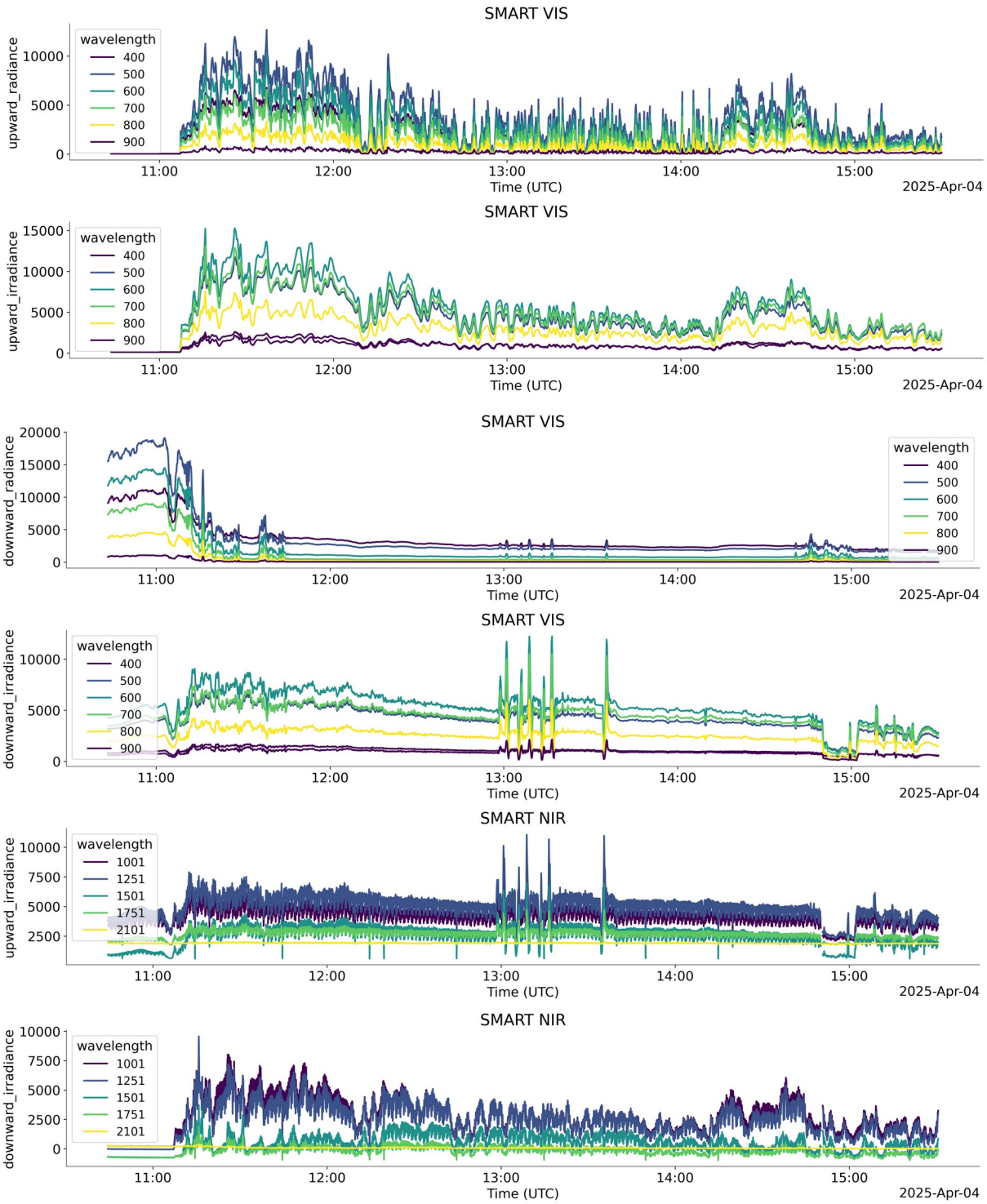


HATPRO channels at K- (top) and V-band (bottom) for the whole flight.

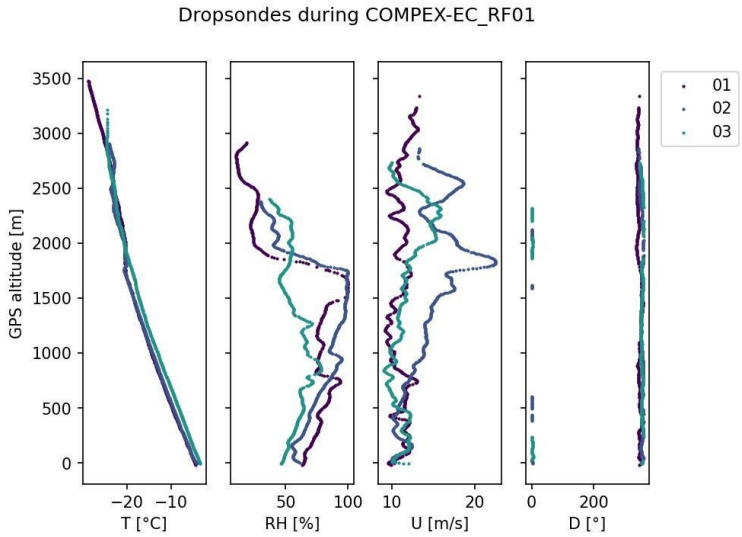
EAGLE NIR for the whole flight.



HAWK for the whole flight.



Up- and downlooking, radiance and irradiance of SMART VIS for the whole flight. Lower panels show the NIR up- and downlooking SMART channels.



Dropsonde profiles from the flight.