

# AFLUX Flight #12– 06 April 2019

Mission PI: Christof Lüpkes

## Objectives:

The main goal of this flight was to obtain vertical profiles of fluxes and cloud particles dependent on sea ice fraction.

## Crew:

Polar 5	
PI	Christof Lüpkes
Basis Data Acq.	Cristina Sans Coll
SMART/Eagle Hawk	Elena Ruiz
Cloud Probes	Manuel Moser
MiRAC	Pavel Krobot
AMALI	Pavel Krobot

## Flight times:

Polar 5	
Take-off	10:25 GMT
Touch-down	15:52 GMT

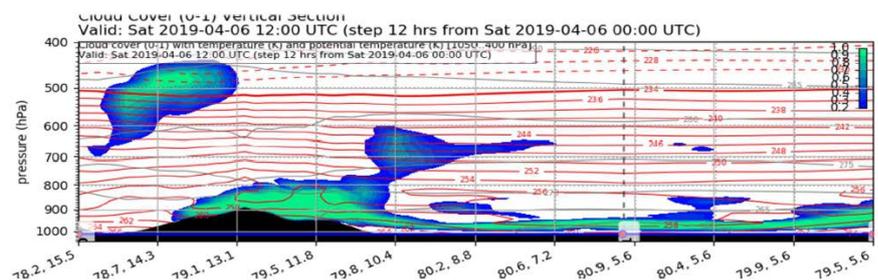
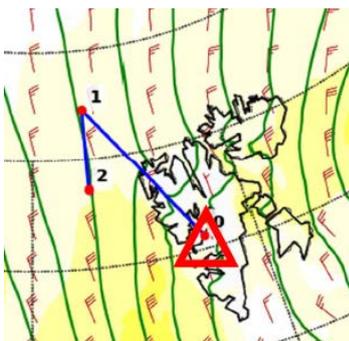
## Overview:

During off-ice flow conditions three staircase patterns were flown over the marginal sea ice zone north of Svalbard. Sea ice cover was inhomogenous with open leads already at the northernmost position. Cloud situation was characterized by the occurrence of low clouds and mid level clouds but the fraction was inhomogeneous and cloud top changed along the staircase legs. Mid-level cloud cover developed during the measurement period.

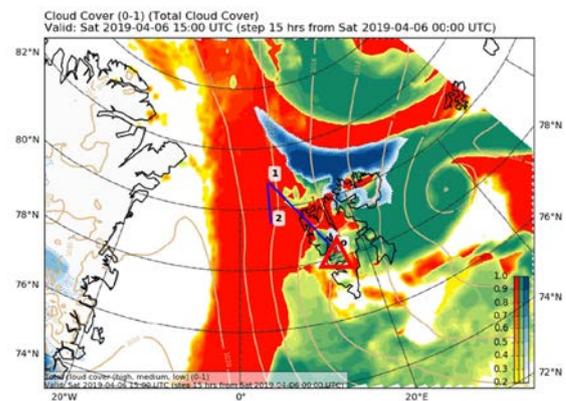
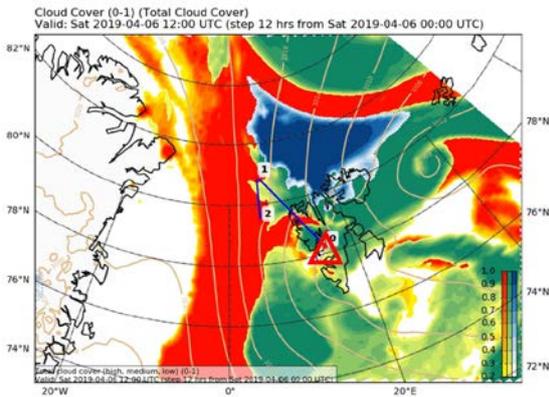
## Weather:

Again, a cold-air outbreak had developed with near-surface wind from North. This was accompanied by a thin layer of low clouds over sea ice and some mid-level cloud fields in the measurement region. Strong wind occurred south of 80 N in the ice free part of the Fram Strait with a maximum close to the coast of Svalbard, which was probably partly a channeling effect along the topography of Svalbard.

*Near-surface wind vectors and clouds (ECMWF).*



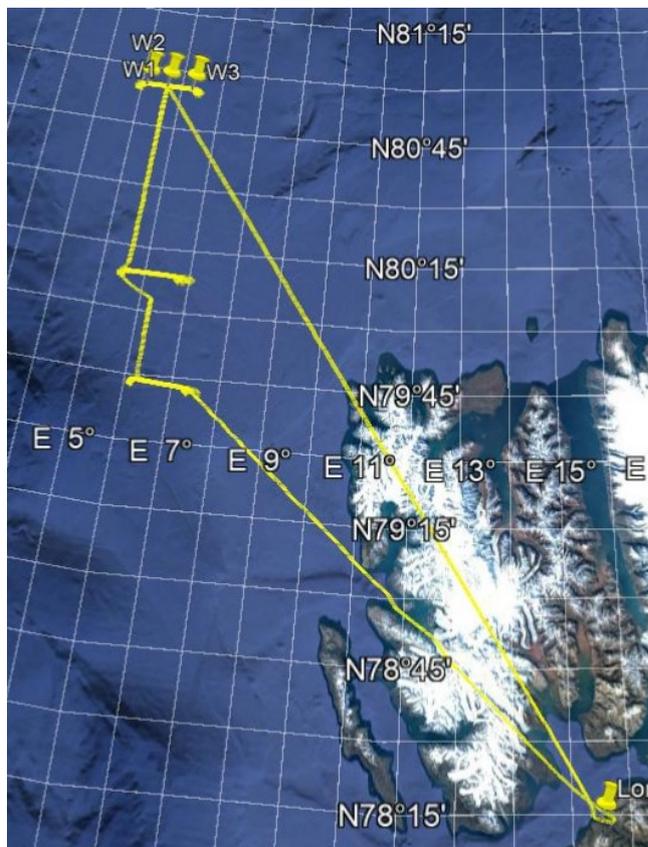
The observed wind agreed well with the prediction, however the development of the mid level clouds during the flight was different. Due to the prediction (see figure below, in which the planned track is given without the staircases) mid level cloud cover should have reduced during the flight. However, the opposite was observed, a layer of mid level clouds moved to the measurement region or has developed there.



ECMWF predictions for 12 and 15 UTC. The mid level clouds (blue) were predicted to reduce.

### Flight track and pattern:

The northern staircase was flown first. The position of the southern staircases were planned at positions exactly south of the northernmost staircase, but the cloud fields were too inhomogeneous at the planned positions. Also the middle staircase was planned at a position further north, but there, no low clouds were found.



Flight altitudes during staircases:

Northern legs:

200 ft, 400 ft, 600 ft, 800 ft, 1000 ft

Middle legs:

200 ft, 400 ft, 600 ft, 800 ft, 1200 ft

Southern legs:

200 ft, 400 ft, 600 ft, 800 ft, 1100 ft, 1300 ft.

## Sea ice and Cloud Conditions

The image shows the closed layer of low clouds north of Svalbard that was present while we crossed the northern coast.



At the positions of the northern and middle staircases several wide leads were crossed.



These were partly ice free, partly covered with very thin nilas. The estimated sea ice fraction was 90 % in the north, 70 % at the middle position and 20-30 % at the southern stair cases. There, sea ice consisted of drifting floes (see below).



### Detailed Flight Logs:

After take-off visibility was low due to mid level clouds. They disappeared at 79.85 N. At this position still high clouds were visible, but after crossing the northern coast of Svalbard only a low layer of 8/8 low clouds existed, which looked homogeneous (from our perspective flying at 10.000 ft). Cloud top during descend to the first staircase was 1500 ft, cloud base at 600 ft. We crossed after reaching W2 first a larger open lead but then thick sea ice prevailed.

The cloud layer turned now out to be inhomogeneous, clouds seemed to dissolve at the western end of the staircase. Both cloud base and top changed along the leg, sometimes cloud base could not be clearly identified because of surface based clouds and sea smoke especially over leads. Cloud top was higher in the eastern part than in the western part of the legs. After the staircase ended it became clear that a layer of mid-level clouds had developed that had not yet been seen at the beginning of the staircase.

At the originally planned position of the 'middle' staircase no low clouds were visible so that we went further south looking for low clouds. Finally, we had to go further to the east than planned originally. There, a position was found with low, dense cloud, and at the beginning no mid-level clouds were present, but again this changed during the staircase.

We crossed then during a temp the mid-level clouds (base 3000 ft, top 3700 ft)

Visibility was bad during the second staircase pattern, due to lower sea ice concentration (more leads) and related sea smoke and clouds. Again, the cloud layer turned out to be inhomogeneous with higher tops in the East. In the western part, clouds dissolved partly. The uppermost leg was flown partly above cloud top (East) and partly still within clouds (West).

At the southern staircase cloud base was more distinct than at the other positions (around 600 ft). Cloud top was at 1100-1500 ft.

After finishing the staircases we aimed to fly then in the mid level clouds that were again present (base 2700 ft) some distance to the south. The leg was flown at 3000 ft, but the layer of clouds disappeared after some miles.

### Drop sondes

No drop sondes

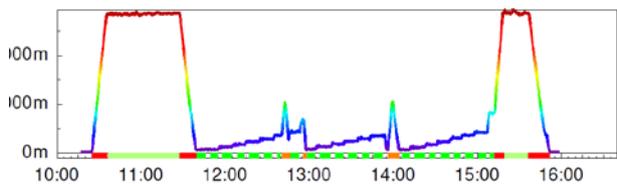
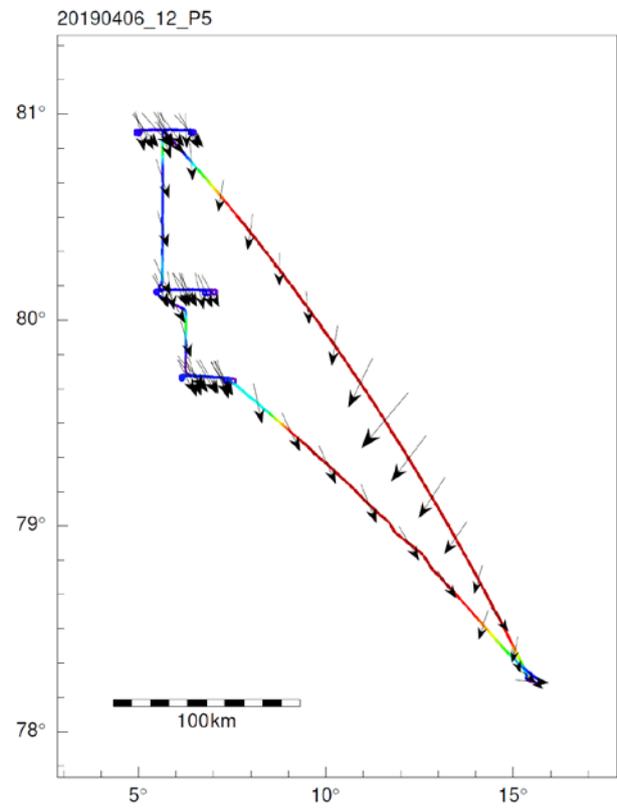
### Instrument Status:

<b>Polar 5</b>	
Basis data acquisition	
Nose Boom	
MiRAC	
AMALi	
SMART	
Eagle/Hawk	
Cloud Particale Probes	

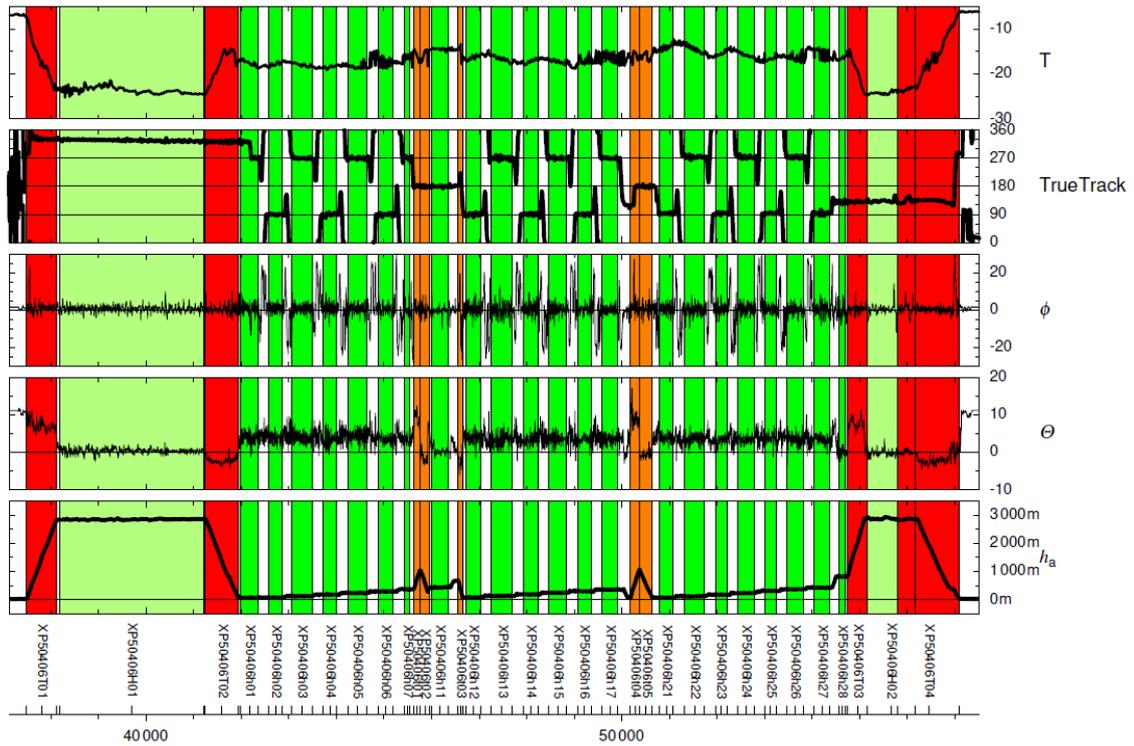
### Quicklooks:

AMALI measurements during the transect LYR→W1→W2

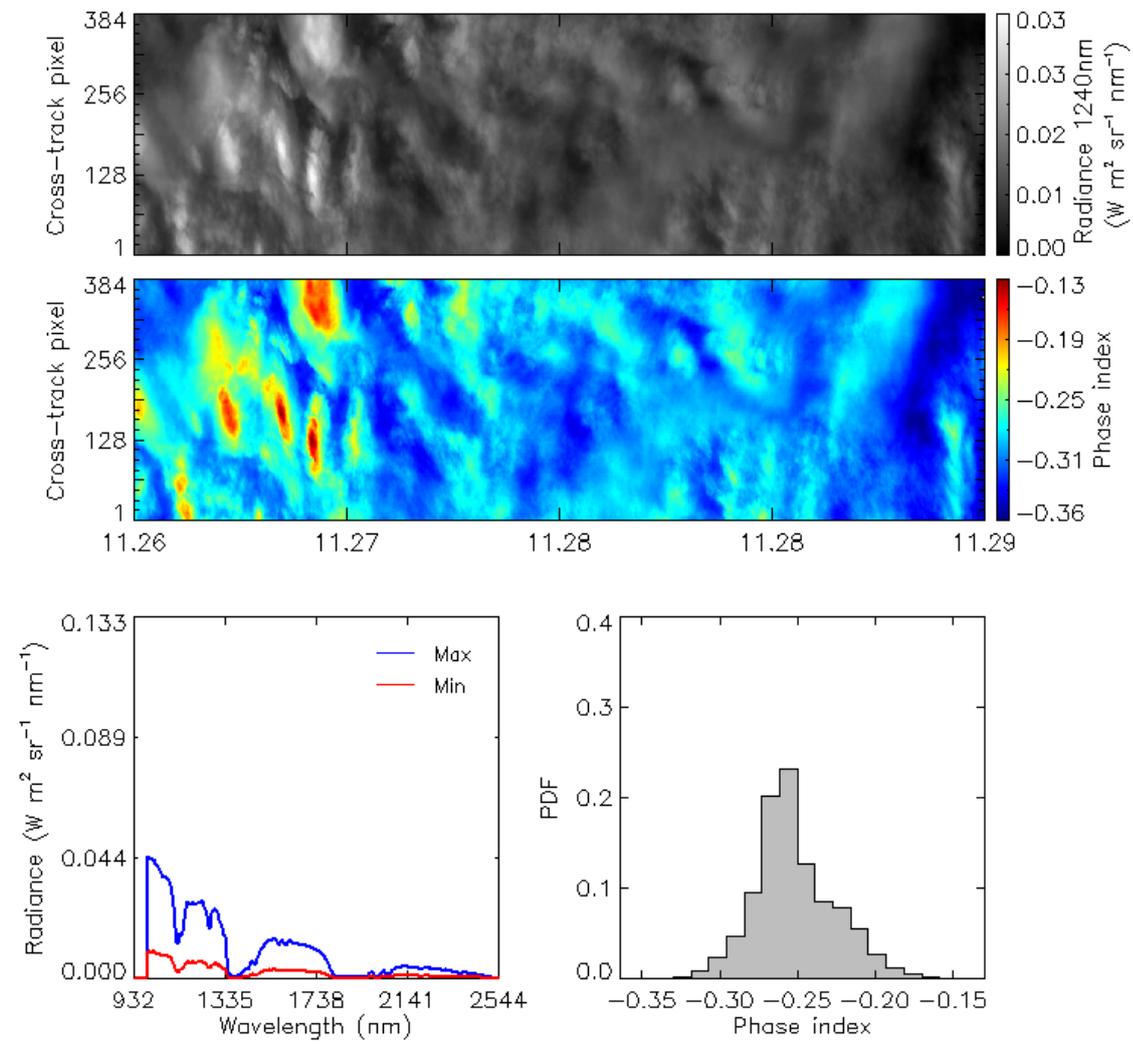
Noseboom data:



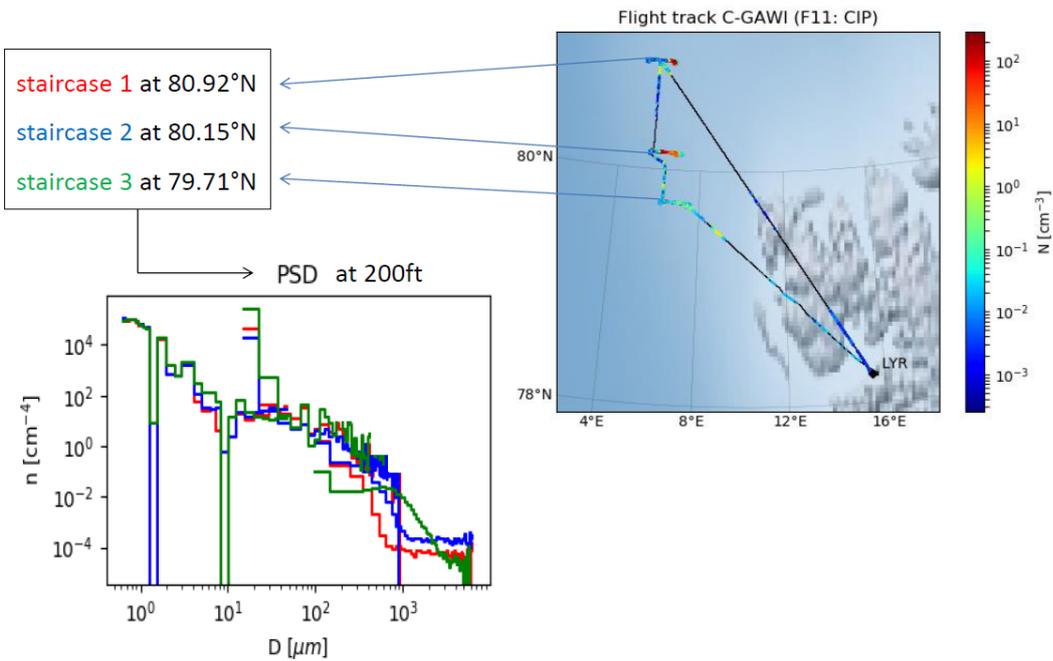
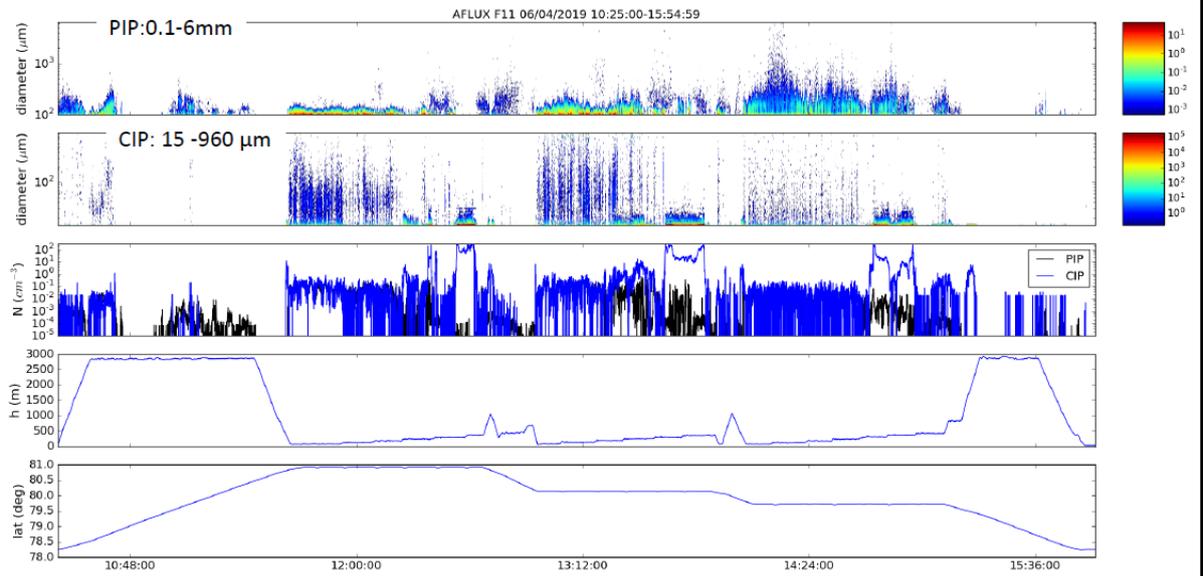
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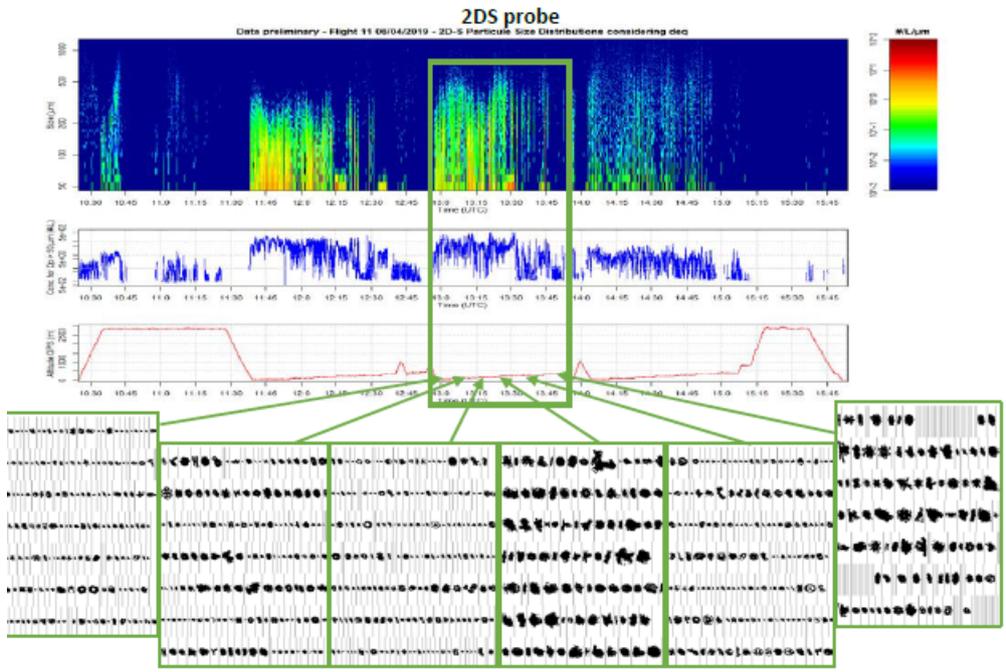
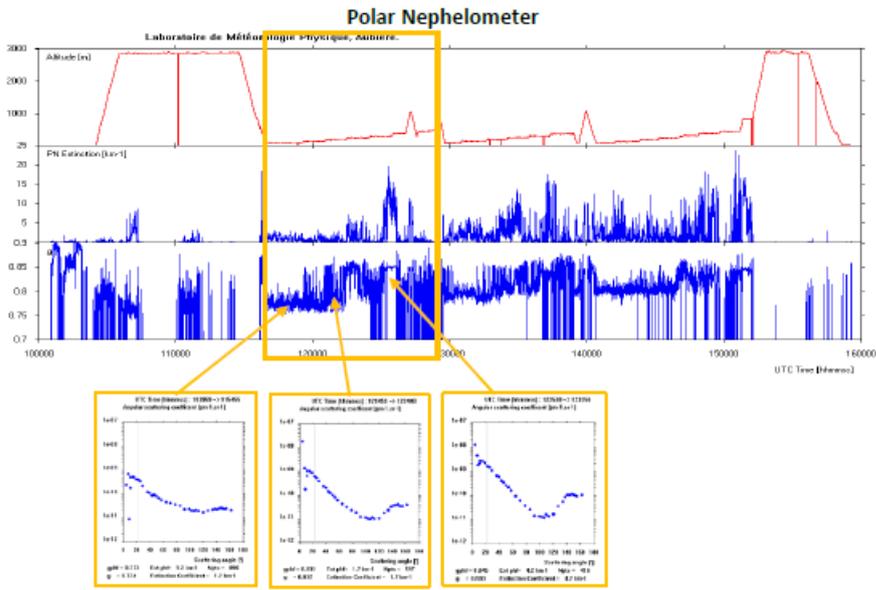
# Eagle HAWK:



# DLR Particle Probes



Flight #11 - 190406 – Quicklook Microphysics LaMP (Preliminary data)



Amali showing wave structure over Svalbard after take-off

