Example use of cloud probe data during activate from CDP, FCDP and 2D-S (NASA-LARC, DLR)

Cold air outbreak
1 March 2020

Seasonal cloud statistics

Winter 2020

<table>
<thead>
<tr>
<th>Winter Duration [s]</th>
<th>1.0</th>
<th>5.0</th>
<th>9.0</th>
<th>13.0</th>
<th>17.0</th>
<th>&gt;21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-17°C to 10°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summer 2020

<table>
<thead>
<tr>
<th>Summer Duration [s]</th>
<th>1.0</th>
<th>5.0</th>
<th>9.0</th>
<th>13.0</th>
<th>17.0</th>
<th>&gt;21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>3°C to 25°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contact Simon.Kirschler@dlr.de; Christiane.Voigt@dlr.de
Cloud microphysical properties & cloud phase

Particle size distribution
23 March 2021

Particle shape for phase discrimination
Timeseries of cloud data

N FCDP
N 2DSliq
N 2DSice
LWC FCPP
LWC 2DS
LWC 2DS
ED 2DSice
ED 2DSliq
MVD 2DS
PSD

Contact: Christiane.Voigt@dlr.de, Simon.Kirschler@dlr.de
Survey of microphysical properties of marine boundary-layer clouds in the Western North Atlantic

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1.) ACTIVATE Campaign

- 35 simultaneous flights by HU-25 (Falcon) and UC-12 (KingAir B200)
- Satellite Underflights:
  - Winter 2020: 1 ASTER
  - Summer 2020: 1 ASTER, 3 CALIPSO

2.) Oceanic Cloud Properties

- Winter 2020: Temperature 17°C to 16°C
- Durations: 1, 5, 10, 15, 20, 30, 40, > 60
- Summer 2020: Temperature 3°C to 25°C
- N [cm⁻³]: 200, 400, 600, 800, 1000, > 1200

3.) Cold Air Outbreak March 1st 2020

Contact: Christiane.Voigt@dlr.de, Simon.Kirschler@dlr.de
**Principle of Operation**

2D Stereo Particle Imaging Probe
Optical Array Probe

- Laser produces a sheet of laser light that passes between the windows located on the inboard sides of the optical arms.
- Sheet of light is directed onto linear array.
- Array is sampled at a rate proportional to the particle’s velocity such that image slices are taken at the pixel resolution.

**Particle detection size**

- 11.4 μm – 1463 μm

**Manufacturer**

- SPEC, inc.

**Sample Area**

- Variable; depends on tip configuration and particle size

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**Principle of Operation**

Fast Cloud Droplet Probe
Light Scattering Probe

- Cloud particles cross the focus of open path laser beam and are illuminated.
- Light is scattered and detected by 2 photo diodes in a forward angular range (4° to 12°).
- On the basis of Mie theory, particle size and concentration is derived.

**Particle detection size**

- 1 - 50 μm

**Manufacturer**

- SPEC, inc.

**Sample Area**

- Variable; depth of field dependent