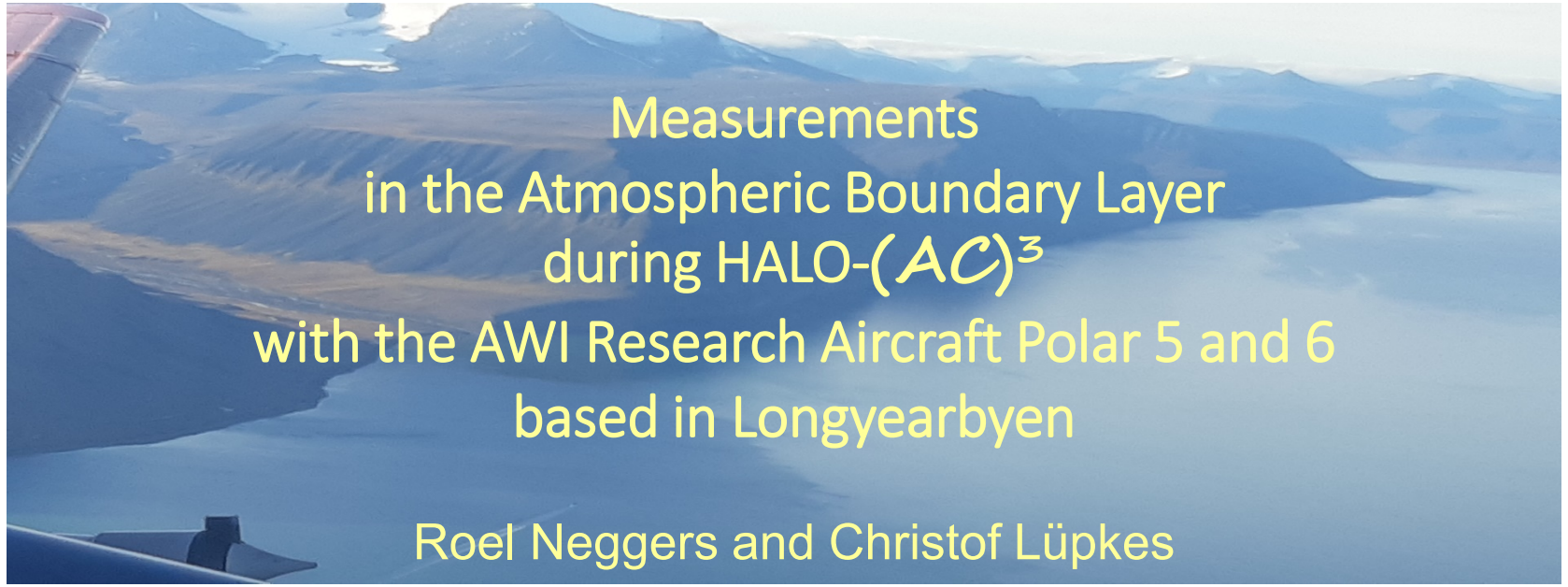
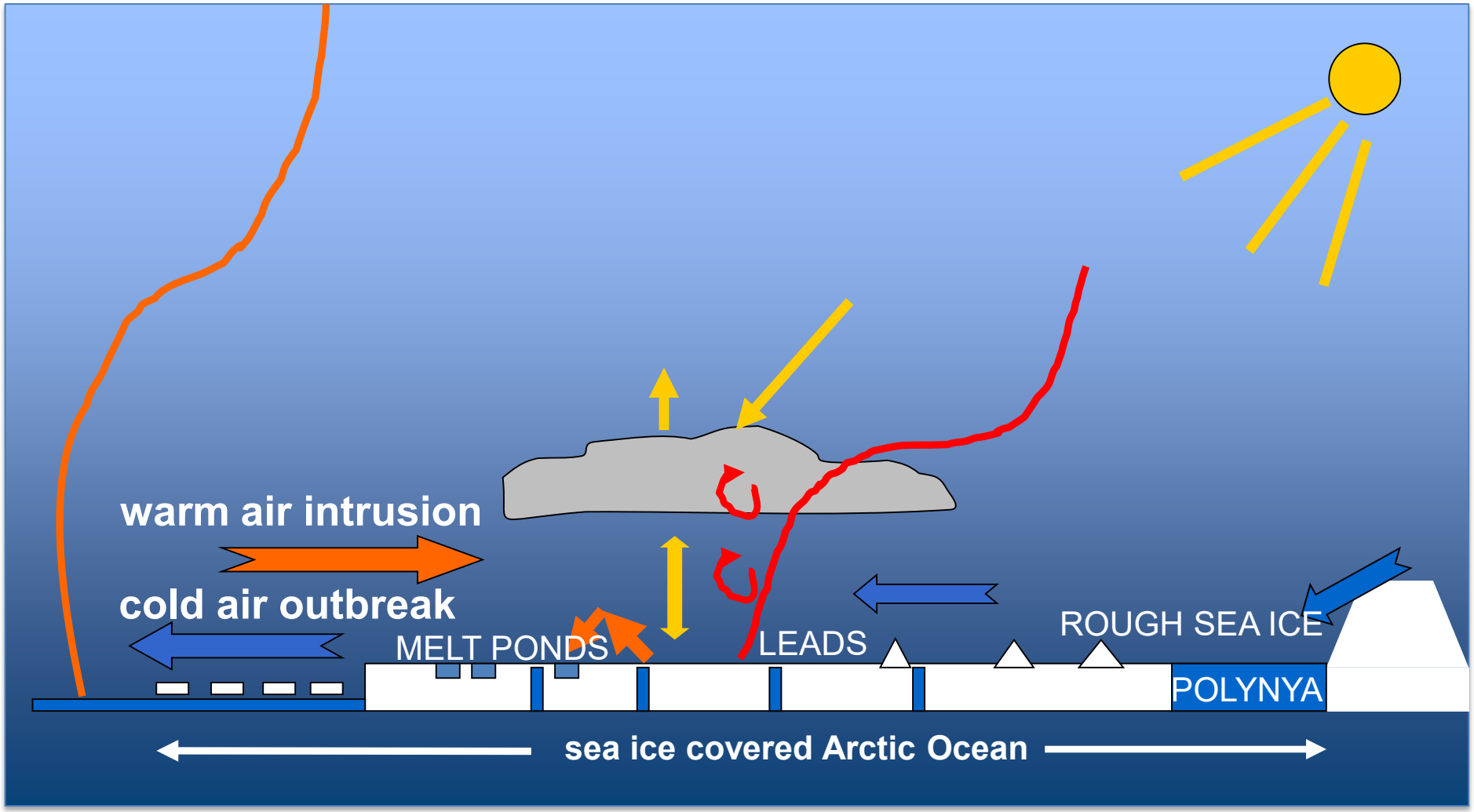
ArctiC Amplification: Climate Relevant Atmospheric and SurfaCe Processes, and Feedback Mechanisms (AC)³



DLR, LaMP

Polar Boundary Layer Processes



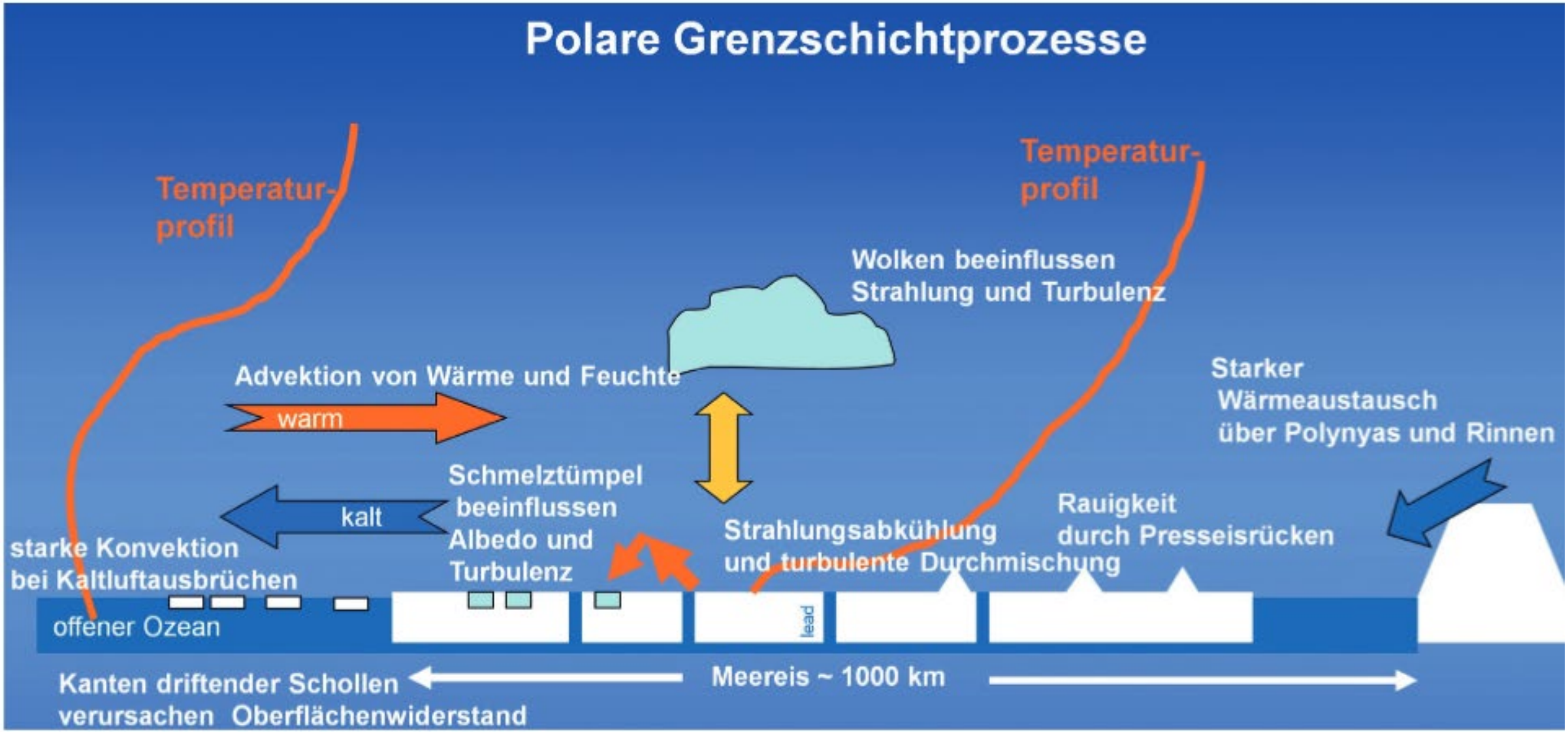


Abb. 7-1: Illustration wichtiger Prozesse in der polaren Grenzschicht (aus: www.awi.de/forschung/klimawissenschaften/meteorologie-der-polargebiete.html).

Goals of Boundary Layer Research During HALO-AC3

Investigate

- air mass transformation in the ABL during CAOs and WAIs, evolution of clouds and fluxes along trajectories
  (Polar aircraft: focus on short range (MIZ); HALO: focus on long range)

- impact of sea ice characteristics versus impact of clouds (single layer and **multilayer clouds**) on the mean ABL structure and vertical transport

- radiation-turbulence interaction in the (cloudy) ABL

- ABL - free troposphere interaction

→ generate a large data base with airborne in-situ measurements of turbulence and radiation in, below, and in between polar clouds

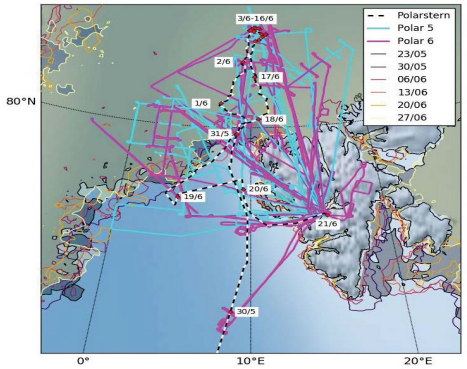
Limitation of the minimum flight altitude

Research in the lower ABL (transfer coefficients, lead impact)
only possible with T-Bird (autumn campaign)

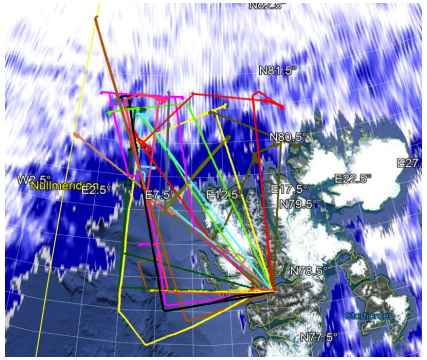
Yesterday, first successful flight

Previous $(AC)^3$ Aircraft campaigns

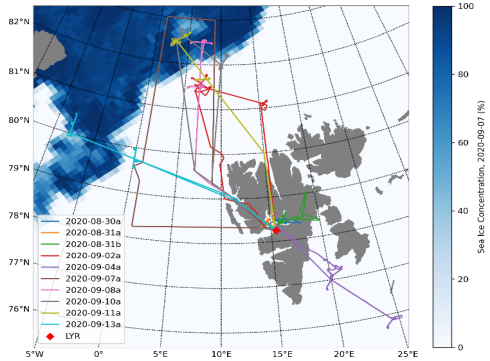
ACLOUD



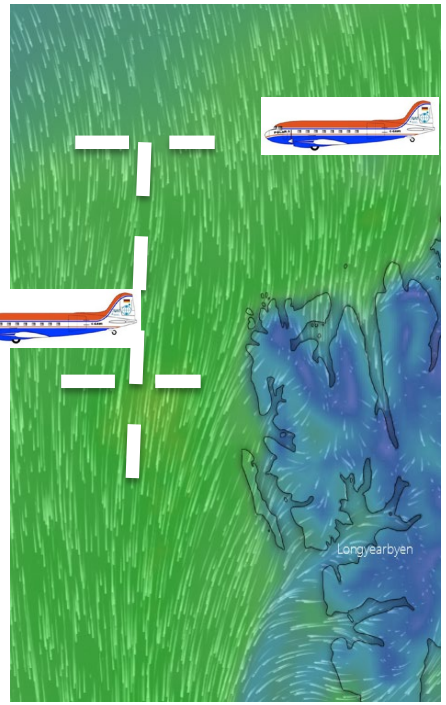
AFLUX

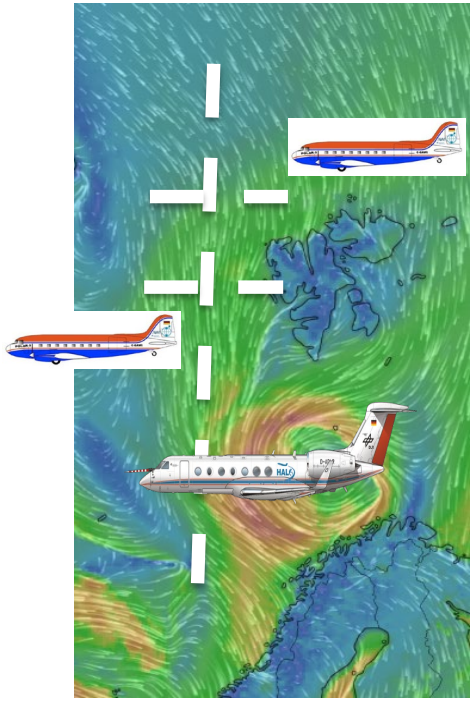


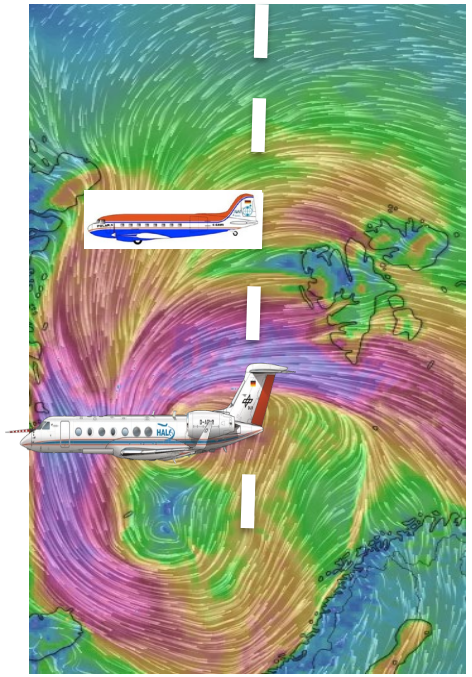
MOSAiC ACA



General Strategy for combined flights P5, P6, HALO







HALO:
Drop sondes and remote sensing

P5, P6:
Small scale in situ pattern

Flights along trajectories
(2 left panels)

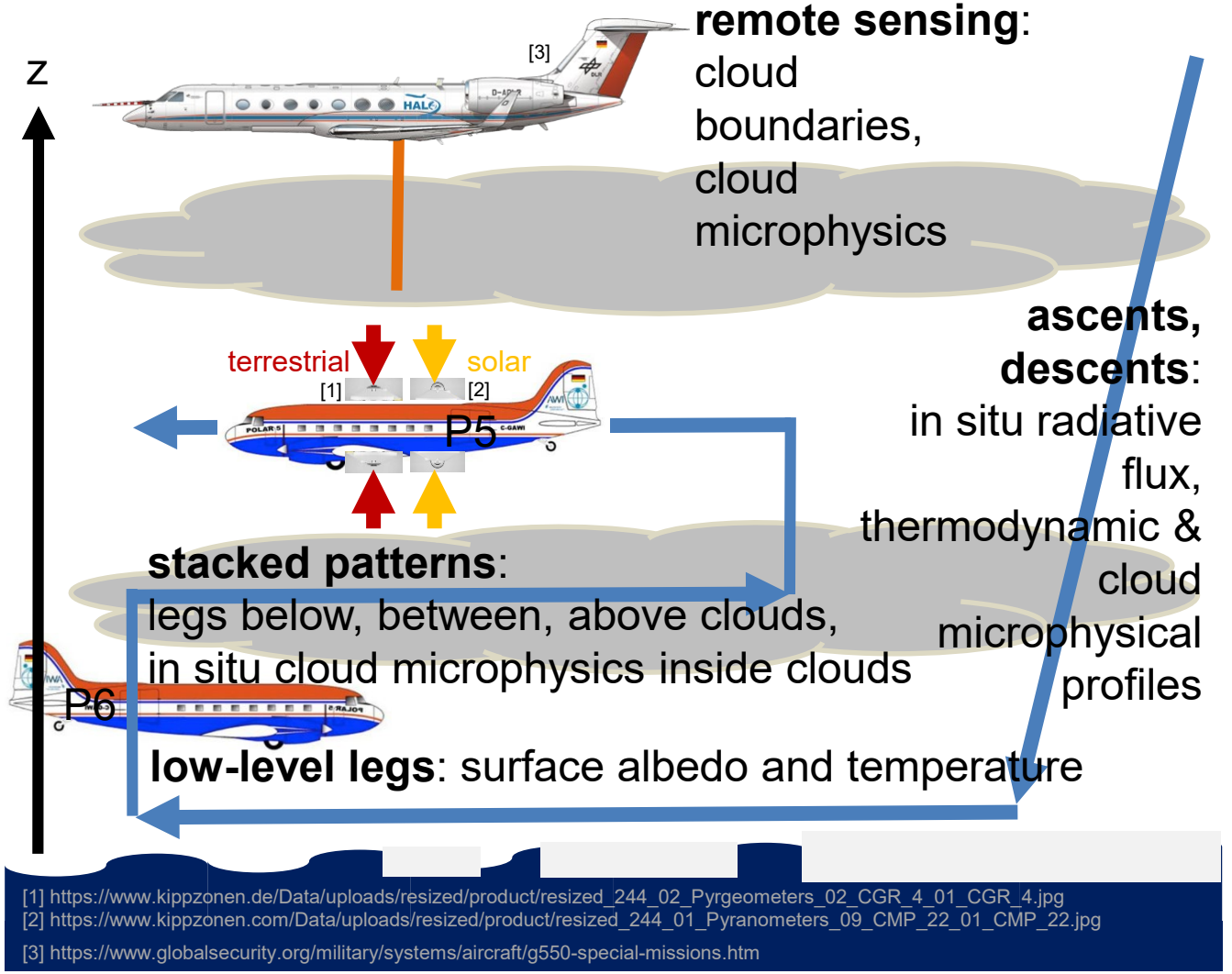
but independent on trajectories
different air masses can be studied
(right panel)

Impact of multi-layer clouds on the radiative energy budget in the atmospheric boundary layer

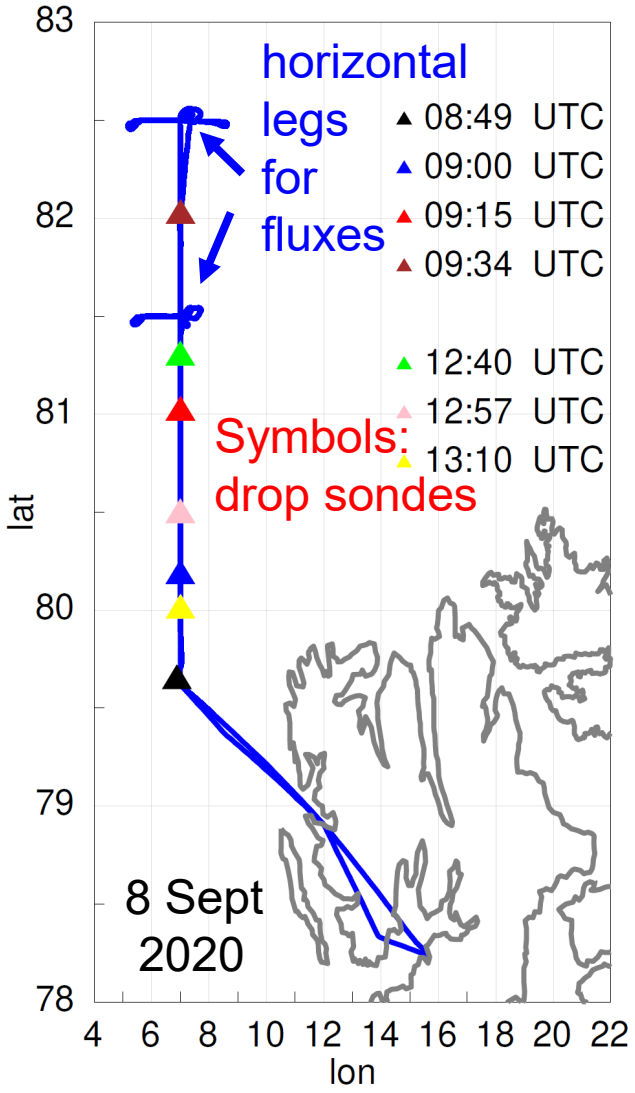
Sebastian Becker

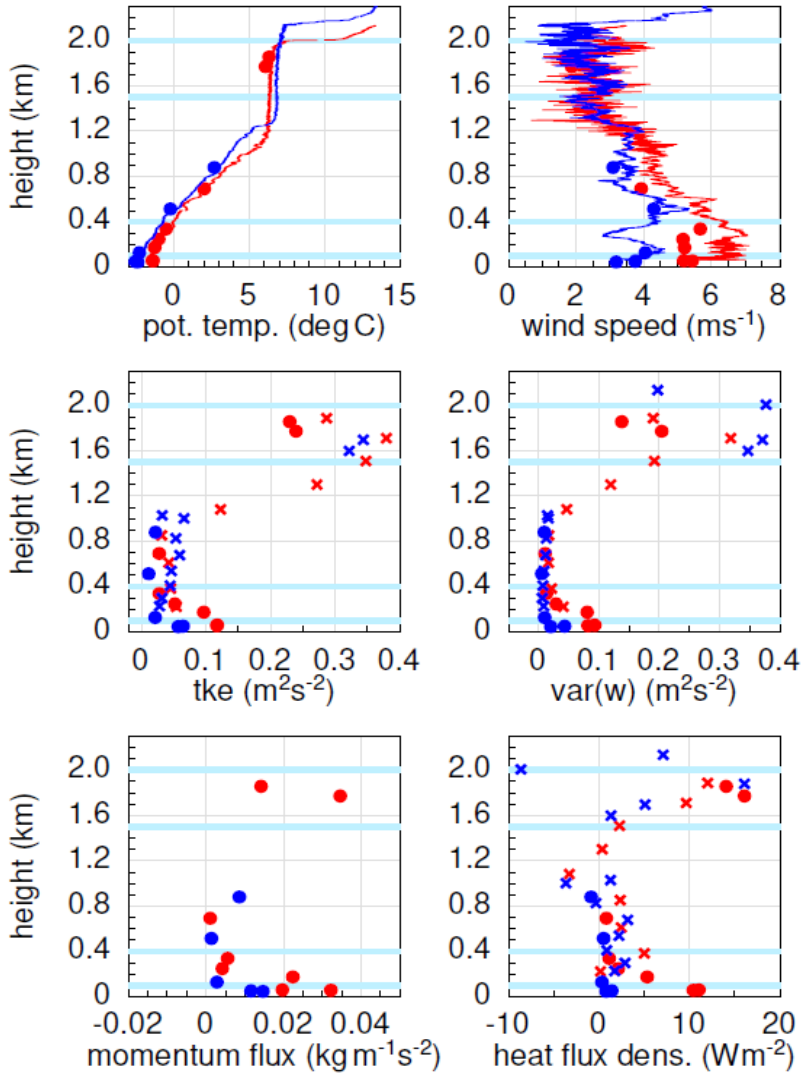
- radiative flux and heating rate **profiles**
- CRF **between** cloud layers (impact of clouds on each other)

→Improved representation of ***cloud and surface properties*** in radiative transfer models



Example of MOSAiC ACA: effect of mid-level clouds





Example of ACLOUD: warm air intrusion of 25 June 2017