Characterization of mixed-phase clouds – description of ATR42 aircraft measurement within the COPS campaign

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**Main goal:**
Cloud with supercooled water layer embedded) within mid-level non-precipitating clouds during the COPS campaign using a synergy of remote-sensing and in-situ devices.

**General overview:**
- 1st and 2nd flights not interested for the campaign setup
- Frontal activity dominating
- No negative value for sZdr

**Aircraft campaign setup**
Horizontal leg(s) – Ascent leg
- -5 flights performed following the same flight pattern (21/07 - 23/07 - 24/07 - 26/07 - 28/07)
- -10 flight hours allocated by EUFAR (European Fleet for Airborne Research)
- 'Golden day' in term of mixed-phase region

**References:**
- (1) www.safire.fr
- (2) www.safire.eu
- (3) C.M.H. Unal et al., Combined Doppler and Polarimetric Radar Measurements: Correction for Spectrum Aliasing and Nonsimultaneous
- (4) Microphysical Model

**Some first highlights**
- Different spectral product behavior within the same cloud region
- Prefered orientation found within columns and plates

**Future plan**
- Within the next months:
  - with the first highlights: improvement of the model for cases which are not working yet + development of an automatic detection of mixed-phase region
  - when receiving calibrated-in-situ data: comparison of the PSD retrieved with the technique and measured with in-situ data + development of an automatic detection of mixed-phase region
  - with BAE146: work on the radar – in-situ data relation for other meteorological situation

**Data required**
- Calibration PSD from the PMS 3D-C probe used for validation of the products retrieved with the technique
- Calibration in-situ data:
  - In-situ data from the 29/08/07 (from the BAE146)
  - Used to increase the data amount in order to get a better statistical evaluation of the retrieval technique (when presence of columns for example)

**Instruments**
- **ATR42 (SAFIRE)**
  - Data format: 
    - Quamoclouds (TARA): 1 Hz
    - Data: 10 Hz
  - En-situ measurements:
    - rimed particles
    - Snow flakes
    - Rimed agg. + plates

**EUFAR activity - Principle**
- Study of the microphysical properties of mixed-phase clouds (i.e. cloud with supercooled water layer embedded) within mid-level non-precipitating clouds during the COPS campaign using a synergy of remote-sensing and in-situ devices.
- General overview:
  - Polarimetric Measurements, J. Atmos. Oceanic Technol, nov.2004

**Thunderstorm activity – Centering**
- Diameter of the PMS 2D-C probe isn’t work during the campaign!!

**Quality check using polarimetry:
- Calibration using ZDR value
- Clutter filtering using signal and dual polarization technique**

**Accuracy of the experimental setup**
- Sensitivity to supercooled water droplets
- Radar and laser incidence (°)
- Realization: 1 Hz
- Polarization: various settings on the 2D-C probe (VV, VV, HH, VH, HV)
- Measurement: 30 min, 1 Hz, Interlaced V, V, H, HH (x4)
- Horizontal leg(s)
- In-situ
- Comparision between Tara data and in-situ measurements

**In-situ data from the 29/08/07 (from the BAE146)**