Event:	Training Workshop on Processing of Cloud Particle Measurements
Date:	July 7-9, 2017 (Precedes ICARE-2 Meeting)
Location:	DLR, Oberpfaffenhofen, Germany
Sponsors:	EUFAR, ICCP
Local Sponsor:	Christiane Voigt (Christiane.Voigt@dlr.de)
Coordinators:	Darrel Baumgardner (darrel.baumgardner@gmail.com) Greg McFarquhar (mcfarq@illinois.edu) David Delene (delene@aero.und.edu)

I. Scientific objectives and scope of the meeting

This workshop is a follow-on of the 2014 Data Analysis Workshop that was convened prior to the AMS cloud physics conference in Boston and the 2016 Software workshop that met prior to the ICCP International Conference on Clouds and Precipitation in Manchester. These two workshops set the stage for the 2017 workshop that will focus primarily on knowledge transfer and training for students and early career scientists who want to learn about techniques for processing data acquired from a broad array of cloud and precipitation probes.

The workshop will provide hands-on training with the software packages that are most widely used by the scientific community to analyze ground based and airborne, in situ measurements of clouds.

By the close of the workshop, participants will not only be moderately proficient in manipulating, analyzing and graphing data, but will also have acquired a basic knowledge of the operating principles of the most frequently employed cloud sensors, their associated limitations and uncertainties, and state-of-art algorithms for deriving cloud microphysical properties from these sensors .

II. Workshop Content

i. Data analysis basics
   a) Pre-processing for quality assurance and identification of interesting segments
   b) Data filtering
   c) Single particle properties (size, aspect ratio, area ratio, mass, habit/shape, phase)
   d) Derivation of cloud microphysical bulk properties: Total number concentration and mass content; average, median volume, and effective diameter; optical properties (scattering, extinction, single scattering albedo and asymmetry factor); rainrate and reflectivity
   e) Time series analysis

f) Frequency distribution analysis
g) Size distributions: number, mass, surface area, extinction, rain rate and reflectivity
h) Correlational analysis, hypothesis testing

ii. Overview of sensors: operating principles and limitations
a) Single particle light scattering spectrometers
b) Single particle imaging spectrometers
c) Liquid and total water sensors

iii. Overview of algorithms used to process optical array probe data
a) Depth of field determination
b) Out of focus particle correction
c) Particle reconstruction for particles partially outside photodiode array
d) Shattering corrections

iv. Introduction to ADPAA, SODA, OASIS, D2G, UIOPS and SPEC
a) Airborne Data Processing and Analysis (ADPAA) – David Delene
b) Software for OAP Data Analysis (SODA) – Aaron Bansemer
c) Optical Array Shadow Imaging Software (OASIS) – Jonathan Crosier
d) D2G – Alexei Korolev (?)
e) University of Illinois OAP Processing Software (UIOPS) – Joe Finlon
f) SPEC – Colin Gurganus (?)

v. Hands-on exercises using actual and simulated data sets
a) Software will be loaded on participant laptops prior to or early on in the workshop via the GitHub project, CoPAS (Community Packages for Airborne Science), see https://github.com/daviddelene/CoPAS.
b) The ADPAA package, the SODA package and a new ADTAE (Airborne Data Testing and Evaluation) project will be installed using the Python script CoPAS.py.
c) Access will be provided to a couple of servers where everything is installed and demonstrations are fully tested. One is a cloud server with lots of network band width.

v. Presentation of analysis results
a) Small teams will be formed from the participants and tasked with independently analyzing data sets unique to each group.
b) Each group will give an oral presentation summarizing their results.

vi. Algorithm documentation and certification
   a) Discussion of what components need documentation
   b) Discussion of where to locate documentation
   c) Discussion of how certification process should be set-up
   d) Plan follow-up algorithm testing

vii. Meeting wrap-up
   a) Organize developer groups.
   b) Work on making plans to integrate packages.
   c) Discussion of what software is available that is not being used.
   d) Discussion of what software tools are missing.

III. Financial Support

Limited funds are available to pay for room and board for students and early career scientists.