

Workshop “Satellite retrieval of cloud droplet number concentration”

19 October 2016, University of Leipzig

(Bibliotheca Albertina, Beethovenstr. 6, Leipzig; 9 am to 5 pm)

1. Motivation

Cloud droplet number concentration (N_d) is a physical quantity that is central to determining the aerosol perturbation of cloud albedo (aerosol-cloud interactions). However, its variability is poorly understood, poorly observed at a large scale, and poorly modelled.

2. State of the art

A reliable retrieval of N_d from satellite data would be a major step forward in advancing these science questions. Building on early retrievals by Han et al. (GRL 1998) and on the work of Brenguier et al. (JAS 2000), Szczodrak et al. (JAS 2001) and Schüller et al. (JAM 2005), there were several studies that computed N_d assuming (sub-)adiabatic clouds from Nakajima and King (1990)-type passive satellite remote sensing (Boers et al., JGR 2006; Quaas et al., ACP 2006; Bennartz, JGR 2007). Aircraft observations showed some skill in these satellite-remote sensing results (Painemal and Zuidema, JGR 2011) but several shortcomings related to the variability in sub-adiabaticity (Merk et al., ACP 2016) and viewing angle (Grosvenor and Wood, ACP 2014) have also been documented.

3. Workshop goal

The goal of the workshop is to document and understand capabilities and deficiencies of current approaches to retrieve N_d from space. Ideally the workshop could propose an avenue towards an uncertainty quantification for the N_d retrieval, conditioned on cloud regime. Along this, new approaches should be discussed that may help to overcome current deficiencies. If possible, we aim at further discussion of the topic also with colleagues that do not attend the workshop on the basis of a document or even a paper draft to be iterated.

4. Workshop scope

The workshop is preceded by an Advanced Training Module (ATM) of the Leipzig Graduate School for Clouds, Aerosols, and Radiation (<http://www.lgs-car.tropos.de/eng>) that introduces in six lectures the scientific basis for N_d variability. Everybody is welcome to attend the ATM.

The one-day workshop will then start with short presentations about current and new approaches to retrieve N_d , and discussions about the shortcomings (morning session). In the afternoon, a synthesis will be aimed at to characterise uncertainties conditioned on cloud regime. This will be followed by a discussion proposing new approaches for better N_d retrievals.

5. Participation

The workshop is organised by the University of Leipzig and the Leibniz-Institute for Tropospheric Research, based partly on discussions in the international Aerosols-Clouds-Precipitation-and-Climate (ACPC) initiative. Everybody is welcome to attend. Please write an e-mail to johannes.quaas@uni-leipzig.de indicating also whether you intend to present a short (15 min) overview about relevant results, thoughts, or discussion items.

Please do also indicate whether you are interested to join discussions if you are unable to attend. On the basis of the workshop conclusions, we will continue discussions by iterating a document, possibly a paper draft.