WP22: WP A framework for cloud-aerosol interaction studies

Deliverable D22.1: Documentation on existing cloud, aerosol, and water vapour retrieval techniques[1]

We provide an overview of selected literature on retrieval techniques of water clouds, aerosol and water vapour. In principle these techniques are suitable for the cloud-profiling observatories of the ACTRIS network, and will serve as starting point for the development of the observational framework in this work package. Key instruments are cloud radars, different types of lidar and microwave radiometers. As starting point of the observational framework we will use the *indirect aerosol effect index IE,* defined as (Feingold, 2003):

$$IE = -\frac{dln(r_e)}{dln(\alpha)}$$

The IE-index gives the sensitivity of cloud parameters (like the effective radius re) to aerosol properties below cloud base (like the extinction α). The remote sensing techniques should be able to measure the relevant cloud and aerosol properties, including profiles of the cloud droplet number concentration and liquid water content. An overview of different techniques to retrieve these parameters is given in the literature overview below. Not every Actris site has the same observational capacity. Subsets of the techniques will have to be selected, depending on the instruments available. We will start with the techniques described in Brandau et al [2010], Loehnert et al [2008, 2009], Boers et al [2000, 2006] and modified versions of Frisch et al [2002] to retrieve the cloud properties. For aerosols we will use the extinction profiles retrieved with Raman lidar. In the absence of such instruments, the usefulness of the backscatter will be tested. Several cloud retrieval schemes will be tested in the EG-Climet blind test (planned for February, 2012).

Core literature

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[1] Originally planned for month 6, but there was a short delay due to staffing issues.

Background reading

Water vapour and aerosol profiles

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