HOPE for clouds and precipitation

ASR-meeting poster abstract (draft)

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In order to better characterize clouds and precipitation in climate models, the German "High definition clouds and precipitation for advancing climate prediction" HD(CP)^2 research initiative is currently setting up a detailed and sustainable observational infrastructure. This includes the operation and harmonization of atmospheric profiling observatories delivering on information of atmospheric aerosol, winds and thermodynamic properties such as temperature, humidity, cloud, and precipitation. In April/May 2013 the HD(CP)^2 Observational Prototype Experiment (HOPE) will be carried out in the direct vicinity of the Jülich Research Center with the goal to provide a critical model evaluation at the scale of the model simulations and further to deliver information on sub-grid variability and microphysical properties that are subject to parameterizations even at high-resolution simulations. HOPE focuses on the onset of clouds (activation) and precipitation (auto conversion) in the convective atmospheric boundary layer. By capturing the 3D cloud distribution the measurement can support the investigation of cloud-overlap and 3D radiative effects.

This poster contribution will describe specific aspects of HOPE, which are relevant for intensifying the collaboration between ARM and EU atmospheric profiling observatories.

1.) Microwave tomography of water vapor: three continuously scanning microwave radiometers will be operated simultaneously with Raman Lidar and DIAL to capture the boundary layer 3D water vapor structure within an area of roughly 5 km x 5 km during clear sky conditions.
2.) Scanning cloud radar: Three cloud radars will be used to capture the spatio/temporal development of boundary layer clouds by means of coordinated scanning procedures. Currently an integrated profiling algorithm for temperature, humidity, cloud water content (LWC/IWC), and effective radius is being tested within a model environment. Next to combining passive and active microwave measurements from the surface, it can also include measurements from geostationary (i.e. Meteosat) as well as polar orbiting (i.e. AMSU) satellites.
3.) Surface radiation balance network and radiative closure studies: a set of 100 low cost pyranometers and several pyrgeometers will be distributed over the experiment area to observe the spatio/temporal variability of the downwelling short and long wave radiation. The observed 3D LWC fields will be applied to 3D radiative transfer models in order to reproduce the observed radiation fluxes and to recover and quantify the effect of cloud-inhomogeneity on cloud radiative forcing.