Cloud side remote sensing - droplet size profiles from specMACS spectral imagery

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For a better understanding of cloud-aerosol interaction, the evolution of water droplets on their way through convective clouds is a key information as it reflects the availability of CCN in the first place. Measurements taken with specMACS (Spectrometer of the Munich Aerosol and Cloud Scanner) during the ACRIDICON-CHUVA campaign aim to provide profiles of the vertical and horizontal distribution of the droplet effective radius along the cloud shell. As opposed to lower resolved space-borne observations with nadir-pointing perspective, where standard 1D retrievals are applicable, the higher resolved side-looking perspective of specMACS poses additional challenges. Opposed to plane-parallel cloud layers as assumed by standard methods, the amount of reflected sun light is strongly depending on the geometry of the clouds surface and other 3D radiation effects which all introduce large uncertainty into microphysics retrievals.

To tackle these additional challenges and reduce and quantify this uncertainty, a statistical retrieval has been developed at LMU using extensive Monte-Carlo calculations. The retrieval has recently been improved to consider geometry and reliably provide liquid water effective radius for specMACS data collected during ACRIDICON-CHUVA. We will present the improved retrieval approach, specific adaptations to ACRIDICON-CHUVA, as well as first cases of retrieved effective radius profiles from the campaign in comparison to particle size measured in-situ.