Cloud side remote sensing - Passive Optical 3D Cloud Shape Reconstruction

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The development of a new liquid water droplet effective radius retrieval for cloud side observations at the LMU has shown that the remaining uncertainty about the 3D structure of observed clouds is a significant source for the overall retrieval uncertainty. Furthermore, passive cloud side reflectivity imagery only carries information on incidence direction, no absolute location is known. Retrievals of phase or effective particle size can only be attributed to a vertical position and thus can only be combined to profile information, if distance to the cloud sides observed is known.

To this end, a method to estimate the distance to the cloud side has been developed. The method uses a combination of stereoscopic reconstruction from the data of a side-looking 2D RGB camera and information from the O2 absorption band around 762 nm as captured by the specMACS instrument during the ACRIDICON-CHUVA campaign. The distance information is further combined with aircraft location and orientation data which yields an estimation of the 3D cloud shell geometry. The geometry information is referenced to geocentric coordinates, which is a necessary prerequisite for the generation of detailed vertical profile data and the intercomparison with in-situ measured data. We will present the estimation method and its application for the effective radius retrieval on selected data from the ACRIDICON-CHUVA campaign.