Geophysical Research Abstracts, Vol. 7, 06167, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06167

The validation and statistical analysis of the liquid water cloud properties, derived from multiyear Cloudnet datasets of simultaneous radar and lidar measurements.

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This paper describes the analysis of liquid water content profiles in water clouds, which were derived from the continuous multiyear Cloudnet datasets for two sites - Cabauw (the Netherlands) and Chilbolton (UK) using a synergetic radar-lidar technique. This technique was specifically developed to overcome the difficulties arising from the “large droplet issue”, which imposes a large uncertainty in the relationship between the radar reflectivity factor and the liquid water content. It uses the ratio between simultaneously measured radar reflectivity and lidar’s optical extinction for the detection of the presence of drizzle particles in water cloud and the classification water cloud cells into three classes - “the cloud without drizzle”, “the cloud with light drizzle” and “the cloud with heavy drizzle”. Different relationships between the radar reflectivity and liquid water content then are applied for different types of cloud cells to retrieve actual liquid water content. The existence and stability of initial relationships for such technique were studied and demonstrated using in-situ measured with aircraft water cloud microphysics data for a few field campaigns that took place in different geographical regions, inside different cloud types, and under different meteorological conditions.

The technique was applied to the radar and lidar data, which were continuously and simultaneously measured at two sites since September 2002 with 30 second averaging time. The optical extinction profiles were derived from lidar backscattering profiles using Klett algorithm and then resampled into radar’s height grid. As far as utilized radar-lidar technique is applicable only for water clouds, the atmospheric target clas-

sification product from Cloudnet datasets was used to detect height regions on every profile where liquid water clouds are presented and radar-lidar technique is applicable. An alternative technique for the liquid water content retrieval that utilizes cloud radar in combination with a microwave radiometer was applied to the same datasets.

The statistical analysis of the synergetic radar-lidar retrieval technique results for different meteorological situations, their validation using independent integral liquid water content measurements with microwave radiometer, and the comparison with an alternative radar-microwave radiometer retrieval technique will be presented.