Cloud radar random and systematic uncertainties

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Clouds play a fundamental role in the Earth's climate system: they are an important part of the hydrological cycle and influence the vertical and horizontal distribution of radiative and turbulent energy which in turn impact atmospheric dynamics. In a long-term perspective, clouds impact climate and climate trends via complex feedback mechanisms.

Due to their higher sensitivity to small cloud particles with respect to weather radars, cloud radars have become a standard and powerful tool to investigate cloud structure. Several retrieval algorithms make use of cloud radar reflectivity to derive profiles of microphysical variables within the cloud, e.g. the vertical profile of liquid and solid water concentrations and droplet and ice particle sizes.

Uncertainties in the absolute calibration of cloud radars could bias the derived products as well as reduce the comparability of standard products derived at different sites, e.g. CloudNet ice and liquid water content. It is also of primary importance to determine the random uncertainties affecting radar observables, because they contribute to the uncertainty of the retrieved products.

In this work, we present an analysis of the systematic and random errors for the 35.5 GHz cloud radar operated at the Jülich Observatory for Cloud Evolution (JOYCE). A new procedure to calibrate the reflectivity of a scanning system with an external target will be compared with the standard calibration (component-based) proposed by the manufacturer.

We will broaden the perspective gained from one single system analysis by also reporting on the outcome of the "*cloud radar calibration workshop*", which is held in fall 2015 in Cologne with participants from the European and the ARM cloud radar community. The main goal of the workshop is to initiate and coordinate cloud radar calibration activities across Europe to ensure high quality and intercomparability of the datasets collected.