Autoconversion describes the mass transfer rate from cloud droplets to embryonic drizzle particles. It is crucial process part of the atmospheric water cycle and plays an important role considering the short and long wave cloud radiative forcing in our climate system.
Since autoconversion is a sub-grid-scale process, several parameterizations have been proposed for numerical models but the evaluation of such schemes remains difficult due to the lack of direct observations.
Here, we focus on new criteria to detect drizzle onset within clouds based on higher Doppler spectra moments (as opposed to the "standard" moments reflectivity, mean Doppler velocity and Doppler spectrum width) obtained from the MIRA cloud radar at JOYCE (Jülich Observatory for Cloud Evolution) and from the synergy of various instruments present.
Among the higher moments, the skewness of the radar Doppler spectrum is able to detect the onset of drizzle formation in the cloud. The new method has been tested on individual cases at JOYCE and areas of drizzle formation within the cloud have been retrieved. We propose that this new method can provide additional observational constraints for autoconversion parametrization in numerical models.
Additionally, two complementary studies have been performed in two other directions. First, simulations of the observations using a Doppler spectra radar forward model have been developed to provide a straight-forward microphysical interpretation of the measurements. Second, IQ raw cloud radar data have been analyzed to evaluate the accuracy of higher moments estimates to and evaluate their sensitivity to basic radar parameter settings (number of FFT points in the radar Doppler spectrum and number of spectral averages).