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Characterization of mid-latitude cirrus cloud with airborne and ground-based lidar measurements during ML_CIRRUS

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Cirrus clouds have a large impact on the Earth's climate and radiation budget, but their microphysical and radiative properties are still insufficiently understood. As these parameters are difficult to measure, our knowledge of the radiative effect of cirrus clouds is mainly based on theoretical simulations. But these simulations use idealized cloud structure and microphysics, as well as radiative transfer approximations. To improve our knowledge of mid-latitude cirrus clouds, measurements onboard the German research aircraft HALO were performed during the ML_CIRRUS campaign over Europe in March and April 2014. During ML_CIRRUS an extensive combination of in-situ and remote sensing instrumentation was used to study the microphysical, optical and radiative properties of cirrus clouds with respect to cirrus cloud formation and life time.

During ML_CIRRUS the airborne water vapor differential absorption and high spectral resolution lidar WALES of DLR-Institute of Atmospheric Physics was operational onboard HALO to measure the 2-dimensional humidity distribution inside and outside of cirrus clouds as well as the cirrus clouds optical properties along the flight track. We will present first results of correlated analyses of the optical cirrus cloud properties and the relative humidity in- and outside the cloud, as well as on the distribution of relative humidity and optical properties within the cloud. In particular we investigate differences of the cirrus cloud properties with respect to cirrus cloud formation and life-time. Additionally, we will show first results of ground-based depolarization lidar measurements with the lidar system POLIS of Meteorological Institute of the LMU to study the optical properties of clouds considering different optical phenomena of the cirrus clouds.