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Ice cloud microphysics studied with simultaneous dual-wavelength radar observations

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Two radars running at different wavelengths, e.g., C-(5.45 cm) and Ka-(0.85) band, have the capability to gay insight into cloud microphysics in terms of water content and hydrometeor size, shape and classification. This relies on the fact that attenuation by liquid water is much stronger for Ka-band than C-band whereas attenuation by ice crystals is negligible for both. As the size of particles increases the Ka-band scatters is in the Mie rather than the Rayleigh regime and its reflectivities reduces below those at C-band. Based on this concept, synchronous RHI scans have been performed for several months with the dual-polarization C-band weather radar Poldirad (λ=5.45 cm) located at DLR, Oberpfaffenhofen and the Mira-36 Ka-band cloud radar (λ=0.85 cm) at the University of Munich. The two radars are separated by a distance of about 23 km and have a large overlapping region. With calibration for both radars, reflectivities are determined and show good agreement within the range between -10 to 10 dBZ which indicating the absence of large ice crystals (both in the Rayleigh regime). For reflecitivites above +10 dBZ, smaller values were observed at the Ka-band than at the C-band which is due to Mie scattering effects for larger ice crystals. In this presentation, we will evaluate the size distributions of ice crystals with the reflectivity differences caused by Rayleigh and Mie scattering and the microphysical properties of ice clouds using the full polarization agility of the C-band radar with combination of the simultaneous linear depolarization ratio LDR measurements with the Ka-band radar.