Comparing Halo Doppler lidar depolarization ratio with PollyXT

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Depolarization ratio is highly valuable in lidar-based aerosol classification and can be used to quantify the contributions of different aerosol types to elevated layers \cite{Mamouri2017}. Typically, aerosol particle depolarization ratio is determined at relatively short wavelengths of 355 nm and/or 532 nm, though some multi-wavelength case studies including 1064 nm have shown strong spectral dependency \cite{Burton2015, Haarig2015}. Here, we demonstrate that Halo Photonics Stream Line Doppler lidars can be used to retrieve aerosol particle depolarization ratio at 1.5 µm wavelength.

We utilize measurements in April-May 2017 at Limassol, Cyprus to compare the Halo 1.5 µm aerosol particle depolarization ratio with Polly XT aerosol particle depolarization ratio. Recently developed post-processing \cite{Vakkari2019} enables retrieving weak signals (as low as -32 dB) with the Halo Doppler lidar. At Limassol, we were able to determine particle depolarization ratio for several cases of mineral dust up to 3 km above ground. Generally, particle depolarization ratio for mineral dust at 1.5 µm appears higher than at shorter wavelengths of 355 nm and 532 nm retrieved by Polly XT. Overall, our results indicate that Halo Doppler lidars can add another wavelength at 1.5 µm to studies on the spectral dependency of aerosol depolarization ratio, at least in the lowest 2-3 km above ground.

\cite{Mamouri2017, Burton2015, Haarig2015}


