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Drizzle drop size estimation method using two elastic lidars at different wavelengths

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The NASA Micro Pulse Lidar Network (MPLNET) is a federated network of Micro Pulse Lidar (MPL) systems designed to continuously measure aerosol and cloud vertical structure, day and night and over long time periods. Such attributes make these data attractive for climate change studies and provide ground validation for models and satellite sensors in the NASA Earth Observing System (EOS). In this paper, we present the results of the first effort by MPLNET to integrate a commercial UV elastic backscattering lidar into the network. Taking advantage of two different wavelengths, respectively at 355nn and 527nm, and collocated observations, it is possible to measure the median average drop size diameter D0 of a drizzle falling from stratocumulus clouds. The method, originally developed by Westbrook et. al. for infrared measurement, is transposed here to VIS-UV region. Differential absorption at 355nm and 527nm is translated into a backscattering cross-section when median average drop size is greater than 50μm. The color ratio, defined as the ratio between the two backscatter coefficients, then provides the measure of D0. The main sources of errors come from multiple scattering in the UV-lidar signal, the influence of aerosol particle scattering, and the assumption of a dispersion parameter, μ, of the drop size raindrop distribution. The total error on drop size retrieval can be quantified at around 45%.