NASA new V3 Micro-Pulse Lidar Network Rain and Snow masking algorithm application: Aerosol wet deposition.

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In this study we illustrate the development of a rain and snow masking algorithm applied to the National Aeronautics and Space Administration (NASA) Micro-Pulse lidar network (MPLNET) observations. The algorithm, once operationally implemented, will deliver in Near Real Time (latency <1.5 hr) the rain and snow masking variables. The products will be publicly available on MPLNET website as part of the new Version 3 release. The methodology, based on image processing techniques, can detect only light to moderate rainfall and snowfall events (defined by intensity and duration) because of laser attenuation. The main underlying technique consists in applying the morphological filters on the volume depolarization ratio composite image to identify squared shapes under the cloud bases that corresponding to the precipitation. Results from the algorithm, besides filling a gap in precipitation and virga detection by radars, are of particular interest for the scientific community because will help to fully characterize the aerosol cycle, from emission to deposition, as precipitation is a crucial meteorological phenomena accelerating the atmospheric aerosol removal through the wet scavenging effect. As an example, in this study we prove, for the first time to our knowledge, how rain detection from ground-based lidar observations are effective in showing a strong negative correlation between the Aerosol Optical Depth (AOD) and precipitation.