RAMAN LIDAR PROFILING OF TROPOSPHERIC WATER VAPOR

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Obtaining vertical profiles of tropospheric water vapor provides critically important information towards understanding short and long term global climate change. Ground-based Raman lidar technique is a powerful tool to precisely evaluating Water vapor Mixing Ratio (WVMR) in the troposphere. In this presentation, an overview of the design and basic components of a Raman water vapor lidar setup employing the third harmonic output (at 355 nm) of a high-powered laser with a telescope and three detection channels will be presented. Also, detailed discussion of the best method to calibrate and evaluate the performance of a typical water vapor Raman lidar will be shown and compared with most common calibration methods. By manipulating the inelastic backscattering lidar signals from the Raman nitrogen channel (386.7 nm) and Raman water vapor channel (407.5 nm), vertical profiles of water vapor mixing ratio (WVMR) will be deduced, calibrated, and compared against WVMR profiles obtained from coincident and collocated radiosonde profiles. This presented methodology will be shown to effectively yield high temporal and spatial resolution measurements of WVMR, with efficient dual detector capability both in the near-and-far fields.