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Investigating optical properties of Atmospheric gases using multi-color collocated Laser system: an application of elastic and inelastic backscattering WATHEQ AL-BASHEER, KEVIN STRAWBRIDGE, Science and Technology Branch, Environment Canada, Center for Atmospheric Research Experiments, 6248 eight line, Egbert, ON, Canada L0L 1N0, SCIENCE AND TECHNOLOGY BRANCH, ENVIRONMENT CANADA, CENTER FOR ATMOSPHERIC RESEARCH EXPERIMENTS TEAM — The application of nanosecond pulsed lasers to probe optical properties of atmospheric gases by the application of elastic and inelastic backscattering mechanisms, is one of the most effective tools to investigate atmospheric gases effect on short and long term climate changes. Capabilities, properties, and limitations of newly built multi-color lidar (light detection and ranging) system at the CARE facility, Ontario, Canada, will be presented and thoroughly discussed. CARE's setup utilizes elastic and inelastic backscattered signals of the second (532 nm), third (355 nm), and forth (266 nm) harmonic outputs of simultaneously employed YAG lasers, which are manipulated to investigate optical properties of ozone, water vapor, and nitrogen molecules up to 25 km geometrical altitude. In particular, by employing inelastic backscattering lidar signals of Raman nitrogen channel (386.7 nm) and Raman water vapor channel (407.5 nm), vertical profiles of water vapor mixing ratio (WVMR) from the near ground up to 12 km geometrical altitude are deduced, calibrated, and compared against WVMR profiles obtained from collocated radiosonde launches. Furthermore, a detailed theoretical treatment to the lidar technique will be presented and related to recent experimental findings.

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