



Progress towards the developments of ground-based, airborne, and space-based CO₂ profiling DIAL systems

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NASA has been funding the development of technologies to enable profiling of CO₂ from ground, airborne, and space-based lidar systems operating in the 2-micron region. Recently, it has awarded a 3-year program for the development, evaluation, and fielding of a ground-based CO₂ profiling system applicable to atmospheric boundary layer studies. This system leverages 2-micron laser technology developed under a number of NASA programs to develop new solid-state YLF laser technology that provides high pulse energy, tunable, wavelength-stabilized, and double-pulsed lasers that are operable over pre-selected temperature insensitive strong CO₂ absorption lines suitable for profiling of lower tropospheric CO₂. It also incorporates novel high quantum efficiency low noise AlGaAsSb/InGaAsSb phototransistor, and advanced signal processors to cover a large signal dynamic range with minimum signal distortions to achieve high precision DIAL measurements. This system can be used as a validation tool of the OCO (Orbiting Carbon Observatory). Data from the semi-continuous CO₂ profiling DIAL system can be used, in conjunction with regional intensive field measurements, to derive regional CO₂ fluxes. Examples of CO₂ measurements with the existing system will be presented along with the progress made towards developing the new system and its projected capability. Further developments are continuing toward the development of airborne and eventually space-borne CO₂ profiling system. A discussion of these developments and the projected capabilities of these systems will also be presented in this paper.