ABSTRACT

The Use of a Pseudo Noise Code for DIAL Lidar

Retrievals of CO2 profiles within the planetary boundary layer (PBL) are required to understand CO2 transport over regional scales and for validating the future space borne CO2 remote sensing instrument, such as the CO2 Laser Sounder, for the ASCENDS mission. We report the use of a return-to- zero (RZ) pseudo noise (PN) code modulation technique for making range resolved measurements of CO2 within the PBL using commercial, off-the-shelf, components.

Conventional, range resolved, measurements require laser pulse widths that are shorter than the desired spatial resolution and have pulse spacing such that returns from only a single pulse are observed by the receiver at one time (for the PBL pulse separations must be >~2000m). This imposes a serious limitation when using available fiber lasers because of the resulting low duty cycle (<0.001) and consequent low average laser output power. RZ PN code modulation enables a fiber laser to operate at much higher duty cycles (approaching 0.1) thereby more effectively utilizing the amplifier's output. This results in an increase in received counts by approximately two orders of magnitude. The approach involves employing two, back to back, CW fiber amplifiers seeded at the appropriate on and offline CO2 wavelengths (~1572 nm) using distributed feedback diode lasers modulated by a PN code at rates significantly above 1 megahertz.

An assessment of the technique, discussions of measurement precision and error sources as well as preliminary data will be presented.

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