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# Mixing Layer Depth Detection Methods using Sodars at the South Pole to interpret Atmospheric Chemistry Experiment Results

**W. Neff** (1), D. Helmig (2), D. Davis (3), A. Grachev (4), D. Gottas (4)

(1) NOAA Environmental Technology Laboratory, Boulder, CO 80305 USA, (2) University of Colorado, Institute for Arctic and Alpine Research, Boulder, CO 80309 USA, (3) Georgia Institute of Technology, Earth & Atmospheric Sciences, P.O. Box 0340, Atlanta, GA 30332 USA, (4) University of Colorado, Cooperative Institute for Research in the Environmental Sciences, Boulder, CO 80305 USA, (William.neff@noaa.gov / Fax: 303-497-6020 / Phone: 303-497-6265)

A high resolution mini-sodar was deployed in a field experiment, carried out in November-December of 2003 at the South Pole, as part of the Antarctic Tropospheric Chemistry Investigation (ANTCI) program. The sodar was designed to operate from 15 m to 180 m with a 1-s cycle time and a 5-m long transmit pulse. The data were sampled at about 1-m intervals. Both facsimile data (time-height cross-sections of reflectivity) were produced as well as digital data that allowed for averaging (typically from 10 min to 30 min). We describe here the automated analysis of 30-min averaged reflectivity profiles and comparison with detailed facsimile records together with tethered balloon profiles of wind, temperature, and nitrogen oxide and, as well, with surface turbulence measurements (that were used to test various scaling laws for the stable PBL). Conditions during the experiment ranged from very stable to well-mixed in response to changes in synoptic forcing. We found PBL structures that ranged from very simple surface-based mixing layers to inversion layers with multiple internal echo structures. Because of the absence of diurnal forcing at the South Pole, these data represent a unique opportunity to study stable boundary layers over a horizontally homogeneous, slightly sloping snow surface at one of the few sites on Earth where an approach to equilibrium is actually possible.