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Boundary Layer Wind Profile measurements for Emission Assessments

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There is an ongoing effort to permanently equip NASA Langley Research Center (LaRC), Hampton, Virginia, USA as a super site for continuously monitoring weather and air quality in the atmospheric boundary layer. As a part of this effort, air quality campaign was carried out from August 1 to August 31, 2009 here at NASA LaRC. Various instruments for carrying out chemistry and physics measurements of the atmosphere as well as ground based in-situ experiments were assembled at this site. This suite of field instruments included atmospheric chemistry profiles using UV spectrometer, water vapor and temperature profiles using an IR Fourier Transform spectrometer, and wind lidar. The wind lidar was used to gather boundary layer wind velocity profiles.

In this paper, wind field evolution measurements made using the Leosphere's WLS 70 windcubeTM lidar will be presented. The WindcubeTM is an active, compact, remote sensor that uses a pulsed laser source operating at 1.54 microns. The system operates based on heterodyne lidar techniques to measure Doppler shift of laser radiation backscattered by particles in the air. The output of lidar system provides minimum and maximum, direction, and standard deviation of horizontal and vertical wind speeds as well as SNR values.

Wind profile measurements were made from August 10 to September 14, 2009. Wind speed and direction were gathered and analyzed. Boundary layer height up to 2 km with height resolution of 50 m has been obtained. The wind field evolution measurements includes strong wind veer and large updrafts. Plans are underway to expand this site with advanced wind lidar for air quality experiments.