

Comparison of Dual-Doppler lidar measurements of wind with helicopter measurements

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Dual-Doppler lidar and heliborne sensors were used to investigate the three-dimensional (3D) structures of the sea breeze around Sendai Airport from 18 to 19 June 2007. The dual-Doppler lidar observation was conducted using the National Institute of Information and Communications Technology (NICT)'s lidar and Electronic Navigation Research Institute (ENRI)'s lidar. The heliborne sensors of Japan Aerospace Exploration Agency (JAXA) measured meteorological elements at the airport.

The NICT lidar performed 10 sector plane position indicator (PPI) scans at elevation angles of 0.65, 1.0, 1.4, 1.8, 2.2, 2.6, 3.0, 3.5, 4.2, and 5.0 degrees, in a 120 degrees arc between azimuths 60 degrees and 180 degrees. The ENRI lidar performed 10 full 360-degree PPI scans, which were stepped up from 0.5 degrees to 5.0 degrees with 0.5 degrees increments. The volume data of each lidar were acquired every 10 minutes. The NICT and ENRI lidars were programmed to cycle through a sequence of these sector PPI or PPI scans every 12 minutes. The JAXA helicopter is equipped with a 3D ultrasonic velocimeter installed at the tip of the nose boom and measured the 3D wind filed at 50 m, 100 m, and 150 m above ground level over the B runway of Sendai Airport, repeatedly.

The radial velocity data of each lidar were analyzed through a 3D variational method to obtain the 3D wind filed around Sendai Airport. The comparison of the horizontal wind components derived from the dual-Doppler analysis and from the JAXA helicopter shows good agreement, whereas the comparison of the vertical wind components shows large error. Now, we improve the 3D variational analysis method. In presentation, we report the result of the comparison of the 3D wind filed derived from the improved analysis method and from the JAXA helicopter.