

Using Surface Returns to Correct for Aircraft Motion Induced Errors

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Abstract

The IPO funded Twin Otter DWL (TODWL) issues related to removal of aircraft attitude and motion effects on wind retrievals, adapting Lidar Altitude and Height Determination and Signal Search Algorithm (LAHDSSA) to TODWL, and some results are presented. TODWL measures profiles of horizontal wind above and below flight level, as well as information on vertical motion, aerosol structures, and turbulence. The goal was to obtain line of sight velocity accuracies with bias <10 cm/s and rms error <10 cm/s. Beam alignment relative to aircraft axes was an issue. Primary sensitivities were to pitch and yaw. Ground returns over land were used to determine altitude offsets to calibrate wind retrievals for open water investigations. LAHDSSA computed pitch and yaw corrections from the variables of flight and instrument dynamics, for a 12 point conical scan with 2-s dwell time, identifying ground return for each dwell. Ground speed error before LAHDSSA averaged 1.298 m/s with standard deviation of 0.156. After LAHDSSA, the error averaged 0.001 m/s with 0.094 standard deviation. Pitch and yaw offsets were determined using ~ 100 downward viewing Velocity Azimuth Displays (VADs) with ground returns.