11.2 ATMOSPHERIC BOUNDARY-LAYER HEIGHT TRACKING FROM S-BAND RADAR RETURNS WITH AN EXTENDED KALMAN FILTER: APPLICATION TO VORTEX-SE

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The application of the extended Kalman filter to Atmospheric Boundary Layer Height (ABLH) estimation in the convective boundary layer from radar and lidar returns has previously been shown by (Lange et al. 2015) departing from earlier works of (Rocadenbosch et al. 1999). Validation of the lidar counterpart has been carried out using different ABL parametrizations in the Weather Research and Forecasting (WRF) numerical model under different synoptic conditions in Barcelona, Spain, and Athens, Greece (Banks et al. 2015).

In the present work, we revisit its application to S-band radar reflectivity measurements in the context of the Verification of the Origins of Rotation in Tornadoes EXperiment-Southeast (VORTEX-SE). A selected case example is presented, from data collected during spring 2016 in Huntsville, AL environs (Tanamachi et al. 2016).

The ABLH estimator is composed of a basic pre-processing filter (threshold median filter to get rid of bioscatterers) and an enhanced Kalman filter. The implementation of the latter is in the form of an Extended Kalman Filter (EKF) with adaptive boundary parameters that define reference height intervals and reflectivity levels in the mixing layer (ML) and the free troposphere (FT) as well as the ML-to-FT interface. Focus is given to appropriate selection of key guiding parameters of the EKF, namely, the ABLH initial guess and intensity factors related to the a priori information passed to the filter (i.e., state-noise and error covariance matrices).

A convenient Signal-to-Noise Ratio (SNR) estimator enables us to estimate the height dependency of the SNR and to use observation-noise information such as the presence of Travelling-Wave-Tube (TWT) spurs, which are to be rejected. Filter limitations are also outlined.

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