Using Dual-Scan and Dual-Polarization of weather radar signals to Detect Ground clutter

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Ground clutter contamination is a long-standing problem in radar meteorology because of the bias it brings to the weather estimates. In order to avoid the potential bias caused by the ground clutter filter, the optimal way is to first detect the locations of ground clutter and then apply ground clutter filter on those contaminated gates.

Polarimetric radars provide additional measurement of characteristics such as size, shape, and spatial orientation. Because ground clutter has very different polarimetric characteristics with weather signals, the dual-pol measurements can be used to distinguish one from the other. The commonly used polarimetric discriminants are obtained from polarimetric parameters, which are the copolar correlation coefficient, differential reflectivity, and differential propagation phase.

Scan-to-scan correlation of weather radar signals is recently used to identify ground clutter. It takes advantage of the fact the correlation time of radar signals from hydrometeors is typically much shorter than that from ground objects.

In this manuscript, we combine the I/Q data from both the dual-scan and dual-polarization, and a test statistic obtained from the Generalized Likelihood Ratio Test (GLRT) is used to determine the existence of ground clutter. Its performance is evaluated using data collected by the WSR-88D KOUN 10-cm polarimetric radar.