

## Locally and Temporally Adaptive Clutter Removal in Weather Radar Measurements

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The level of ground clutter contamination in weather radar signals varies not only from one bin to the other but also from scan to scan. Anomalous propagation is a distinct example when even distant return echoes may be tainted with ground clutter. Also, weather conditions and seasonal changes may affect its strength significantly. We have developed and tested an adaptive ground clutter removal system which is capable of dealing with different levels of clutter contamination varying both locally and temporally.

In order to produce reliable reflectivity and velocity information, the algorithm must be able to cope with data tainted with strong ground clutter. On the other hand, even weak ground clutter components may reduce the quality of dual-polarization products which are needed, for example, in meteorological classification. Clutter removal of varying strength can be achieved by selective filtering.

The underlying idea of the adaptive algorithm is to use a predefined set of ground clutter filters and choose the best candidate by analyzing their output. We can select, for example, a set of four filters corresponding to different strengths of ground clutter. The raw I/Q data is processed using all filters and the dual-polarization products are calculated for all cases. By analyzing how the output varies from one filter to the other, it is usually possible to determine the weakest filter which is capable of getting rid of the clutter component. Especially in long-range measurements, the most common case is that the signal does not have to be filtered at all. The key products which are utilized in choosing the appropriate filters are (1) the co-polar correlation coefficient ( $\text{RHOHV}$ ), (2) reflectivity ( $Z$ ) variation between neighboring bins and (3) smoothness of differential phase ( $\text{PHIDP}$ ) with respect to range.