Reflectivity quality control based on 2D and 3D parameters

Sorin Burcea
National Meteorological Administration, Romania
Cărbunaru, Daniel (National Meteorological Administration, Bucharest, Romania)

E-mail: sorin.burcea@meteoromania.ro

Weather radars can detect both meteorological and non-meteorological targets present within the volume scan. Although there are several effective signal processing techniques for identifying and removing non-meteorological echoes, radar data can still be contaminated. This is due, for instance, to residual clutter, biological targets, anomalous propagation or external electromagnetic interferences. Addressing data contamination and quality control can be regarded as a double task: first detection and removal of contaminated data, and second, mitigation of the effects of the first step on good data.

This study presents a reflectivity quality control method that makes use of its three-dimensional structure, both horizontal and vertical parameters being computed. The algorithm is executed on raw polar volumes to remain at the level of the data recording. The main algorithm is made up of a series of sub-algorithms, each of them handling specific tasks. The algorithm builds up upon several key quality issues, namely, residual clutter, anomalous propagation, and external interference echoes. First, a noise filter is applied in order to identify and remove isolated reflectivity bins, followed by the identification and removal of radials contaminated by external signals. Further, the horizontal texture and vertical gradient of reflectivity are computed to address the anomalous propagation issue.

The algorithm has been tested on data sampled by radars located in various scanning environments (e.g., plain, complex terrain, near the sea), and from different seasonal and diurnal times. The algorithm performs well, results showing that non-precipitation echoes are successfully identified. Depending on the characteristics of the scanning environment, fine-tuning the parameter settings or executing only certain sub-algorithms can improve the final output.