Geophysical Research Abstracts
Vol. 20, EGU2018-2838, 2018
EGU General Assembly 2018

An Evaluation of Rain Radar Adjustment Algorithms Using Synthetic Data

Micha Silver (2), Arnon Karnieli (2), and Erick Fredj (1)

(1) Lev Academic Center, Lev Academic Center, Computer, Jerusalem, Israel (fredj@jct.ac.il), (2) Ben Gurion University, Sde Boker

Adjustment and correction of rain radar using gauge observations have been an accepted procedure by many national meteorological services for operational weather reporting and forecasting systems for decades. Several studies have tested various adjusting algorithms under specific conditions: a given network of radar stations, density of point sensors (both rain gauges and Commercial Microwave Link (CML) attenuation data), and certain type of storm. However, a comprehensive comparison between the different adjustment algorithms with uniform, controlled inputs of rain radar and sensors is lacking, to the best of the authors' knowledge.

This study attempts to consolidate a list of best-practice rain radar adjustment procedures for varying storm/radar/sensor scenarios by creating synthetic, idealized rain grids representing both convective and stratiform storm types. Simulated radar grids are prepared from idealized rain distributions by adding noise with differing bias and perturbation levels. The chosen domain size, 100x100 pixels, is intended to simulate rain-radar data at a resolution of 1 kilometer. Two sets of random point observation locations are created, simulating gauge and CML distributions, where the gauges are considered to exactly represent the true rain rate at 25 random locations. The CML locations, also randomly chosen, are placed at varying densities. In contrast to the gauges, CML rain rates are shifted by an error factor. Four different error factors are examined in this work. The combinations of storm type, radar, and point sensors at varying density and error levels constitute synthetic, uniform test scenarios.

Adjusted rain grids are then prepared for each scenario, using four popular adjustment procedures, which merge the gauge and CML rain rates to correct the radar. Resulting adjusted grids are validated against precipitation rates from another set of 400 random locations. From these validation results, the most suitable adjustment procedure for each scenario emerges.

Initial finds show that combining gauges and CML rain data and applying the adjustment once, as opposed to in series, improves the correlation between the original rain and the adjusted grid, in most cases. Convective type storms are not handled well by any of the adjustment algorithms unless the CML error level is below 10%. Rain radar from Stratiform storms, on the other hand, can be adjusted fairly well with any of the algorithms including the simple Mean Field Bias. Conditional Merge performs better with higher CML error levels, up to about 40%. And all algorithms show a slight improvement when the CML density is high, up to one sensor per 40 square kilometers.