How does reconstruction of clutter areas improve by accounting for the spatial and temporal variability of rainfall?

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Identification and elimination of ground clutter is fundamental for ensuring data quality in radar Quantitative Precipitation Estimates (QPE). For uncorrected scanning reflectivity after signal processing, the removed areas have been often reconstructed by horizontal interpolation, extrapolation of non-contaminated PPIs aloft, or combining both if the precipitation type is known. The performance of these methods depends on the structure of the precipitation field.

We present a general reconstruction method that would adapt to any type of precipitation by adding both the spatial and temporal variability of the field provided by the multi-dimensional semi-variogram. Using 4-Dimension neighboring reflectivity observations, the formula is specified to reconstruct the gap based on 1) horizontal interpolation (HOR), 2) vertical extrapolation (VERT), 3) past observations by extrapolation in time according to the motion field (NOW) and the combination of these in 4) volumetric (HV), 5) horizontal and temporal (HN), and 6) volumetric and temporal (HVN) according to an Ordinary Kriging approach.

The evaluation of the reconstruction method is done in two ways: i) implementing the techniques over a clutter-free area where the originally observed values can be used as reference, and ii) comparing the rainfall accumulations estimated form the reconstructed values over the real clutter-contaminated areas with the observations of a raingauge network. The results for 24 analyzed events (with a variety of convective and widespread cases) suggest that the contribution of time is not fundamental, and the HV method is the one that overall adapted the best to the different situations.