AN EXAMINATION OF DUAL-POLARIZED RADAR NOWCASTS AND THEIR VERIFICATION USING MODERN SHAPE ANALYSIS TECHNIQUES

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ABSTRACT

Meteorological forecasting and verification on a very short time scale using radar data has always posed numerous problems since the advent of modern radar technology, including what field to use, how strongly to advect the forecast, and how to determine and implement growth and decay rates for the short-term forecast. Therefore, the fields of radar nowcasting and verification research have become more popular in recent years, but a crucial new meteorological technology has been under exploited – dual-polarized radar data. As such, it is the goal of this thesis project to introduce the dual-polarized parameters of differential reflectivity and specific differential phase into current nowcasting and verification methods in conjunction with traditional radar reflectivity with the goal of determining the viability of nowcasting these products, hopefully, to reduce risk and increase warning lead time for the public. Radar reflectivity, differential reflectivity, and specific differential phase nowcasts were created using WDSS-II for 13 storms of varying type using six different threshold bands for each parameter. These nowcasts were then verified using the Procrustes Shape Analysis Verification program under variable set-up conditions so that the various components of forecast error could be determined. Based on results from this study, it is clear that nowcasting reflectivity, differential reflectivity, and specific differential phase is entirely feasible; as is the verification of these forecasts using the Procrustes shape analysis scheme. The best set-up for WDSS-II and Procrustes when evaluating these forecasts is still uncertain, but based on the data analyzed during this study there is evidence that these set-ups can be determined.