Public Abstract

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Graduation Term:SP 2016
Department:Soil, Environmental & Atmospheric Sciences
Degree:MS

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

Meteorological forecasting 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. In addition, it is difficult to determine the accuracy of these short-term forecasts, known as nowcasts, using traditional statistics such probability of detection and false alarm ratio. 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. Thirteen cases were studied ranging in type from supercells through pop-up thunderstorms to create a wide variety of data to work with. Reflectivity, differential reflectivity, and specific differential phase nowcasts were created for each case using six different threshold bands which were then verified using the Procrustes verification scheme under variable set-up conditions so that different components of the forecast including translation, intensity, rotation, and dilation error could be determined; thus, providing a framework from which to begin more vigorous studies of dual-polarized nowcasting and verification. 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. A determination of which threshold bounds to use for nowcasting in WDSS-II could not be provided in a precise manner based on the results of this study, and neither could reliable set-up values for Procrustes. However, as a proof of concept there is optimism and it is believed that delving further into the setup of both programs, and the inclusion of significantly more cases could provide the results desired.