# Quantitative precipitation nowcasting using specific differential phase

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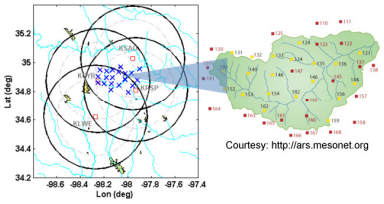
## Introduction

- Recent research indicates that using specific differential phase ($K_{dp}$) has several advantages over using reflectivity for estimating rainfall
- This paper presents an evaluation of nowcasting rainfall fields based on $K_{dp}$ estimates relative to reflectivity-based estimates

## Data

- Approximately 27 h of data (1593 data frames) collected during the 2009 CASA IP1 were used for evaluation
- Rain gauge cross-validation was performed using data collected by gauges located within the USDA Little Washita River Experimental Watershed



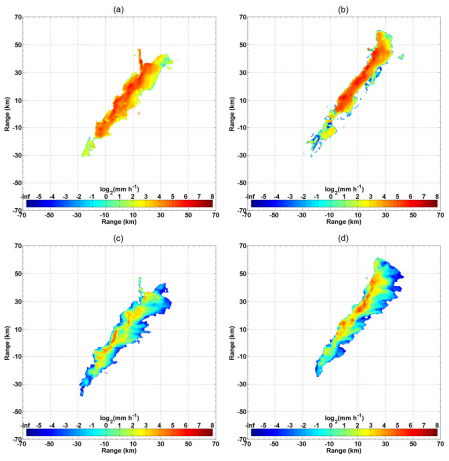

## Nowcasting methodology

- The Dynamic and Adaptive Radar Tracking of Storms (DARTS) algorithm was used to estimate motion between successive estimated rainfall fields
- DARTS represents the general continuity equation as a linear model constructed in the Fourier domain

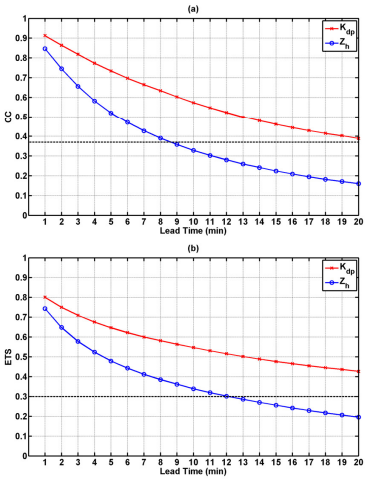
$$\frac{\partial}{\partial t}F(x,y,t) = -U(x,y)\frac{\partial}{\partial x}F(x,y,t) - V(x,y)\frac{\partial}{\partial y}F(x,y,t)$$

## Results

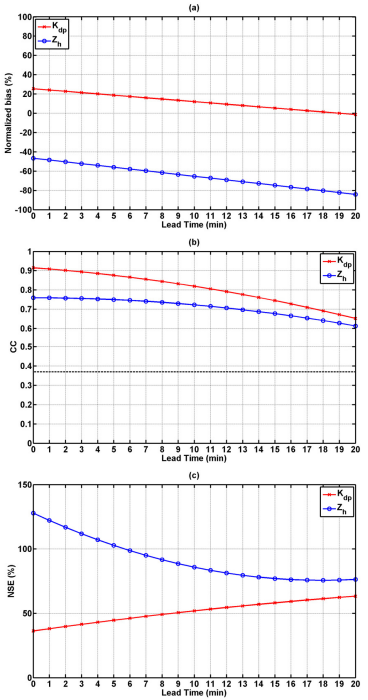
- Rainfall fields estimated from $K_{dp}$ exhibit approximately twice the predictability as reflectivity-based estimates using ETS and CC values when referring to radar-based estimates
- Rain gauge cross-validation showed the benefits of QPE using $K_{dp}$ decrease with increasing lead time



Rain rate fields corresponding to 0055 UTC 31 Mar 2009: (a) initial estimate and (b) corresponding 10-min prediction of rainfall field derived according to $R = 18.15K_{dp}^{0.791}$, (c) initial estimate and (d) corresponding 10-min prediction of rainfall field derived according to $Z = 300R^{1.4}$



Comparison of nowcasting performance using (a) CC and (b) ETS scores and radar-based estimates as scoring reference



Comparison of nowcasting performance using (a) NB, (b) CC, and (c) NSE scores and rain gauge observations as scoring reference