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# Recent Improvements in Radar Wind Data Quality Control (QC) for Data Assimilation

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## 1. Introduction

This paper presents two recently developed and improved radar wind data QC techniques for radar data assimilation applications: (i) An automated technique to identify contaminated velocities by birds, especially migrating birds. (ii) An improved dealiasing technique for velocities scanned from tornadic mesocyclones.

## 2. Identify bird-contaminated velocities

This technique builds upon the existing hydrometeor classification algorithm (HCA) for dual-polarimetric WSR-88D radars developed at the NSSL. It performs two steps: (1) The HCA is simplified and used to differentiate biological scatterers (BS) from meteorological scatterers (MS). (2) A simple fuzzy logic method is used to differentiate bird echoes (BSb) from insect echoes among BS. The technique has been tested with polarimetric data collected from the operational KVNX and KICT radars during the 2011 fall and 2012 spring and fall migrating seasons. The detailed technique is described in Jiang et al. (2013, *Advances in Meteorology*. doi: 10.1155/2013/769275). An example is shown in Fig. 1.

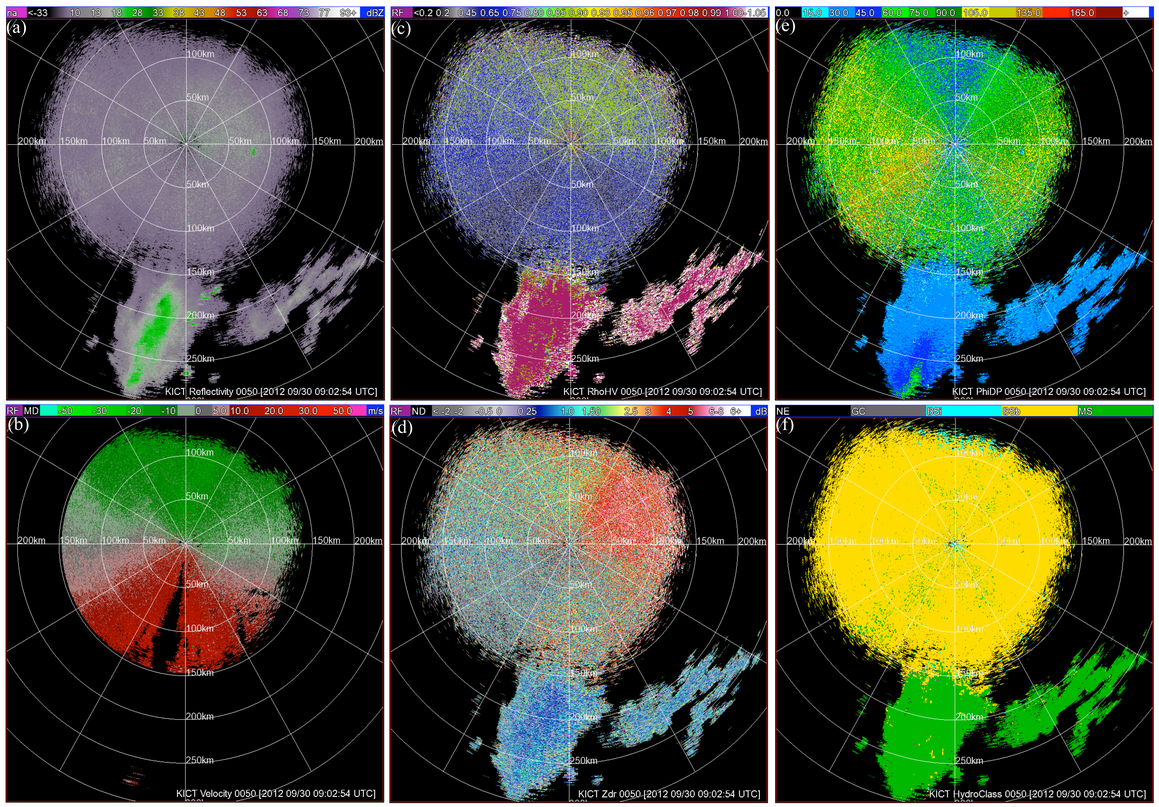


Fig. 1. Images of (a) $Z$, (b) $v_r$, (c) $\rho_{hv}$, (d) $Z_{DR}$, (e) $\Phi_{DP}$, and (f) classification results from KICT radar 0.5° scan at 090142 UTC (local time 4 am) on 9/30/2012.

## 3. Improved Doppler velocity dealiasing

The alias-robust variational analysis (Xu at al. 2012, *JTech.*, **29**, 1723–1729) is modified adaptively and used in place of the alias-robust velocity azimuth display (VAD) analysis (Xu at al. 2011, *JTech.*, **28**, 50–62) for all scan modes (including WSR-88D VCP31 with the Nyquist velocity reduced below 12 m/s and TDWR Mod80 with the Nyquist velocity reduced below 15 m/s), so more raw data can pass the stringent threshold conditions used by the reference check in the first step of Doppler velocity dealiasing. This improves the dealiased data coverage without false dealiasing, as required by radar data assimilation. The dealiasing technique is then further improved by adding new procedures to the continuity check in the second step to increase the dealiased data coverage over storm-scale areas threatened by intense mesocyclones and their generated tornados. The detailed technique is described in Xu et al. (2013, *Advances in Meteorology*. in press). An example is shown in Fig. 2.

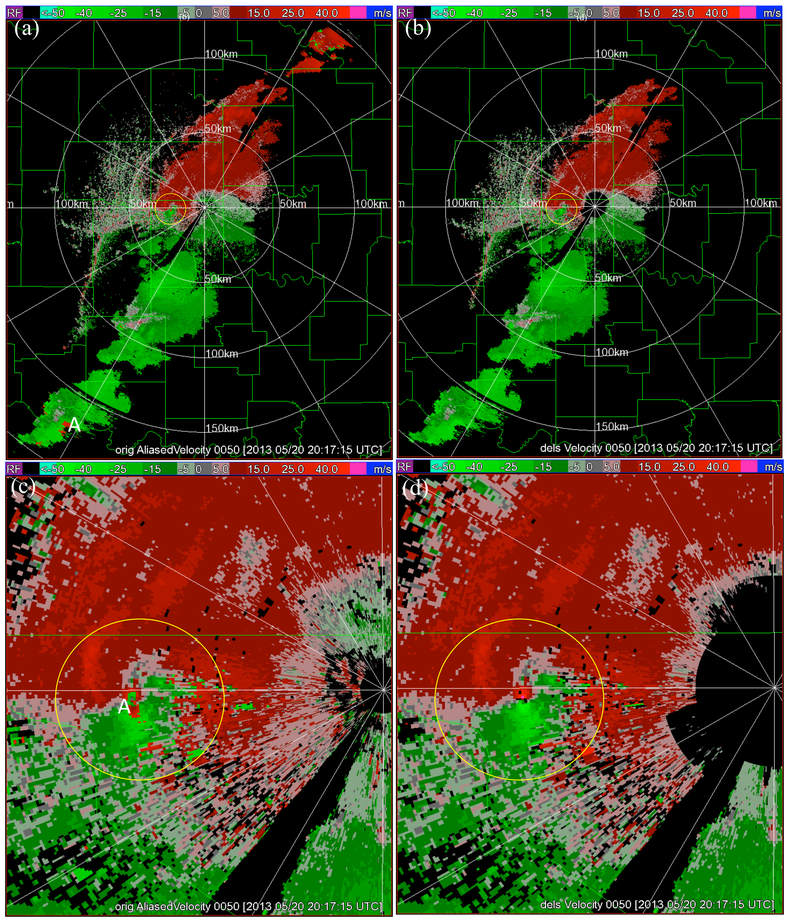


Fig. 2. (a) Raw radial velocity $v_r$ from KTLX radar (with $v_N$ = 26.1 m $s^{-1}$) on 0.5° tilt at 201715 UTC on 20 May 2013 for the Moore, Oklahoma tornadic storm. (b) Dealiased radial velocity produced by the improved method. (c) and (d) Enlarged displays of the mesocyclone in (a) and (b), respectively. The white letters "A" in (a) and (c) mark the aliased-velocity areas. The yellow circle marks the tornadic mesocyclone area in each panel.