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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of Single Doppler and Multiple Doppler Wind Retrievals in Hurricane Matthew (2016)" *by* Ting-Yu Cha and Michael M. Bell

Anonymous Referee #2

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recommendation: I only found one thing to change, in the Introduction, noted below.Otherwise this a fine original paper which is perfectly suitable for publication in AMT. My comments below are mainly for the authors as I have no minor or major revisions to ask for.

Abstract: The abstract is a clear and concise description of the paper. Fine as is.

1. Introduction: You write " One limitation is that a ground-based Doppler radar has to be located outside of the radial distance between the radar and the storm center in order to sample the full tangential component of the vortex circulation accurately." I think you meant to write that the radar has to be outside the radius of maximum wind.

It is impossible for the radar to be located farther away than the storm center to radar distance!

2. Data Sets and Methodology: This section nicely summarizes the data procedures. I am curious why the SAMURAI analyses were interpolated to a polar array while the VoRTRAC were apparently still in Cartesian form. If in fact the end result of the Vortrac analyses also ended up in polar form that should be stated here.

3. The GVTD technique improvement: 3.1: a lot of math shown here but all of it necessary. I wonder if there was earlier work on data gaps and noise influence on maximum wavenumber to retrieve. Probably not needed but I believe the code in GBVTD to select max wavenumber was developed originally by the late Tom Matejka for the Extended VAD which is an ancestor of the VTD. Well, probably too much detail for this paper anyway. 3.2 GVTD-simplex center finding The description of the simplex minimization algorithm is a bit sparse. Maybe you should add a direct reference. Either that or remove the references to "contraction or expansion of the simplex" since you did not really explain what those terms mean. Also in the text when you mention comparisons of simplex-derived centers from different WSR88D radars you might list the locations: KMLB (Melbourne,FL) and KJAX (Jacksonville, FL). I think Harasti et al.(year?) had a nice description of many different of finding circulation centers. Also you might mention that the "dynamic"centers are smooth because the spline fit is to only a few aircraft derived centers, One per pass, so one would not expect them to show as much variation as the G*VTD centers available every 5-6 minutes. also you have an independent wind field from SAMURAI TDR analyses. Did you try simplex center finding on the pseudo-dual Doppler arrays? The Marks used the simplex to show variation of center with height in his airborne radar work and this was then later applied by Lee and Marks to the GBVTD.

4 Wind retrievals comparison between single Doppler and airborne dual Doppler analyses This is the real meat of this paper and it is amazing that no one did this before. Maybe it had to wait for the development of GEVTD and SAMURAI before such a study

could be done, but I think this part alone should be part of any class on radar meteorology from now on. 4.1 Wavenumber 0 tangential wind retrieval this section shows that GEVTD (both versions) capture well the wave 0 tangential wind by comparing with the pseudo dual Doppler analysis rom the P3. This is a slick idea to generate 88d obs by projecting the TDR analysis on the 88d radials and then doing the VTD on those "data" rather than on the original 88d data. As i read this, I couldn't help thinking you could just as easily plopped some idealized vortex on Matthews position and used totally synthetic data to test the VTD algorithm performance. I am not suggesting you do this as you already have the SAMURAI analysis, just a thought that you did not need a "real" storm to do this part of the analysis. 4.2 Asymmetric wind retrievals This is a very interesting discussion. I do wonder if the authors could say a bit more about the signature of the VRW in the reflectivity or is the VRW only visible in the windfield? It is easy to visualize in my mind the wave 1 asymmetry, but higher wave numbers make me think there should be a series of bumps in the dBZ, or is the reality that the asymmetries are more finer in scale, so requiring higher wave numbers? That is, are convective cells in the RMW giving rise to wind asymmetries that are then aliased onto wave #2? well, probably can't answer that with this dataset. I know that VORTRAC also can produce a MSLP estimate from the symmetric wind field. I wonder if the VTD analyses give mslp similar to the flight level data. If the wind fields agree so well I would think the pressure retrievals should also. Not necessary for this paper though. 5 Conclusions the authors nicely summarize their work here and hint that there is more to be said about the analyses themselves. In this paper they have validated both methods of analysis and I imagine the next Cha et al. will go into more detail about the VRW's and other features of this dataset including the eyewall replacement. This methods-oriented paper is a fine introduction to that topic.

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