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Hydrology and Earth System Sciences Discussions

Interactive comment on "A comparative analysis of two wind velocity retrieval techniques by using a single Doppler radar" *by* Hee-Chang Lim and Dong-In Lee

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This is a reply to the Referee Comment (C35-C36) and the useful Checklist (C39-C39).

We are grateful to the referees for their helpful comments and notes, which would be carefully considered in preparing our next revised version. The Comment C35-C36 is no doubt valuable, and we are to make a proper reply. On the other hand, even though the reply wasn't made in another journal, the checklist from the second referee (C39-C39) (frankly, we haven't got the checklist from the journal committee) also seems very helpful and we do appreciate his considerate comments for the revision. In the following, the questions centered on the comments from the first referee will be mainly

answered.

As you pointed out, the practical analysis using actual data is important and maybe necessary to make the current idea applicable. Of course, it is currently being considered to apply for the more practical case, but it would be done in the next publication. Although there were several reasons why the actual data is not included in this paper, we would explain it in brief as below.

1. From engineering point of view, a direct implantation of the current methods on the radar platform might be recommended and useful, furthermore could be issued in a written paper. However, as you might agree, it's not only our purpose to analyze an actual data using this method, but we also want to improve this method in further typical cases and to verify the results in some appropriate ways on the certain reference radar data. We mainly focus on the latter one to get more useful results so that we think this result may be an invaluable tool for solving various climate and wind engineering problems.

2. This study has applied only two methods, VAD and VARD by using data obtained by an artificial (or pseudo) Doppler radar station. In addition, merely two pre-assumed shapes of the wind velocity distribution - uniform and parabolic are considered. Even though both profiles represent the non-sheared or low-sheared wind flow of the Atmospheric Boundary Layer (ABL), strictly speaking it only makes a simple 2-dimensional wind field. In order to implant more a typical 3-dimensional wind structures under a complex thermodynamic climate coaxially, more realistic distorted flow structure such as the divergent and convergent flow as well as the fluctuating flow containing the complex turbulent flow would be applied. For example, an instantaneous large vortex flow arising from a protruded surface or a typhoon or a tornado could be more difficult case. Therefore, the analysis using an actual data will be made in near future alongside making an implantation with those various methods.

3. One of the missing things we had to focus on was the pattern matching of the

radar wind map. Pattern Recognition (PR) from PPI (Plan Position Indicator) has been taking a great interest to the meteorology researchers. As some flow patterns are much alike, it is very hard for the computer to classify them correctly. In order to predict the flow pattern using a single Doppler radar, PR requires a reference precursor of high cognition accuracy in translation, scaling and orientation, but despite of easily obtaining their position, size and orientation in a radar image the classification of two-dimensional (2D) shapes remains a difficult problem. In the next study what we're currently thinking is a feature extraction. Authors would like yielding more productive results and it could effectively improve the efficiency of classification.

In addition, the merits of the current method can be described as follows.

1. The implication of current method is that it produces an immediate calculated pattern from a single Doppler radar under a well defined two vertical wind profiles in a horizontally homogeneous environment. An earlier study has also been discussed by Wood and Brown (1986). The patterns obtained from the wind field can be portrayed with contour lines or vector fields of a Doppler velocity; these fields represent the speed and velocity fields of atmospheric flow structure. Therefore, we hope that for an academic purpose or some related applications the patterns readily aid recognition and interpretation of such a complex wind field.

2. The wind pattern (i.e. the reference precursor) explained above may be simple, but it could be applied to various fields such as reducing measurement errors of all wind velocity components and more interestingly making a transformation function by using curve-fitting of a higher order polynomial equation describing a complicated flow field. In addition, the fitting curve (of wind speed and direction profiles) can produce a unique single Doppler velocity pattern (signatures) in a PPI scope display. These signatures can be used by operational meteorologists to identify the current wind conditions through a considerable depth of the atmosphere. More importantly, one is able to recognize when the wind field is evolving and when frontal discontinuities are passing the radar coverage area.

The authors do appreciate for the minor comments of both reviewers regarding to the current paper and will be modified in the revised version of the paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 963, 2009.