

## ***Interactive comment on “Combining cloud radar and radar wind profiler for a value added estimate of vertical air motion and particle terminal velocity within clouds” by Martin Radenz et al.***

### **Anonymous Referee #2**

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The paper presents a method to separate cloud/precipitation radar returns from clear air returns using a 35 GHz cloud radar and a 482 MHz radar wind profiler (RWP). Previous work by Williams and others has shown the utility of using two RWP (UHF and VHF) to separate air motions and hydrometeor terminal velocity. The use of a 35 GHz cloud radar plus a RWP has the specific advantage that it is only sensitive to particles and does not show any influence of Bragg scattering. The authors present a detailed methodology for the approach using Doppler spectra from the clear air and cloud returns. Overall I like the approach but I have some concerns about its robustness since some parameter adjustments are still required. The two cases presented with the separation approach are too limited to adequately assess the technique. The authors

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should improve the meteorological discussion since they provide magnitudes of air motion and terminal velocity but they do not mention much whether the terminal velocity are realistic given the measured reflectivity in the same region. Other Comments: 1.) The results in the paper are intentionally focused on meteorological situations that are low rain rate, low terminal velocity, and low air motions. The Ka-band should be able to penetrate higher reflectivity clouds – the examples in the paper max out at around 10 dBZ. Can you say more about the upper limits of applicability of both the approach, and Ka-band radar? Does it matter if the Ka-band returns are attenuated in terms of the Cloud Radar/RWP spectra separation? William's use of two RWP allows for studies of more intense precipitation systems. 2.) Page 13, Line 31: I'm not clear how the dynamics are a key driver for this cloud. I see upward vertical motion at 5500 m at approximately 16:48 UTC. Is it possible that ice particles are formed aloft in this updraft region, and they fall down through the detected layer. The vertical motions below 5000 m are generally not upward and they do not seem to support ice particle growth. 3.) Page 12, lines 3-13: The LDR threshold of -13 dB based on Matrosov (1991) seems somewhat arbitrary. How good is your LDR calibration since this calibration can sometimes be challenging. What fraction of the data with detectable cloud reflectivity is deleted based on this threshold. 4.) The reference list is appropriate and the technical aspects of the paper in the paper are acceptable.

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