

Status of a Comprehensive Warm Cloud Vertical Velocity Retrieval Product

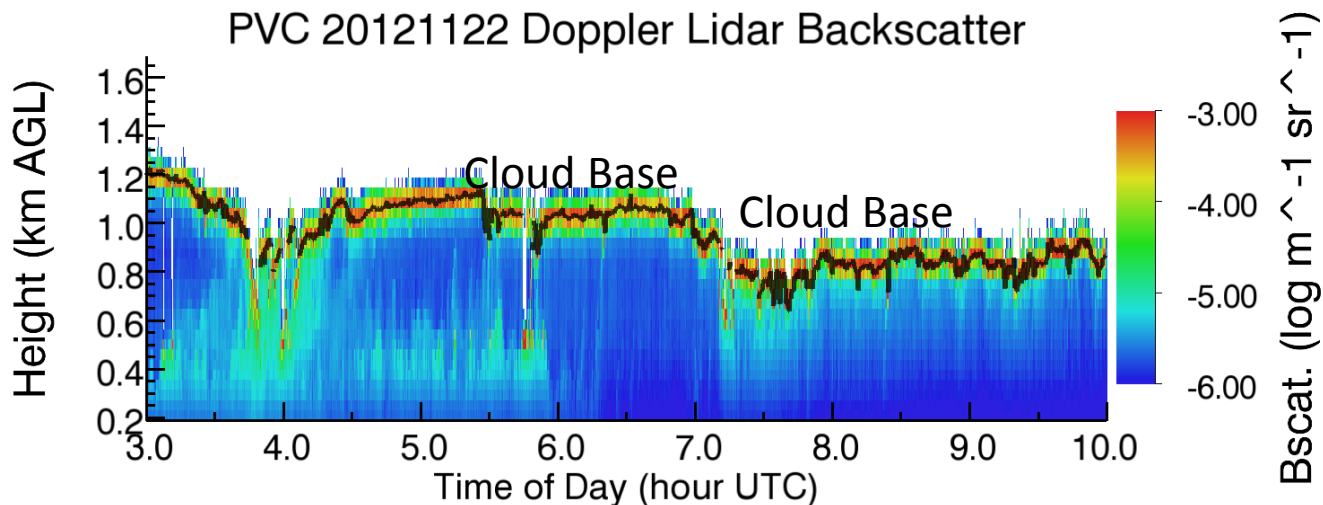
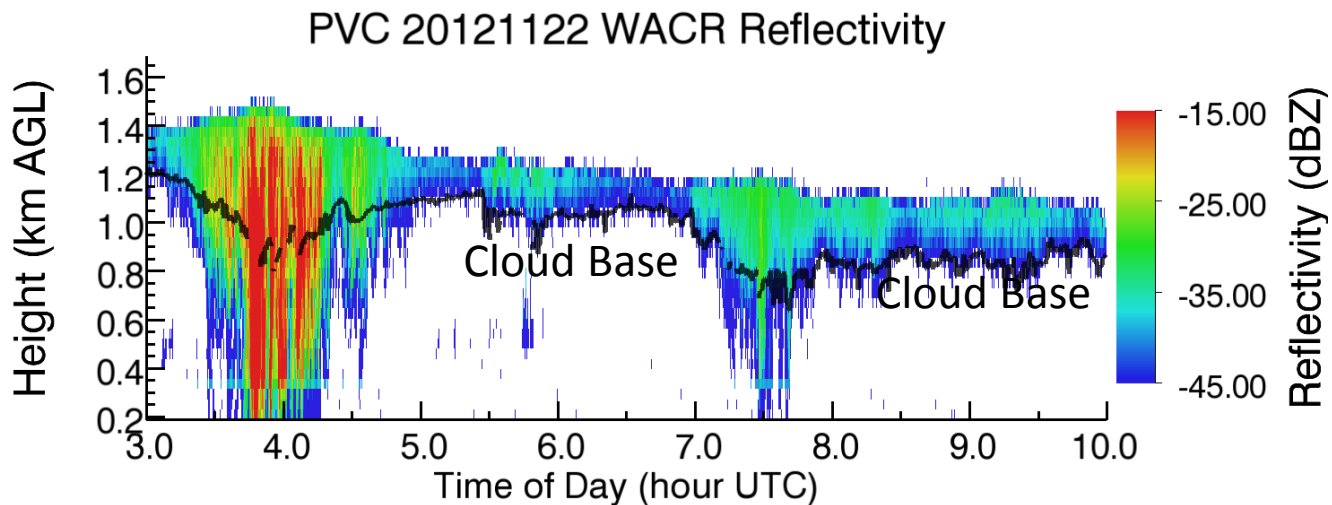
Edward Luke and Pavlos Kollias

Vertical Velocity Focus Group Breakout Session
2013 ASR Science Team Meeting
March 19, 2013

(also see poster 188 today)

Drizzling StCu Case: Radar and Lidar Views

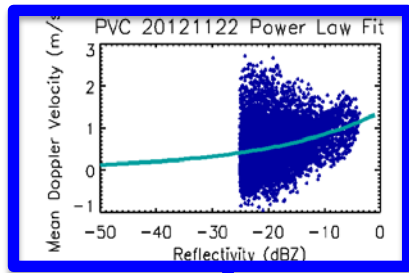
The complementary operational spatial domains of radar and lidar provide the basis for seamless retrievals of vertical air velocity from the ground to the top of drizzling and non-precipitating warm stratiform clouds



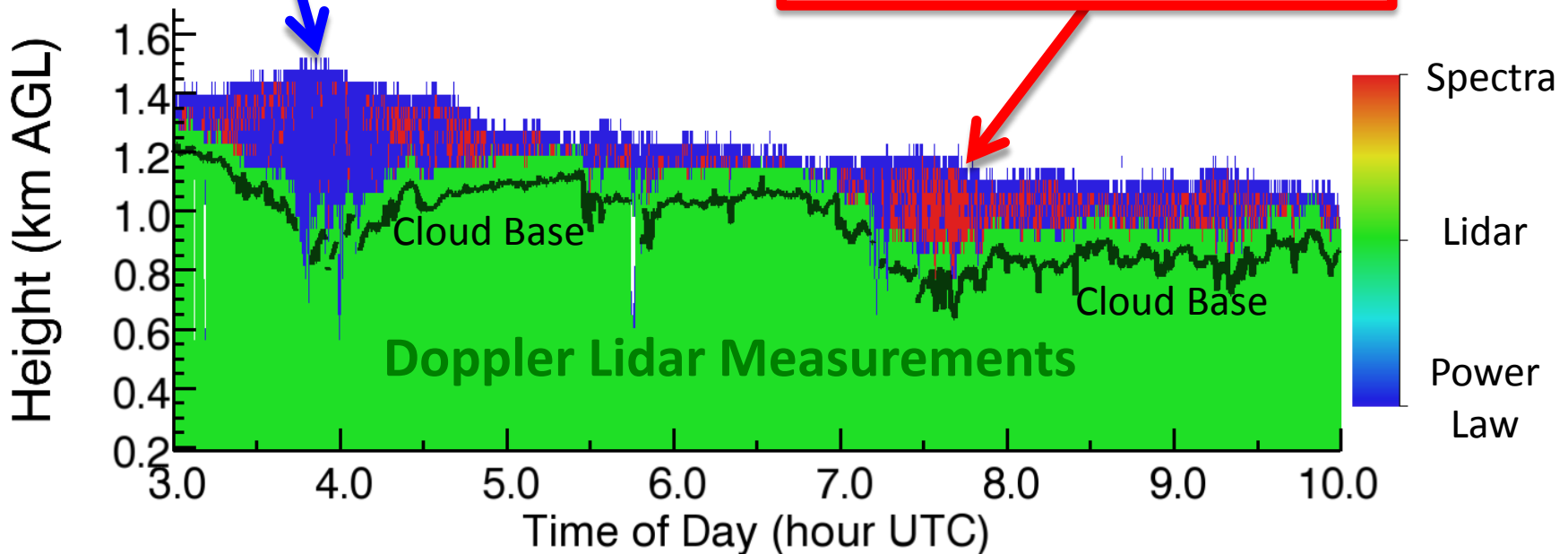
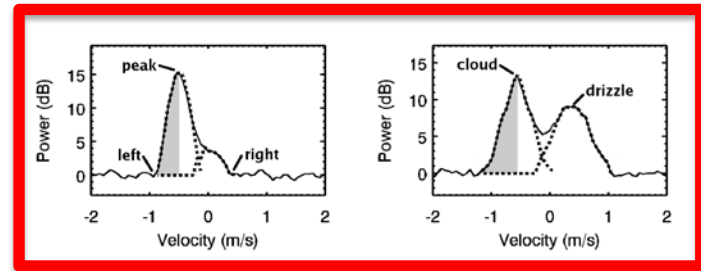
Retrieval Partitioning

Radar Doppler spectrum decompositions (Luke and Kollias, 2013) combined with radar Z-V power law fits and Doppler lidar measurements provide seamless, high resolution vertical air velocity retrievals from the ground to cloud top.

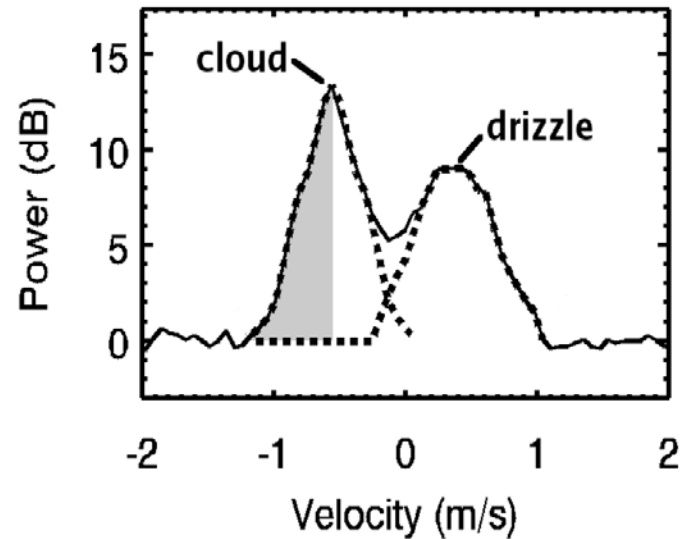
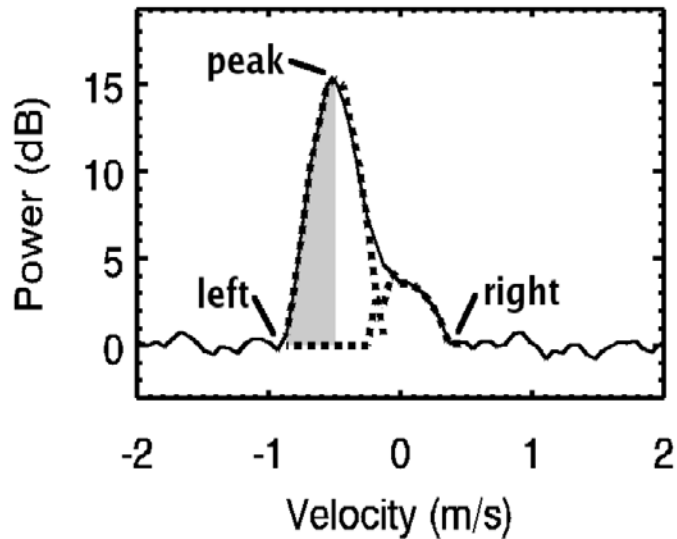
Z-V Power Law Fits



Radar Spectrum Decompositions (Luke and Kollias, 2013)



Radar Doppler Spectra Decomposition in Lightly Drizzling StCu

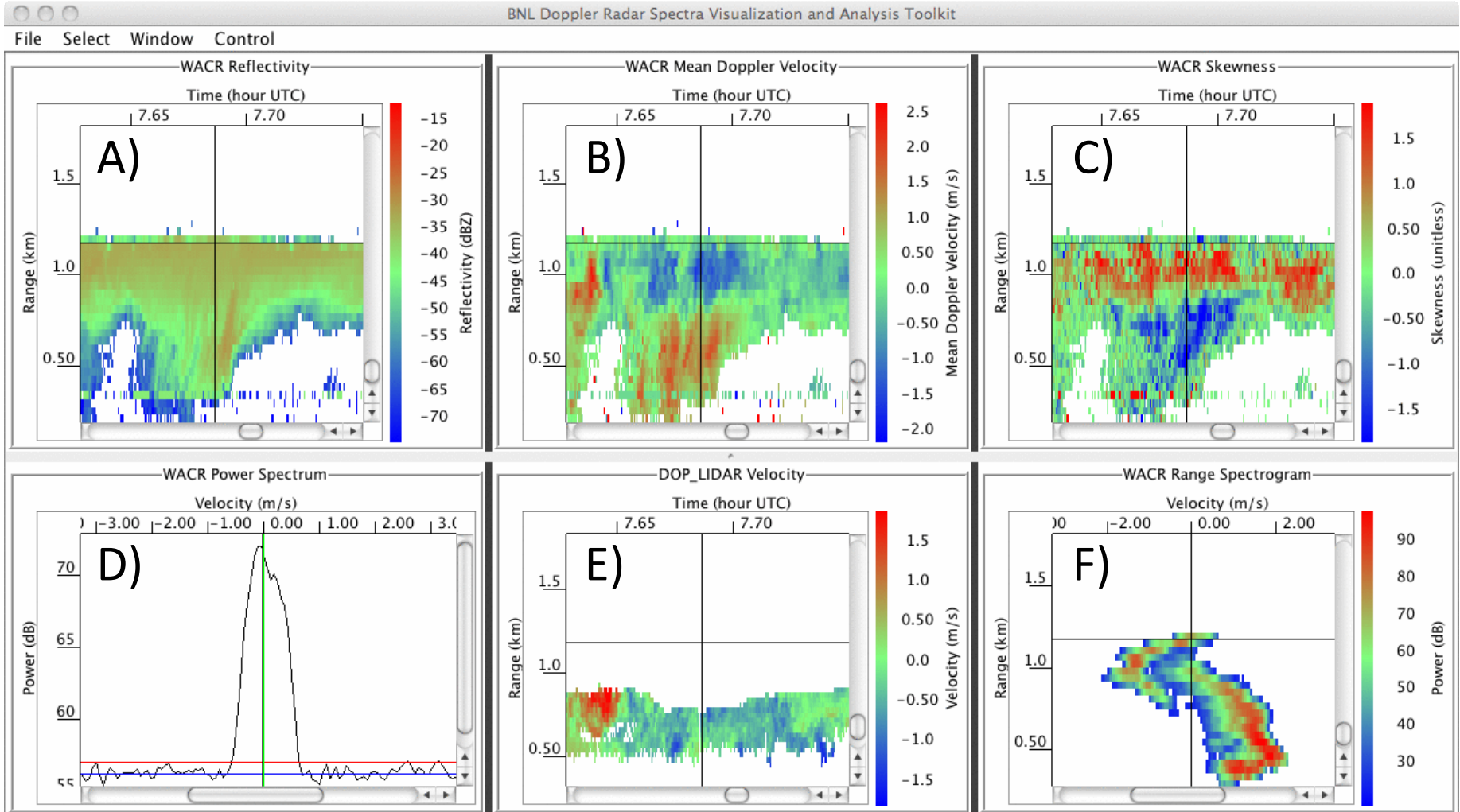


Luke, E.P. and P. Kollias, 2013: Separating cloud and drizzle radar moments during precipitation onset using Doppler spectra. *J. Atmos. Oceanic Technol.*, in press, doi: 10.1175/JTECH-D-11-00195.

Lightly Drizzling StCu at Cape Cod

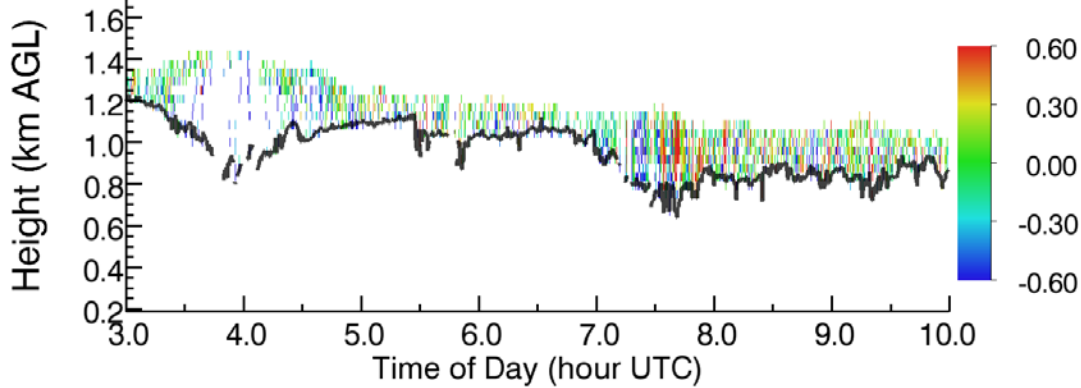
November 22, 2012

- A) Radar Reflectivity
- B) Radar Mean Doppler Velocity
- C) Radar spectral skewness
- D) Radar power spectrum
- E) Doppler Lidar Velocity
- F) Radar range spectrogram

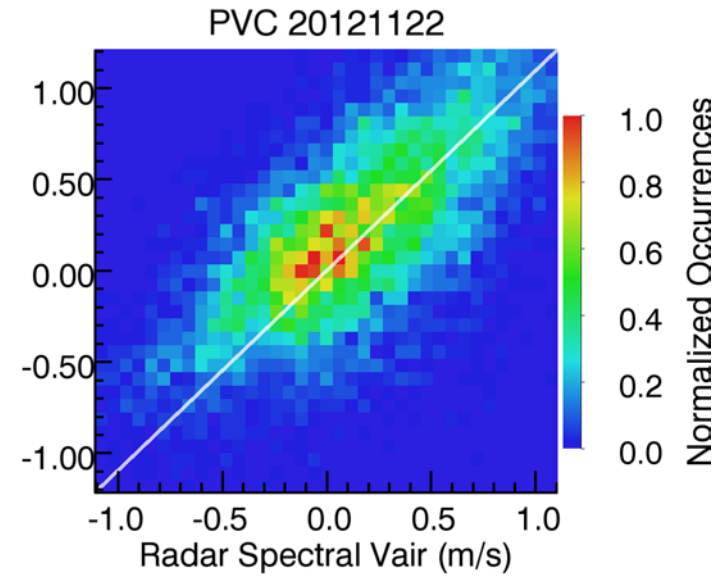
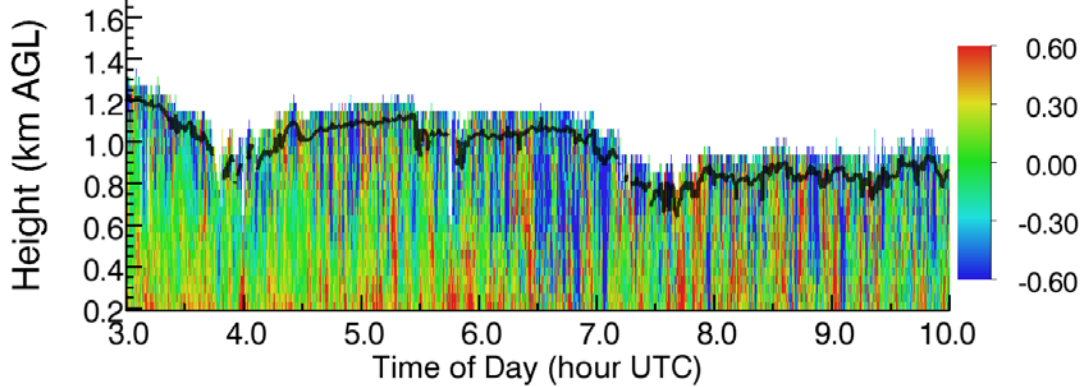


Radar Spectral vs Doppler Lidar V_{air}

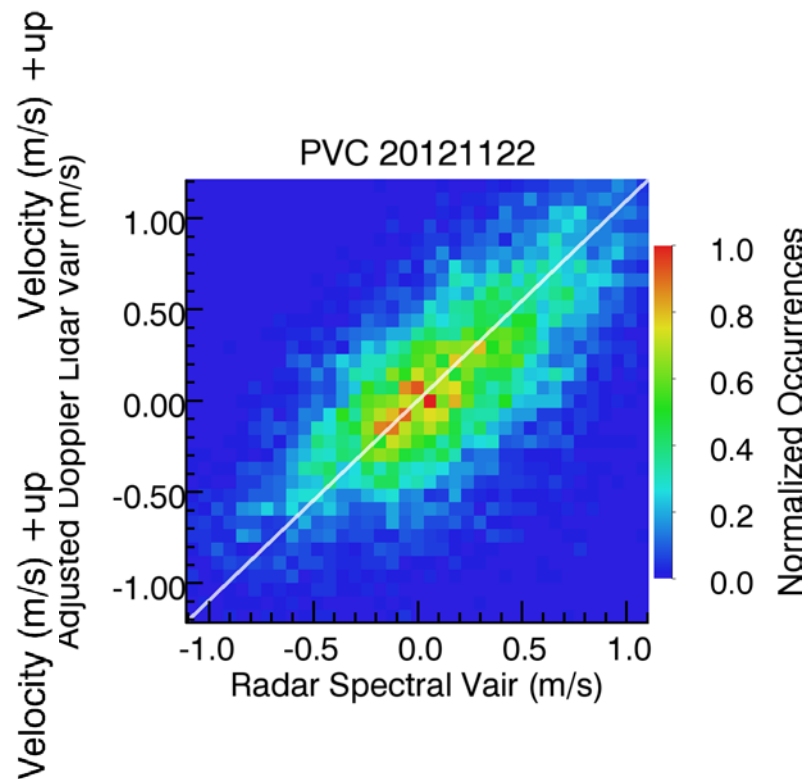
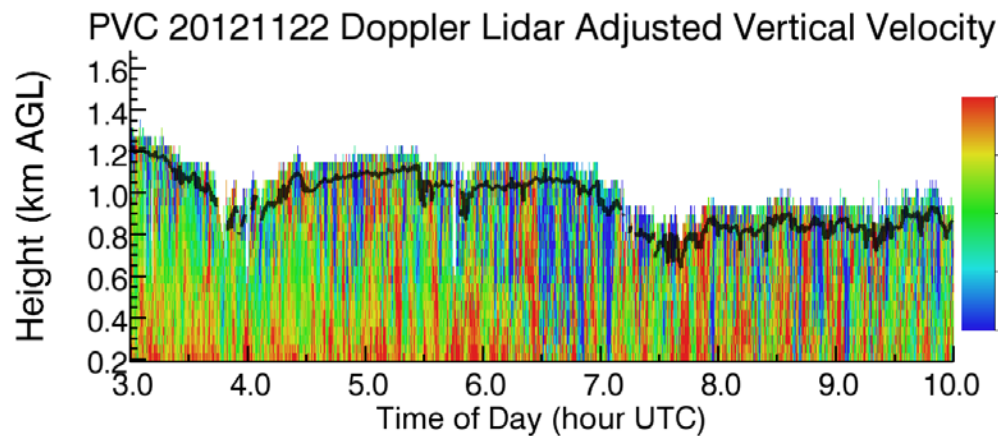
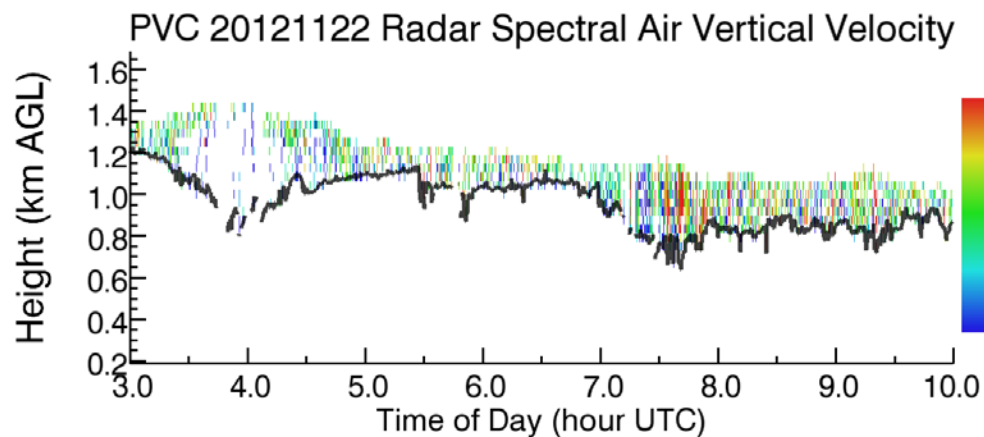
PVC 20121122 Radar Spectral Air Vertical Velocity



PVC 20121122 Doppler Lidar Vertical Velocity

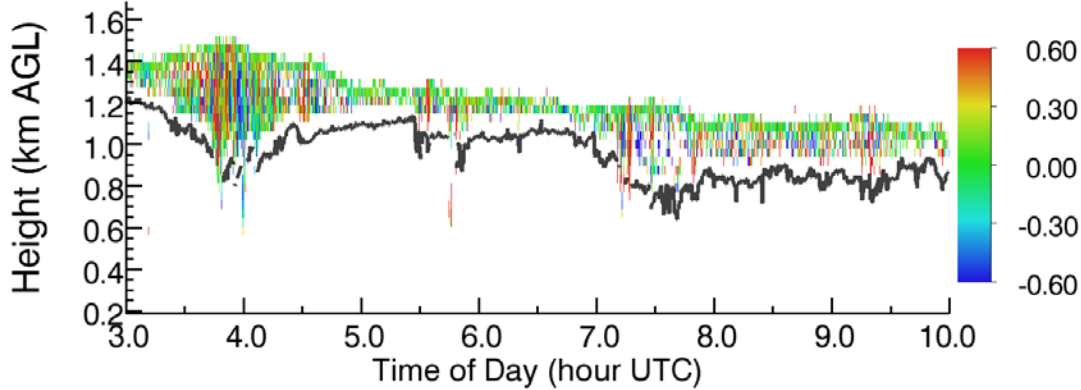


Radar Spectral vs Adjusted Doppler Lidar V_{air}

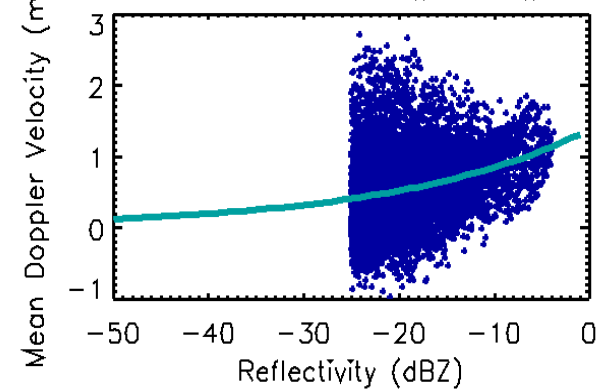


Radar Power Law vs Doppler Lidar V_{air}

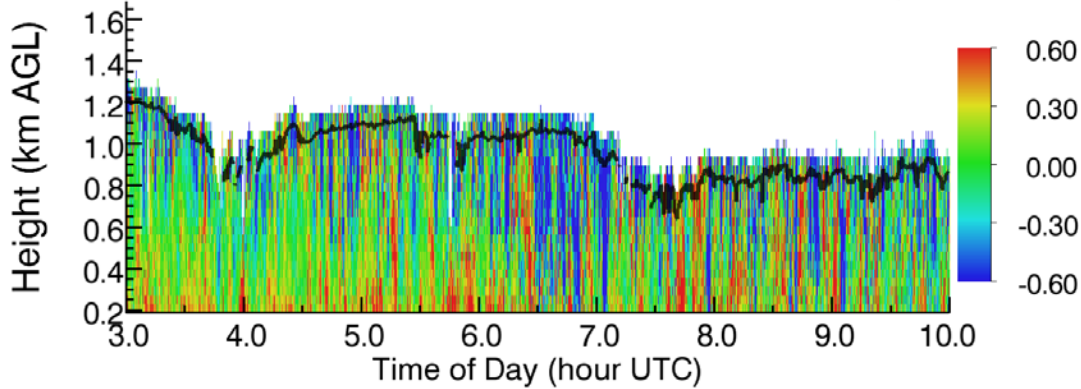
PVC 20121122 Power Law Air Vertical Velocity



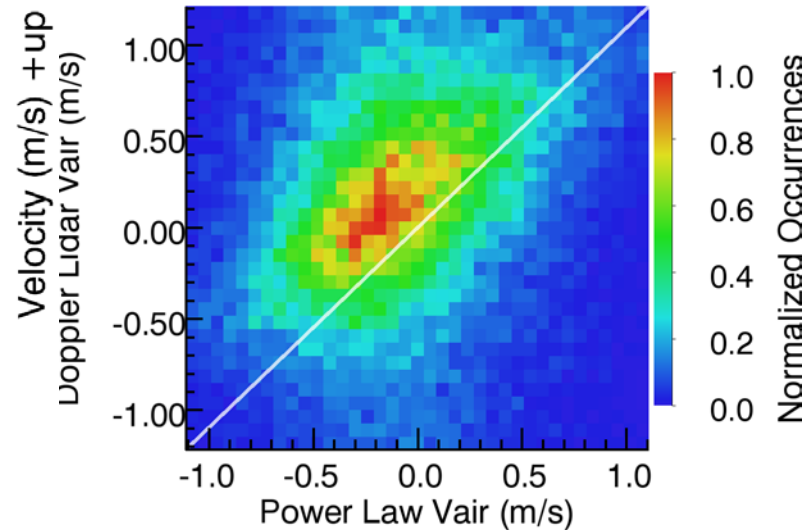
PVC 20121122 Power Law Fit



PVC 20121122 Doppler Lidar Vertical Velocity

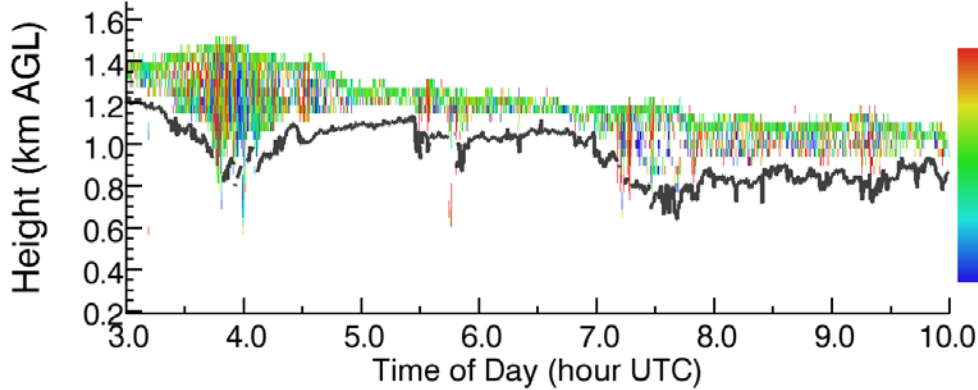


PVC 20121122

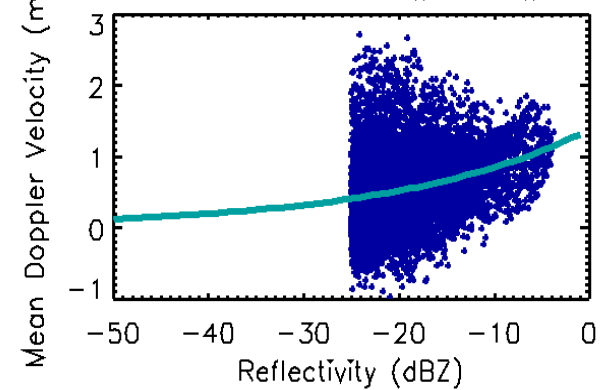


Radar Power Law vs Adjusted Doppler Lidar V_{air}

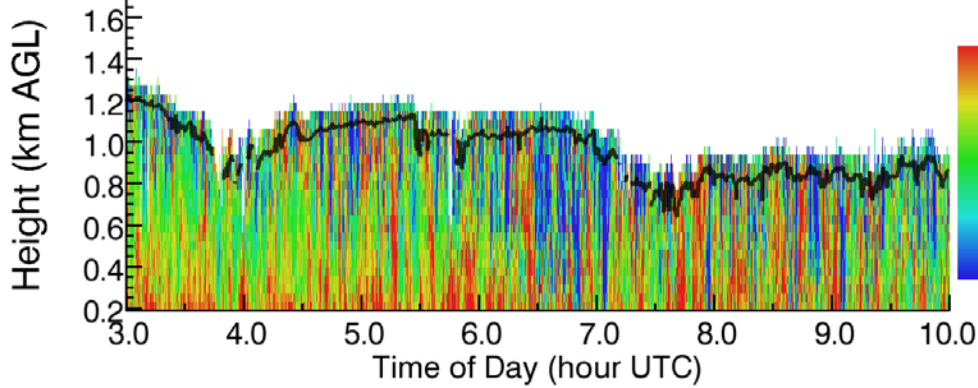
PVC 20121122 Power Law Air Vertical Velocity



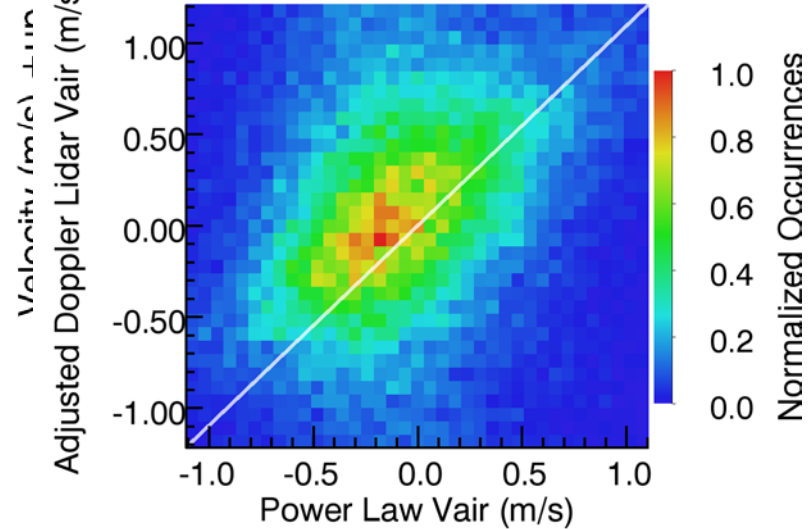
PVC 20121122 Power Law Fit



PVC 20121122 Doppler Lidar Adjusted Vertical Velocity

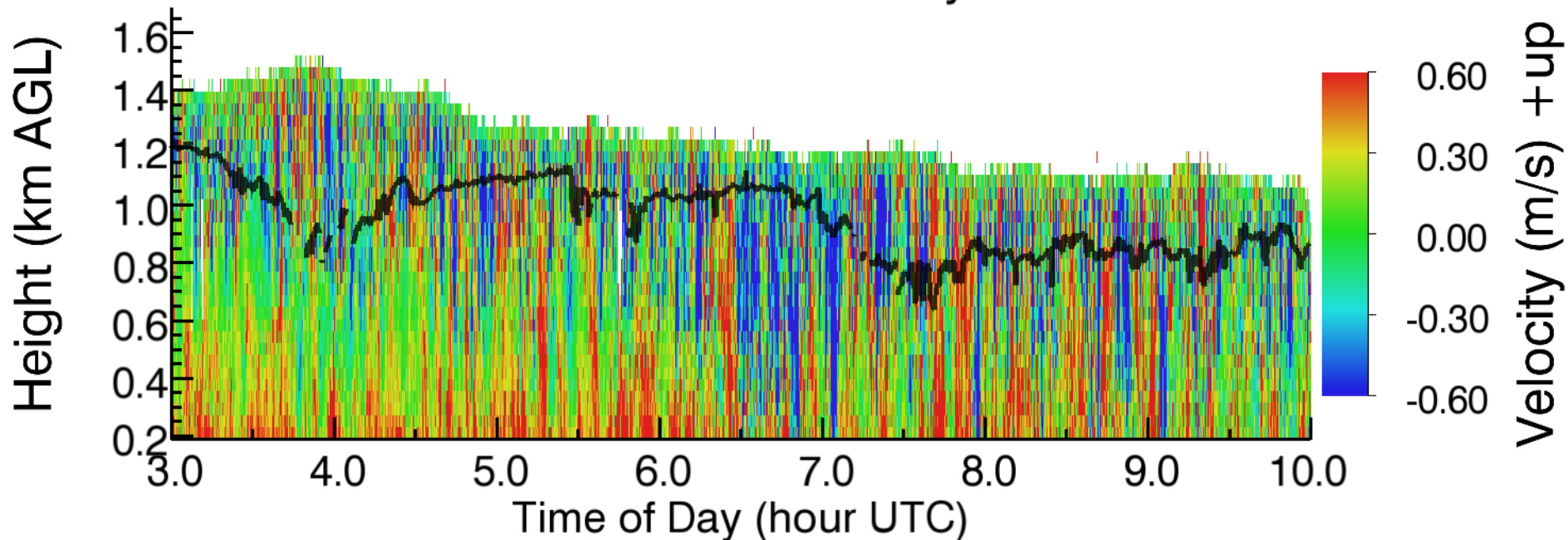


PVC 20121122



Vertical Air Velocity Best Estimate

PVC 20121122 Air Vertical Velocity Best Estimate



**Synergistic retrievals of vertical air velocity in warm stratiform clouds:
Luke, E.P. and P. Kollias, *Geophys. Res. Let.*, manuscript in preparation**

Next Steps

- Better understand possible Doppler Lidar biases
- Refine Z-V fit
- Expand retrievals to cumulus clouds