

# A First Look at MAGIC Cloud Radar Doppler Spectra

*Edward Luke,*

*Pavlos Kollias*

*MAGIC Breakout Session*

*2013 ASR Science Team Meeting*

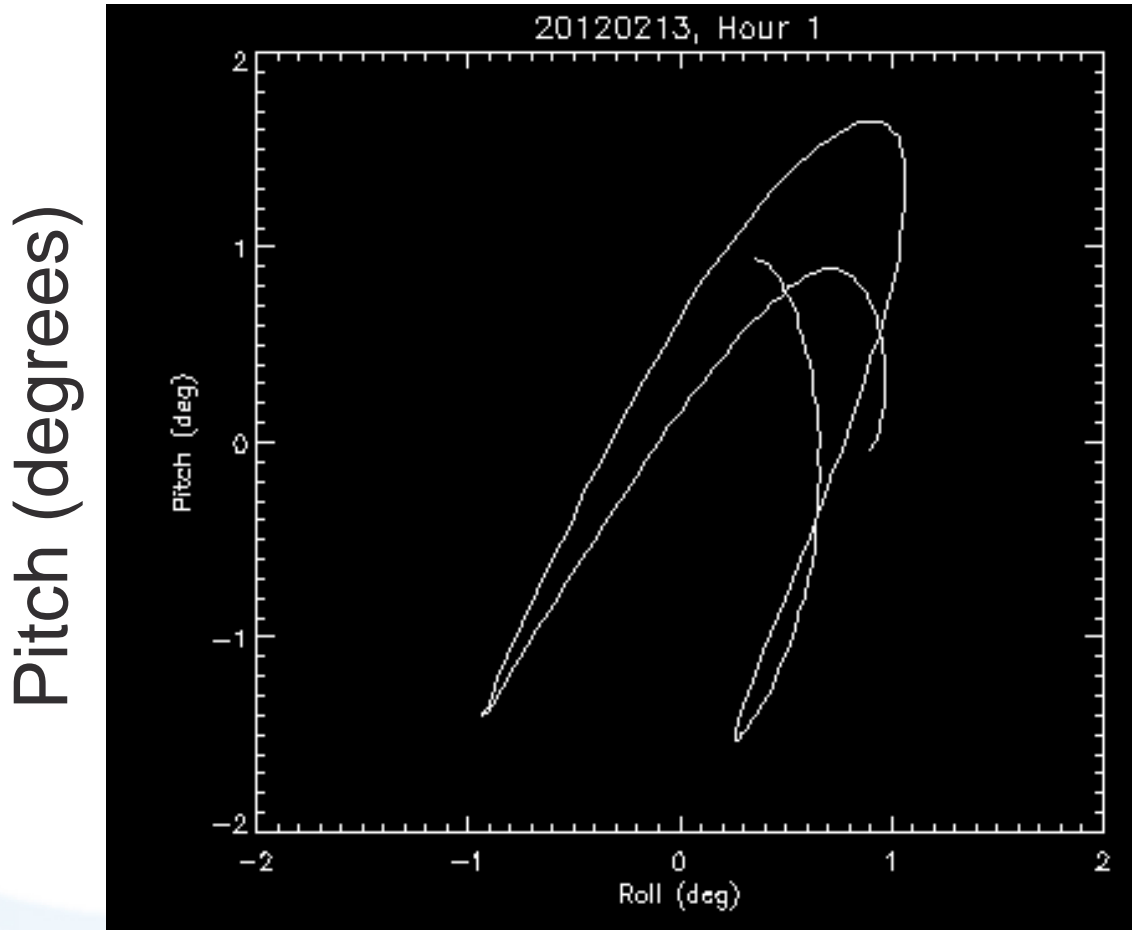
*March 20, 2013*

**BROOKHAVEN**  
NATIONAL LABORATORY

*a passion for discovery*

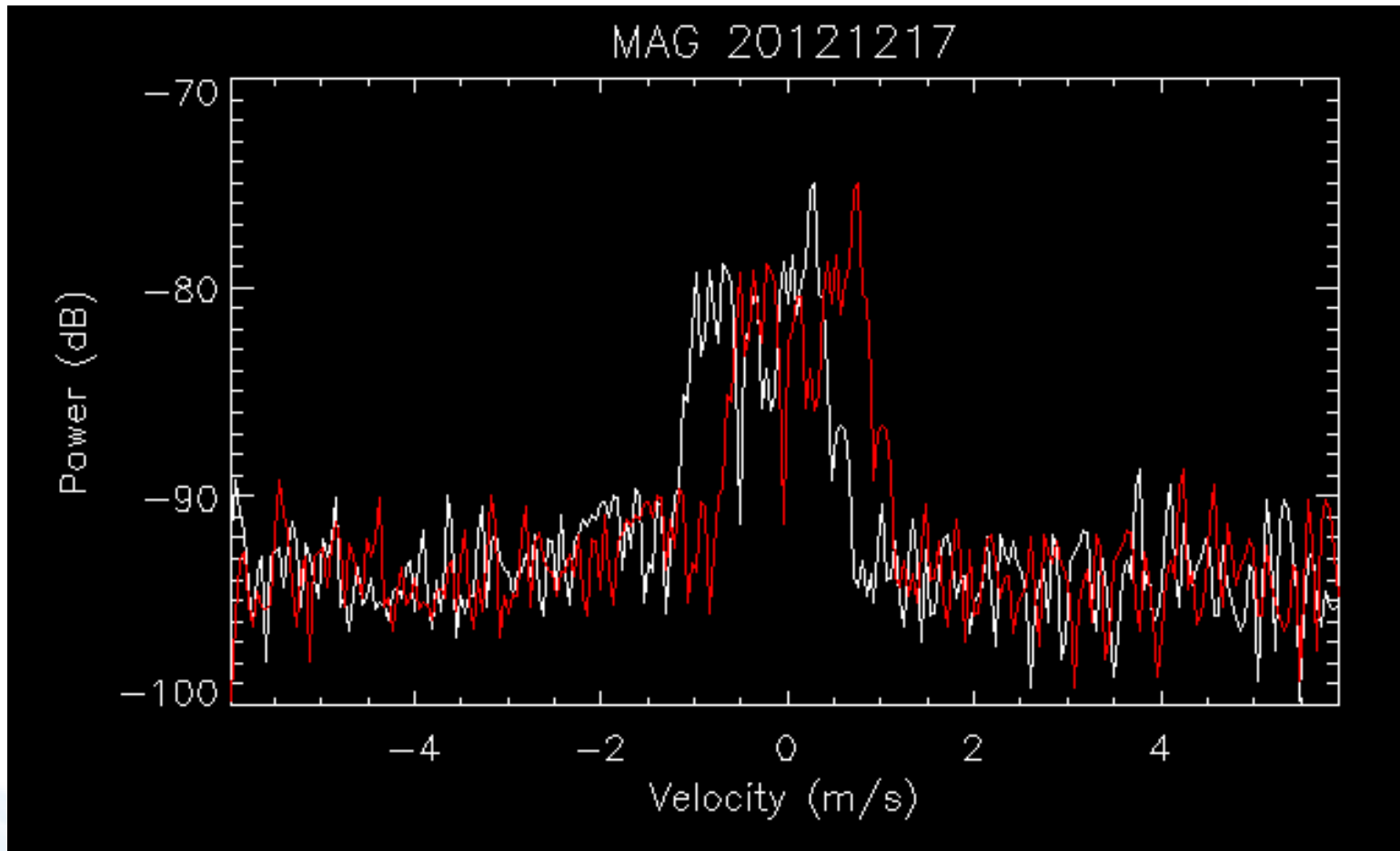


# Pitch and roll recorded during MAGIC Leg0



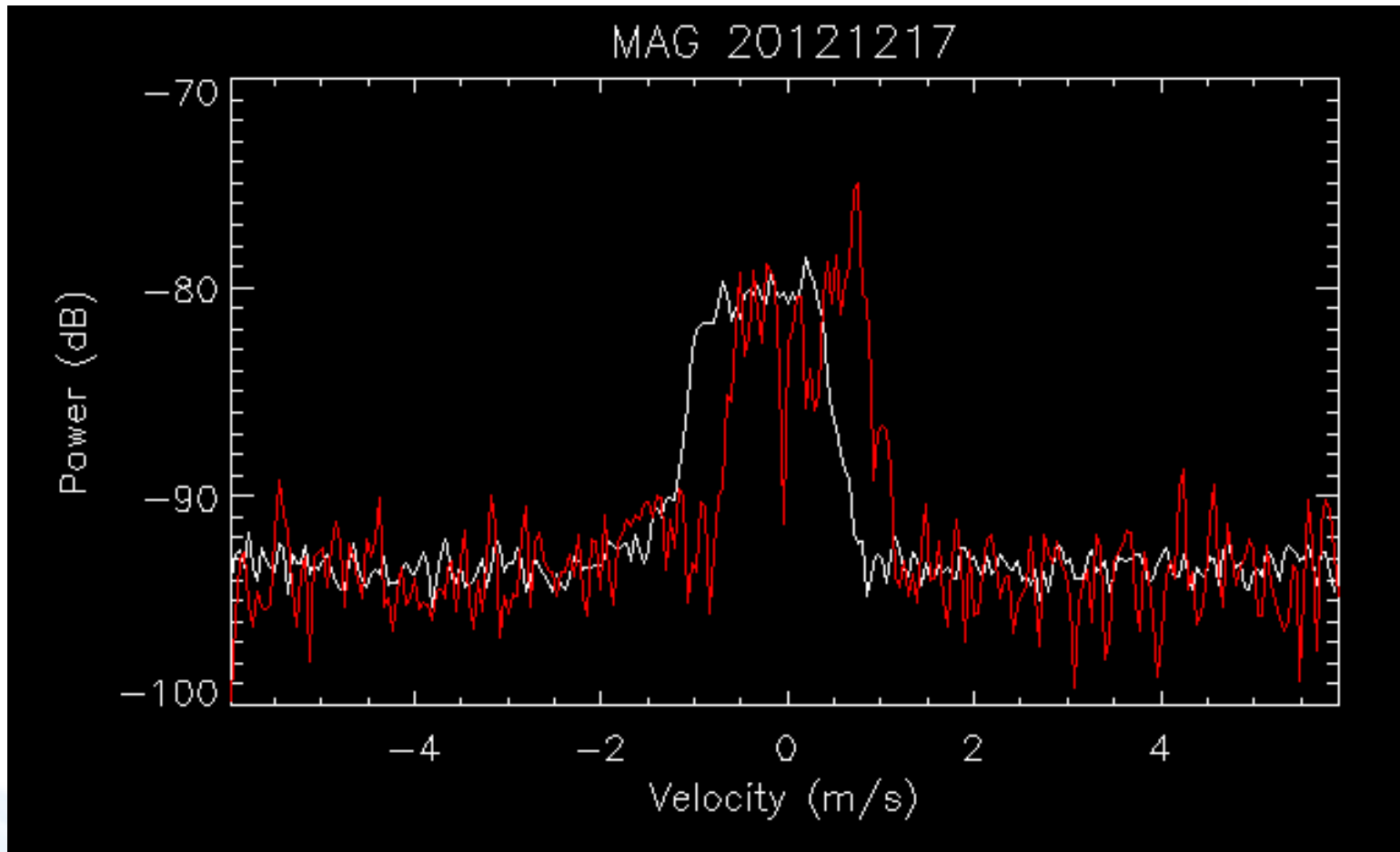
# MAGIC KAZR Radar Doppler Spectra

White: motion compensated    Red: not motion compensated



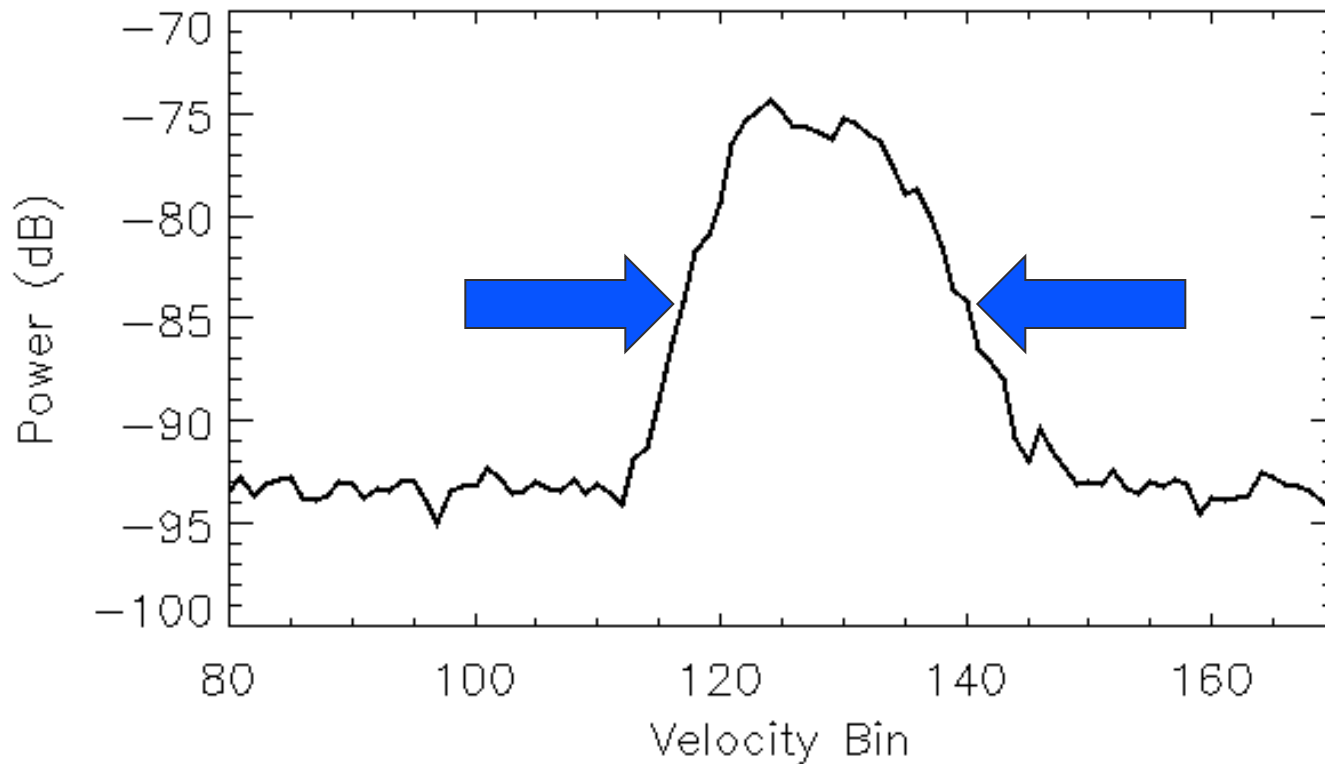
# MAGIC KAZR Radar Doppler Spectra

White: motion compensated and time-averaged



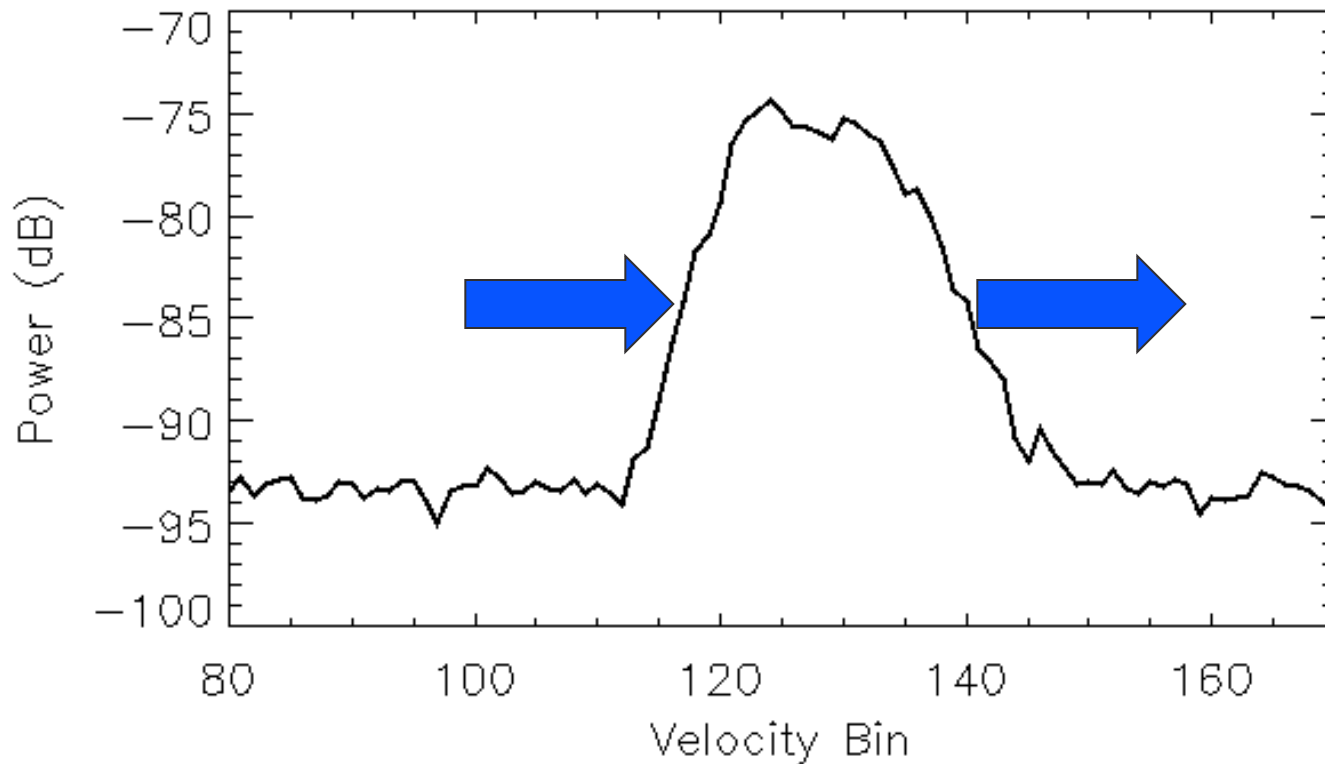
# Effect of Ship Tilt

Cosine term compresses the spectrum in velocity, but by less than one velocity bin for anticipated tilt angles.

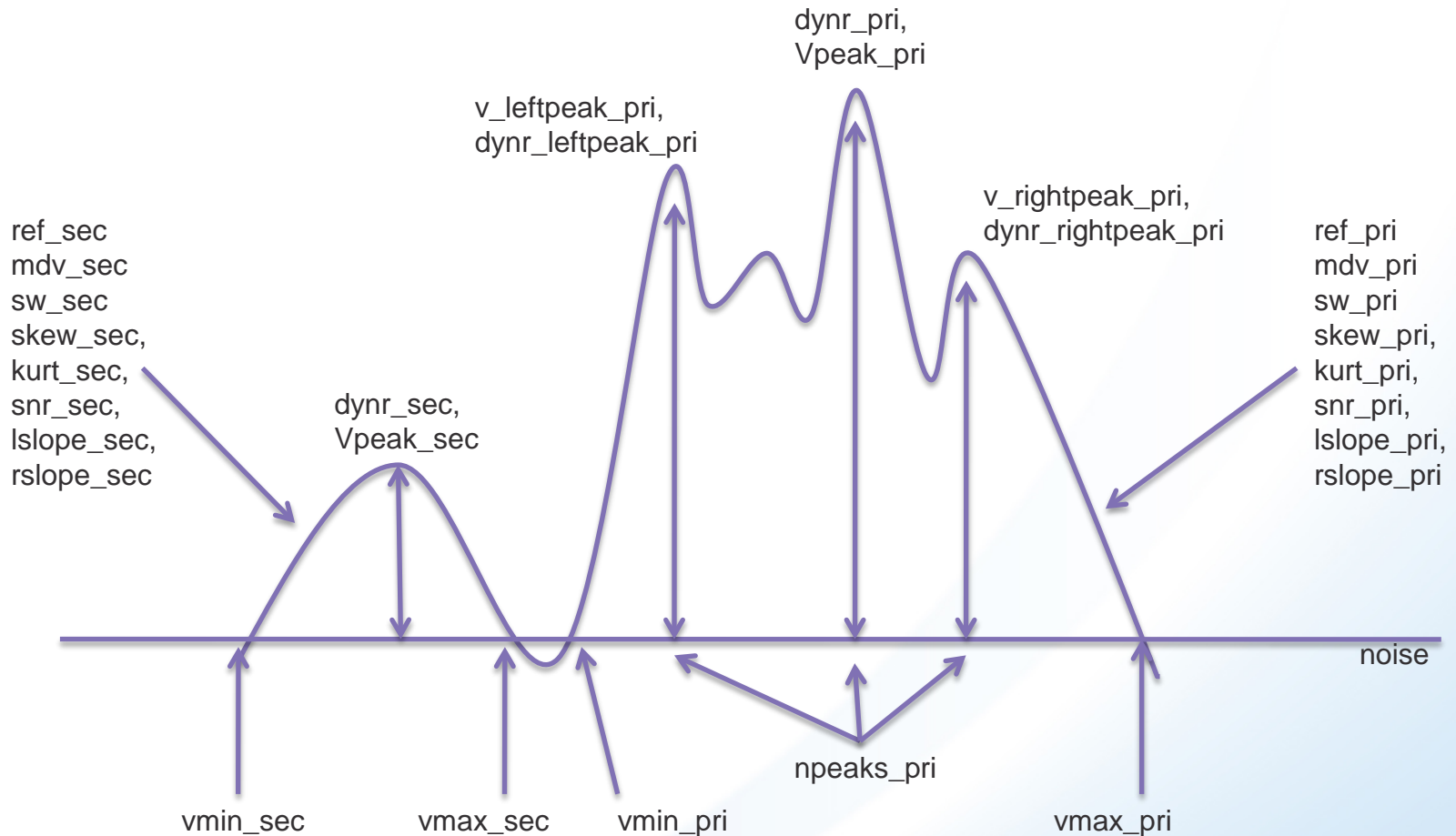


# Effect of Ship Tilt

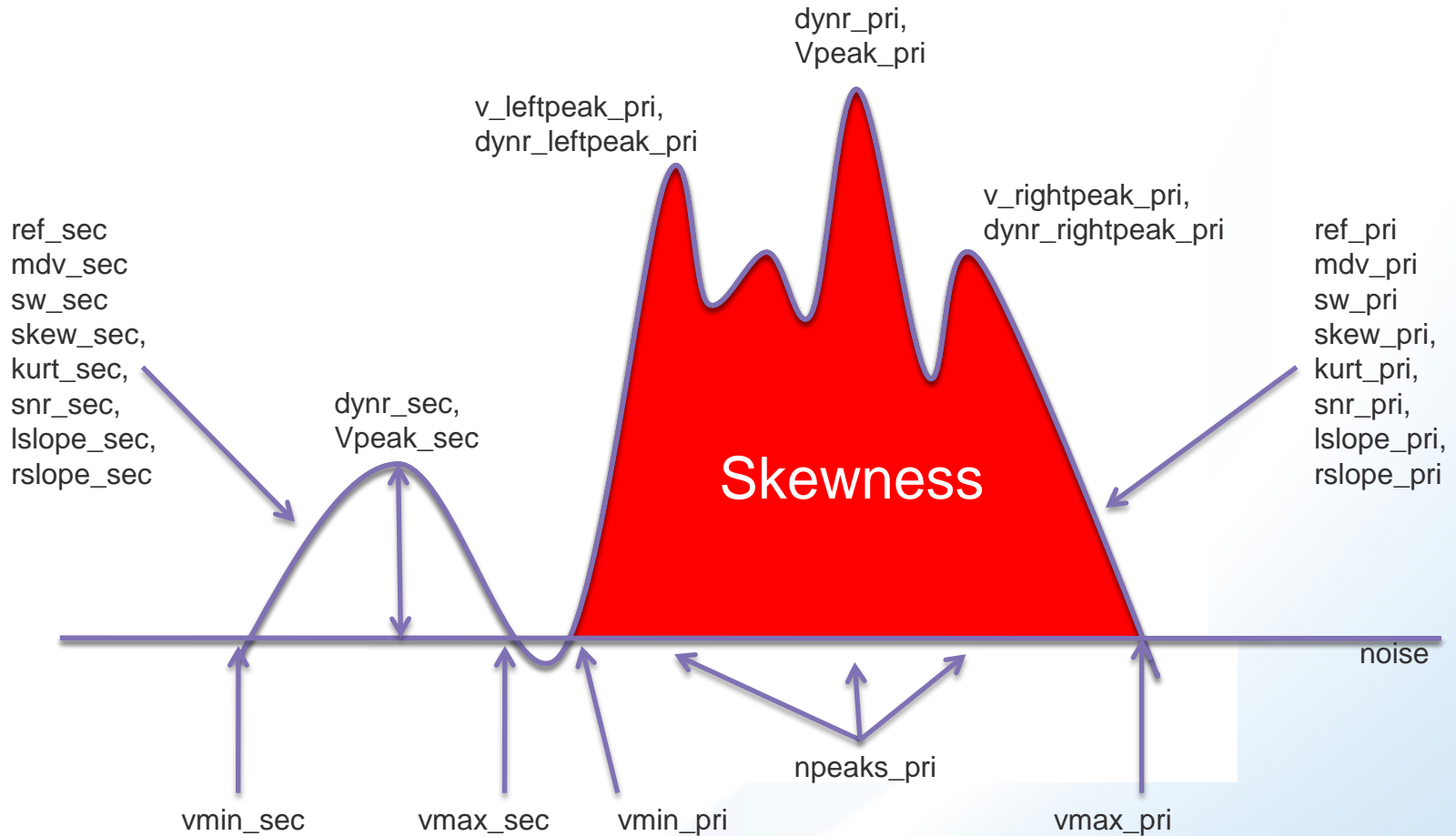
Sine term shifts the spectrum in velocity from coupling of the mean crosswind, by a significant amount.



# Doppler Spectrum Information

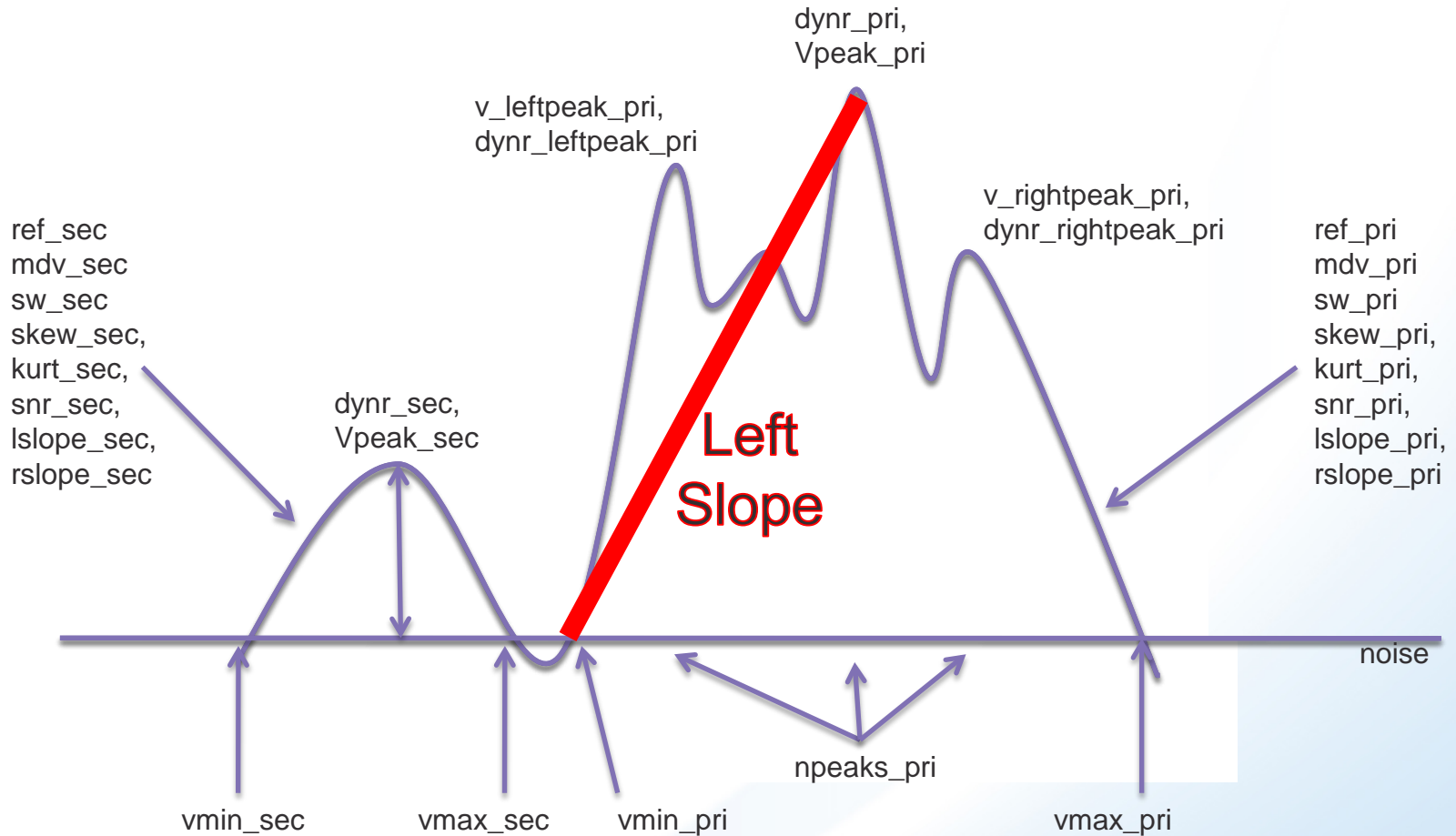


# Skewness

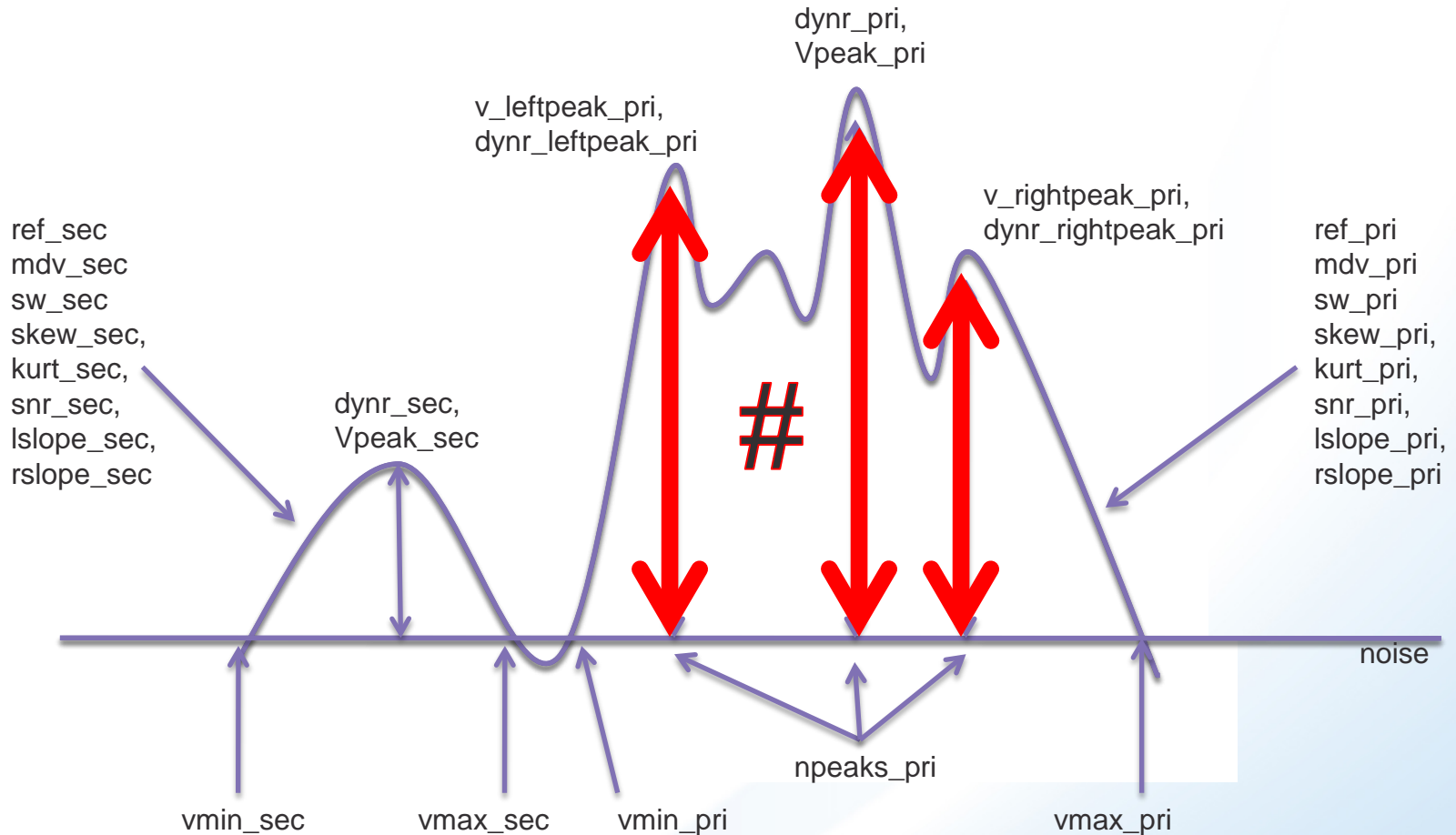




# Left Slope

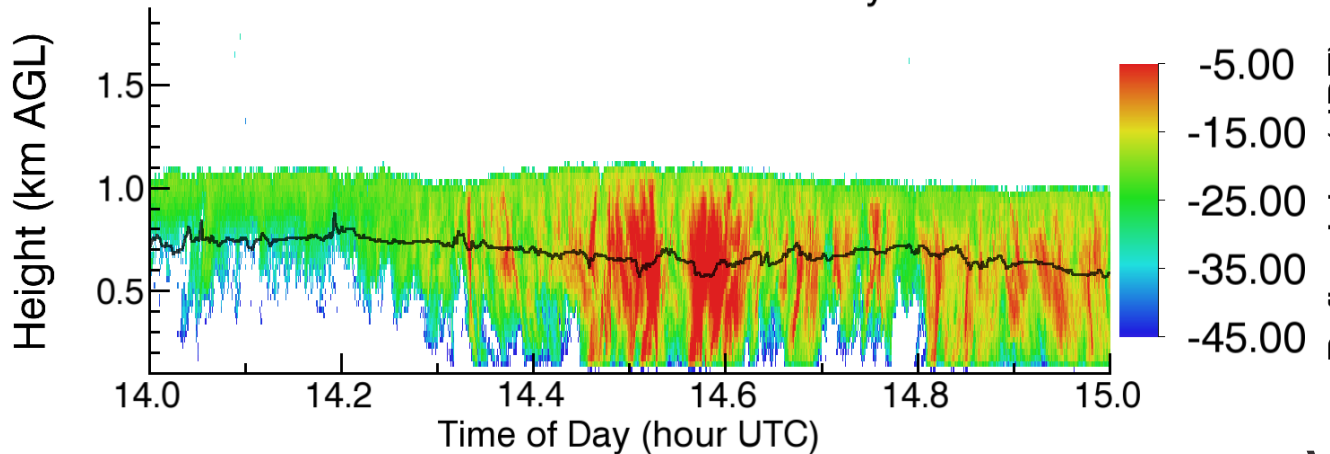


# Number of Local Maxima

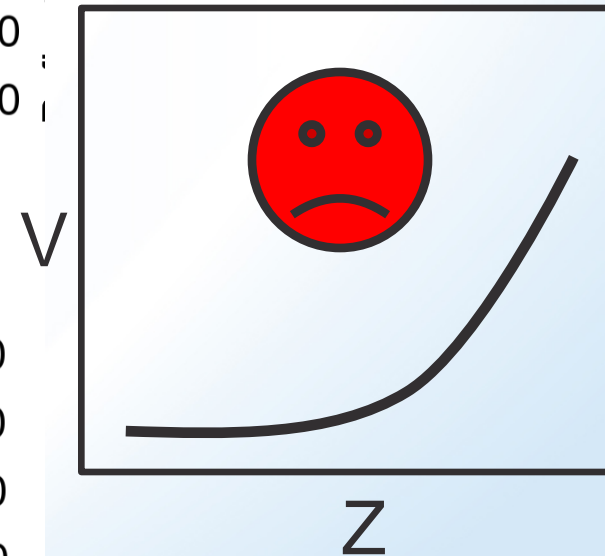
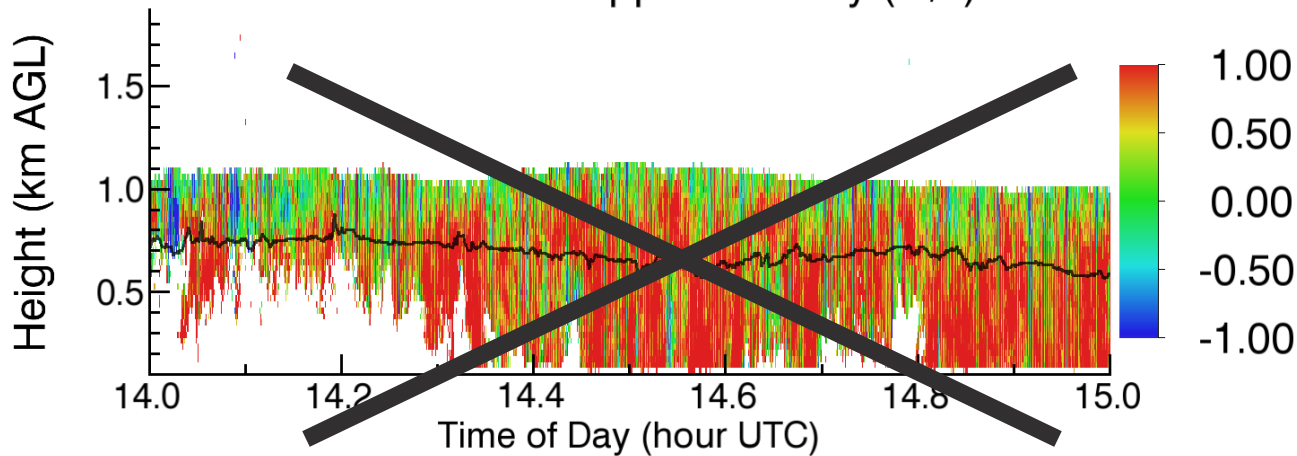


# Usefulness of measurements that are not motion compensated?

MAG 20121217 Reflectivity

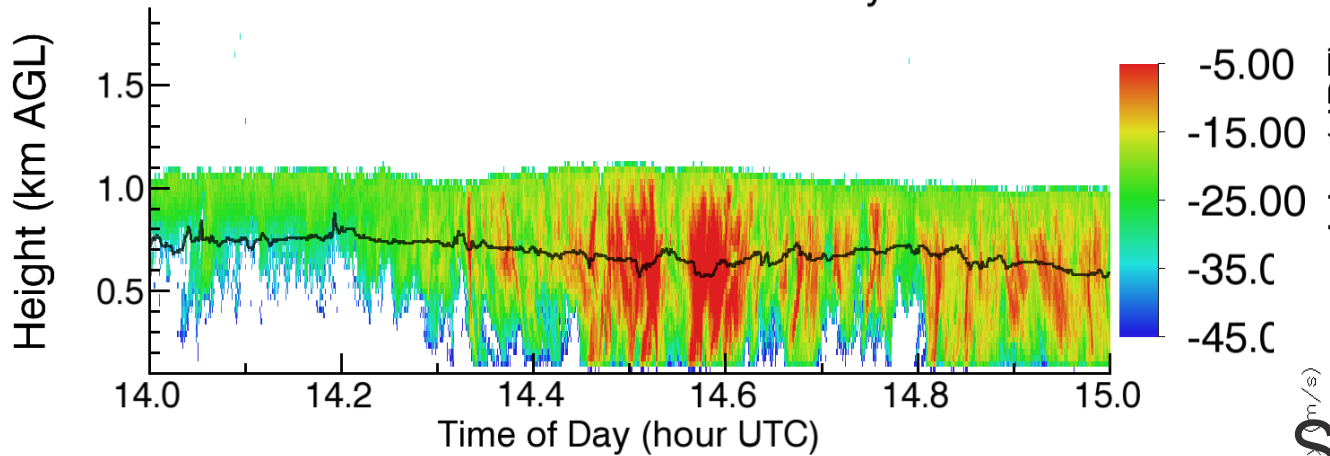


MAG 20121217 Mean Doppler Velocity (m/s) +down

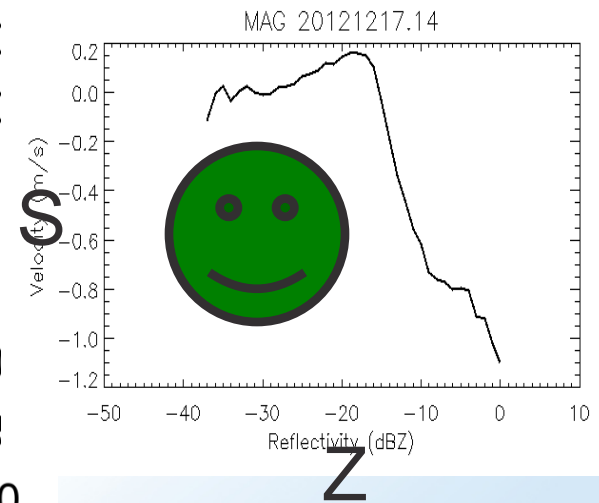
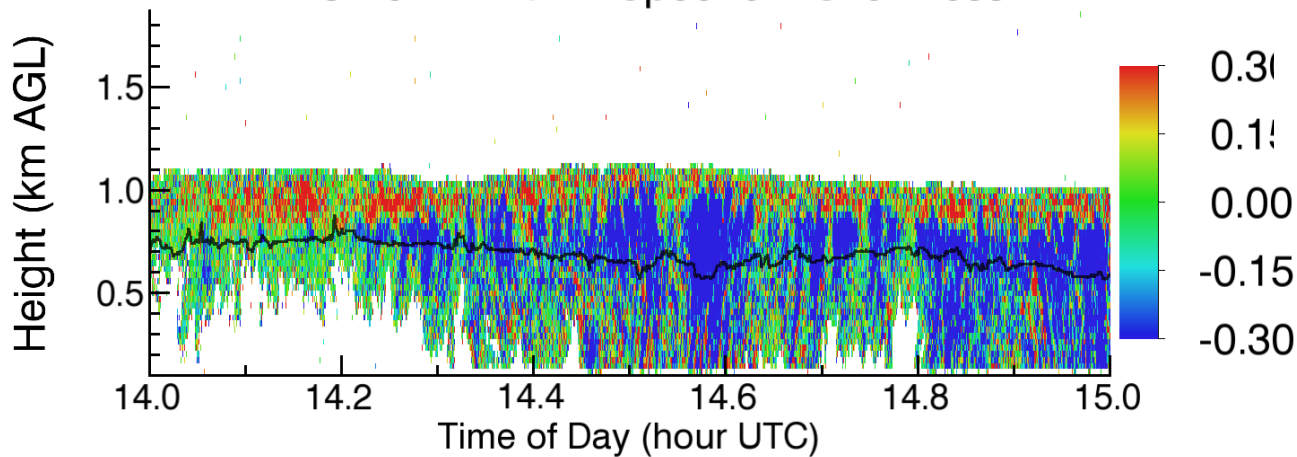


# Usefulness of measurements that are not motion compensated?

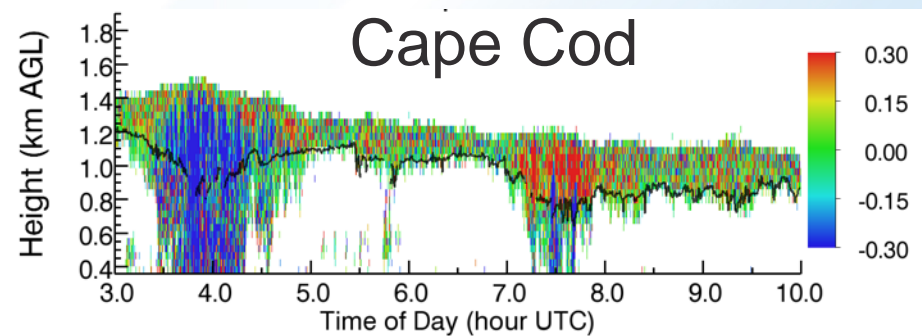
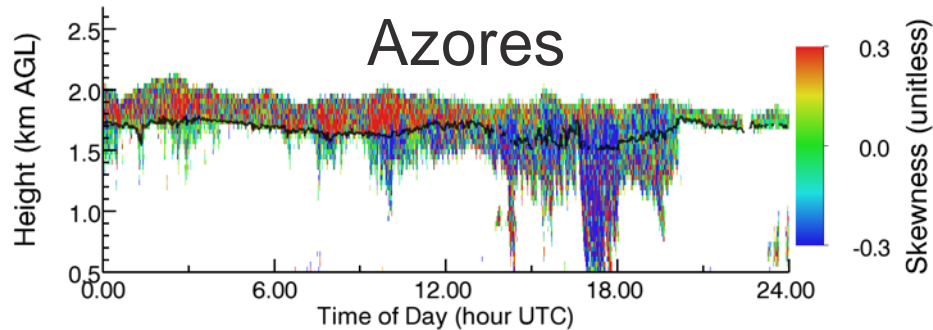
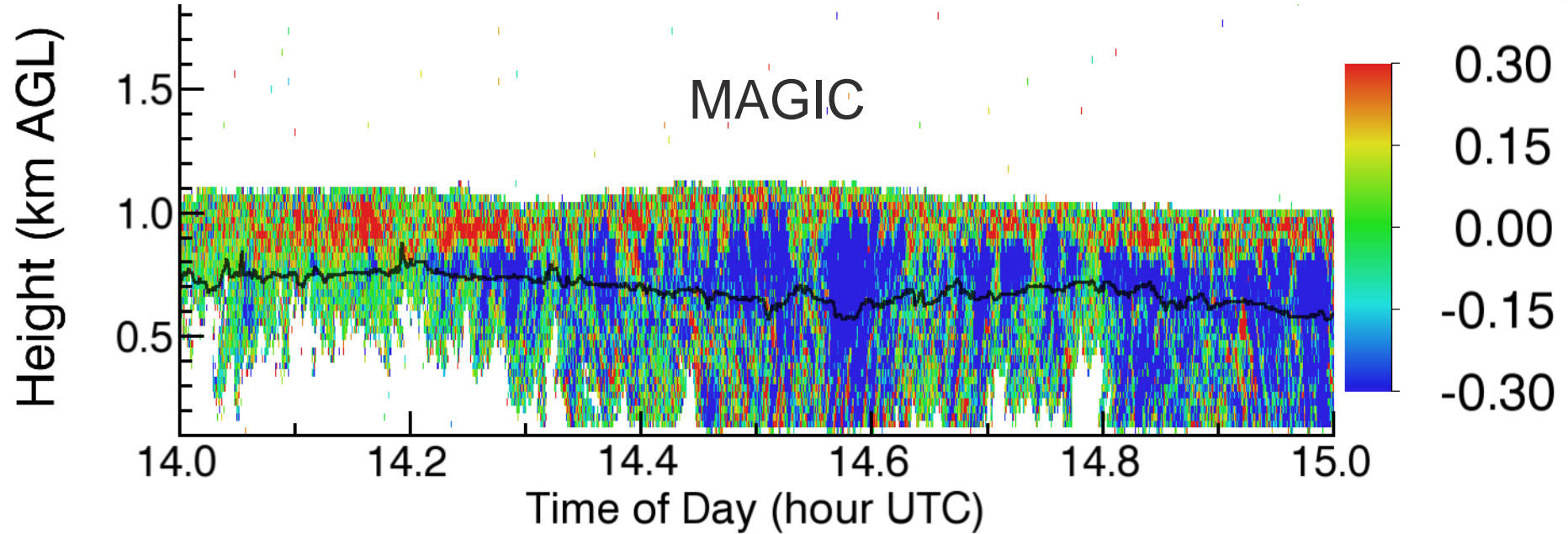
MAG 20121217 Reflectivity



MAG 20121217.14 Spectrum Skewness



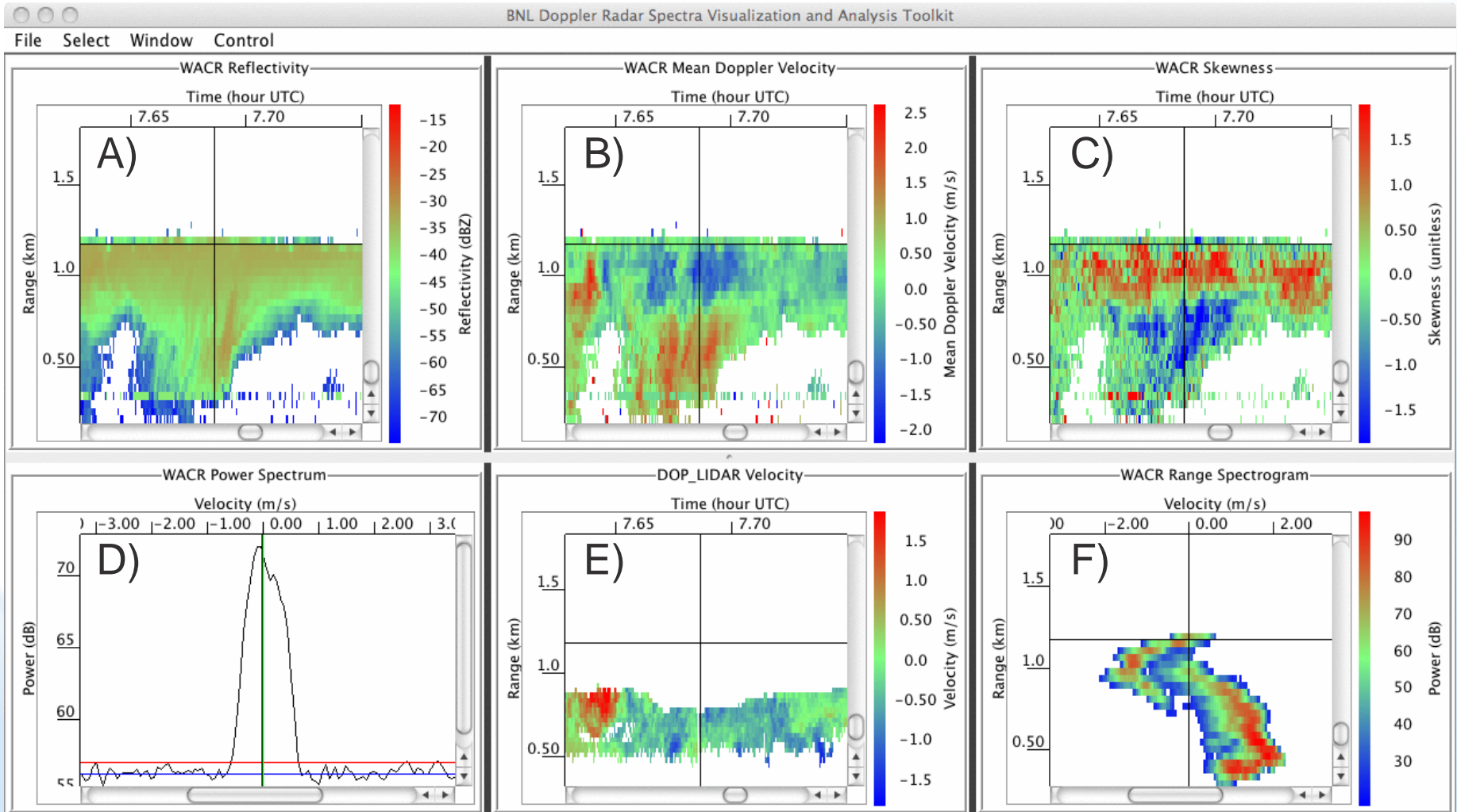
# Radar Doppler Spectrum Skewness



# Lightly Drizzling StCu at Cape Cod

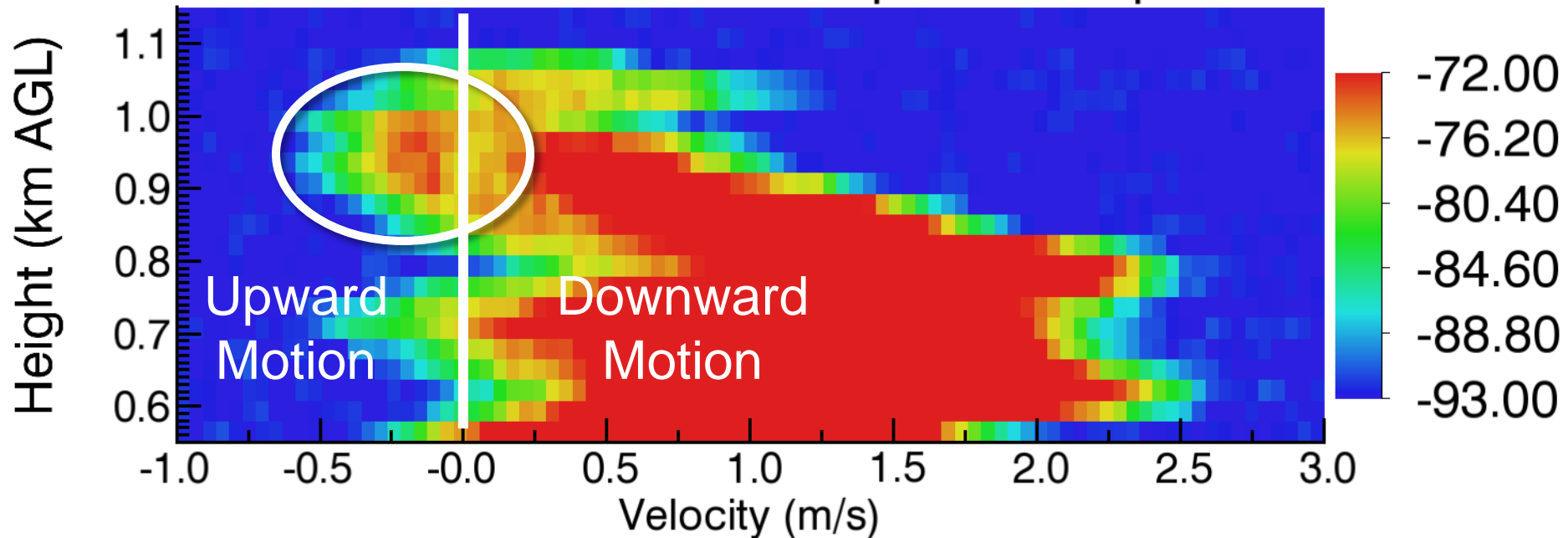
## November 22, 2012

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

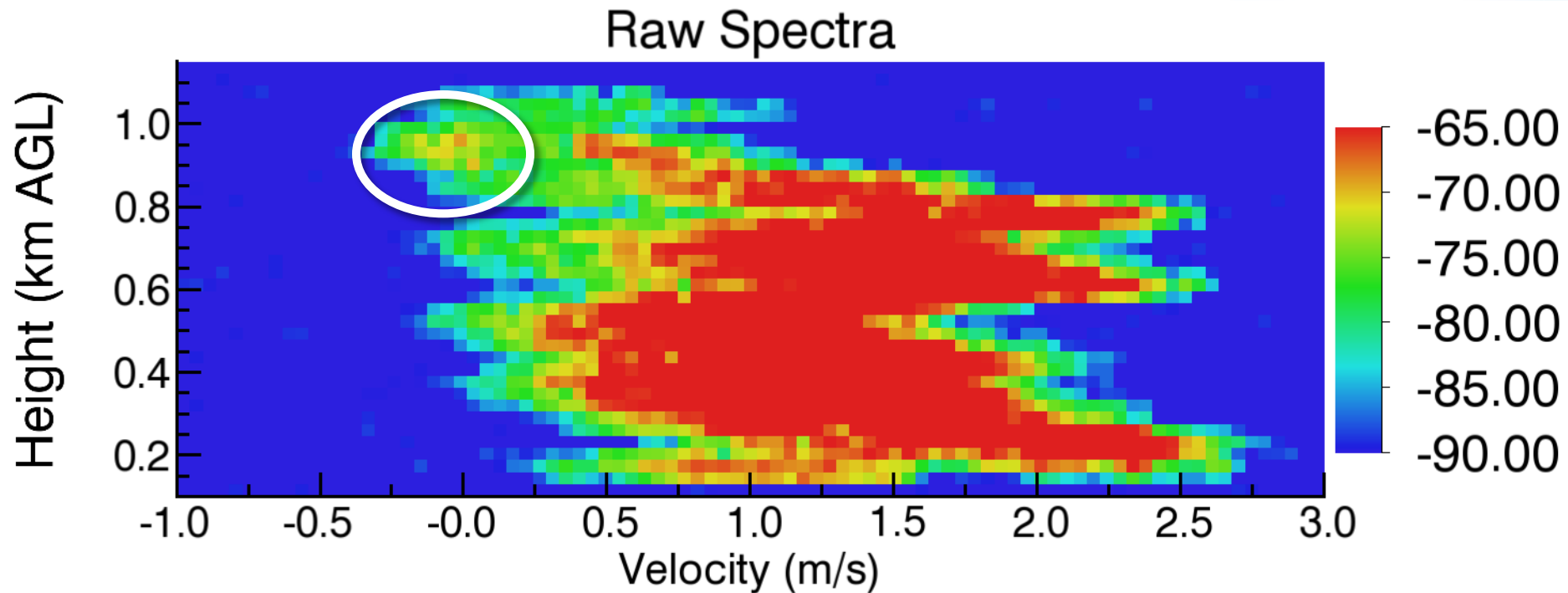


# Drizzling Cloud Spectrogram

MAG 20121217 Motion Compensated Spectra



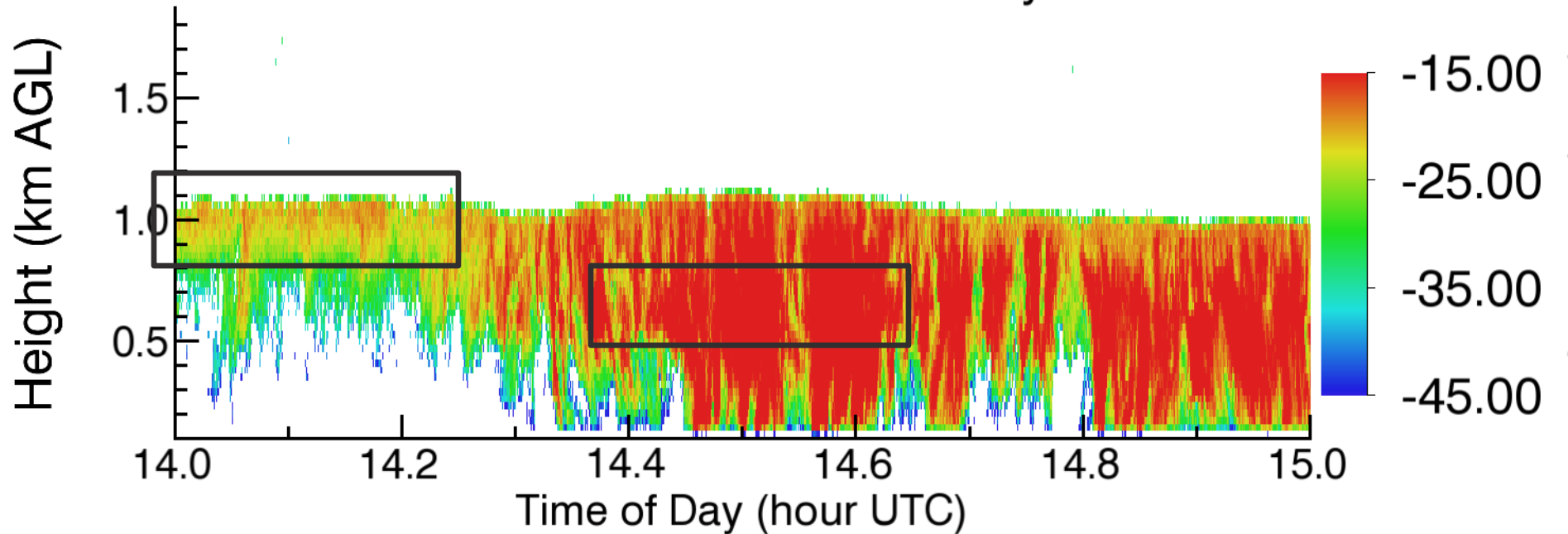
# Drizzling Cloud Spectrogram





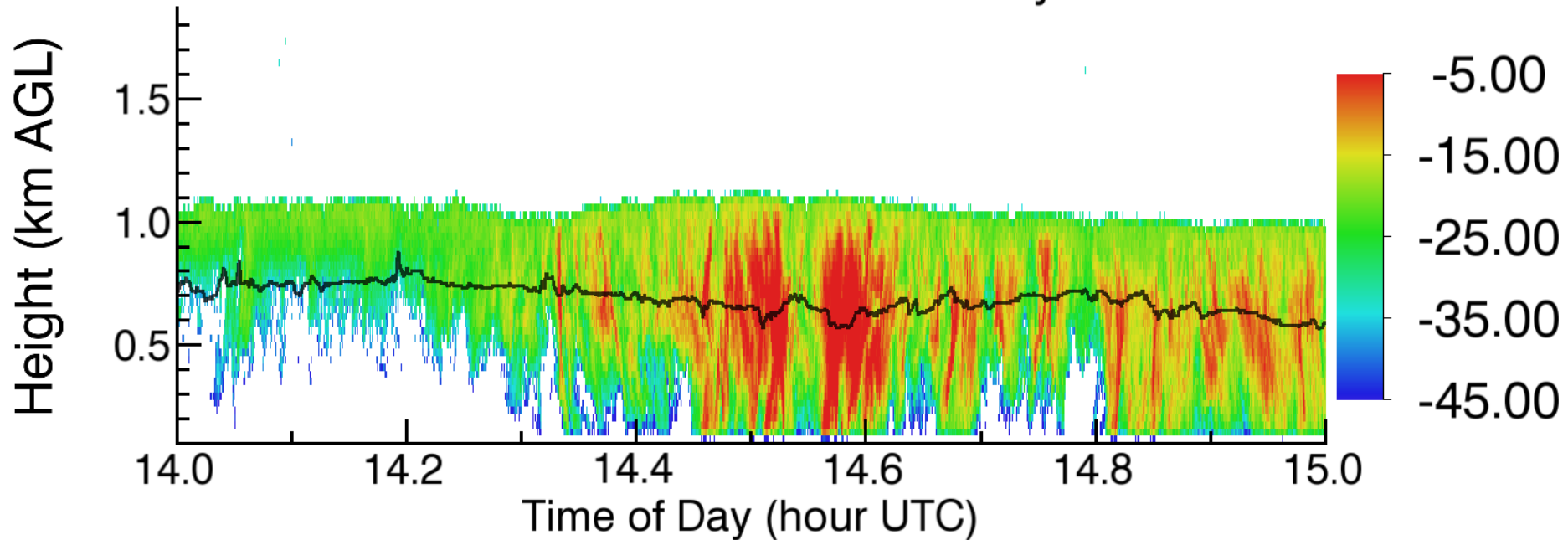
# Drizzling Cloud Reflectivity

MAG 20121217 Reflectivity



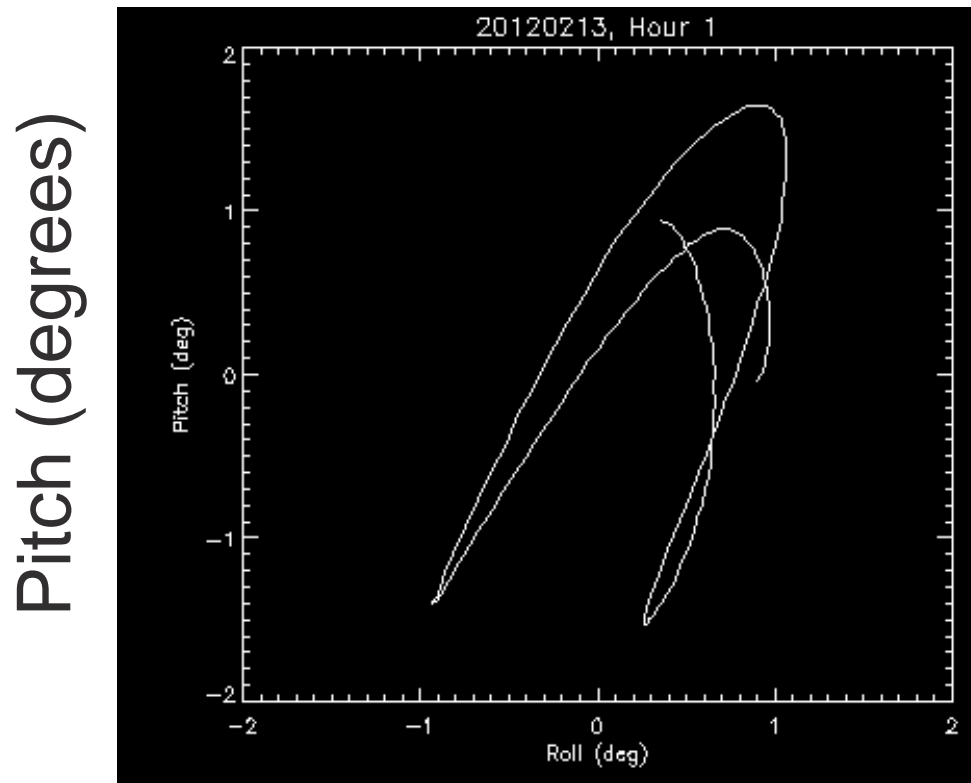
# Drizzling Cloud Reflectivity

MAG 20121217 Reflectivity



# A Word about Removal of Crosswind Coupling

Solution may be viewed as a modified VAD problem



Roll (degrees)

# A Word about Removal of Crosswind Coupling

...or, lacking INS data, a spectral analysis approach may be useful

