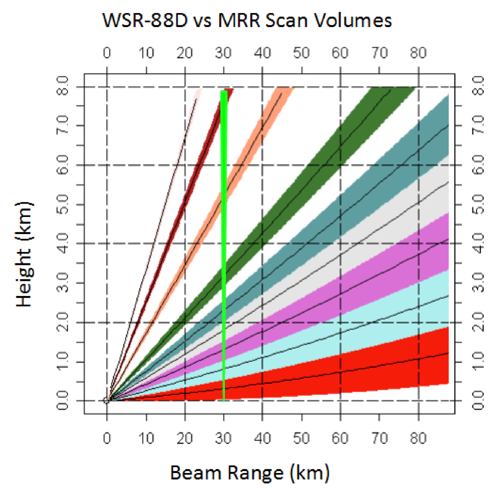

Determination of Relative Radar Calibration for Multi-Sampled Storm Volumes

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I. Introduction and Location

Goal

To determine the relative calibration offset between an operational scanning radar and a research vertically pointing radar

Equipment

NWS Radar (WSR-88D) Scanning Radar

- Large coverage volume
  - Slices ranging from 0.5 - 19° in elevation to a radius of 230 km
- Lower temporal and spatial resolutions
  - 5-10 minutes per scan
- Volume dimensions @ 30km ~ 6.2 x 10^8 m^3:
  - Height – 785 m
  - Width – 785 m
  - Length – 1000 m

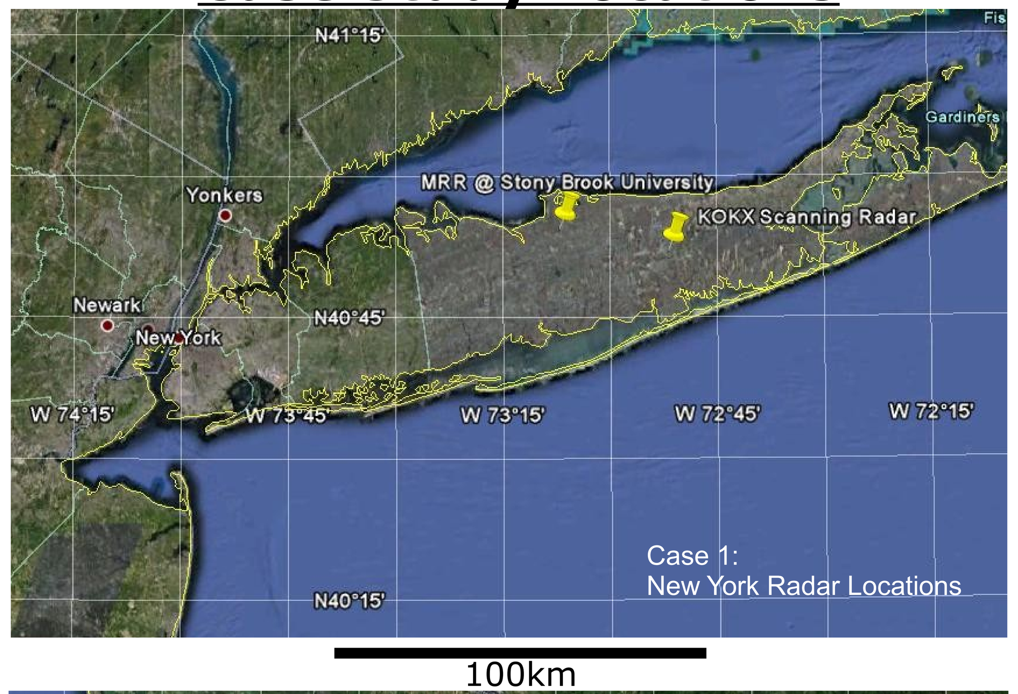
MicroRainRadar (MRR) Vertically Pointing Radar

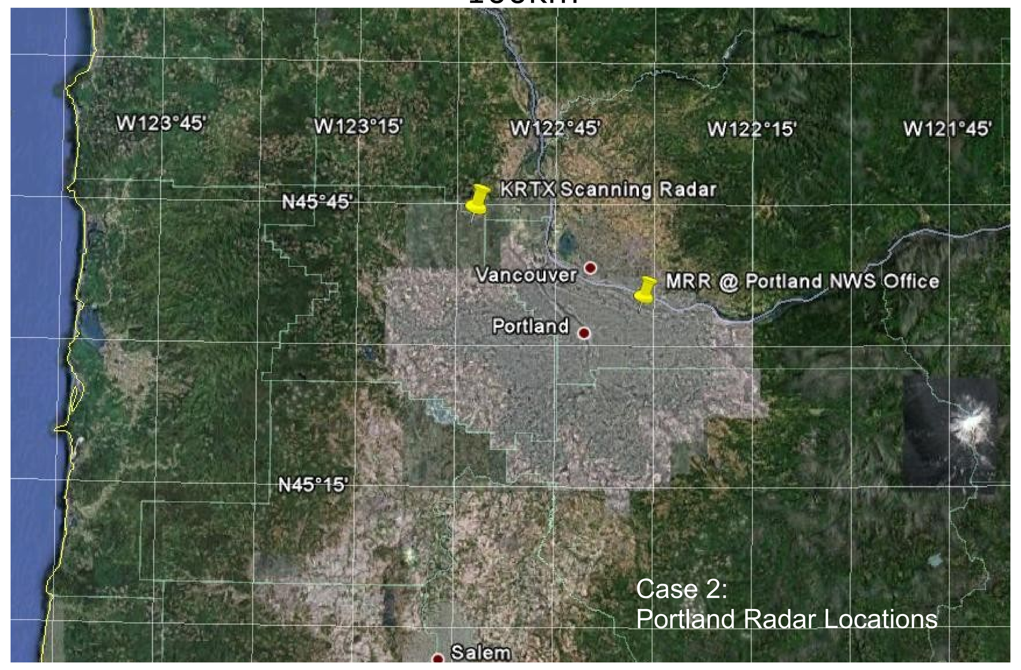
- Small coverage volume
  - Small fixed cone 2° wide with a max range of ~8km
- Higher temporal and spatial resolutions
  - 1 minute per scan
- Volume dimensions @ 3km ~ 2 x 10^6 m^3:
  - Height – 150-250 m
  - Width – 100 m
  - Length – 100 m

Complicating Factors

- Scanning radar resolution volume that encompasses the vertically-pointing radar has to be determined for each scan
- WSR-88D beam curves up with increasing distance due to refraction and the earth's curvature
- WSR-88D scan azimuth and elevation vary slightly with each scan

Case Study Locations

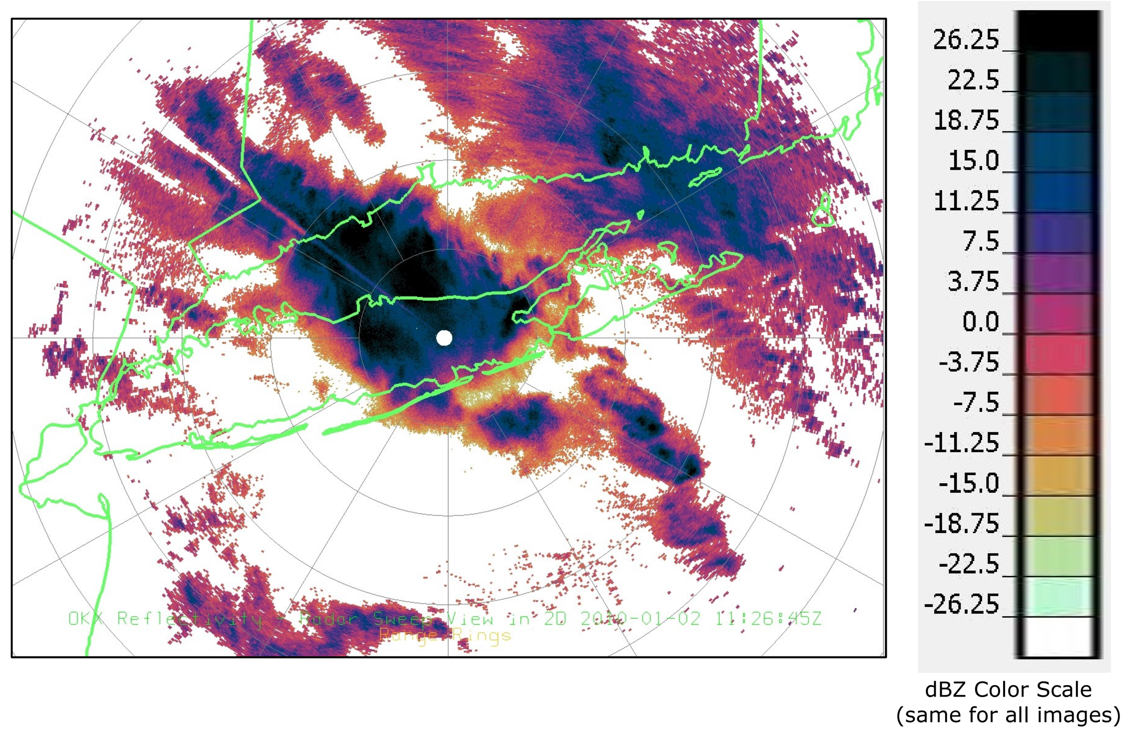




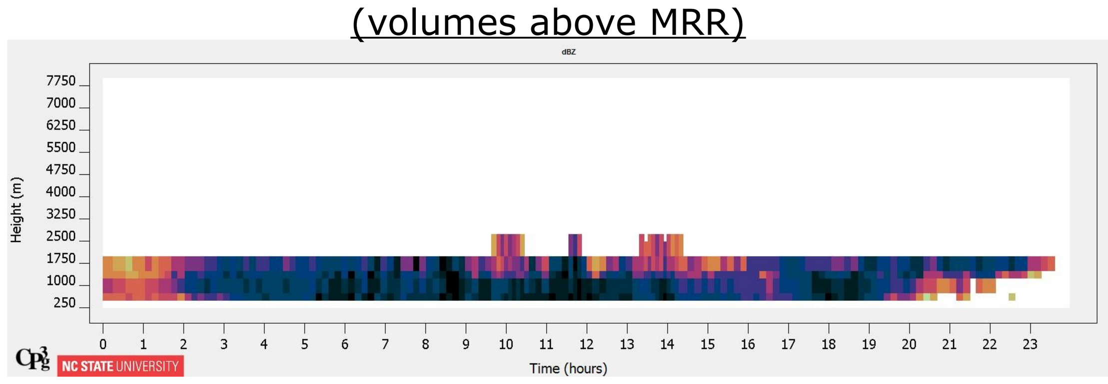
II. Data

Case 1: Long Island, New York

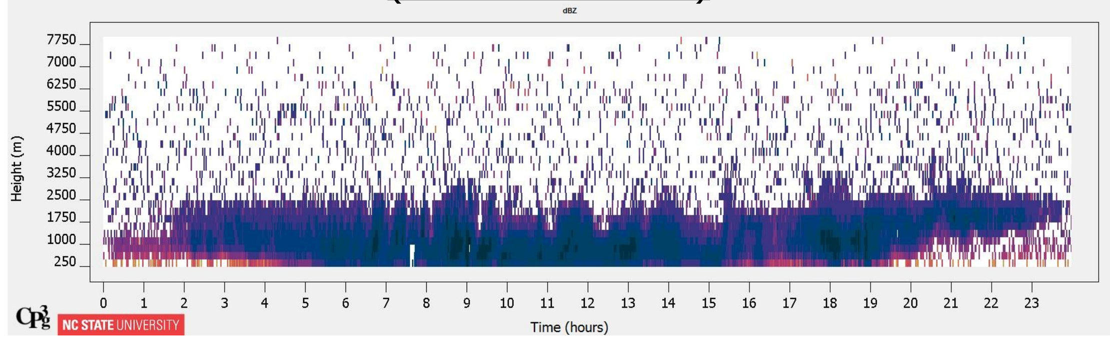
WSR-88D Scanning Radar for 1126 UTC 02 Jan 2010



WSR-88D Time vs Height for 02 Jan 2010 (volumes above MRR)



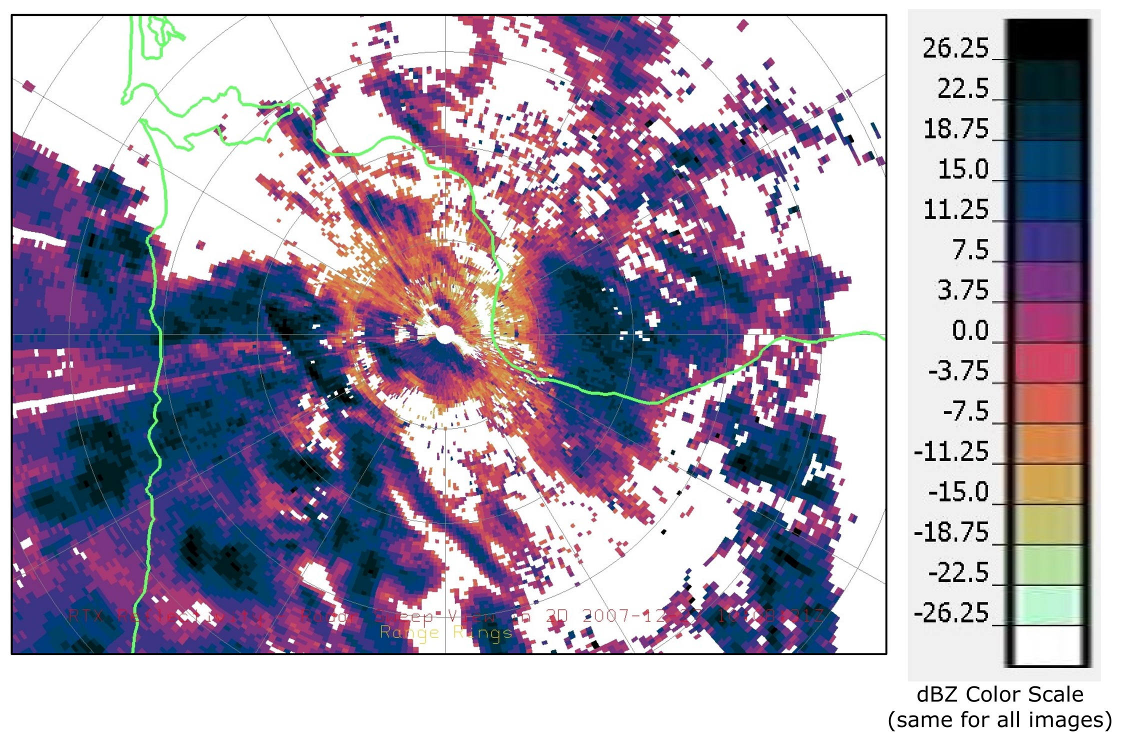
MRR Time vs Height for 02 Jan 2010 (offset = -0.8 dB)



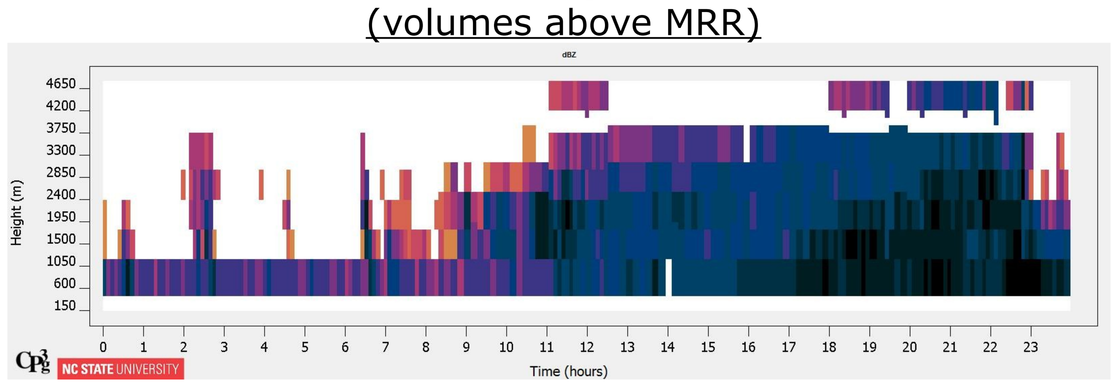
- Four snow events were compared between 1 January 2010 and 8 February 2010
- The example above shows that the MRR is well calibrated relative to the scanning radar (Note the significantly increased vertical and temporal resolution the MRR can provide)
- When properly cross-calibrated the two radars can be used together to provide valuable statistical data of storm duration, size, and intensity

Case 2: Portland, Oregon

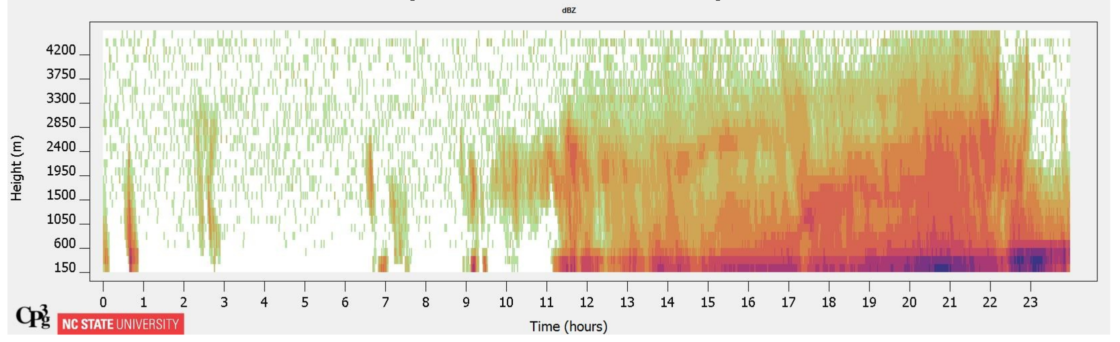
WSR-88D Scanning Radar for 1008 UTC 27 Dec 2007



WSR-88D Time vs Height for 27 Dec 2007 (volumes above MRR)



MRR Time vs Height for 27 Dec 2007 (offset = 27.9 dB)

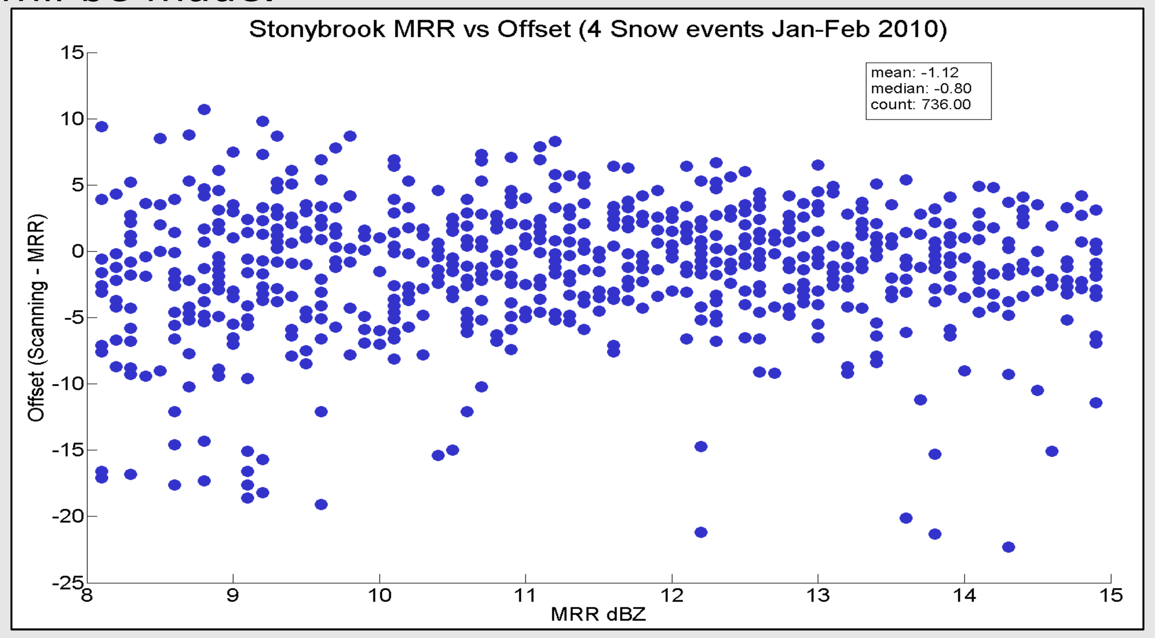


- Several storms were compared, only areas of lighter precipitation with relatively shallow rain columns were used
- For the example shown, only the hours of 7 to 19 UTC were used in making comparisons to the scanning radar for determination of the offset
- Later times were omitted due to the increased attenuation of the MRR in strong rain columns
- The storm above shows that the MRR has a substantial calibration offset from the scanning radar and requires correction before further statistical analysis can take place

III. Conclusions

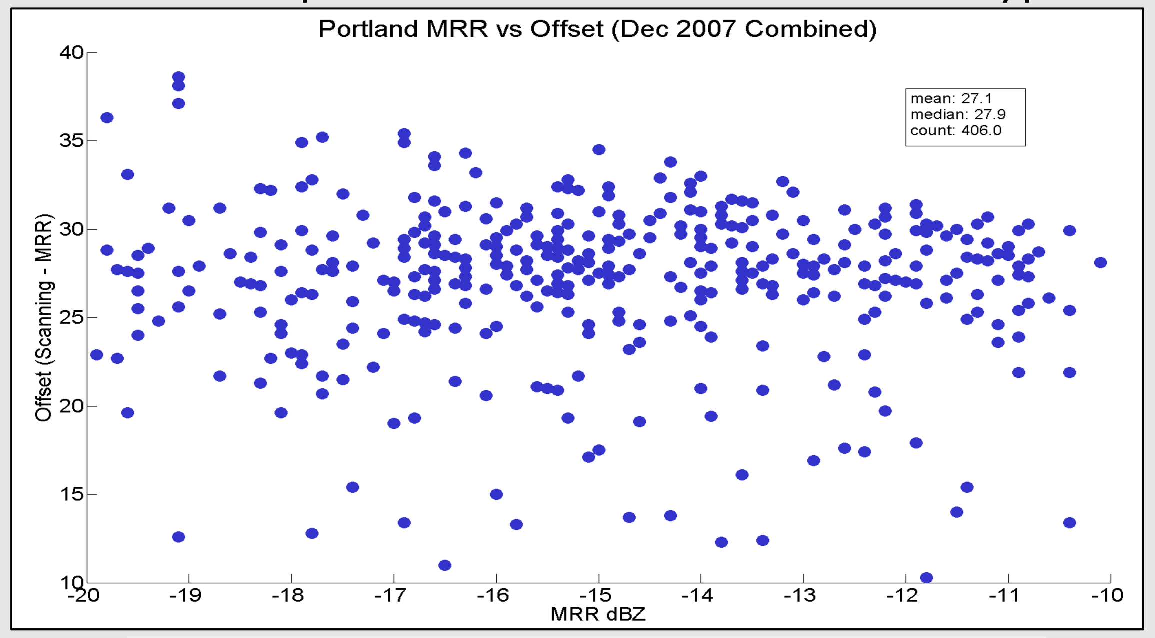
Case 1: Long Island, New York

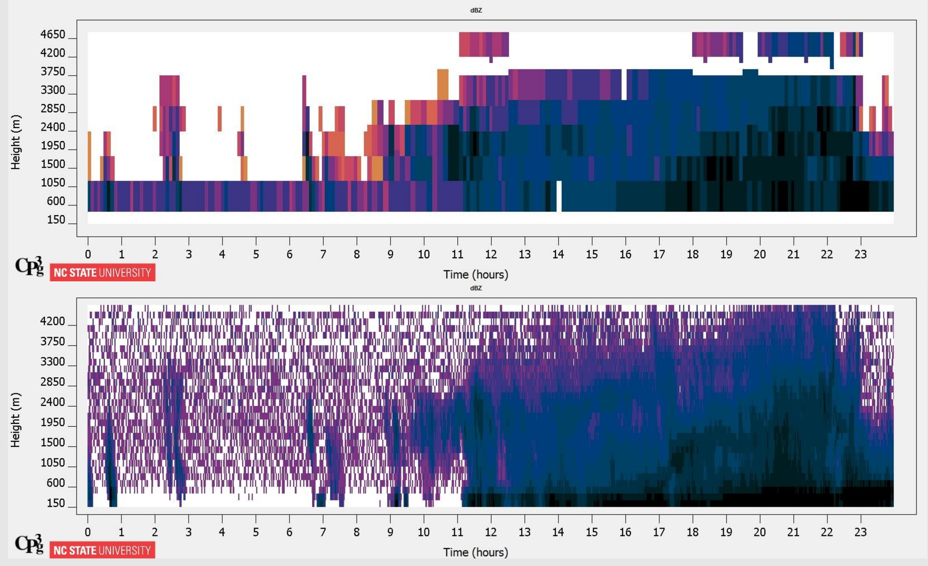
Shown here are the combined data for all 4 investigated storms. A median of -0.8 dB is well within the acceptable range of differences, so no correction will be made.



Case 2: Portland, Oregon

Shown here are the combined data for portions of several storms. The 406 points show a strong, flat distribution around the median value of 27.9 dB. This value will be added to the MRR values to allow for statistical comparisons between the two radar types.





The corrected MRR image (bottom) for Portland, OR 27 Dec 2007 in comparison to the scanning radar (top)

IV. Future Work

- This process will be repeated for further cases of interest in New York and Oregon and additionally in Colorado
- Comparisons of columns of MRR data with columns of forecast model output data will be made to improve forecast model accuracy

Acknowledgments

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