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Rainfall estimation using a C-band polarimetric radar

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1. Introduction

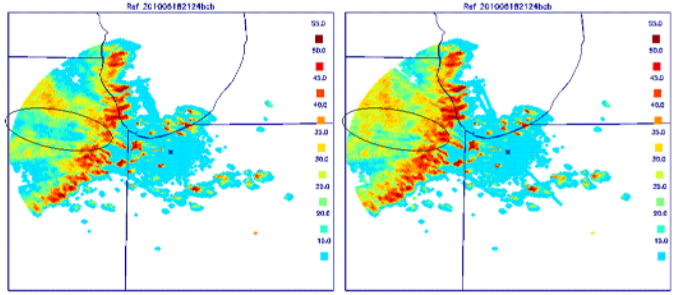
The ultimate objective is to estimate the **total rainfall** due to a specific weather system from polarimetric radar observations.

The steps involved in the pre-processing of the radar data include:

- **Calibration** of reflectivity (self-consistency: Gorgucci *et al* 1992, Gourley *et al* 2009) and differential reflectivity (vertical pointing)
- Correction for **attenuation** and **differential attenuation**

The method used in the estimation of rainfall is the one described in Gorgucci et al. 2001 applied to a C-band radar (Gorgucci, personal comunication).

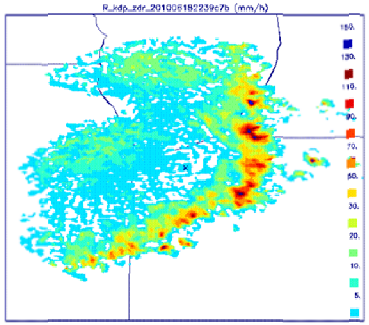
2. Attenuation



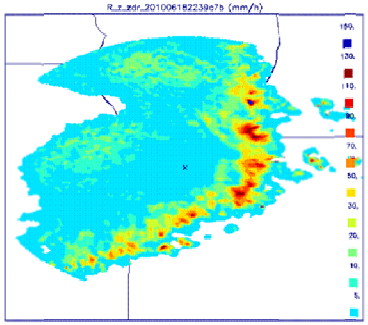
Before Correction After Correction

3.1 Results: Rain Rate

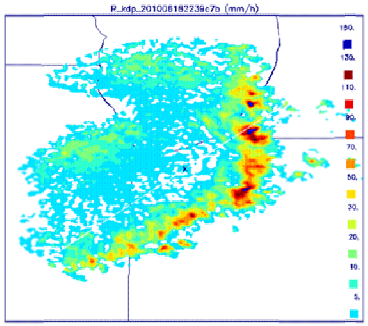
Rain rate (mm/h) at 2239Z



$$R_\beta(K_{dp}, Z_{dr}) = c_3 K_{dp}^{a_3} 10^{0.1 b_3 Z_{dr}}$$

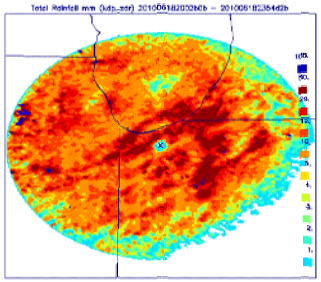


$$R_\beta(Z_h, Z_{dr}) = c_1 Z_h^{a_1} 10^{0.1 b_1 Z_{dr}}$$



$$R_\beta(K_{dp}) = c_2 K_{dp}^{a_2}$$

3.2 Results: Total precipitation



4. Validation (future work)

Comparison with ground observations

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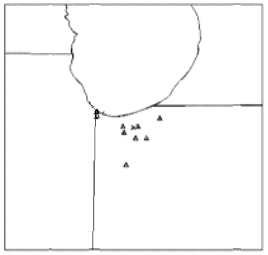

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References

Gorgucci, E., G. Scarchilli and V. Chandrasekar, 1992: Calibration of radars using polarimetric techniques. *IEEE Transactions on Geoscience and Remote Sensing*, 30, 853-858.

Gourley, J.J., A. J. Illingworth and P. Tabary, 2009: Absolute calibration of radar reflectivity using redundancy of the polarization Observations and implied Constraints on drop shapes. *Journal of Atmospheric and Oceanic Technology*, 26,689-703.

Gorgucci, E., G. Scarchilli, V. Chandrasekar, and V.N. Bringi,2001: Rainfall estimation from polarimetric radar measurements: composite algorithms immune to variability in raindrop shape-size relation. *Journal of Atmospheric and Oceanic Technology*, 18,1773-1786.