AN ATTENUATION CORRECTION TECHNIQUE BASED ON THE NETWORK OF RADARS

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It is well known problem that attenuation effect caused by precipitation can be significant at frequencies higher than S-band. For any quantitative applications that use reflectivity and/or differential reflectivity, radar observations need to be compensated for attenuation effects due to precipitation.

Since Hitchfeld and Borden (1954) proposed the attenuation correction technique based on empirical relationship of reflectivity (Z_h) versus specific attenuation (α_h), many attenuation correction algorithms have developed. For ground radars with polarimetric capability, a simple attenuation correction method using differential phase shift (ϕ_{dp}) was discussed in Bringi et al. (1990). Subsequently, a constrained solution for path-integrated attenuation (PIA) derived from ϕ_{dp} was proposed by Testud et al. (2000). This algorithm is sensitive to the specific attenuation versus specific differential phase (K_{dp}) parameterization. To eliminate this problem, Bringi and Chandrasekar (2001) suggested a self-consistent algorithm combining differential phase shift and differential reflectivity (Z_{dr}) constraint. Self consistency means that the optimal values of parameters for the α_h-K_{dp} relation and the differential specific attenuation (α_{dp})-K_{dp} relation corresponding to each ray profile are selected by combined ϕ_{dp} -Z_{dr} constraint. However this optimization method is still sensitive to signal fluctuation and backscattering phase, especially at higher frequencies.

Chandrasekar and Lim (2008) proposed a methodology for reflectivity retrieval in a networked radar environment. A solution for the specific attenuation distribution is provided by solving the integral equation for reflectivities from networked radars (Note that this method does not use the dual polarization observations).

This paper presents a network based attenuation correction system for a network of dual polarization radars, which combines the network approach and the conventional ϕ_{dp} based attenuation correction technique. The proposed method uses retrieved reflectivities and differential reflectivities as constraints for optimal value selection process. Fig. 1 depicts the conceptual arrangement for a network of radars.

In this paper the network based attenuation correction will be evaluated by using Collaborative Adaptive Sensing of the Atmosphere Integrated Project 1 (CASA IP1) radar data.

The preliminary results show that the networked based attenuation correction algorithm retrieves reflectivity properly. For extensive evaluation the retrieved results by the proposed system will be compared with the WSR-88D radar (KOUN) observations.

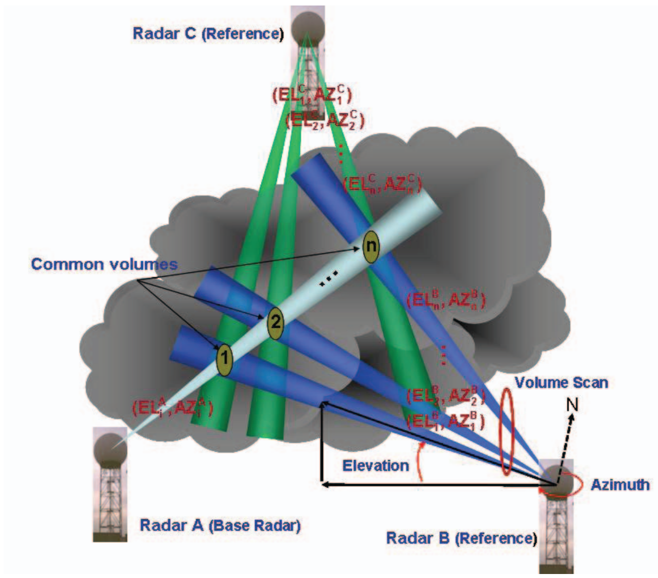

Fig. 1 The conceptual arrangement for the network of radars.

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