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Toward a representation of the error covariance matrix for the assimilation of radar rainfall measurements

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Traditionally, simplified diagonal error covariance matrices have been used for radar rainfall assimilation into numerical models, assuming low spatial correlation of the errors affecting radar rainfall measurements. In this framework, the main goal of the present work has been improving the analysis of the spatial and temporal structure of these errors. This has been the topic of some very recent work, mainly based on analyzing the residuals between rain gage and radar measurements. An alternative to this first approach would consist of studying the covariances of the different errors separately and their cross-covariances in a simulation framework. Here, we focus on the most important sources of error (at unattenuated wavelengths): (i) the uncertainty due to the Z-R transformation (already studied by Lee et al., 2007) and (ii) the errors associated with distance. The work has been carried out with reflectivity measurements obtained at ranges close to the McGill S-band radar in stratiform situations, which have been used to simulate radar observations at different ranges. The cross-covariance between both errors has been analyzed by comparing radar simulated reflectivity profiles with the uncertainty in the Z-R relationship observed by a collocated POSS disdrometer.

Lee, G.W., A. W. Seed, I. Zawadzki, 2007: Modeling the variability of drop size distributions in space and time. J. Appl. Meteor. Climatol. (in print).