Calibration of Ground Radars During the Mid latitude Continental Convective Cloud Experiment (MC3E)

Joseph C. Hardin and V. Chandrasekar

Colorado State University, Fort Collins, CO, 80523

This work provides a consistent table of the operational calibration biases of the primary ground radars in operation during the Mid Latitude Continental Convective Cloud Experiment (MC3E) in central Oklahoma. Inevitably, when operating radars small biases in the measurements get introduced from drifting performance of each of the many components that comprises the system, as well as from several different environmental variables. MC3E was a large joint campaign between the US Department of Energy and NASA consisting of many ground and airborne instruments working cooperatively to study mid latitude convective storms as part of the GPM Ground Validation field experiments. The primary ground radars have overlapping fields of view and are located nearby many other passive instruments such as disdrometers. Many of the ground radars have documented biases in their measurements that can have severe effects on derived products such as rainfall and attenuation corrected fields.

In this paper we will describe a technique that will determine the bias from the self-consistency principle of dual-polarization observations. Based on a combination of the analysis of the observations, a set of calibration guidance tables is developed for the biases of the primary ground radars, namely NASA's NPOL, and the DOE C-SAPR and X-SAPR radars throughout the campaign. The goal is to serve as a reference by which the data used may be corrected. Calibration biases for absolute reflectivity and differential reflectivity will be calculated using a combination of internal self consistency measures based on dual polarization variables that have been shown to be reliable indicators of calibration such as $\chi_{pp.}$,which is defined as the space of K_{dp}/ Z_h versus Z_{dr}. These variables will be compared against simulation results that provide bounds on the variables in different Drop Size Distribution (DSD) regions and allow us to ascertain whether the calibration of the radars is correct. Additionally we will take advantage of the overlapping fields of view between the different ground radars to ensure that the radars provide a coherent picture of the underlying DSD fields, accounting for attenuation in addition to system biases.