Comparison of Cloud Statistics Observed by Cloud and Precipitation Radars during the DYNAMO/AMIE Experiment at Addu Atoll

Zhe Feng1, Sally A. McFarlane1, Courtney Schumacher2, Scott Ellis3, Robert A. Houze4, Nitin Bharadwaj1

1PNNL; 2Texas A&M University; 3NCAR; 4University of Washington

This study compares the measurements from the S-Pol and SMART-R to those from the more sensitive KAZR during DYNAMO/AMIE field campaign in order to characterize the hydrometeor detection capabilities of the two scanning precipitation radars on Addu Atoll. Frequency comparisons for precipitating convective clouds and non-precipitating high clouds agree much better than non-precipitating low clouds for both scanning radars due to issues in ground clutter. On average, SMART-R underestimates convective and high cloud tops by 0.3 to 1.1 km, while S-Pol underestimates cloud tops by less than 0.4 km for these cloud types. S-Pol shows excellent dynamic range in detecting various types of clouds and therefore its data are well suited for characterizing the evolution of the 3D cloud structures, complementing the profiling KAZR measurements. For detecting non-precipitating low clouds and thin cirrus clouds, KAZR remains the most reliable instrument. However, KAZR is attenuated in heavy precipitation and underestimates cloud top height due to rainfall attenuation 4.3% of the time during DYNAMO/AMIE. An empirical method to correct the KAZR cloud top heights is described, and a merged radar dataset is produced to provide improved cloud boundary estimates, microphysics and radiative heating retrievals.