2.13 CONVECTIVE CLOUD TOP HEIGHTS IN NORTHERN AUSTRALIA IN DIFFERING WET SEASON REGIMES

R. JACKSON[1], S. COLLIS[1], A PROTAT[2], V LOUF[2], W LIN[3], A. VOGELMANN[3], S. ENDO[3]
[1] Argonne National Laboratory, USA
[2] Bureau of Meteorology, Australia
[3] Brookhaven National Laboratory, USA
rjackson@anl.gov

General circulation models (GCMs) have difficulty representing the hydrological cycle owing, in part, to the parameterization of convective systems. Furthermore, mechanisms coupling large scale forcing and convective organization are not well represented, leading to a poor representation of the macrophysical properties of convection. The U.S. Department of Energy (DOE) Energy Exascale Earth System Model (E3SM) aims to run at a regionally refined resolution of 12 km. At this scale mesoscale motions are partially resolved but how they interact with the convective parameterization is unknown. This prompts the need for observational datasets to validate the macrophysical characteristics, including cloud top heights, of convection in simulations and guide model development in E3SM in several regions of the globe. This presentation will showcase a radar based study of convective systems observed at the Tropical Western Pacific (TWP) ARM site in Darwin, Australia and the surrounding maritime continent. In Darwin clear forcing regimes occur during the wet season from November to April with the onset and break of the Northern Australian Monsoon and the phase of the Madden-Julian Oscillation (MJO) which can alter the characteristics of convection over the region. The echo top heights (ETHs) are derived using a novel technique based on reflectivity and velocity texture from fifteen years of continuous plan position indicator scans from the C-band POLarimetric (CPOL) radar. ETHs in convective regions are 2 to 3 km lower than those retrieved by the Multifunctional Transport Satellites over Darwin at ETHs greater than 10 km, suggesting that the radar underestimates the vertical extent of deep convection. Bimodal distributions of convective echo top heights have been observed at heights of 5 to 7 km and at 12 to 13 km during break conditions. More unimodal ETH distributions are observed when the convective mode of the MJO is over Australia. A stable layer present at 4 km can likely explain the bimodality seen in break conditions. During the daytime, the spatial distribution of ETHs are more consistent with the presence of Hector and seabreeze convergence lines during break conditions. At night and during monsoon conditions, the spatial distributions are consistent with more widespread mesoscale convective systems.