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The dynamical and microphysical properties of wet season convection in Darwin as a function of wet season regime.

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A known deficiency of general circulation models (GCMs) is in their representation of convection (Arakawa 2004), typically parameterized using given assumptions about entrainment rates and mass fluxes that depend on the dynamical and microphysical characteristics of convection and lack any sort of representation of the organization of convection. Furthermore, mechanisms that couple large scale forcing and convective organization are poorly represented (Del Genio 2012). The Accelerated Climate Model for Energy (ACME) version 1 aims to run at resolutions of 25 km, too coarse for convective parameterizations used in large eddy simulations but too fine for typical convective parameterizations used in GCMs. This prompts the need for observational datasets to validate simulations and guide model development in ACME in several regions of the globe.
The focus of this study will be at the Tropical Western Pacific (TWP) site in Darwin, Australia and the surrounding maritime continent. In Darwin, well defined forcing regimes occur during the wet season of September to April with the onset and the break of the Northern Australian Monsoon (Drosdowsky 1996; Pope et al. 2009). In this study, the vertical velocities retrieved from over ten years of continuous plan position indicator scans from the C-band POLarimetric and Berrima radars stationed at the Atmospheric Radiation Measurement TWP site in Darwin are derived. This long term dataset in such a region provides an opportunity to explore the statistics of vertical velocities in convection as a function of large scale forcing and modes of convective organization. Initial attempts to classify the convective organizational state and derive vertical velocities using three-dimensional variational data retrieval (Potvin et al. 2012) are shown. The results will be used to validate ACME Regionally Refined Mesh simulations over Darwin as well as guide convective parameterization development.