Abstract:

Observations of hydrometeor characteristics throughout the lifecycle of convective storms in Hawaii are scarce. The lack of detailed observations has limited our understanding of the microphysical processes in tropical precipitation formation. The utility of dual-polarization weather radar for determining hydrometeor characteristics has been known for some time, but until the recent upgrade of the WSR-88D operational radars this technology has been limited to research radars and field projects. Dual-polarization radars can measure precipitation backscatter with both horizontal and vertical polarization, allowing them to retrieve hydrometeor characteristics in two dimensions. With this technology, it is possible to gather information about hydrometeor size, shape, and type and deduce information about the underlying microphysical processes that are occurring in the convective environment. The arrival of the DOW 7 Mobile X-Band Dual-Polarization Radar with the Hawaiian Educational Radar Opportunity (HERO) project in October 2013 provided a unique opportunity to record high-resolution dual-polarization radar data on Oahu. On 27 October, a weakened trade wind inversion allowed sea-breeze convection to develop relatively deep cumulus in the Central Valley. Observations of the entire lifecycle of a convective cell from initiation to dissipation were analyzed. The analyzed cell stayed primarily below the freezing level and generated significant precipitation in 30 minutes through the warm rain process, with reflectivity exceeding 50 dBZ. Vertical columns of convection were analyzed using contour frequency by altitude diagrams (CFADs), and probability distributions of reflectivity and differential reflectivity. Preliminary analysis of Hurricane Ana, which recently passed very close to three recently upgraded dual-polarization WSR-88D radars, will also be discussed.