ABSTRACT

Using Eglin Air Force Base, Florida afternoon rawinsonde sounding data, this study investigated the thermodynamic characteristics of the summertime U.S. Gulf Coast wet microburst environment. Uniquely, these soundings sampled the troposphere during a period (1700-2100 UTC) of weak vertical wind shear, peak boundary layer mixing and thermodynamic instability prior to the release of deep convection. Using data over a six year period (1998-2003), mean soundings were generated to operationally distinguish between wet microburst event and non-event days (i.e., days with thunderstorms, but no microbursts). A composite of summer month mean soundings was generated to illustrate the effects of seasonal progression on the regional thermal and moisture vertical profiles.

The event day mean sounding is warmer and more moist below the melting level and vice versa above. It possesses a greater surface to freezing level lapse rate and a higher absolute value of boundary layer moisture compared to the non-event mean sounding. The chance of a wet microburst occurring becomes relatively higher when mixed-layer convective available potential energy >3095 J kg^{-1}, surface-900 hPa mean mixing ratio >17.6 g kg^{-1}, surface-freezing level lapse rates >7.97 C km^{-1} and relatively lower when mixed-layer convective available potential energy <1350 J kg^{-1}, surface-900 hPa mean mixing ratio <13.5 g kg^{-1}, surface-freezing level lapse rates <6.84 C km^{-1}. Seventy-five percent of the non-event mixed-layer convective available potential energy distribution is <1350 J kg^{-1}, which in itself, provides a great deal of confidence when forecasting the non-event. Not unlike past studies, results reveal that in order for a microburst to occur in this type of environment, enough thermodynamic instability must first exist in order to produce a strong enough updraft to reach well into the dry layer.