Supplemental Material

In Figs. 2 and 3 of the main text, composites were based on deep convective events meeting stringent criteria (minimum precipitation rates of 10 mm h^{-1} and coincident with $\Delta\theta_e$ of -5° C or less, as well as complete data coverage from the radar wind profiler in the hour surrounding the precipitation maximum). Additionally, the data were averaged by convection type (isolated cell or MCS). Here, we composite without requiring both criteria or complete data coverage from the radar wind profiler. All events with a minimum $\Delta\theta_e$ less than or equal to -5°C within a 12 h window are averaged and shown in Fig. S1 (183 events), and events with precipitation rates greater than or equal to 10 mm h^{-1} within a 12-h window are averaged and shown in Fig. S2 (166 events). Error bars are +/- 1 standard deviation with respect to time 0. A total of 65 events meet both criteria coincidentally, and from this sample of 65, 28 are used in the main body of the text (11 isolated cases, 17 MCSs). The cases composited in Figs. 2 and 3 are listed in Table I.

The composites based on $\Delta\theta_e$ (Fig. S1) show marginal differences in the thermodynamic variables compared to the composite based on precipitation (Fig. S2): lower relative humidity, higher temperature, and higher CWV. It is likely that this results from a daytime bias for the composites in Fig. S1. They do, however, differ in their respective mean rain rates and $\Delta\theta_e$ at time 0, confirming that not all precipitation produces $\Delta\theta_e$ of -5° C or greater and vice versa.

Lastly, mean profiles of θ_e and relative humidity are shown in Fig. S3 for the isolated and MCS cases leading the passage of the convective systems by up to 6 h. The MCS cases have higher RH and θ_e throughout the column than the isolated cases, except for in the boundary layer, consistent with the higher CWV observed in the composites of Fig. 3 compared to Fig. 2.

Date	Time (UTC)	Date	Time (UTC)
03/27/14	13:30	03/11/14	15:30
03/31/14	07:00	03/17/14	18:30
04/01/14	16:00	05/20/14	17:00
05/16/14	18:00	07/17/14	21:30
06/19/14	16:00	08/15/14	19:30
06/21/14	02:30	09/09/14	19:30
07/03/14	10:30	09/13/14	17:30
07/22/14	20:00	09/22/14	15:30
08/16/14	15:00	10/06/14	16:30
10/04/14	15:00	01/04/15	16:30
10/12/14	05:00	02/03/15	21:30
10/18/14	15:00	03/02/15	21:00
01/10/15	14:00		
01/14/15	18:00		
01/19/15	20:00		
03/29/15	16:30		
04/25/15	16:00		
07/22/15	14:00		

Table I: Dates and times (UTC) of MCS (left column) and isolated cell (right column) passage. Data is obtained from the timeseries of $\Delta\theta_e$ (30-min averages) and signifies the timestep before the drop in equivalent potential temperature observed at the surface.

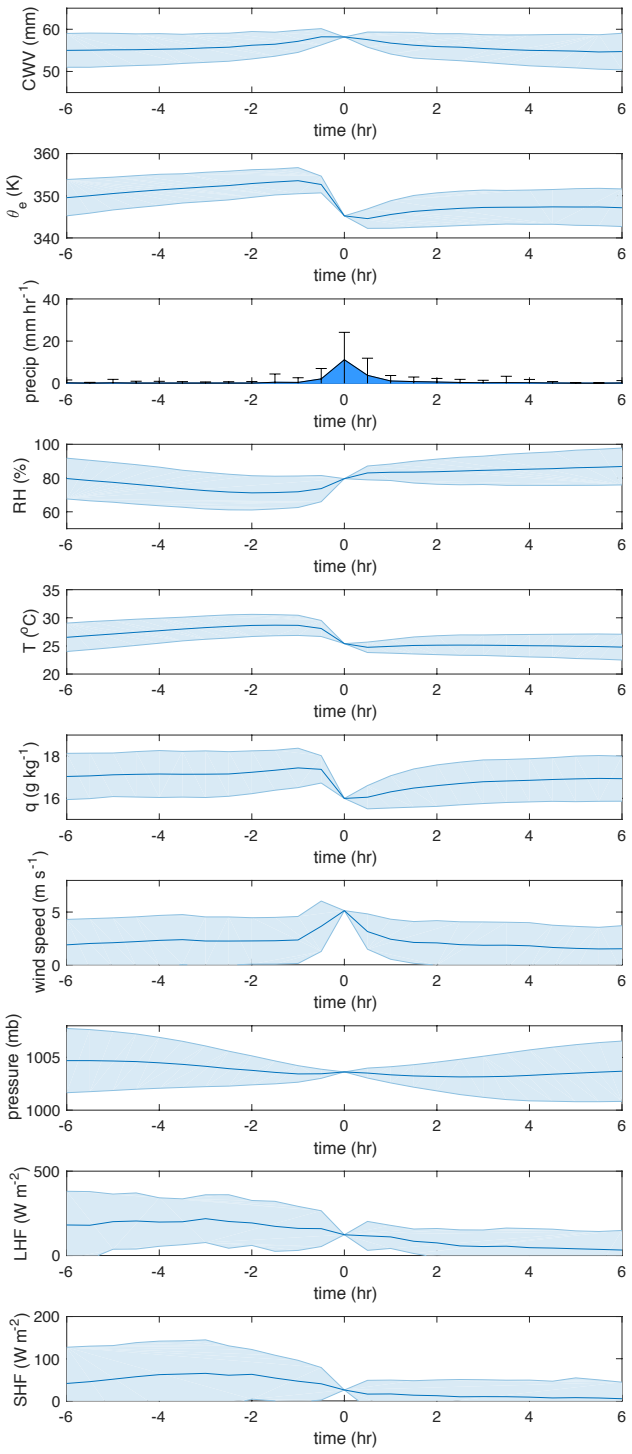

Figure S1: Composites of meteorological variables from the AOSMET station at site T3 (GOAmazon) 6 h leading and 6 h lagging drops in equivalent potential temperature less than or equal to -5^o K. 183 events total, sampled from 10 Jan 2014–20 Oct 2015, contribute to the composite. Error bars are +/- 1 standard deviation with respect to time 0.

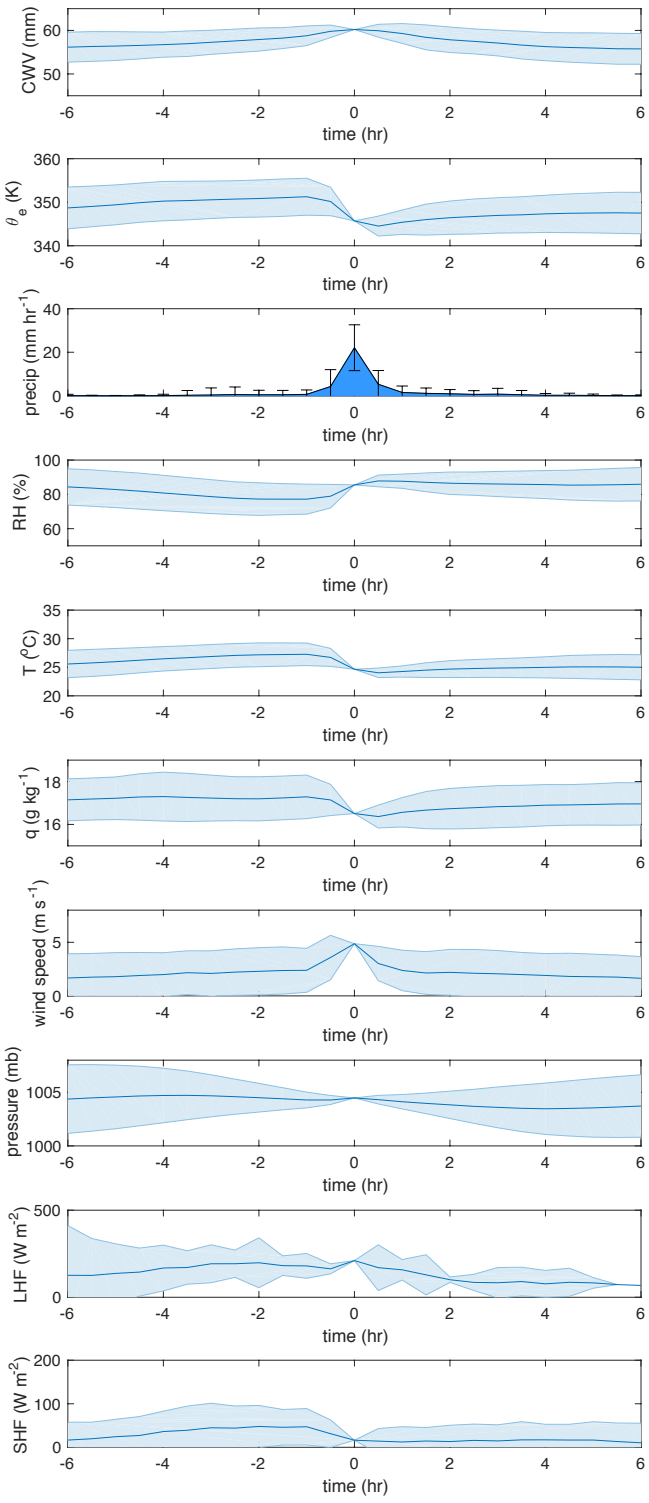

Figure S2: Same as Fig. S1, except composites are based on precipitation rates greater than 10 mm h^{-1} instead of $\Delta\theta_e$. 166 events are averaged, 65 of which are coincident with drops in $\Delta\theta_e$ less than or equal to -5^o K and thus included in the composites in Fig. S1.

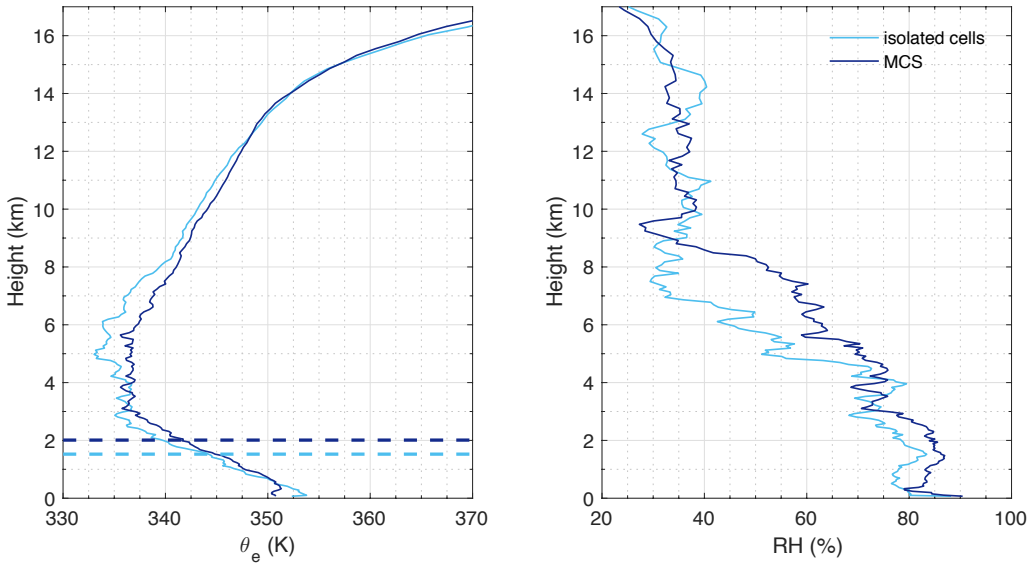

Figure S3: Mean thermodynamic profiles (equivalent potential temperature, left; relative humidity, right) within 6 hours leading the passage of a deep convective event. Dashed lines at 1.3 km and 2.0 km (with an average pressure of 860 mb and 800 mb, respectively) indicate the first altitude at which the minimum surface θ_e matches the θ_e in the vertical profile for isolated cells and MCSs, respectively.