

Figure 1: Radar reflectivity CAPPI's at a height of 2 km for the 930209 ship-MCS at (a) 0932 UTC, (b) 1032 UTC, (c) 1132 UTC, and (d) 1212 UTC. The location of the MIT (TOGA) radars are indicated by the filled circle (triangle) in each panel.

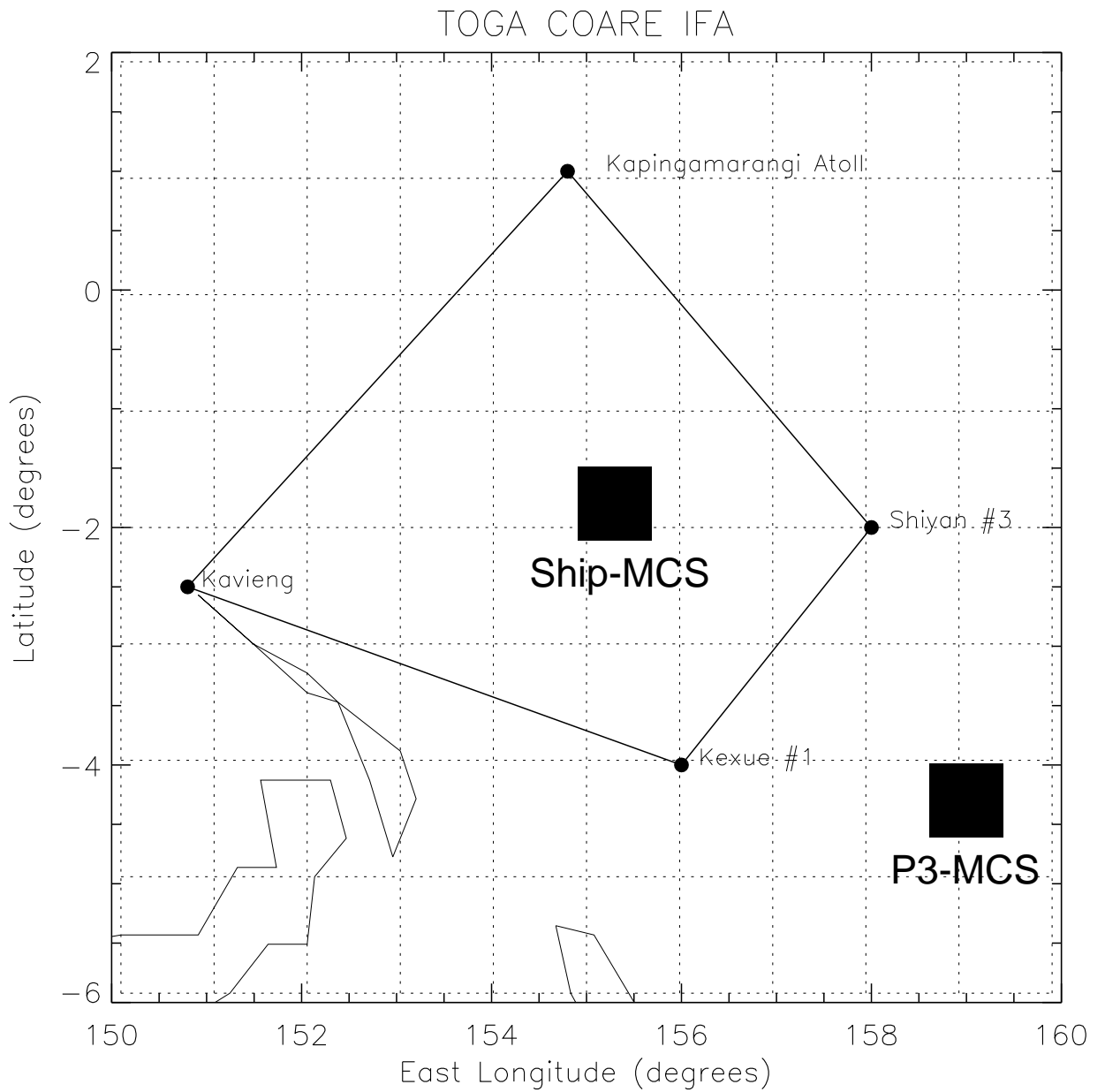
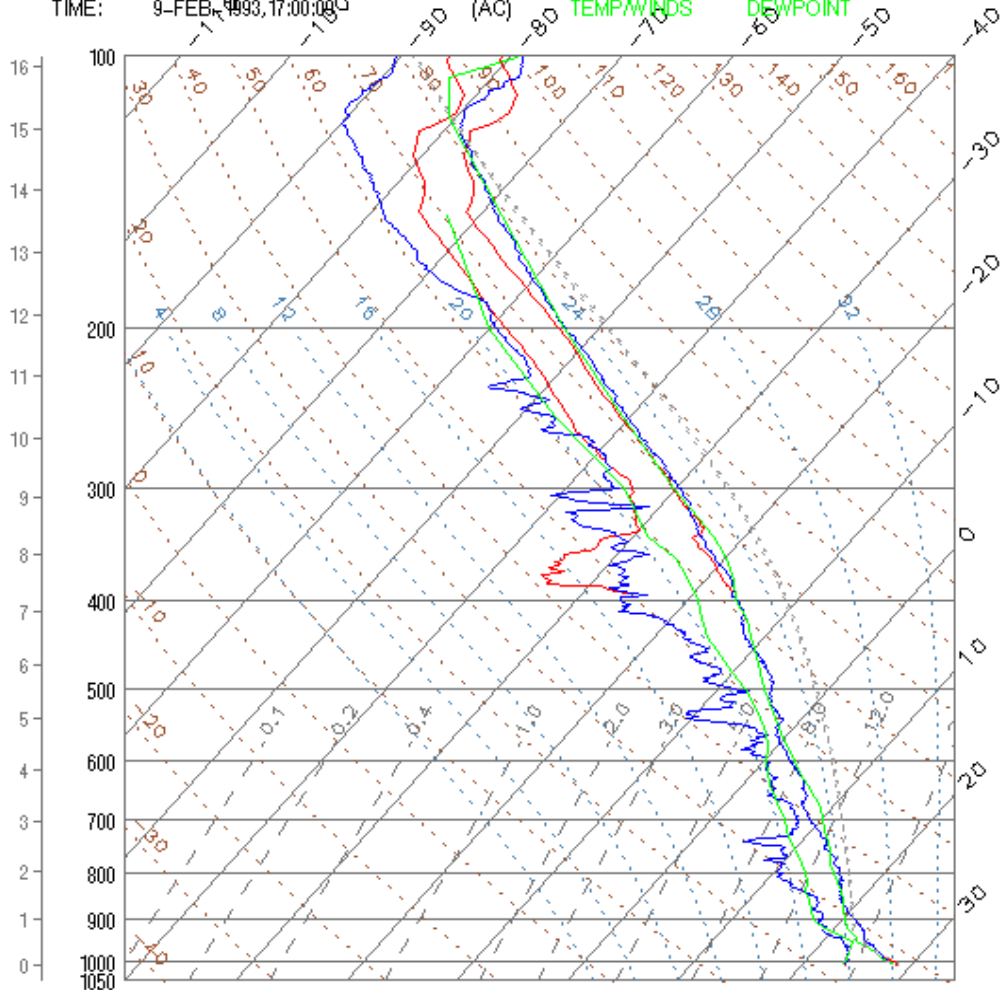
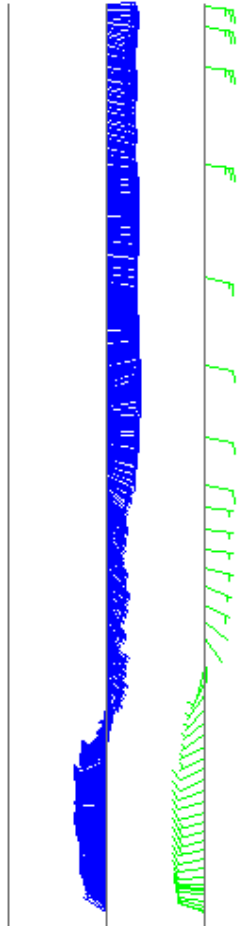


Figure 2: Map of the COARE IFA (outlined quadrangle) showing locations of selected radiosonde launch sites as well as the ship-MCS and P3-MCS sampled on 9 February 1993. The ship-MCS was sampled by the MIT and TOGA radars (see Fig. 1) on-board the R.V. Vickers and PRC # 5, respectively. The P3-MCS was sampled by the NOAA P-3's and NCAR ELDORA radars.

SITE: Vick-MnWv    TIME: 9-FEB-1993,10:00:00    (MVIC)    TEMPWINDS    DEWPOINT  
 SITE: R/W-Vickers  
 TIME: 9-FEB-1993,05:34:00    (VIC)    TEMPWINDS    DEWPOINT  
 SITE: MBL,SC1  
 TIME: 9-FEB-1993,17:00:00    (AC)    TEMPWINDS    DEWPOINT



PLOT GENERATED: 29-MAY-2001,14:47:55



WINDS PROFILE  
 One barb = 10.0 m/s

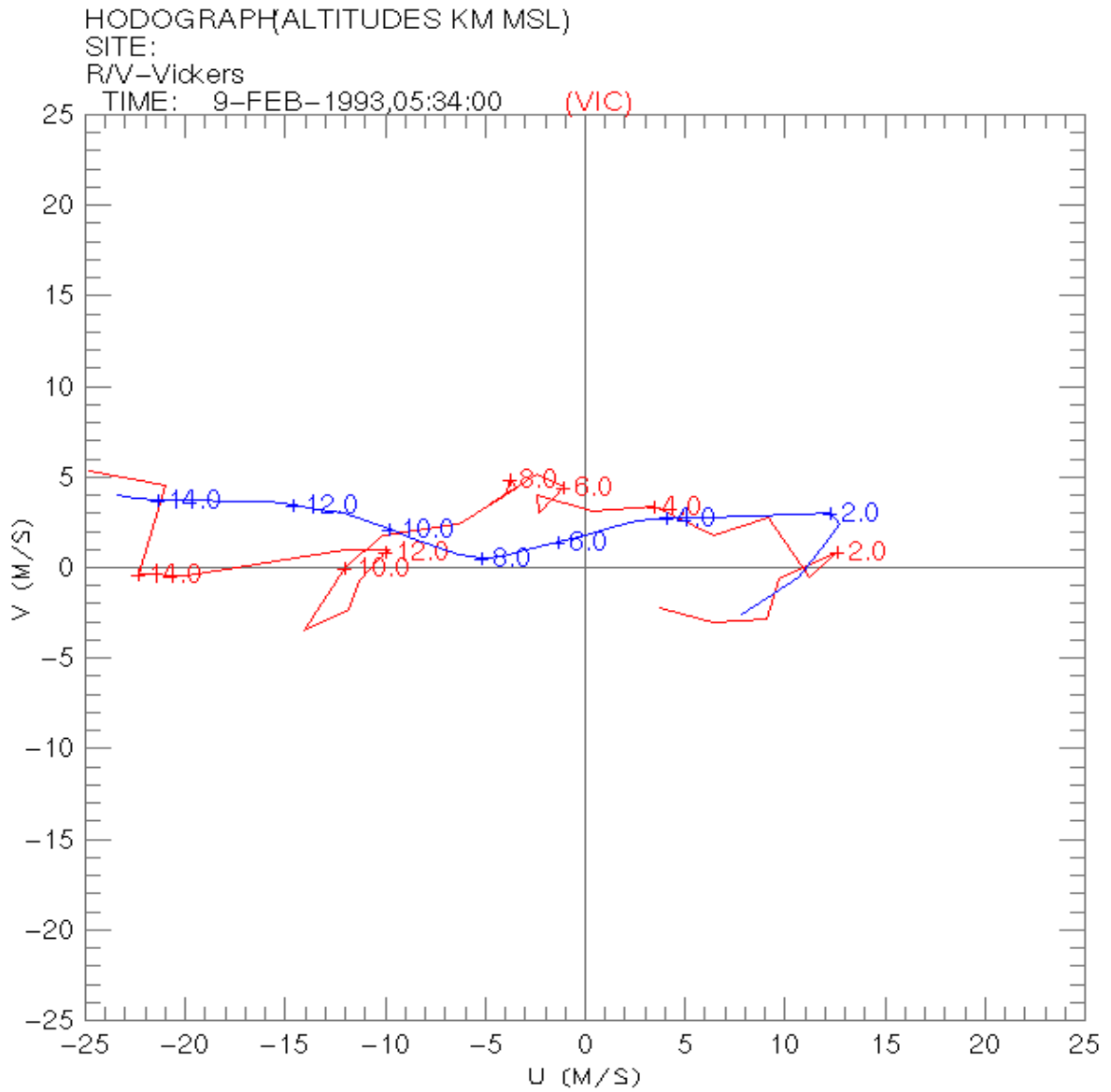


Figure 3: (top) Skew-T diagram with overlays of the 9 February 06 UTC Vickers sounding (blue), 9 February 10 UTC modified Vickers sounding (red), and 9 February 17 UTC aircraft sounding (green). (bottom) Hodographs from the Vickers (red) and aircraft (blue) soundings with heights (km) indicated along each trace.

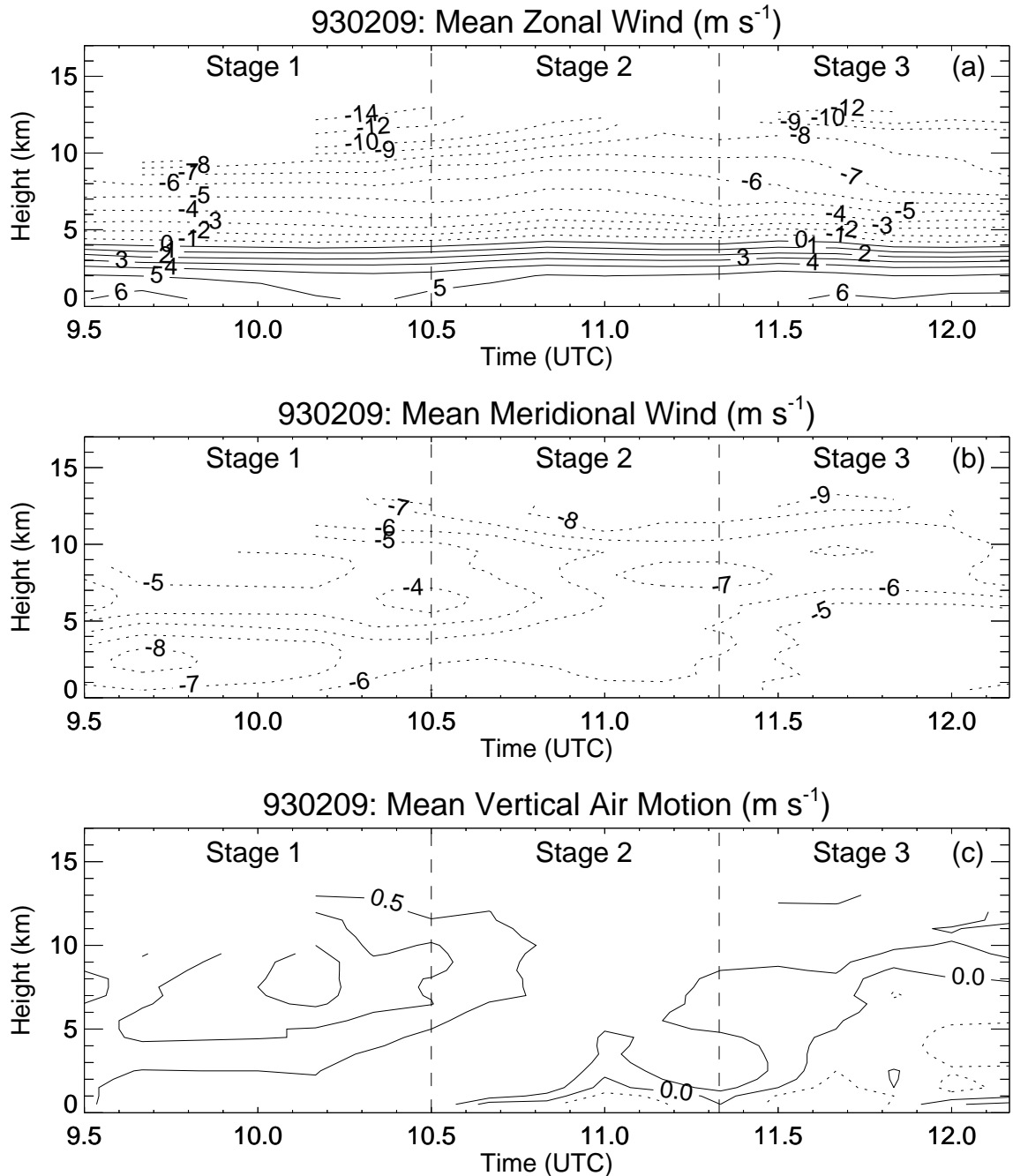


Figure 4: Time-height cross section of (a) average storm relative zonal wind, (b) average storm relative meridional wind, and (c) average vertical wind for the ship-MCS. Solid lines indicate positive flow (westerly, southerly, and upward) in panels (a), (b), and (c). Dashed lines indicate negative flow (easterly, northerly, and downward). Contour interval in (a) and (b) is  $1 \text{ m s}^{-1}$  from  $-10$  to  $10$  and  $2 \text{ m s}^{-1}$  for values larger than  $\pm 10 \text{ m s}^{-1}$ . Contour interval in (c) is  $0.25 \text{ m s}^{-1}$ . The different stages are indicated in each plot.

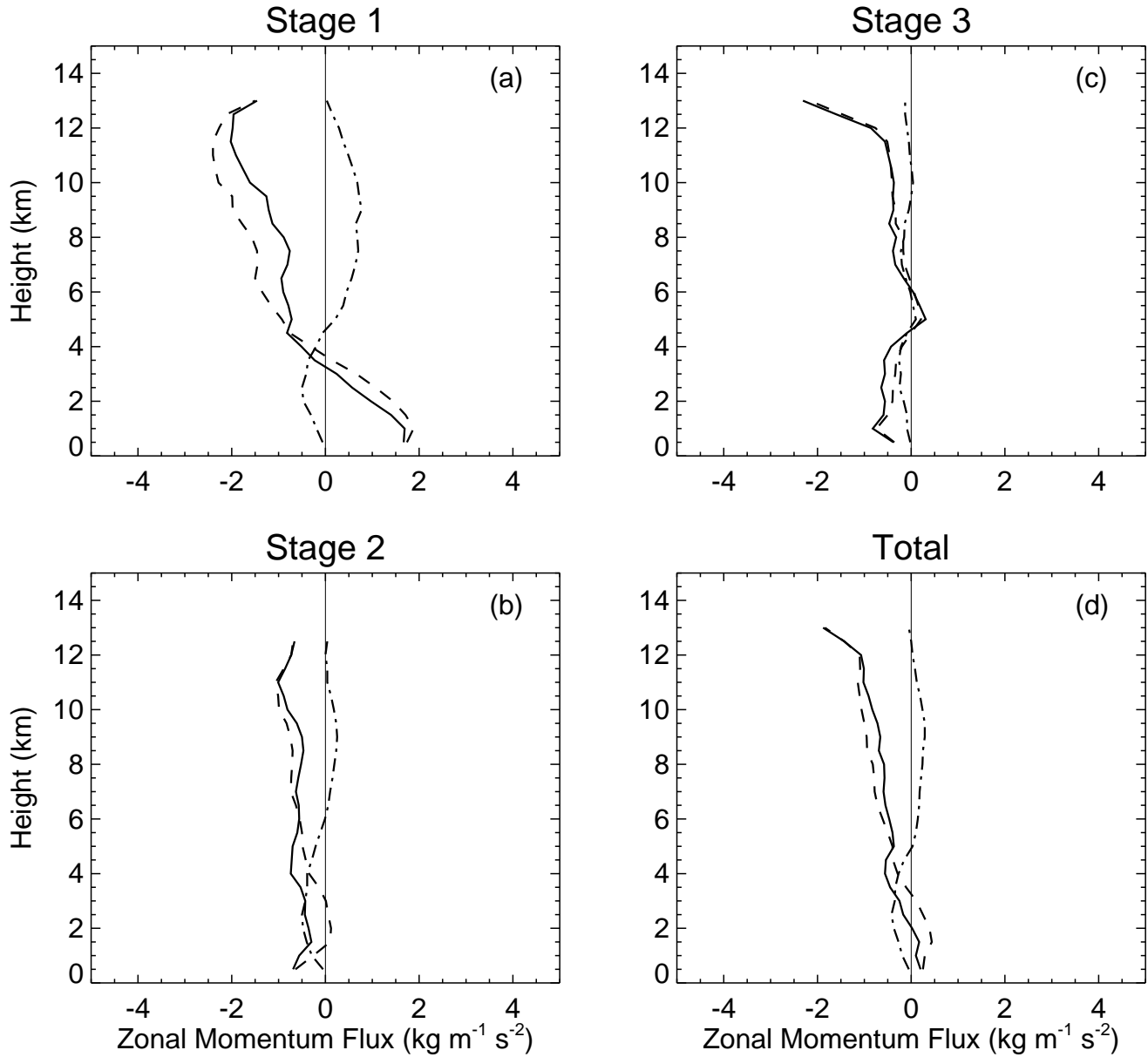


Figure 5: (a) Zonal ( $\tilde{U}$ ) momentum fluxes in kg m<sup>-1</sup> s<sup>-2</sup> for (a) stage 1 sampling period (0932-1032 UTC), (b) stage 2 sampling period (1042-1122 UTC), (c) stage 3 sampling period (1132-1212 UTC), and (d) total sampling period (0932-1212 UTC). Total, mean, and perturbation contributions are indicated by the solid, dashed, and dash-dot lines, respectively.

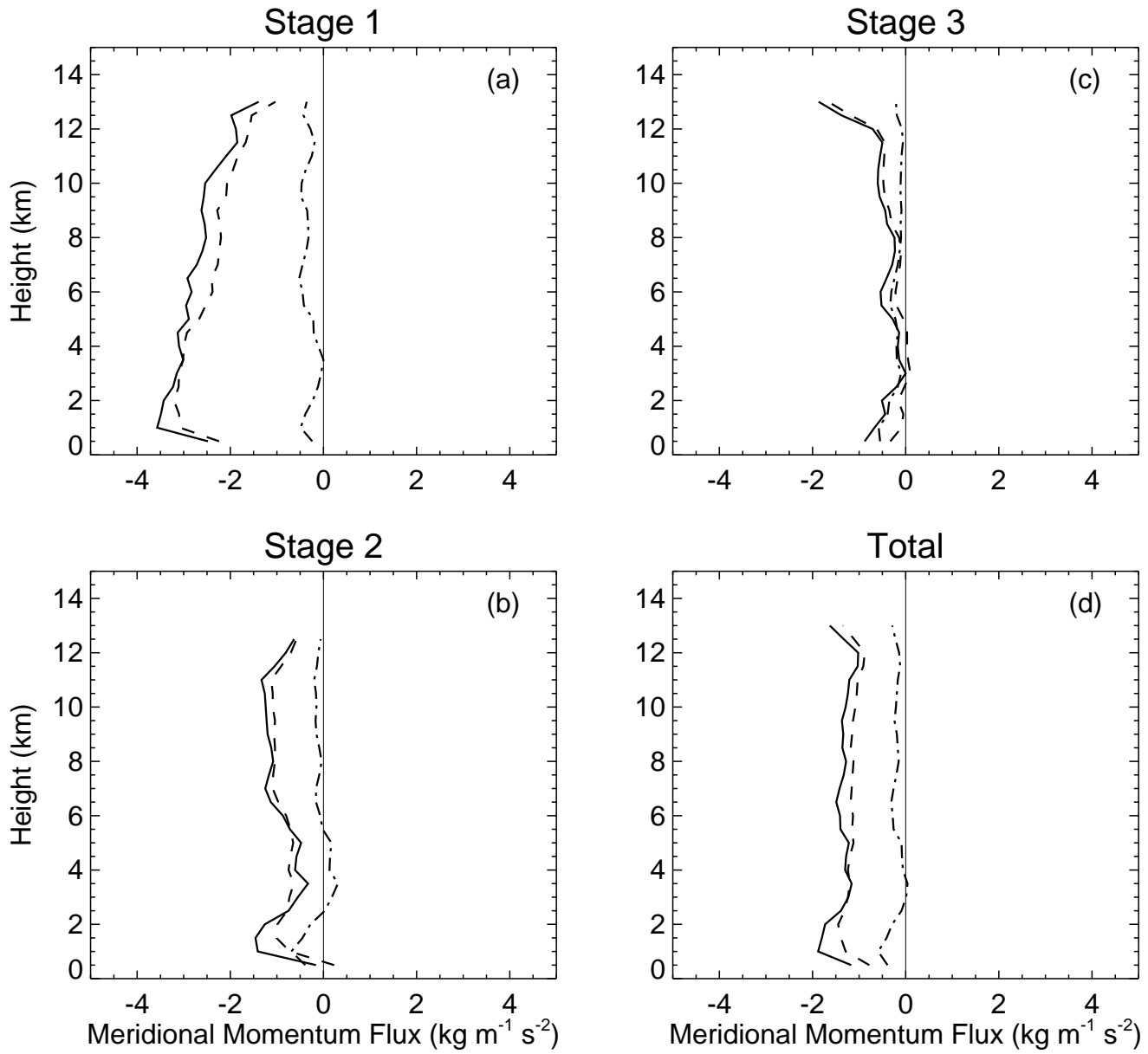


Figure 6: Same as Fig. 5 except for meridional momentum flux ( $\tilde{V}$ ).

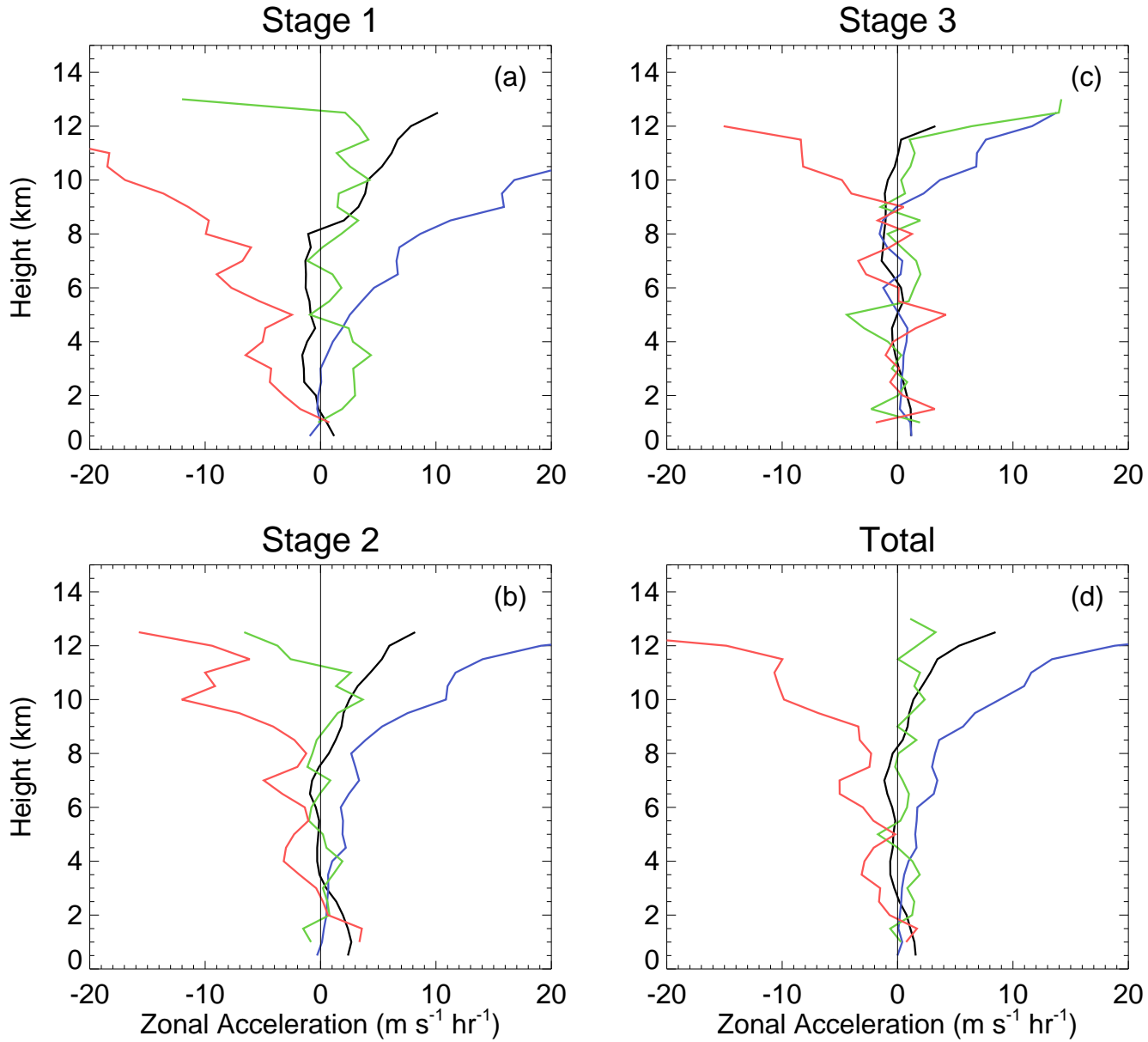


Figure 7: Zonal momentum budget terms for (a) stage 1, (b) stage 2, (c) stage 3, and (d) total in  $\text{m s}^{-1} \text{hr}^{-1}$ . Zonal tendency, zonal vertical advection, zonal horizontal advection, and work done by the zonal pressure gradient are indicated by the black, green, blue, and red lines, respectively. Each acceleration term is displayed with the same sign as shown in Eq. 5.



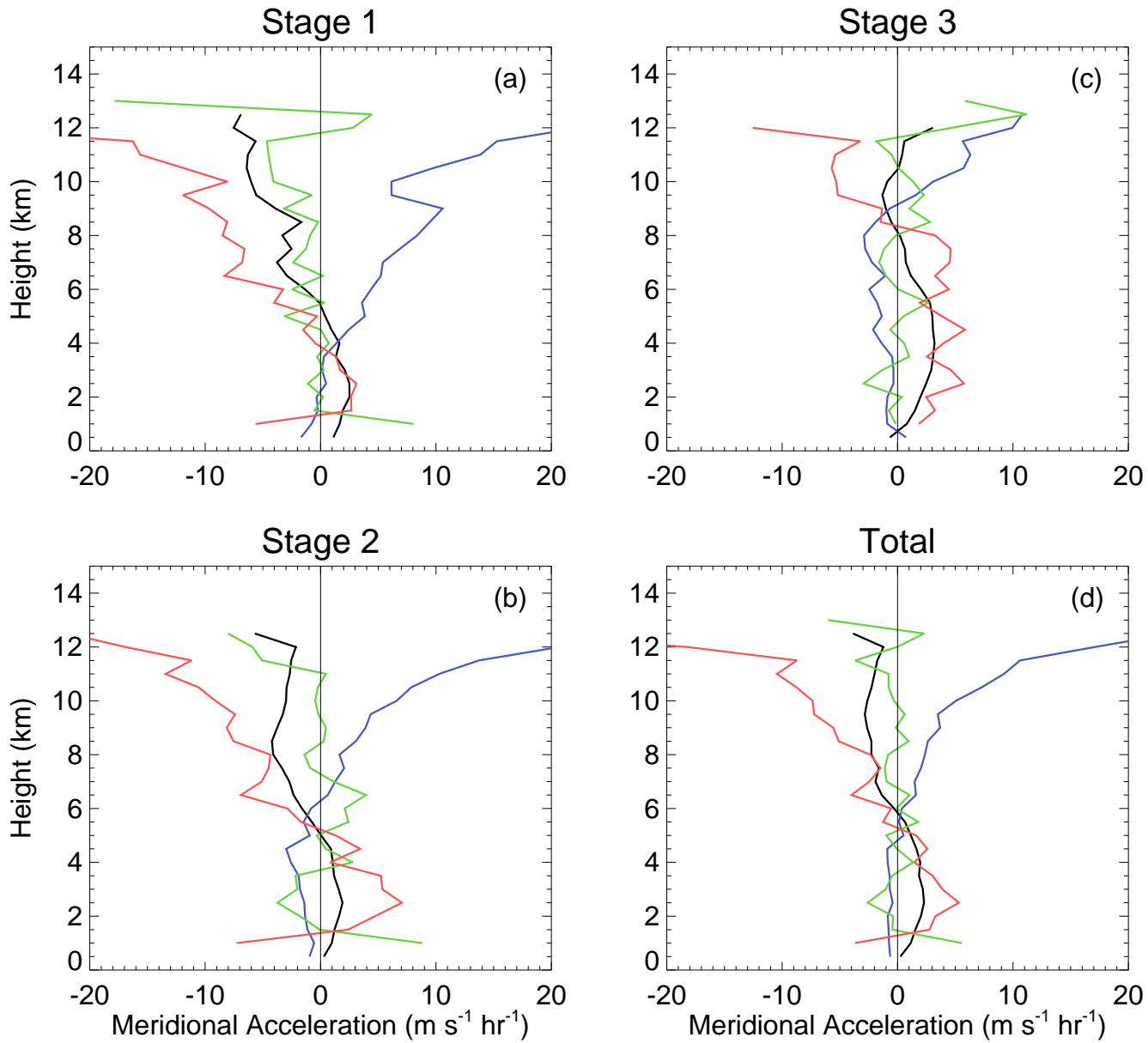


Figure 8: Same as Fig. 7 except for meridional direction.

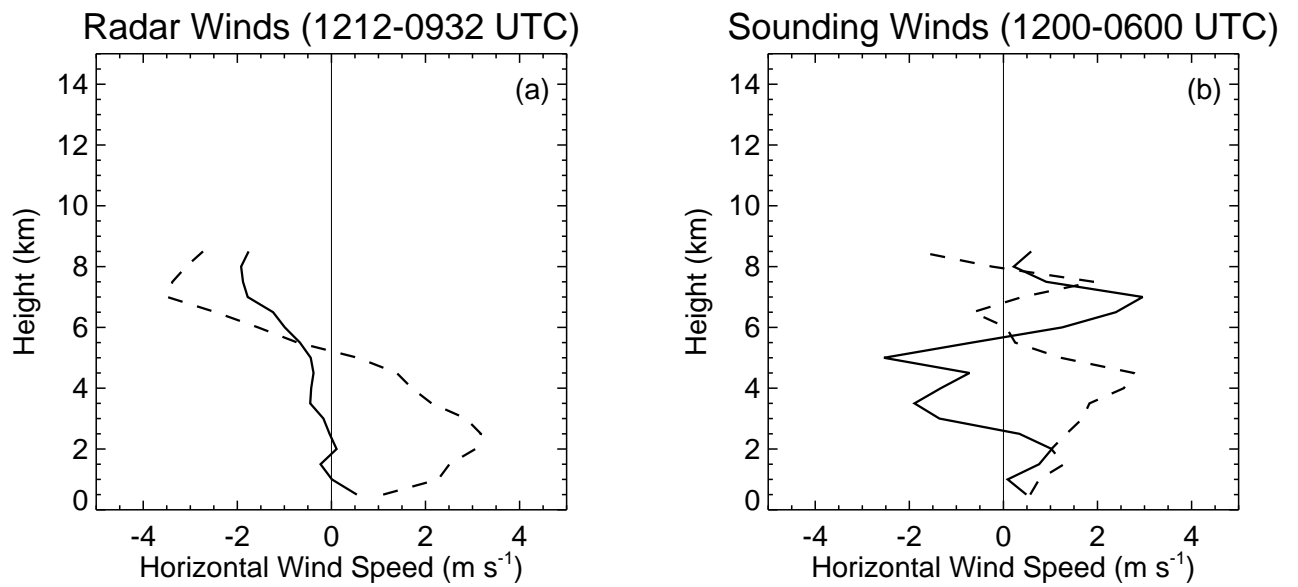


Figure 9: Change in horizontal wind components based on (a) dual-Doppler retrievals at 1212 and 0932 UTC and (b) 12 and 06 UTC IFA gridded sounding winds at  $2^{\circ}$  S,  $155^{\circ}$  E. In each plot, the solid (dashed) line represent zonal (meridional) wind.

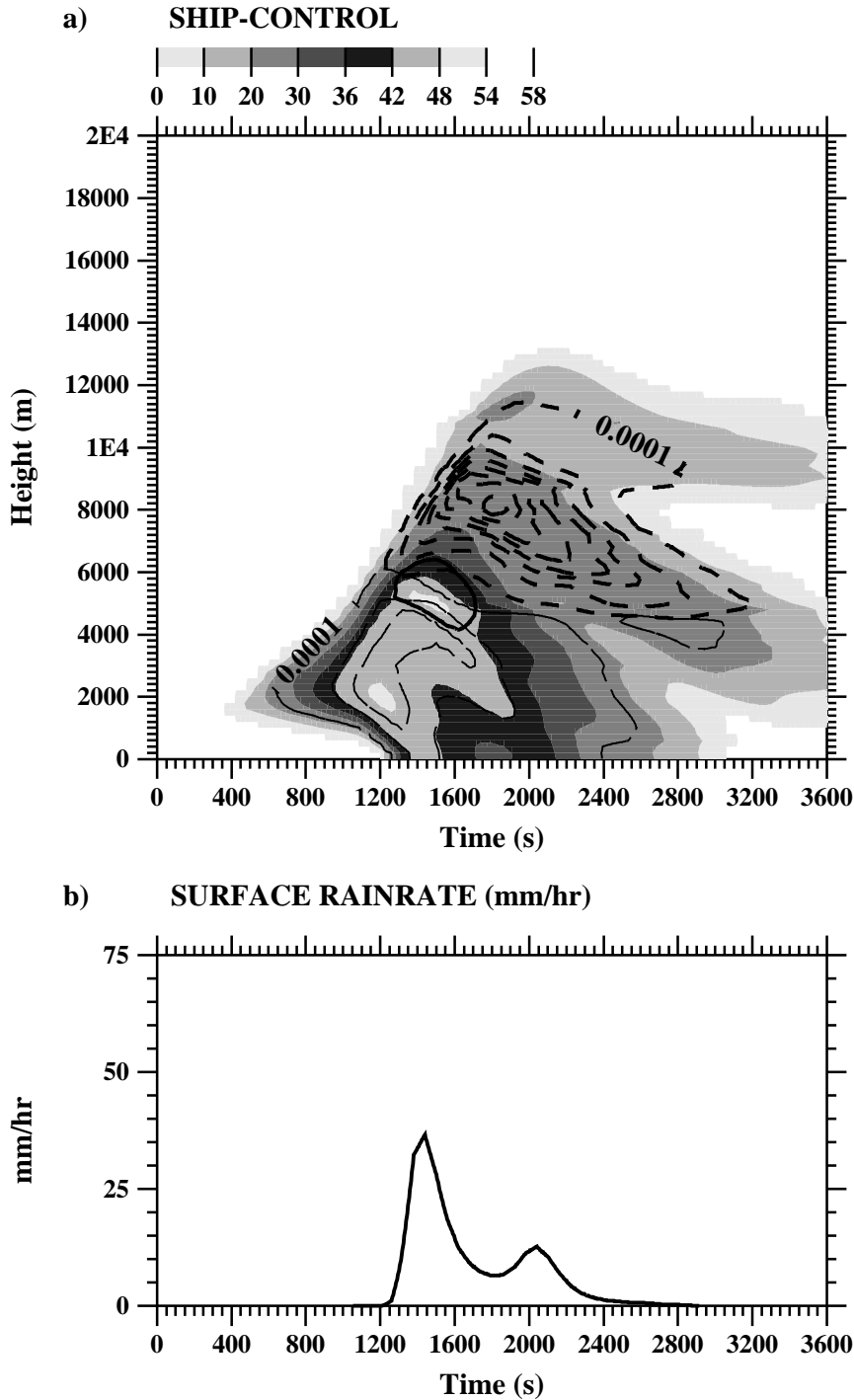


Figure 10: Time-height cross section of 1-D model cloud using the ship-MCS sounding. (a) Reflectivity (shaded) with rainwater content ( $\text{kg kg}^{-1}$  - thin solid lines), frozen drop concentration ( $\text{kg kg}^{-1}$  - thick solid lines), and graupel ( $\text{kg kg}^{-1}$  - dashed lines). Contour intervals are  $1 \times 10^{-4}$  starting at  $1 \times 10^{-3}$  for rainwater,  $1 \times 10^{-3}$  starting at  $2 \times 10^{-3}$  for frozen drops, and  $1 \times 10^{-4}$  starting at  $2 \times 10^{-4}$  for graupel. (b) Surface rainrate ( $\text{mm hr}^{-1}$ ).

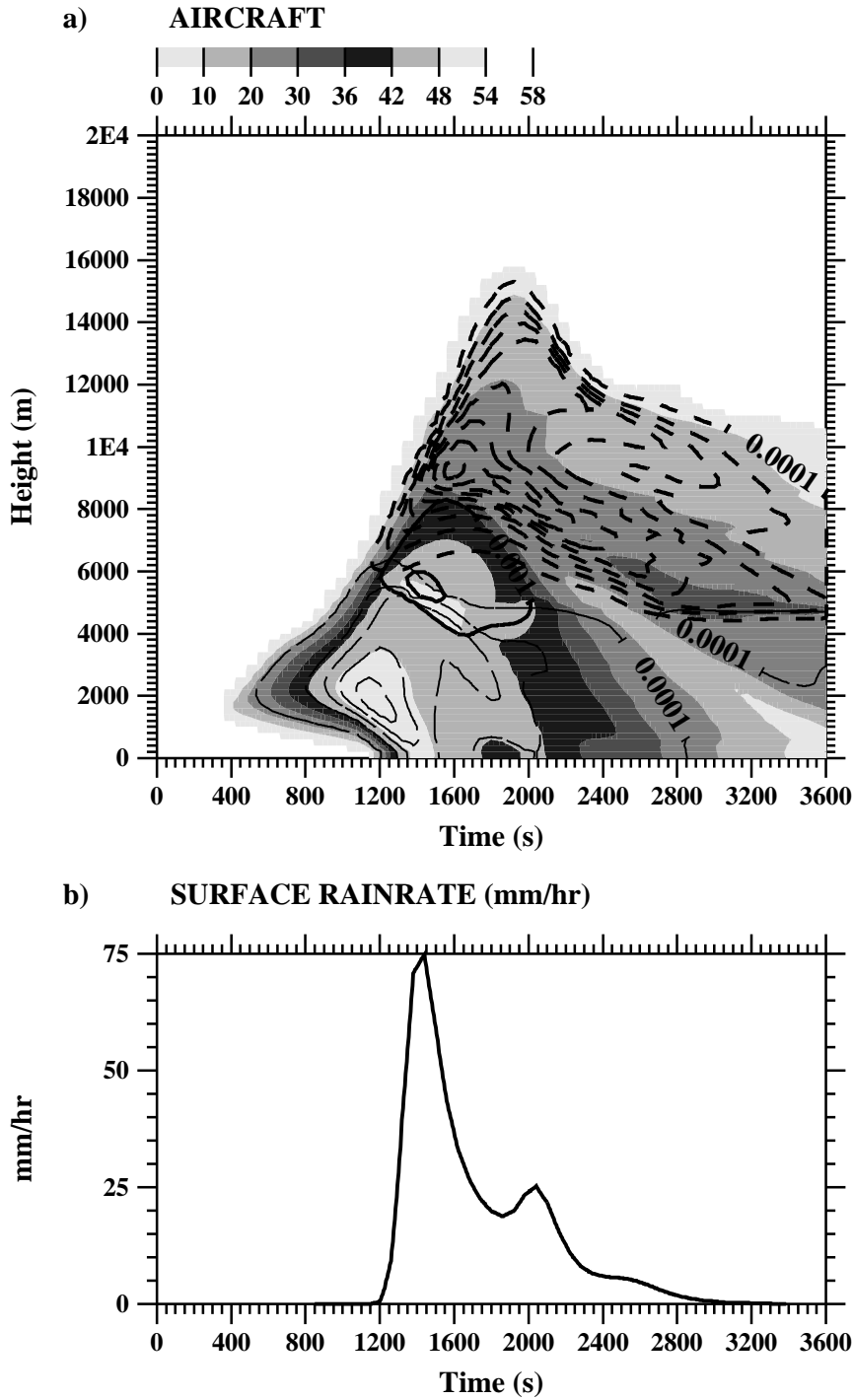


Figure 11: Same as Fig. 10 except using the P3-MCS sounding.

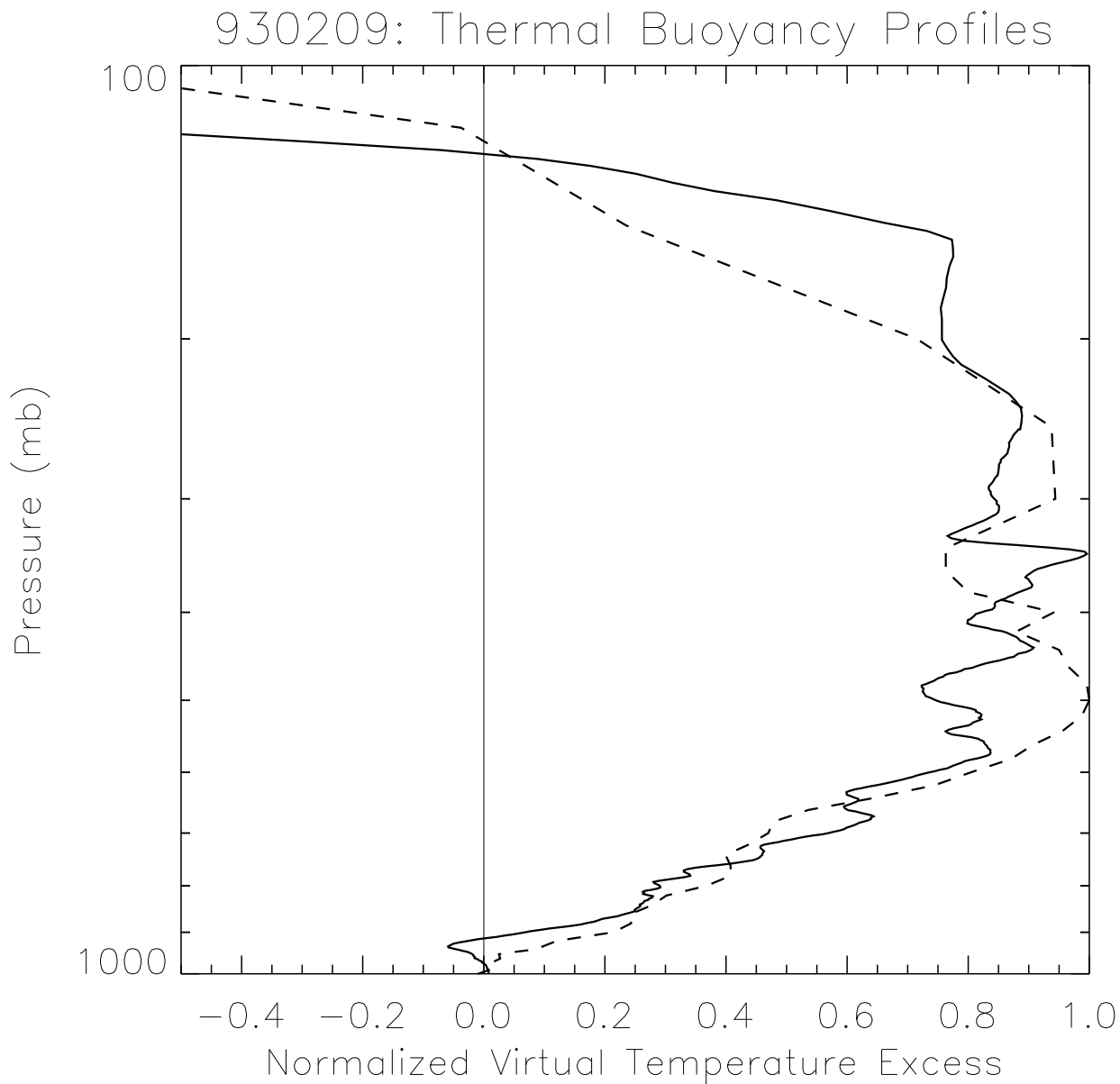


Figure 12: Profiles of virtual temperature excess ( $^{\circ}$  C) for the ship-MCS sounding (solid line) and P3-MCS sounding (dashed line) normalized with respect to the maximum value in each profile. The profiles were constructed assuming a 50 mb mixed layer depth and pseudo adiabatic ascent with no contribution from ice processes.

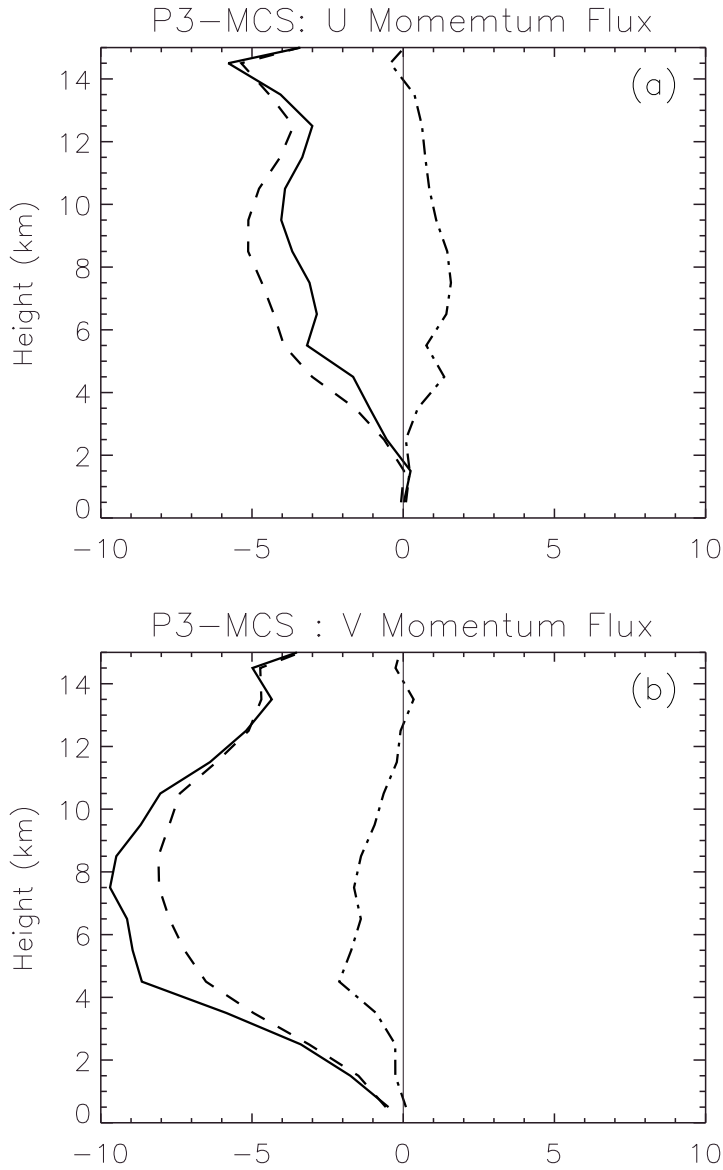


Figure 13: (a) Zonal and (b) meridional momentum fluxes in  $\text{kg m}^{-1} \text{s}^{-2}$  for the P3-MCS based on a total of six multiple-Doppler analyses collected between 1614-1705 UTC. In each plot, the total, mean, and perturbation contributions are indicated by the solid, dashed, and dash-dot lines, respectively.