AT 540 – Daily Weather Laboratory – Lab 10

Vertical Structure of Fronts

Theory (5 points)
1. Derive an expression for potential temperature starting with the first law of thermodynamics. (3 points)

2. Assuming adiabatic motion, what is the freezing level for air that originates from the surface with a potential temperature of 294 K? (2 points)
Analysis (15 points)

3. Draw in the front and tropopause on the vertical cross section. How did you find their location? (4 points)

4. Print out a surface map from this time (12Z on 31 October 2003). Does the location of your front on the vertical cross section agree with the analyzed front at the surface? Explain. (2 points)

5. Which sounding is located behind the front (1 or 2)? Provide at least three reasons to justify your answer. (4 points)

6. Identify the location of both soundings on the vertical cross section. Explain. (3 points)

7. On the vertical cross section, shade the most unstable area in red. Why did you choose this area? (2 points)
Sounding 1

ETA point-B Sounding 12/11/2002 01-Oct-03
Sounding 2

PRECIP WAT Ex= 0.47 in
NDX 1
SWEAT INDEX = 99
DRIY MICROBURST POT=10: GST < 30 kts
FREZING LEVEL= 1967 ft ASL
WET-BULB ZERO HGT= 1793 ft ASL
8-8 KM AVG WIND= 262°/27 kts
8-8 KM STM MNT (28/75)= 202°/20 kts
5-3 KM STM REL HELICITY= 154 m/s
FORECAST MAX TEMP= 37°F
TRIGGER TEMP= 40°F/99°F
SOUNING INDEX= NA

- PARCEL T=FCST MXP; Td=50 mb MEAN
- MOD PARCEL P= 962 mb
- MOD PARCEL T/Td= 37/28°F; 2/-1°C
- CONVECTIVE TEMP= 34°F
- LIFTED INDEX= 25.7
- CCL= 2911 ft ASL/ 916 mb
- LCL= 3405 ft ASL/ 896 mb
- LFC= 3405 ft ASL/ 896 mb
- MAX HAILS= 0.0 cm/0.0 in
- MAX VERTICAL VELOCITY= 2 m/s
- EQUIL LEVEL= 4346 ft ASL/667 mb
- APPROX CLOUD TOP= 5200 ft ASL
- POSITIVE ENERGY ABV LFC= 4 J/kg
- NEGATIVE ENERGY BLW LFC= NONE

ETA point-A Sounding 1) 01/12 08:00Z SAT-Oct-0