

Please show all work.

1. From the Albany, NY, 0000 UTC sounding information (Table 1), compute the magnitude (m s^{-1}) and direction ($^{\circ}$) of the thermal wind in the 925–500-hPa layer.
2. Based on your answer to (1), use the thermal wind equation with appropriate assumptions to obtain the magnitude [$^{\circ}\text{C (100 km)}^{-1}$] and direction ($^{\circ}$) of the 925–500-hPa layer-mean ∇T at Albany at 0000 UTC.
3. Use the attached soundings (Figs. 1 and 2) to briefly describe Albany's sensible weather at 0000 and 1200 UTC.
4. Based on the attached sounding (Fig. 1), what is the sense of the temperature advection over Albany at 0000 UTC? Use sketches to explain your answer.
5. Temperature advection in a layer is mathematically expressed as $-\bar{V} \cdot \nabla \bar{T}$.
 - a. Using the 0000 UTC 925–500-hPa layer-mean wind (computed from data in Table 1), calculate the temperature advection [$^{\circ}\text{C (12 h)}^{-1}$] in the 925–500-hPa layer at Albany for 0000 UTC.
 - b. Based on your answer to (a), what is the expected 925–500-hPa layer-mean temperature ($^{\circ}\text{C}$) at Albany 12 hours later?
6. Using the 1200 UTC sounding information given (Table 2), calculate the observed 925–500-hPa layer-mean temperature ($^{\circ}\text{C}$) at Albany at 1200 UTC. How does the temperature compare with your predicted temperature obtained in (5b)? What factors might explain any discrepancy between the predicted and actual temperature?

Table 1. 0000 UTC ALB sounding data.

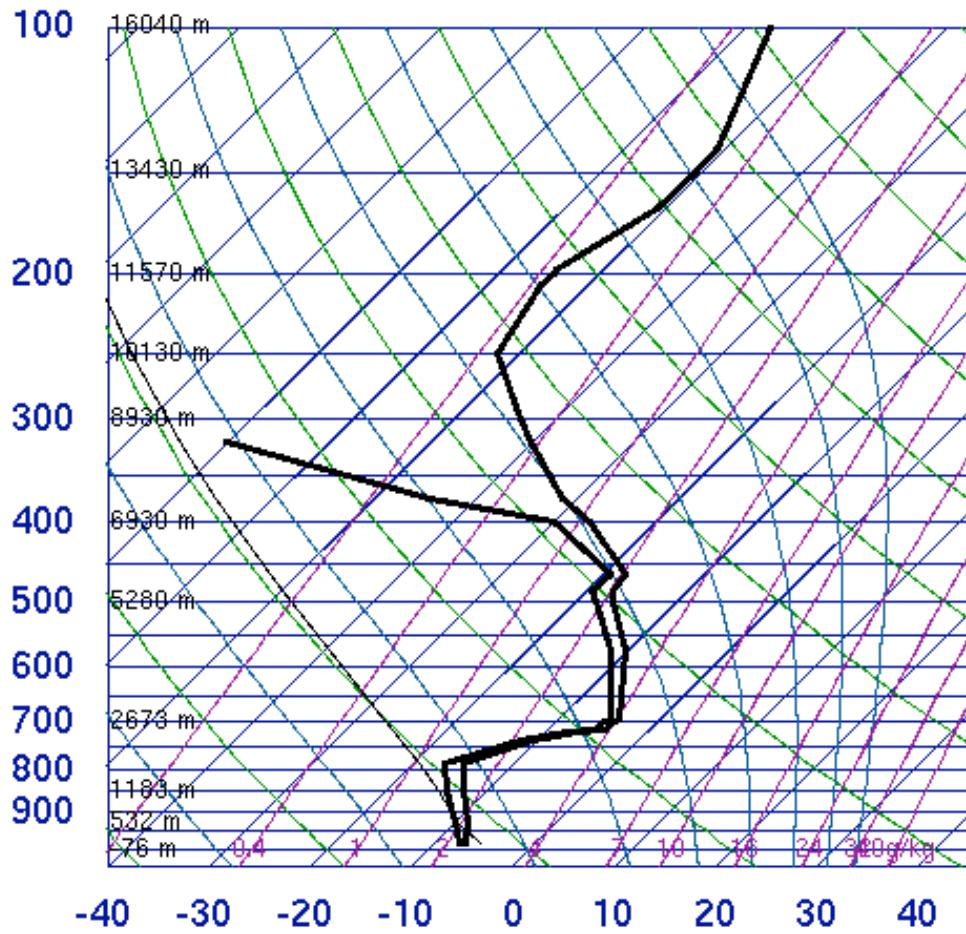
PRES	HGHT	TEMP	DWPT	DRCT	SKNT
hPa	m	C	C	deg	kt
1000.0	-76				
925.0	532	-8.9	-10.1	45	36
850.0	1183	-12.3	-14.0	75	47
700.0	2673	-4.3	-5.2	165	65
500.0	5280	-16.3	-18.0	190	79

Table 2. 1200 UTC (T+12 h) ALB sounding data.

PRES	HGHT	TEMP	DWPT	DRCT	SKNT
hPa	m	C	C	deg	kt
1000.0	-171				
925.0	434	-12.1	-13.4	310	32
850.0	1075	-16.5	-18.2	340	33
700.0	2522	-17.3	-18.7	320	32
500.0	5030	-25.5	-27.2	255	23

72518 ALB Albany

0000 UTC



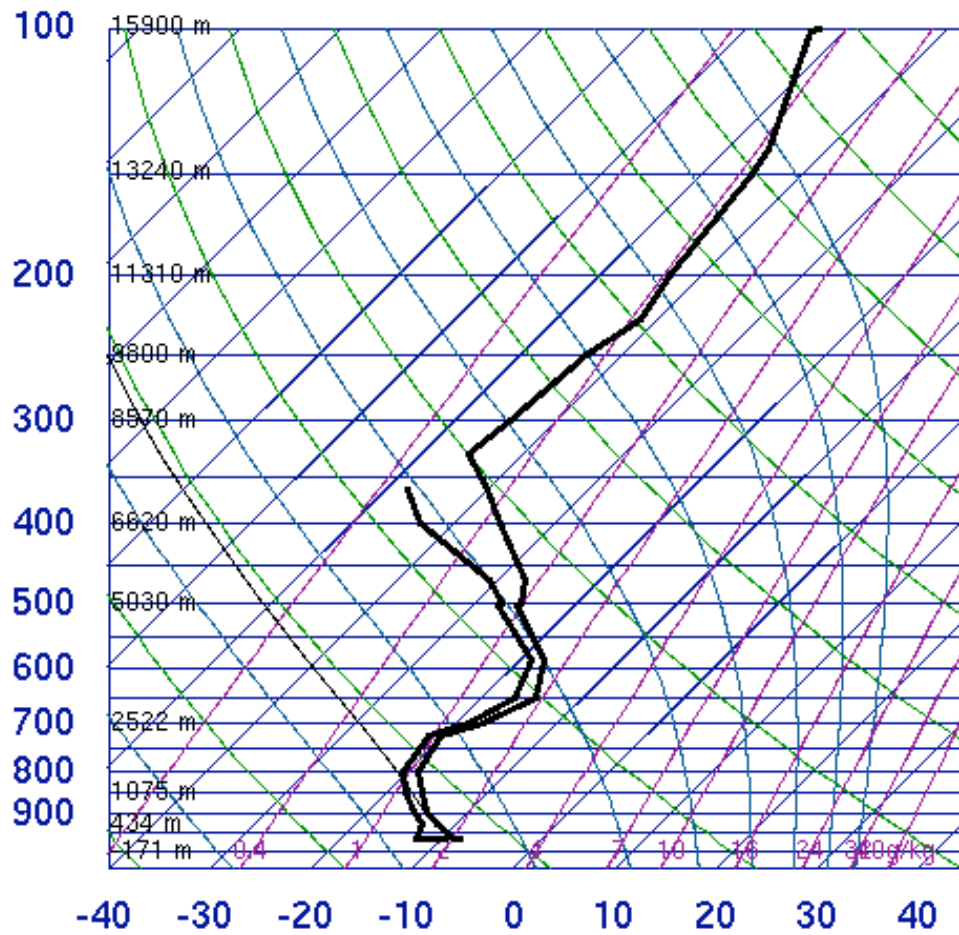
ALBANY NY
0000 UTC
72518

SLAT	42.70
SLON	-73.83
SELV	96.00
SHOW	29.42
LIFT	31.75
LFTV	32.03
SWET	173.0
KINX	-10.9
CTOT	2.30
TTOT	4.00
TOTL	6.30
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	263.9
LCLP	934.6
MLTH	269.0
MLMR	2.04
THCK	5356.
PWAT	13.08

Fig. 1.

72518 ALB Albany

1200 UTC



SLAT	42.70
SLOX	-73.83
SELV	96.00
SHOW	24.75
LIFT	25.39
LFTV	25.51
SWET	89.01
KINX	-10.6
CTOT	7.30
VTOT	9.00
TOTL	16.30
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	259.4
LCLP	904.7
MLTH	267.0
MLMR	1.48
THCK	5201.
PWAT	6.43

Fig. 2.