

**Atmospheric Sciences 5300**  
**Exercise #4**  
**Due Friday, September 25, 2020**

This exercise deals with moist (saturated) adiabatic processes and the skew  $T$ -log  $p$  chart: calculating liquid water and total water mixing ratios.

1. A parcel ascends adiabatically over a mountain range starting from 950 mb, where  $T = 23^\circ\text{C}$  K and mixing ratio =  $12 \text{ g kg}^{-1}$ , to 550 mb. Then it descends adiabatically back down to 950 mb.
  - (a) Complete the following table of parcel properties. The parcel ascends from time 1 to time 4, then descends. from time 4 to time 6.

time (arbitrary units)	1	2	3	4	5	6
pressure (mb)	950		675	550		950
temperature ( $T$ , $^\circ\text{C}$ )	23					
saturation mixing ratio ( $w_s$ , g/kg)		12			8	
water vapor mixing ratio ( $w$ , g/kg)	12	12			8	8
liquid water mixing ratio ( $w_l$ , g/kg)	0					
total water mixing ratio ( $w + w_l$ , g/kg)	12		10	8	8	
Relative humidity (percent)		100	100	100	100	

- (b) Plot the parcel's temperature and dewpoint temperature versus pressure during ascent and descent on a skew- $T$  log  $p$  diagram. (For example, <http://www.inscc.utah.edu/~krueger/5300/skew-T-400-labels.pdf>.) Label each point with its corresponding time.