Atmospheric Sciences 5310
Exercise #2
Due Friday, January 27, 2012

This exercise deals with dry adiabatic processes and the skew T-log p chart.

1. To help you get familiar with *SkewT/Log-P Diagram*, you are strongly encouraged to use the *Skew-T Mastery* program. To get started, go to the URL `http://www.meted.ucar.edu/mesoprim/skewt` (or use the *Skew-T Mastery* link on the class web page). You need to register first. You do not need to enter anything for supervisor/instructor's E-mail. After you register, work through the *Introduction*, *Skew-T Description*, and *Parameters* sections, including the following material in the *Parameters* subsection (all of the items under *Moisture/Humidity* and the items down to *Lifting Condensation Level* under *Temperatures/Levels*).

2. Consider a parcel that ascends dry adiabatically from $p = 1000$ mb, where $T = 20°$C and relative humidity $= 50\%$, to its *saturation pressure* (also known as *lifting condensation level*, or LCL.)

   Use the skew T-log p chart and calculations (but only as needed) to obtain the quantities listed below for the parcel. *Plot the quantities at 25 mb intervals and at the LCL on the accompanying graph.* Use colored pencils as indicated to plot the variables.
   (a) Relative humidity (black).
   (b) Vapor pressure, e (red); saturation vapor pressure, e_s (blue).
   (c) Mixing ratio, w (red); saturation mixing ratio, w_s (blue).
   (d) Potential temperature, θ (green); temperature, T (red); dewpoint temperature, T_d (blue).

3. Use the skew T-log p chart and calculations (but only as needed) to obtain the quantities listed below for a parcel that ascends adiabatically from $p = 1000$ mb, where $T = 10°$C and relative humidity $= 50\%$, to its LCL. Plot the quantities at 25 mb intervals on a new graph.
   (a) Relative humidity.
   (b) e (red), e_s (blue).
   (c) w (red), w_s (blue).
   (d) θ (green), T (red), T_d (blue).

4. For the parcel described in Problem 3, determine its saturation pressure p_s (or LCL) and saturation temperature T_s.

p	RH	e	e_s	w	w_s	θ	T	T_d	T_v
(mb)	(%)	(mb)	(mb)	(g/kg)	(g/kg)	(K)	(K)	(K)	(K)
700									
725									
750									
775									
800									
825									
850									
875									
900									
925									
950									
975									
1000									

p	RH	e	e_s	w	w_s	θ	T	T_d	T_v
(mb)	(%)	(mb)	(mb)	(g/kg)	(g/kg)	(K)	(K)	(K)	(K)
700									
725									
750									
775									
800									
825									
850									
875									
900									
925									
950									
975									
1000									