

ESE 134: Cloud and Boundary Layer Dynamics (HW 4, due May 17):

Moist convection and thermodynamics.

1. Define the terms: (i) lifted condensation level, (ii) level of free convection, (iii) level of neutral buoyancy. Please use equations in your definitions.
2. Show that the adiabatic equivalent potential temperature is approximately given by

$$\theta_e = \theta \exp\left(\frac{Lq}{c_p T_{LCL}}\right).$$

What are the approximations involved?

3. What is the interpretation of the adiabatic equivalent potential temperature? That is, write a sentence that starts with “The adiabatic equivalent potential temperature is the temperature an air parcel would have . . .” Please draw a diagram of height vs. the relevant temperatures (including the LCL) of the thermodynamic process you envision.
4. What is the liquid water potential temperature, and under what conditions is it conserved?