

Lecture Ch. 6b

- Moist adiabatic ascent of air
- Equivalent temperature
- Aerological diagrams

Curry and Webster, Ch. 6

For Tuesday: Read Ch. 7 (look at but don't solve Prob. 3)

Equivalent Potential Temperature

- Accounts for liquid water heating

$$\theta_e = \theta \exp\left(\frac{L_{lv} w_s}{c_{pd} T}\right) \quad (6.48)$$

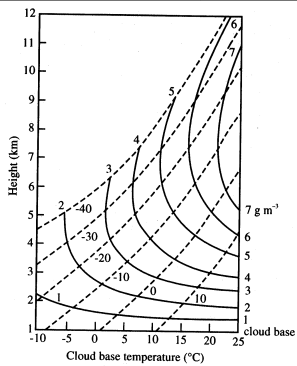


Figure 6.5 Adiabatic liquid water mixing ratio as a function of height above the cloud base and cloud base temperature. (After Goody, 1995.)

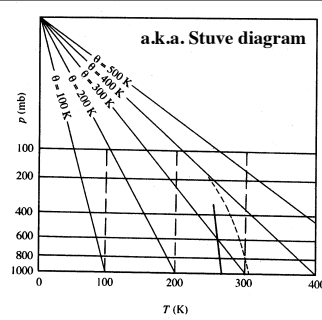


Figure 6.6 Construction of the pseudo-adiabatic chart.

the surface. Thus the ordinate may be proportional to $-\ln p$ (the Emagram) or to p^{β/c_p} (the Stueve diagram). The Emagram has the advantage over the Stueve diagram in that area on the diagram is proportional to energy. Before the advent of computers,

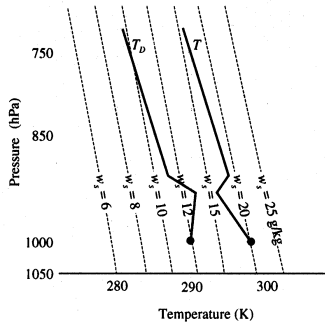


Figure 6.7 Determination of w_s , w_s^* , and T_D given the vertical profiles of temperature and dew-point temperature.

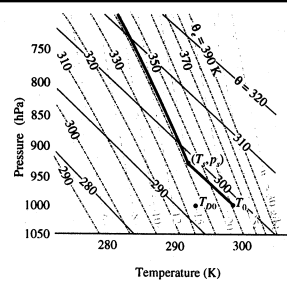


Figure 6.8 Adiabatic ascent of a parcel from p_0 . The parcel initially ascends dry adiabatically along the constant potential temperature line that passes through $(T_0, 1000 \text{ hPa})$. As the parcel ascends, the saturation mixing ratio decreases while the actual mixing ratio remains the same. At the point at which the actual mixing ratio of the parcel is equal to the saturation mixing ratio, the parcel becomes saturated. Further lifting of the parcel occurs along the saturated adiabat that passes through the point, (T_s, p_s) .

$$\theta_e = T_e \left(\frac{p_0}{p_e}\right)^{R_d/c_p}$$