Spring 2008
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Earth's Atmosphere, ESS 55

Homework 5, due Friday May 23 (Discussion scheduled for May 22)

1. Describe the "thermal wind". Based on thermal wind arguments, why do we have a jet (a maximum in zonal wind speed in the upper troposphere) in midlatitudes and why is it particularly strong in winter?

2. How is atmospheric heat transport accomplished in the following latitude bands:

a. from equator to subtropics (sensible heat, geopotential energy, latent heat separately)

b. from subtropics to high latitudes.

3. Verify that the temperature change in the lower figure in Box 7.1 (page 196) is correct. Show your calculation.

4. Refer to Figure 5.1 and Table 5.1 (page 116) in Hartmann.

The approximate volume of water retained in soil moisture and groundwater is given in Table 5.1. Use the data in Fig. 5.1 to calculate the time it would take for precipitation over land to deliver an amount of water equal to the soil water and groundwater. How long would it take to replace the groundwater and soil moisture if only 10% of the runoff could be redirected to replenishing the groundwater?