Meteorology 455/555 Group Problems - 3

Due 12 April 2006

1. Suppose the effect of the midlatitude eddies is to weaken rather than strengthen the extratropical zonal jet. More specifically, suppose that

$$[v^* u^*](\phi, p) = M_o \left\{ \frac{\phi}{90^o} \right\} \exp\left\{ -\left(\frac{p - 200\,mb}{50\,mb} \right)^2 \right\}$$

in midlatitudes, where M_o is a positive constant, ϕ is in degrees and p is in mb.

Show that [v*u*] as given does indeed weaken the extratropical jet. You may find it useful to focus simply on the flux at 200 mb.

2. For all parts of this question, it is important to keep in mind (or look at a figure of) the distribution of temperature with latitude.

One source of heating for the atmosphere is the flux of sensible heat from the surface to the atmosphere, F_{sh}. A zonal, annual average distribution of F_{sh} with latitude in the Northern Hemisphere appears below. Is [G] *produced by this flux alone* $> 0, < 0$ or ≈ 0? Explain your answer.