

**651-2124-00:**

**Atmospheric General Circulation Dynamics** (HW 3, due April 18):

1. **Hadley circulation.** Global warming will lead to an increased static stability (buoyancy frequency  $N$ ) of the tropical atmosphere because the stratification is nearly moist adiabatic, and a moist adiabat at higher temperatures is associated with greater (dry) static stability. Discuss how that may affect the Hadley circulation. Consider two limiting cases:
  - (a) A Hadley circulation in the angular momentum–conserving limit with  $Ro \rightarrow 1$  in the upper branch.
  - (b) A Hadley circulation in the eddy-driven limit with  $Ro \rightarrow 0$  in the upper branch.
  
2. **Monsoons.** Discuss how global warming may affect Earth’s large-scale monsoons (especially the South Asian monsoon). In particular:
  - (a) How is monsoonal precipitation expected to change as the climate warms?
  - (b) Can you speculate how the monsoonal mass fluxes may change?
  - (c) What do mass flux changes imply about changes in zonal surface winds in the monsoon region?