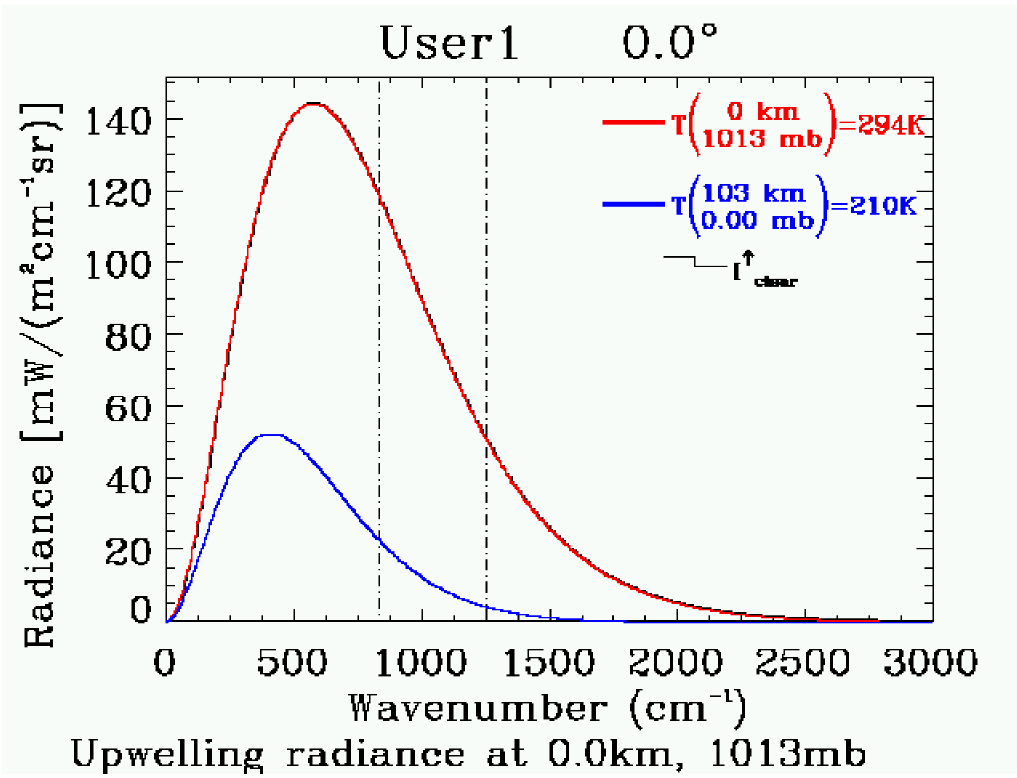
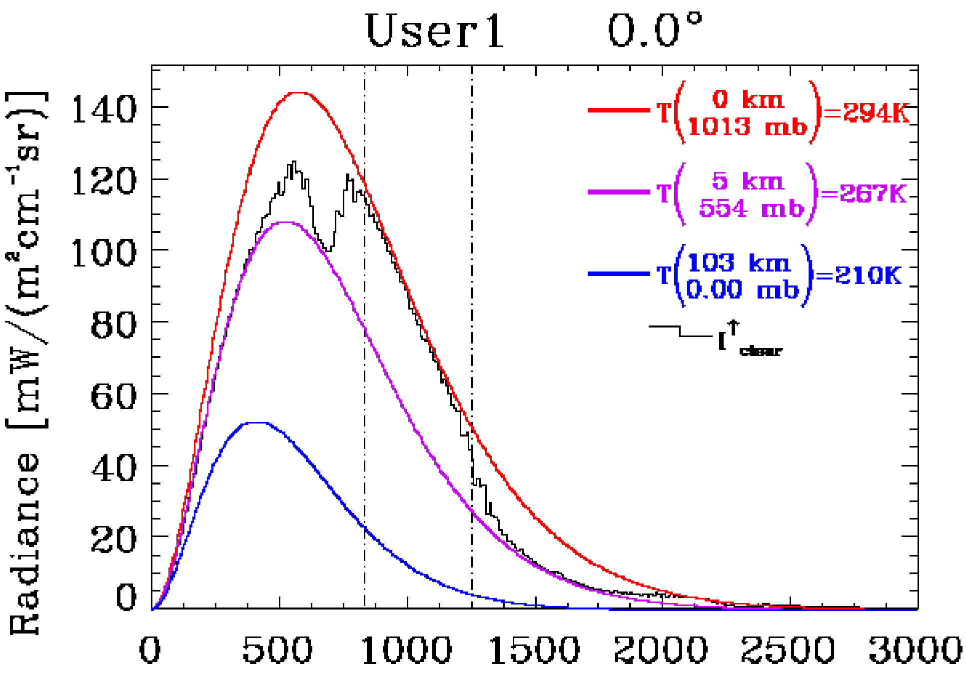
ATOC/ASTR 5560 Lab 5 Solution Figures

September 28, 2001

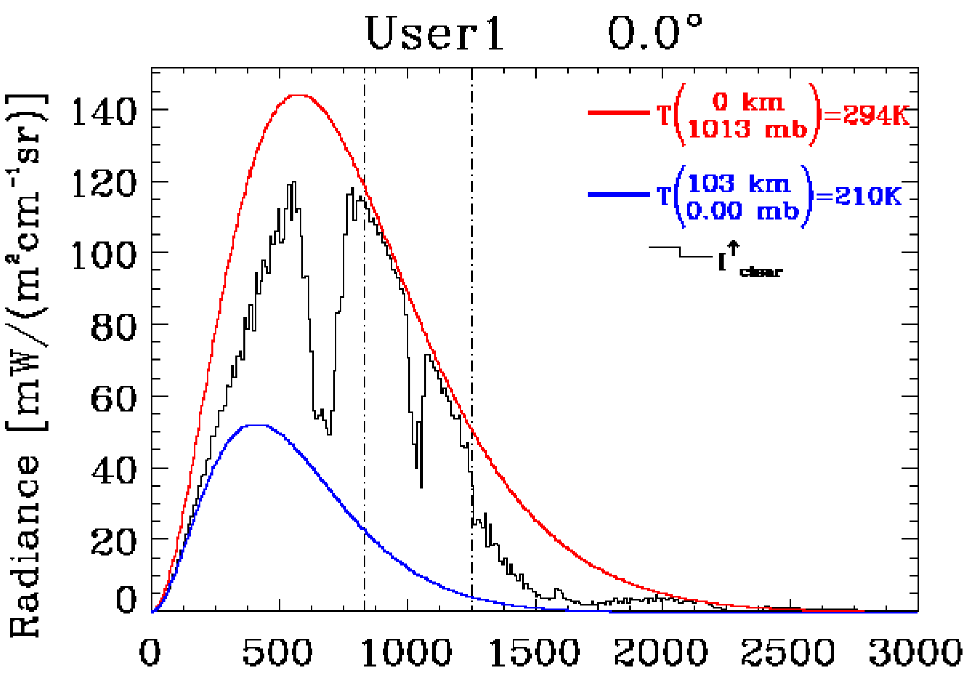
1. *First practice running MDTERP.*

2. *a) Plot the upwelling radiance spectrum (at* $0°$*) for the midlatitude summer atmosphere. Explain the differences between the upwelling radiance spectra at 0 km, 5 km, and the top of the atmosphere.*



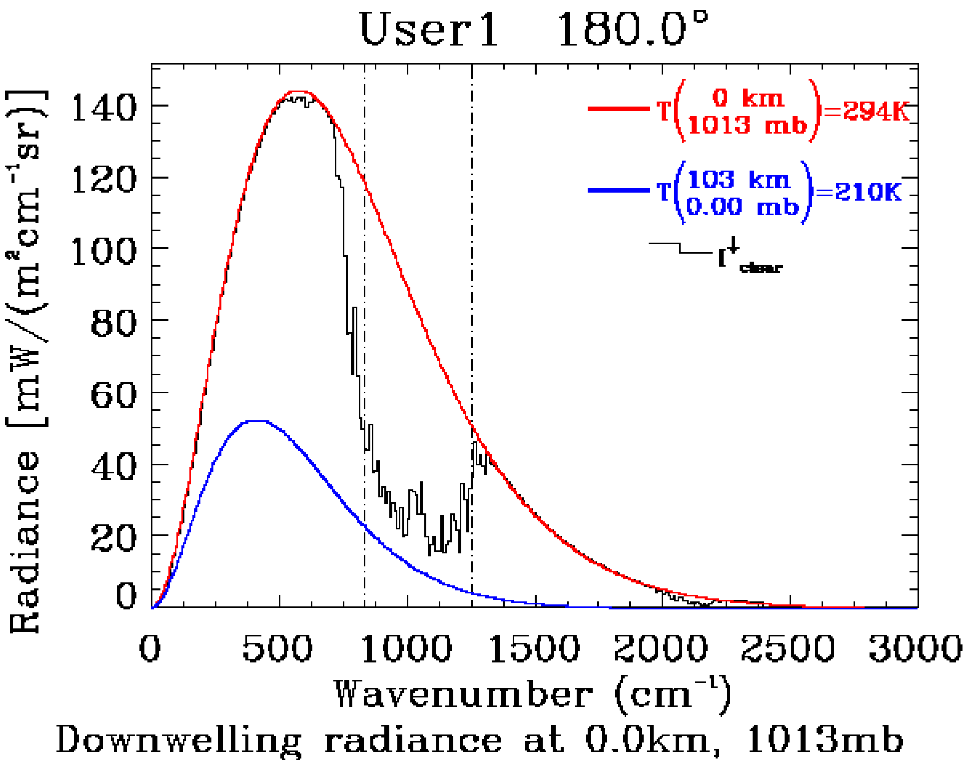


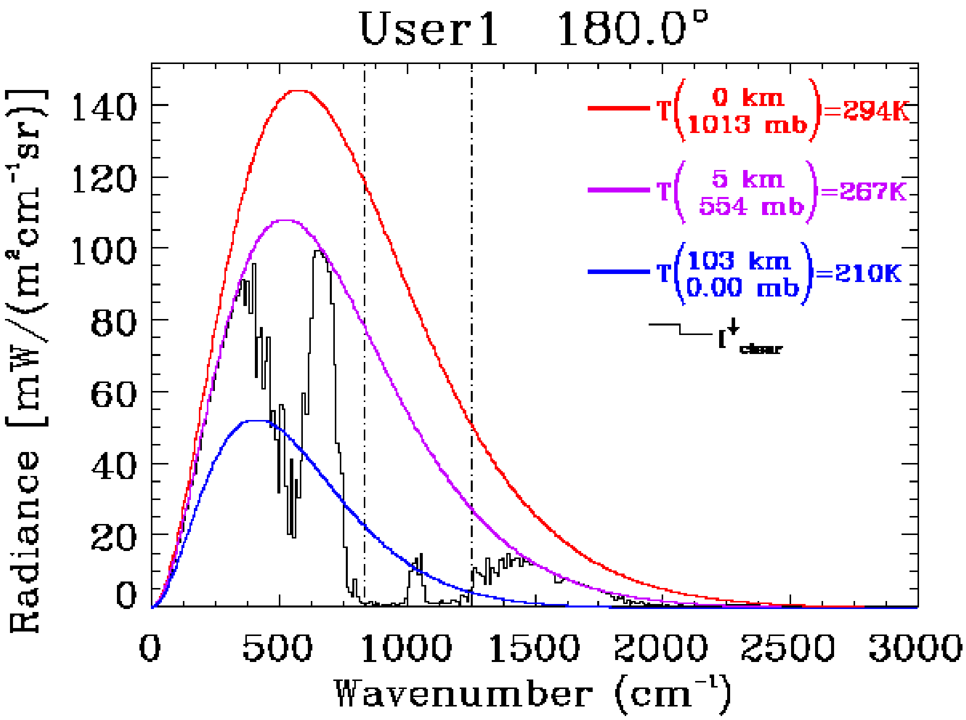
Upwelling radiance at 5.0km, 554mb



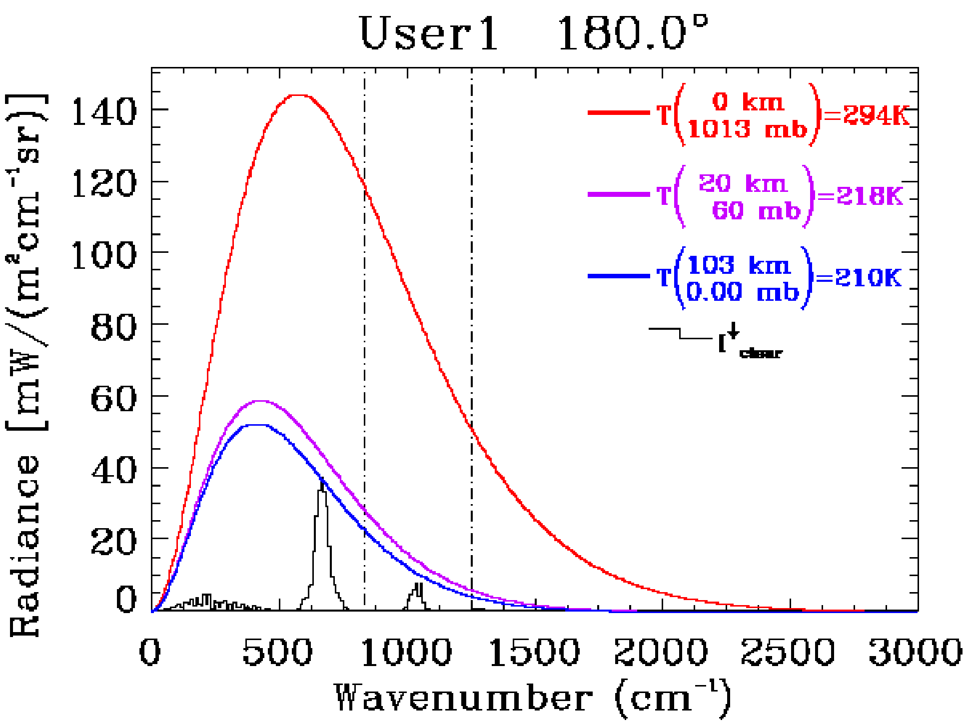
Upwelling radiance at 102.9km, 0.00mb

b) Plot the downwelling radiance spectrum for the midlatitude summer atmosphere. Explain the differences across the spectrum between the downwelling radiances at 20, 5, and 0 km.



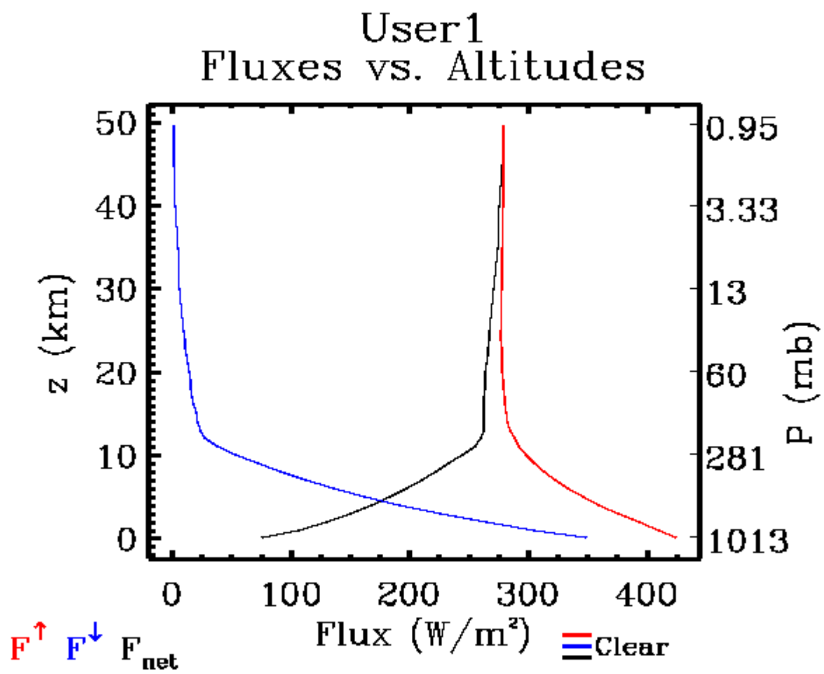


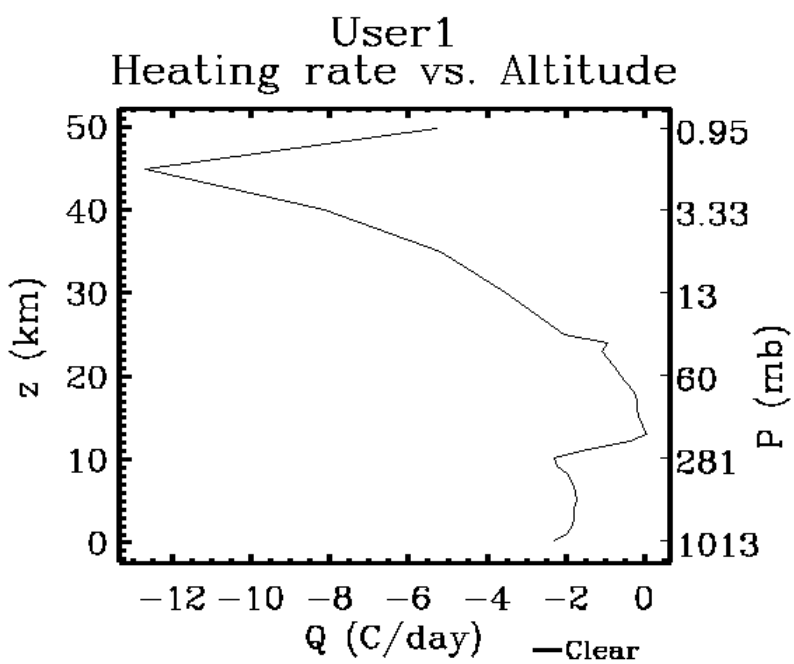
Downwelling radiance at 5.0km, 554mb



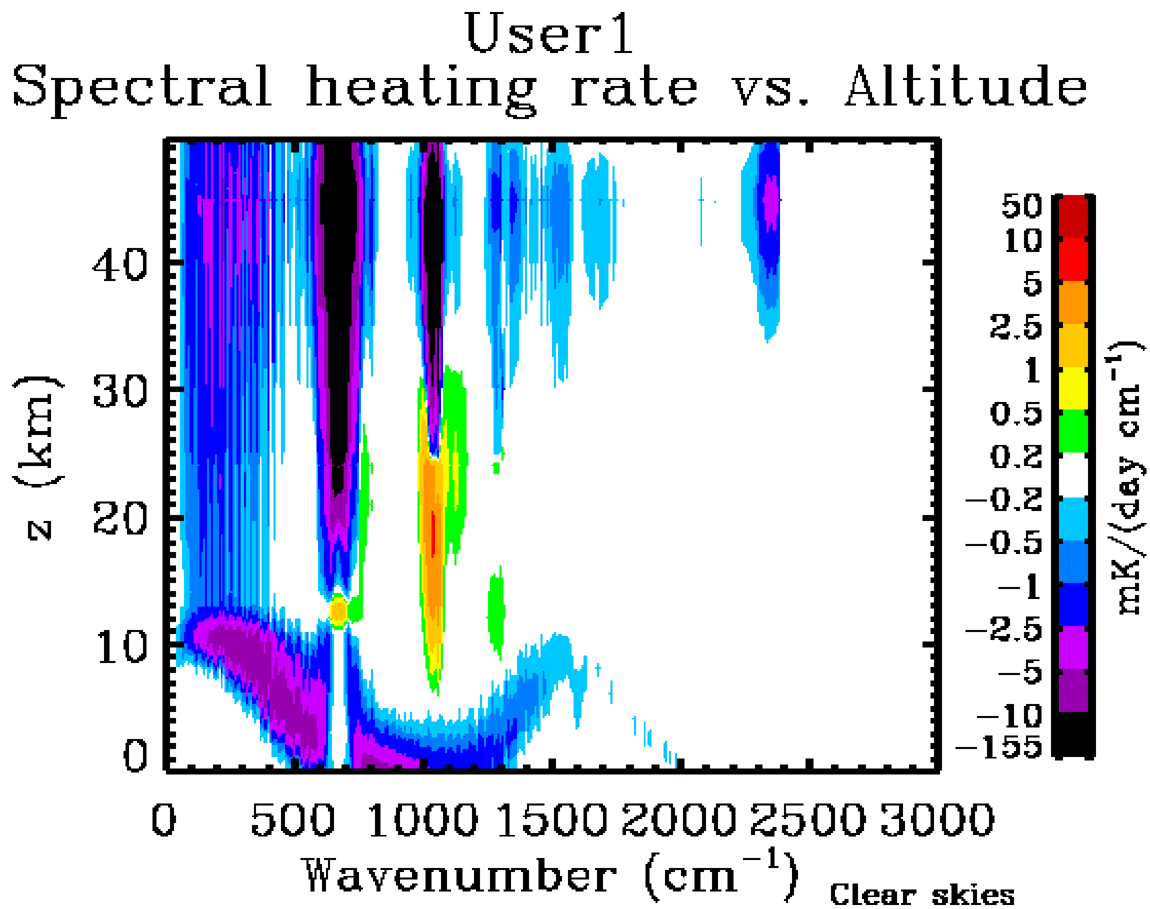
Downwelling radiance at 19.9km, 59.5mb

3. *a) Plot the spectrally integrated fluxes and heating rate for the midlatitude summer atmosphere. Plot as a function of altitude and use 49 km for the upper level so only the troposphere and stratosphere are plotted. For a different perspective, change the y-axis of the plots to pressure.*



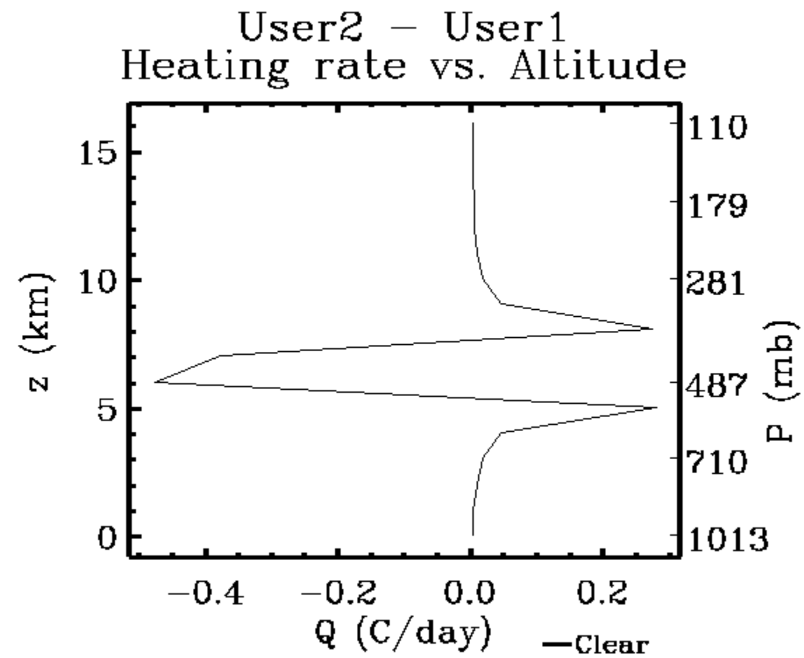


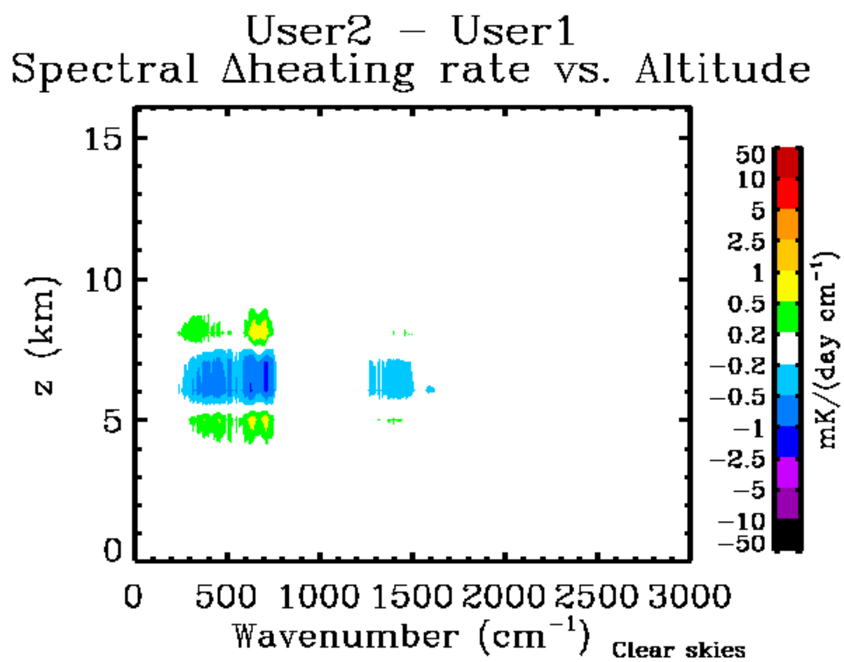
4. *Look at the heating rate in more detail for midlatitude summer by making a Clough spectral heating rate profile plot (use an upper altitude of 49 km).*



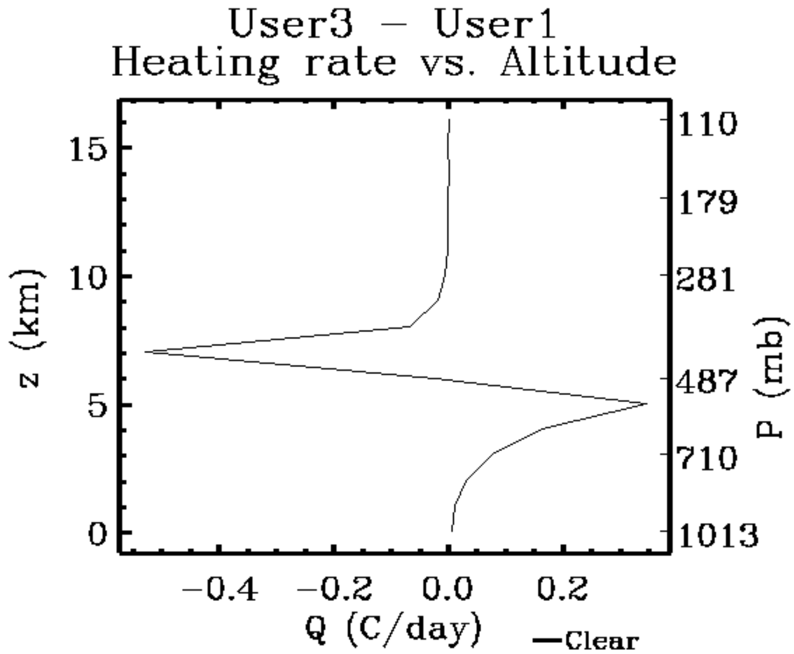
5. *Now we'll look at the effect of single level temperature and water vapor perturbations on the heating rate profile.*

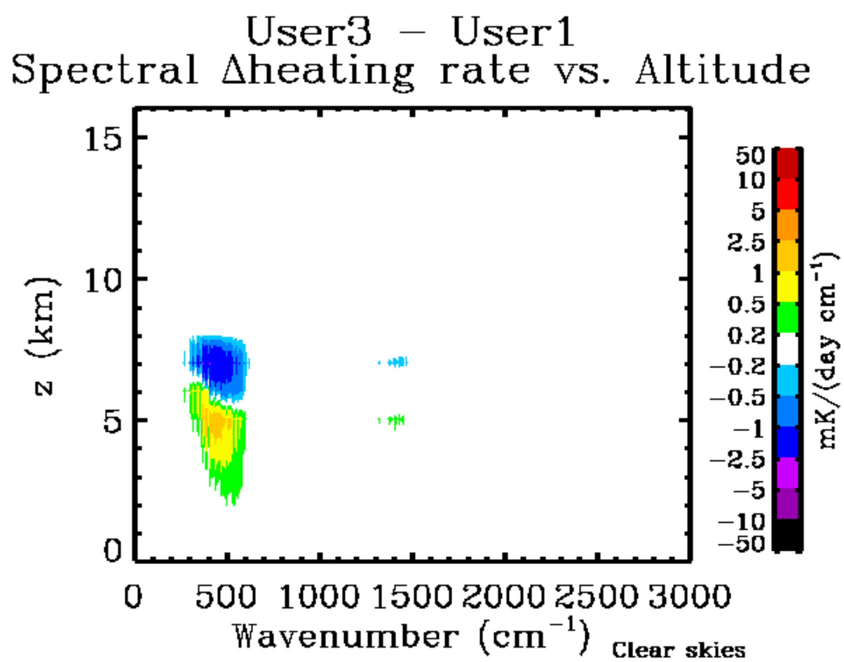
b) Plot the broadband heating rate profile of the difference between the temperature perturbed and the original sounding (plot "Sounding 2-1").





c) Plot the broadband heating rate profile of the difference between the water vapor perturbed and the original sounding (plot "Sounding 3-1").





6. *Now look at the effect of doubling carbon dioxide.*

b) Plot the broadband heating rate profile of the difference between the doubled CO_2 and original sounding (plot "Sounding 2-1").