

ATS 521 Homework 3 due Wednesday, April 24th 2013

1. Copy the two netcdf data files ERBE_mean.cdf and ncep.mean.nc containing ERBE satellite data of top-of-the-atmosphere radiative fluxes and surface temperatures, respectively, from /home/server/scratch/ATS421-521/data to your directory. Open the data in FERRET. Calculate and plot the zonally averaged values of temperature T , fluxes F_{SW} , F_{LW} , F_{m} , and planetary albedo a . (2)
2. Implement the 1D-EBM in a fortran program. Set up a grid from 90°S to 90°N with $N=18$ boxes and $\Delta\phi=10^\circ$. Use zero flux at the poles ($F_{m1}=F_{mN+1}=0$) as boundary conditions. Use $K(\phi)=K_0\cos(\phi)$ (see Figure 2.14), with $K_0=2\times 10^5 \text{ m}^2/\text{s}$, the albedo parameters given in Fig. (2.16), and initialize the model with $T=293 \text{ K}$ everywhere. Run the model to equilibrium and plot the simulated distributions of temperature T , F_{SW} , F_{LW} , F_{m} , and albedo. (6)
3. Experiment with different values of the parameters. Set $K_0=(0,1,2,3,5)\times 10^5 \text{ m}^2/\text{s}$ and plot the temperature distributions. (2)

