P463/P763 Assignment 6

Due: 10:00 pm on Monday, 16 September, 2024

1) **Stellar profiles.** Make the following plots for your star for the **first** snapshot (ZAMS) and **last** snapshot (onset of He burning). On each plot draw **two** curves, one for each of the snapshots. For **each** plot, write **two to three short sentences** to summarize the results **and their physical significance**. Make sure to **compare** the two curves in your discussion. For log plots, it is generally preferable to use logarithmically spaced rather than evenly spaced tick marks, and label the values rather than the log of the values. An example is shown below.

   a) $\log_{10}(\rho)$ vs $\log_{10}(r/R)$. Use units of $\mathrm{g\,cm^{-3}}$ for ρ. Note that the horizontal axis goes from $r/R = 0$ to $r/R = 1$, so start at a sufficiently small value of $\log_{10}(r/R)$ and go up until the surface at $\log_{10}(r/R) = 0$.

   b) $\log_{10}(T)$ vs $\log_{10}(r/R)$. Use units of K for T.

   c) $m(r)$ vs r/R [use log scale(s) if necessary]. Use units of $\mathrm{M_\odot}$ for $m(r)$.

   d) Luminosity $l(r)$ vs r/R [use log scale(s) if necessary]. Use units of $L_\odot$ for L.

   e) X, Y, and Z vs r/R [use log scale(s) if necessary].

   f) P_{rad}/P vs r/R, where P includes contributions from both gas and radiation [use log scale(s) if necessary].

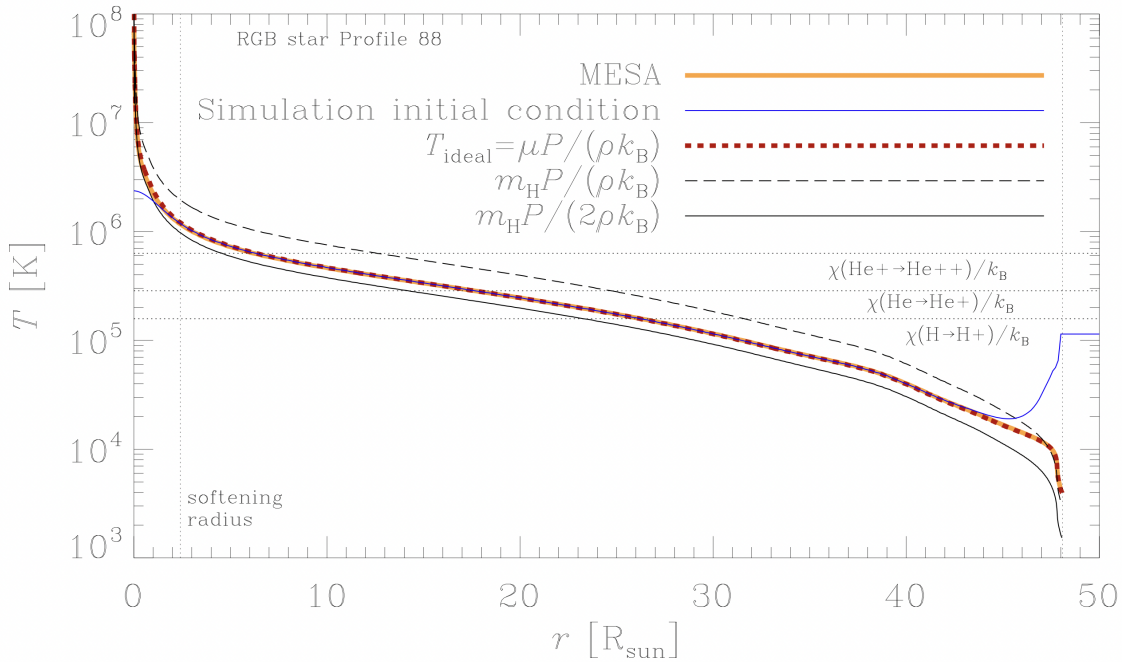   g) $\nabla - \nabla_{\mathrm{ad}}$ vs r/R [use log scale(s) if necessary].

Figure 1: Temperature profile for a $2\,\mathrm{M_\odot}$ star on the red giant branch. The temperature is plotted on a logarithmic scale.