PRE ZAHB

This test is to show the evolution of a 1 $M_\odot$ star through the pre zero-age horizontal branch phase. The pre ZAHB phase begins, by definition, after the star settles down after the helium core flash and any secondary flashes. This test should be cut off when the center mass fraction of helium drops below 0.75 (`xa_central_lower_limit_species(1) = 'he4' ; xa_central_lower_limit(1) = 0.75d0`).

The HR-diagram below (figure 1) shows the star's evolution through this phase, starting in the upper right corner.

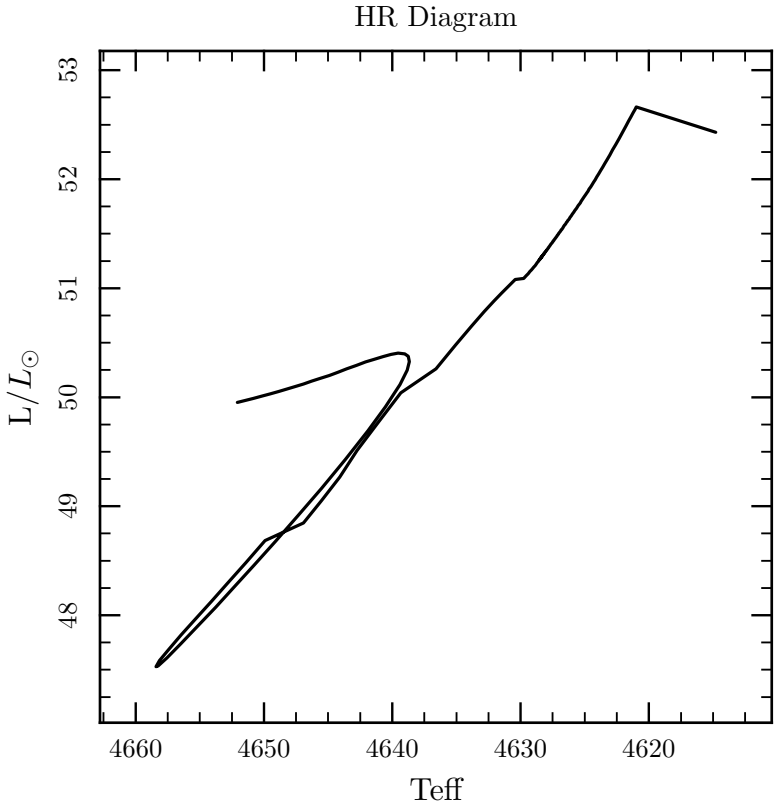

Figure 1: HR-diagram, evolution start in upper right corner

The two abundance profiles below taken from the start (figure 2) and the end (figure 3) of the run show that the abundances in the envelope change very little, and that the helium in the core is being burned into heavier elements.

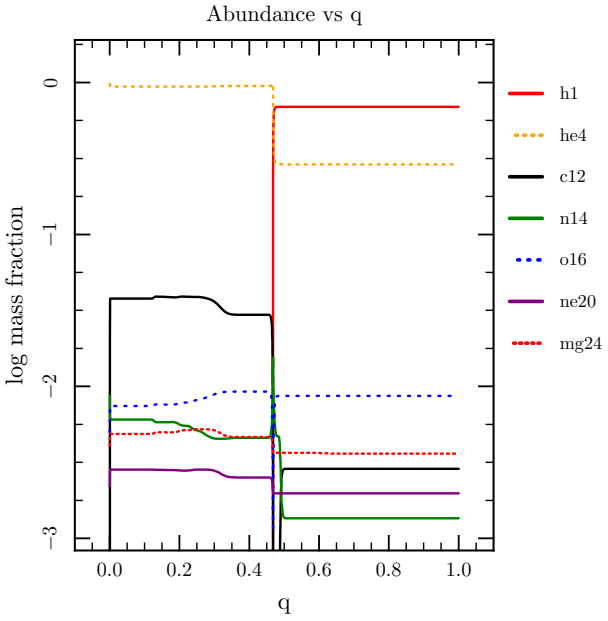

Figure 2: Abundance profile at start of run

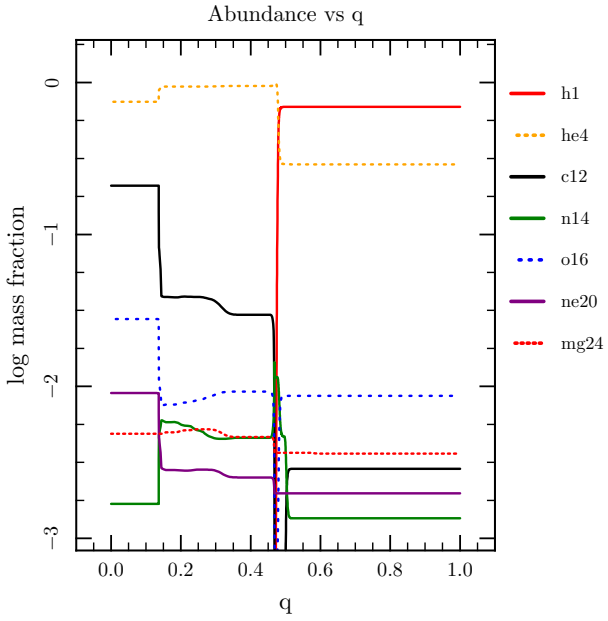

Figure 3: Abundance profile at end of run

Below is a burning rate profile from the end of the run (figure 4) to show the helium burning core and hydrogen burning shell.

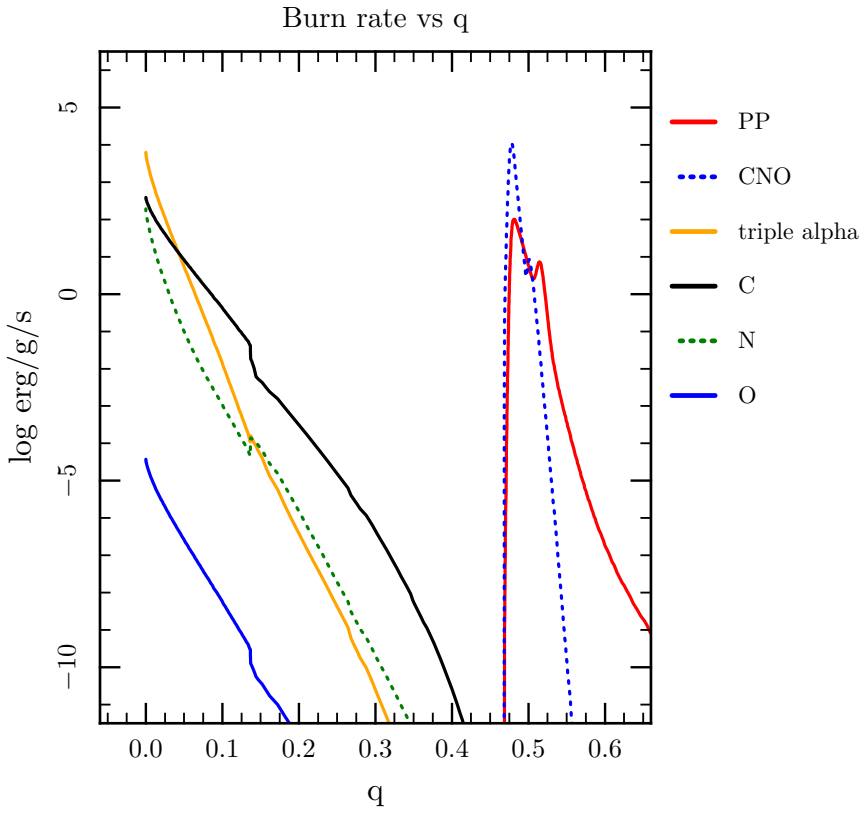

Figure 4: Helium burning core inside hydrogen burning shell

The plot to the left (figure 5) shows the evolution of the center density and temperature, starting in the bottom right corner. To the right is a temperature density profile (figure 6) taken from the start and the end of the run. Both of these figures show the initially inert, dense helium in the core begin to burn and expand.

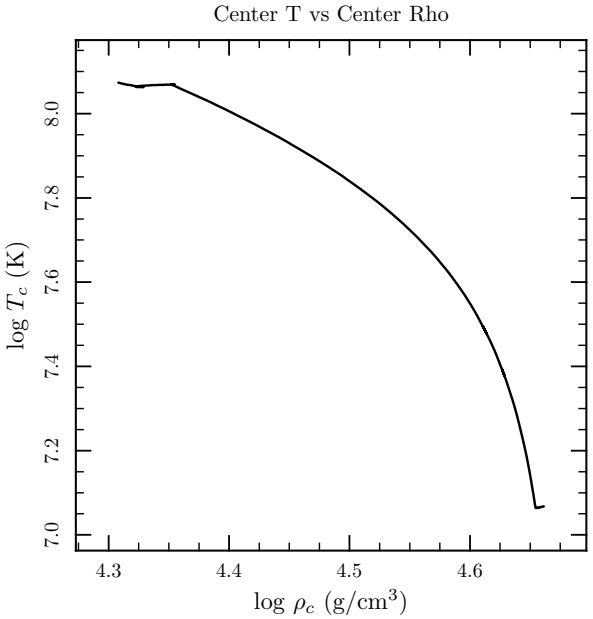

Figure 5: Evolution of center temperature and density

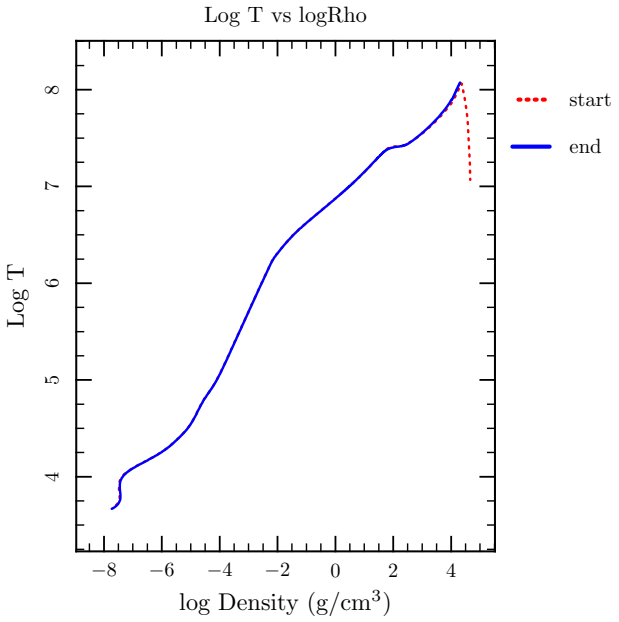

Figure 6: Temperature-density profile from the start and end of the run

This final plot (figure 7) shows a few internal MESA variables, such as the size of the time-step, the number of zones, and the number of retries against the model number in order to give some understanding of how hard MESA is working throughout the run and where some areas of problems/interest might be.

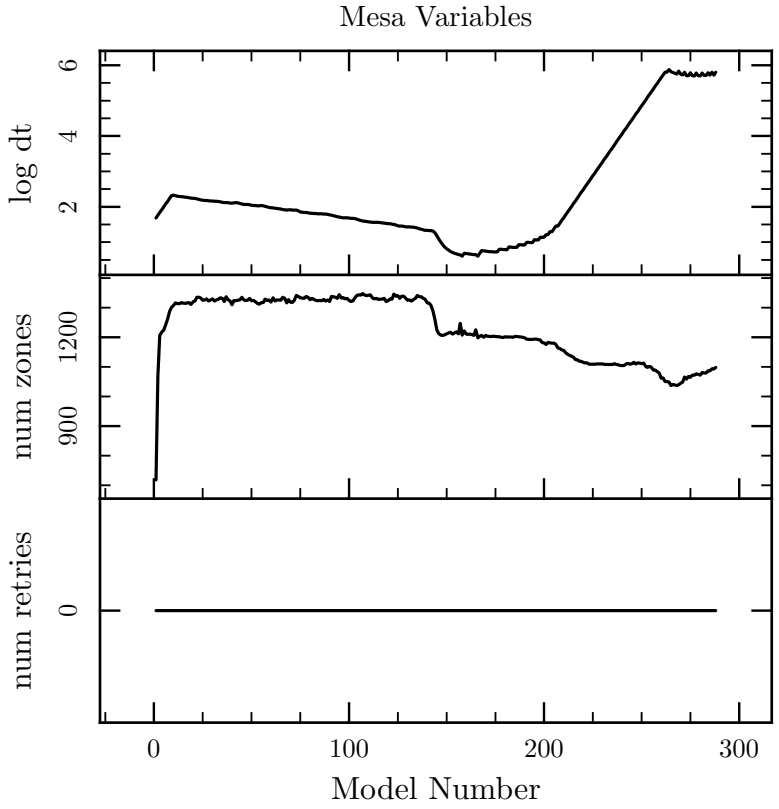

Figure 7: MESA variables plotted against model number show how hard MESA is working