WD COOL 0.6M

This test is to show a 0.6 $M_\odot$ white dwarf peacefully cooling for billions of years. Therefore, this test cuts off when the effective temperature drops below 4400 K (`Teff_lower_limit = 4400`).

This test case starts with a 0.6 $M_\odot$ carbon-oxygen white dwarf that cools for approximately 6.4 Gyr. Below is an abundance profile (figure 1), which plots mass fraction against logxq where logxq = log(1-q) and q is the fraction of star mass interior to outer boundary of each zone, moving outward fromt the core. (Note: The Ne20 shown here actually represents Ne22, this is because `MESA` is using a simplified nuclear reaction network.)

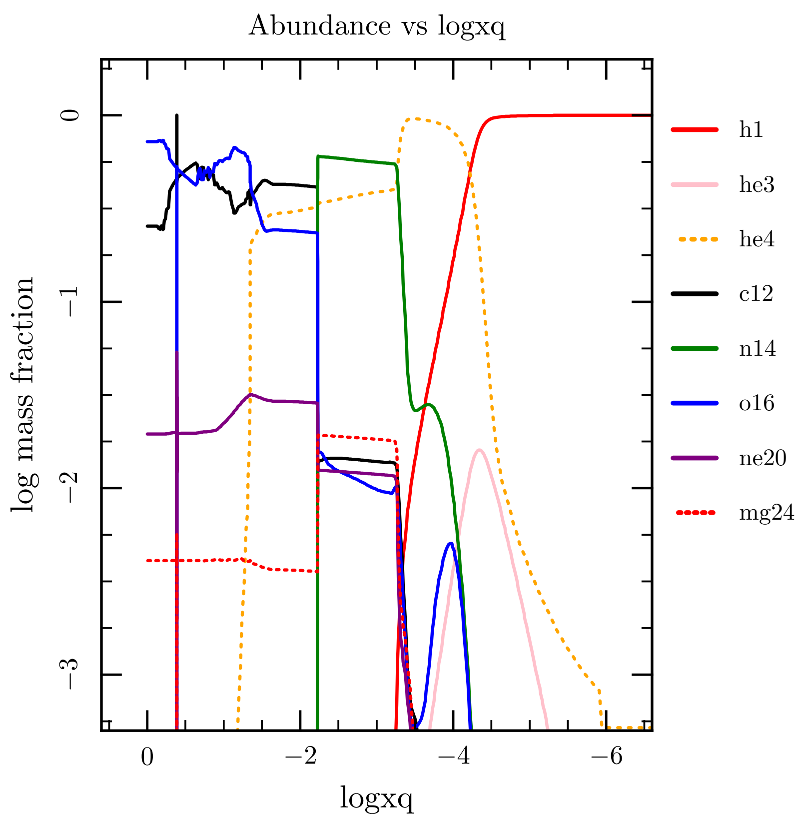

Figure 1: Abundance profile from end of run

Because the white dwarf has no major heat sources, temperature slowly falls throughout the star's core and envelope, as is shown in the profile below to the left (figure 2), causing its luminosity to decrease as well (figure 3).

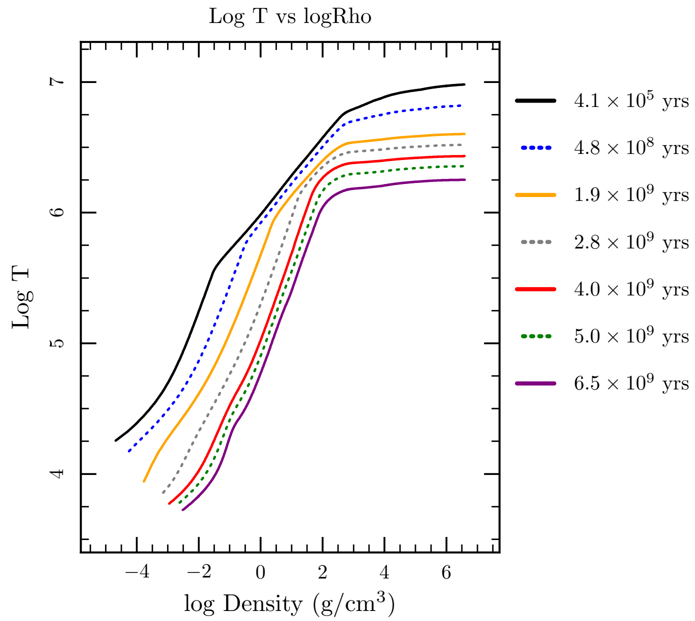

Figure 2: Temperature-density profile at different ages

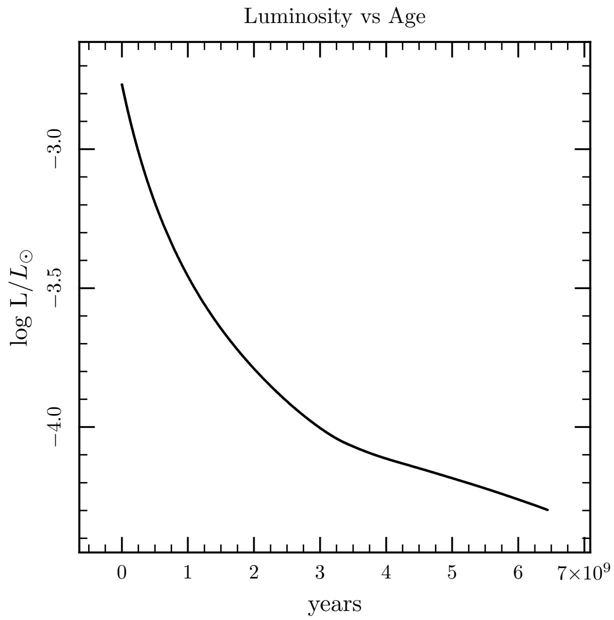

Figure 3: Luminosity decreases as the white dwarf cools

The slope on the upper part of the curve on the log plot below (figure 4) is about 2.5, which implies the following power law relation between luminosity and center temperature: $L \propto T^{5/2}$.

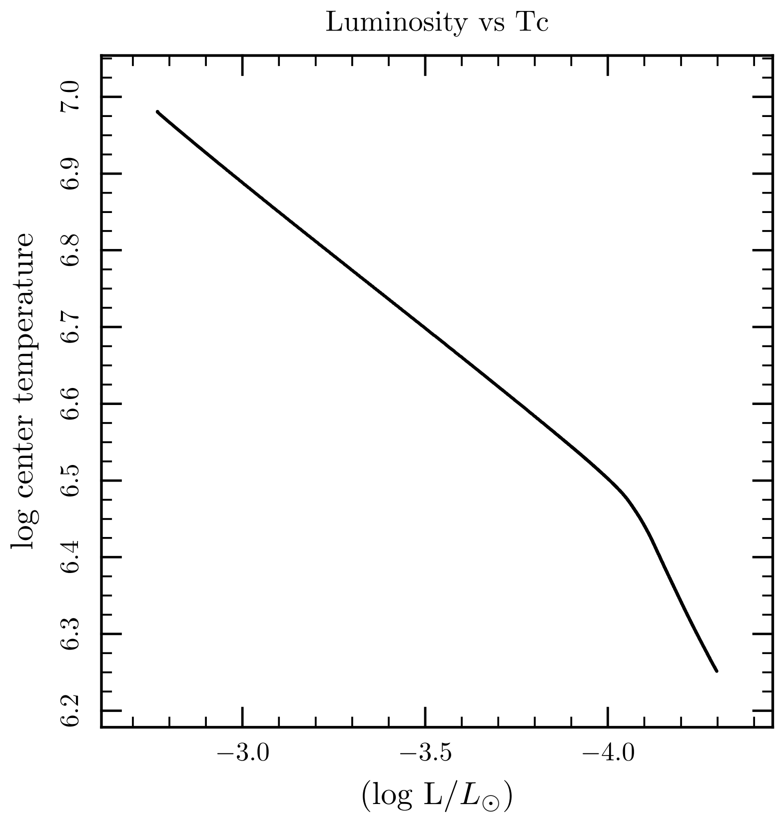

Figure 4: Luminosity vs Core Temperature

This final plot (figure 5) 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.

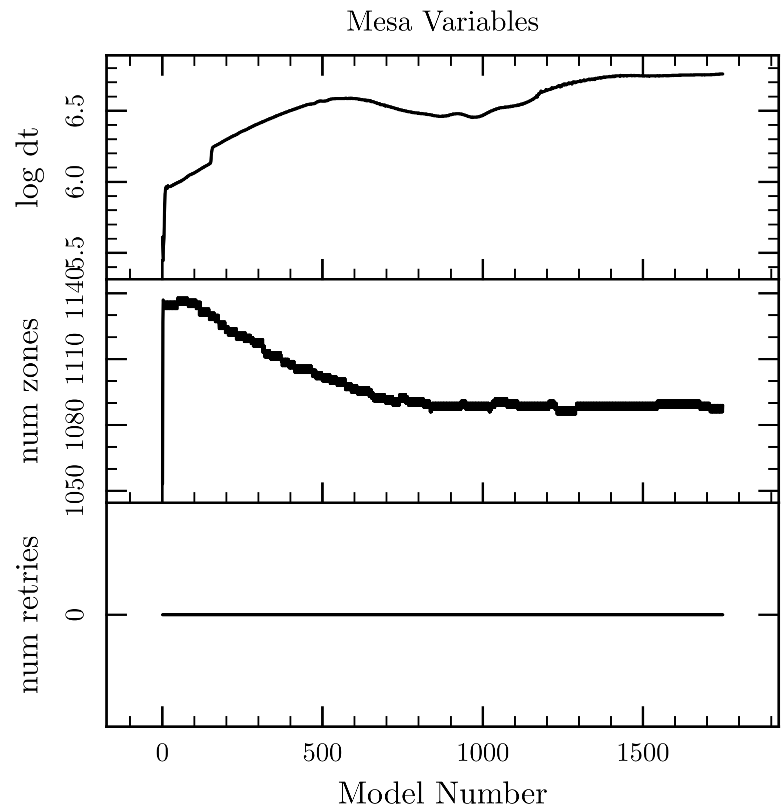

Figure 5: `MESA` variables plotted against model number show how hard `MESA` is working