WD

This test is to show a 1 $M_\odot$ white dwarf beginning ignition of the hydrogen shell at the start of a nova burst. Therefore, this test should be cut off when the luminosity reaches 10^3 $L_\odot$ (`log_L_upper_limit = 3`).

The inlist for this test loads a pre-saved white dwarf model from `mesa/data/star_data/white_dwarf_models`, and accretes about 5×10^{-5} $M_\odot$ over about 9500 yrs (a rate of 5×10^{-9} $M_\odot$/yr, `mass_change = 5d-9`), composition of the accreted material listed below.

Accreted Material composition (mass fractions):

- ^{1}H: 0.749
- ^{3}He: 2.9291e-5
- ^{4}He: 0.237

To the left is an abundance profile from the end of the run (figure 1). To the right is a burning rate profile from the end of the run (figure 2). Both are plotted against logxq, where logxq = log(1-q) and q is the fraction of star mass interior to outer boundary of each zone, moving outwards from the core. This shows that the hydrogen burning is taking place on the surface of the white dwarf.

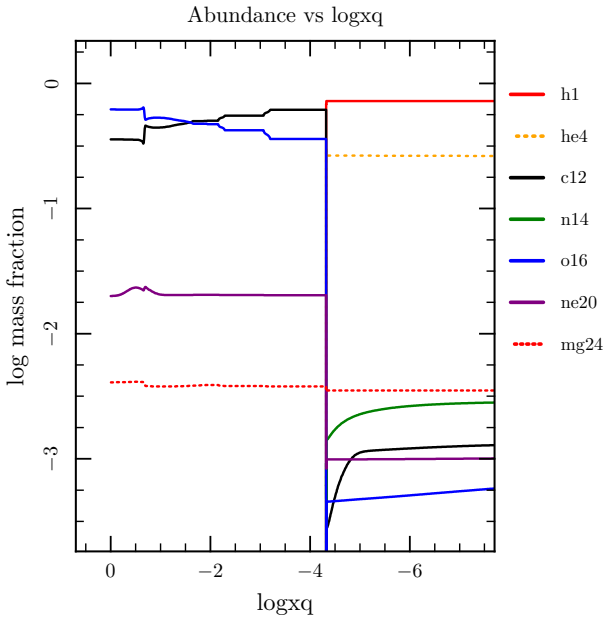

Figure 1: Abundance profile from end of run

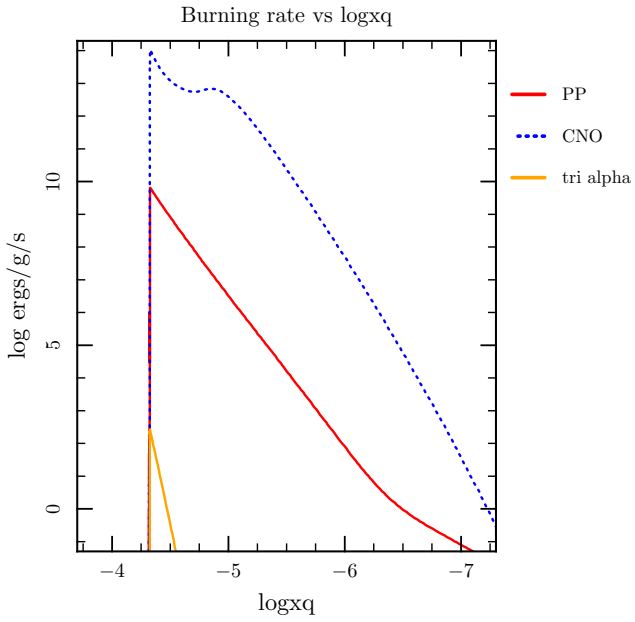

Figure 2: Burning rate profile from end of run

This burning leads to a rise in hydrogen luminosity (figure 3) and the released heat causes a jump in the radius (figure 4).

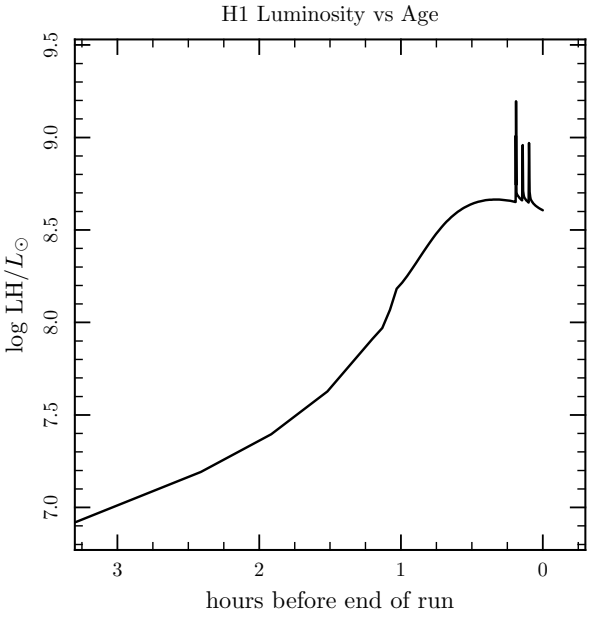

Figure 3

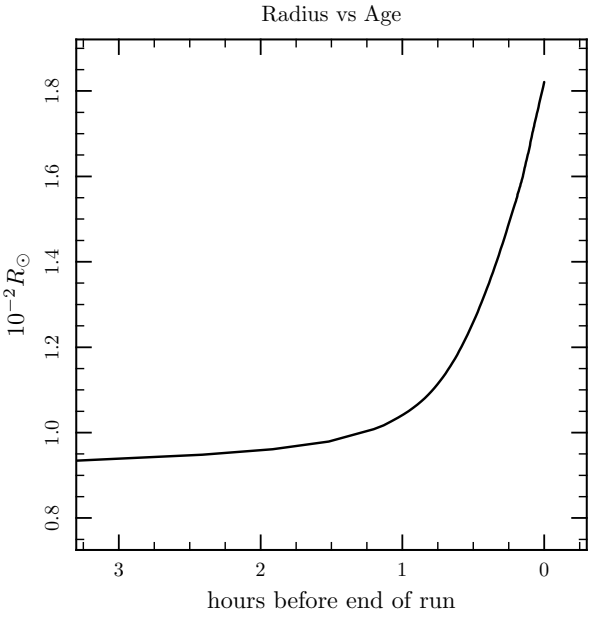

Figure 4

Due to this rapid adiabatic expansion, effective temperature (figure 5) and total luminosity (figure 6) drop a bit before increasing rapidly from the burning hydrogen.

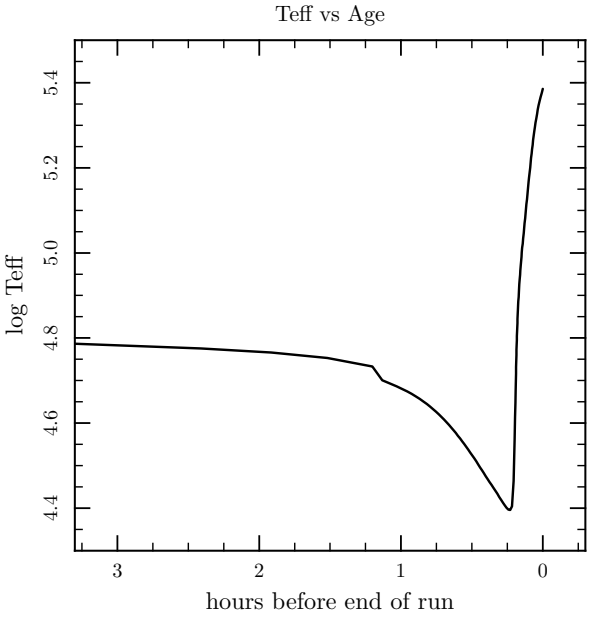

Figure 5

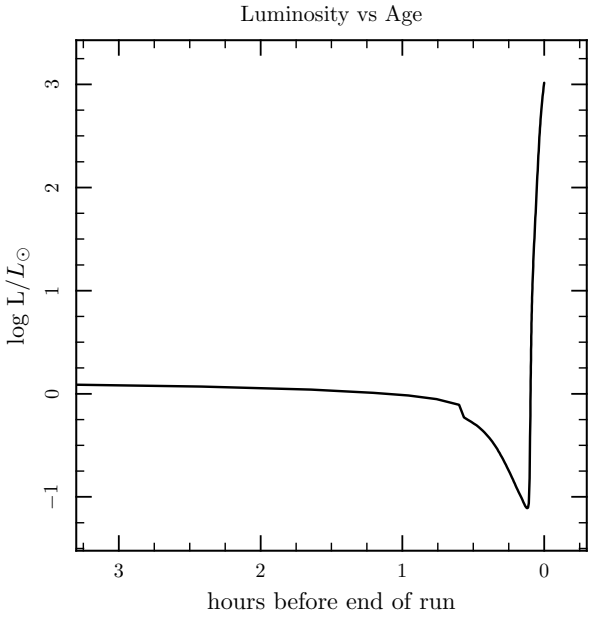

Figure 6

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.

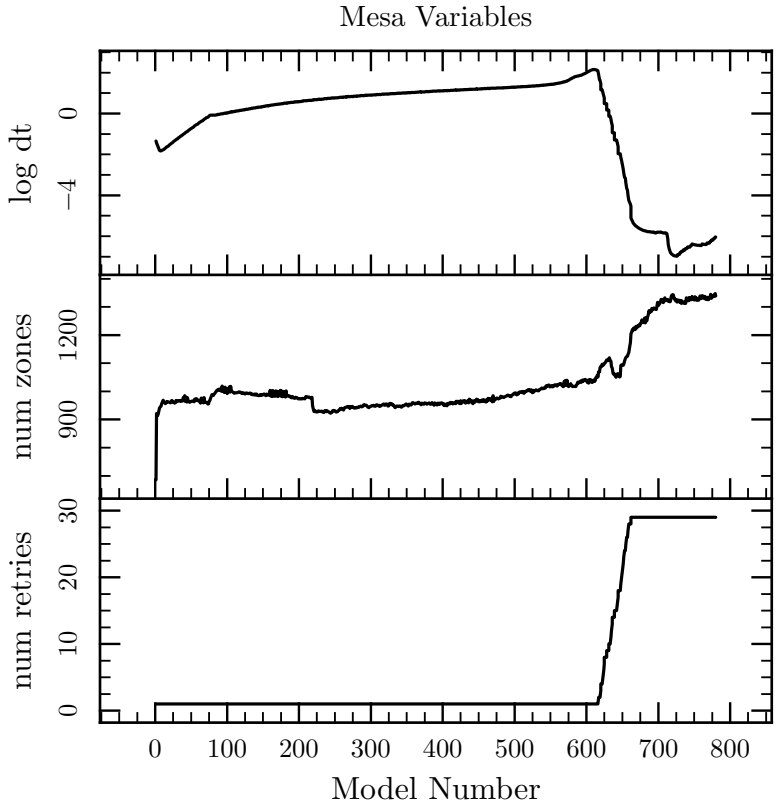

Figure 7: MESA variables plotted against model number show how hard MESA is working