SEWIND

This test is to show super eddington wind during a classical novae on an accreting white dwarf. Therefore, this test should be cut off when surface luminosity drops below 1 $L_\odot$ (`log_L_lower_limit = 0`).

This test case loads a pre-saved model of a 1 $M_\odot$ carbon-oxygen white dwarf and sets an accretion rate of $10^{-9} M_\odot$/yr (`mass_change = 1d-9`). The option for allowing super eddington wind is turned on by setting the inlist control `super_eddington_wind_eta` from 0 to 1.

Accreted Material composition (mass fractions):

- ^{1}H: 0.749
- ^{3}He: 0.29291e-4
- ^{4}He: 0.237

This novae can be seen in the loop the star's evolution takes in the HR-diagram below (figure 1). To the right of that is a plot of radius of the star (figure 2) showing significant expansion during the novae, which is associated with the dip in effective temperature. This also shows that the novae only lasts a few months.

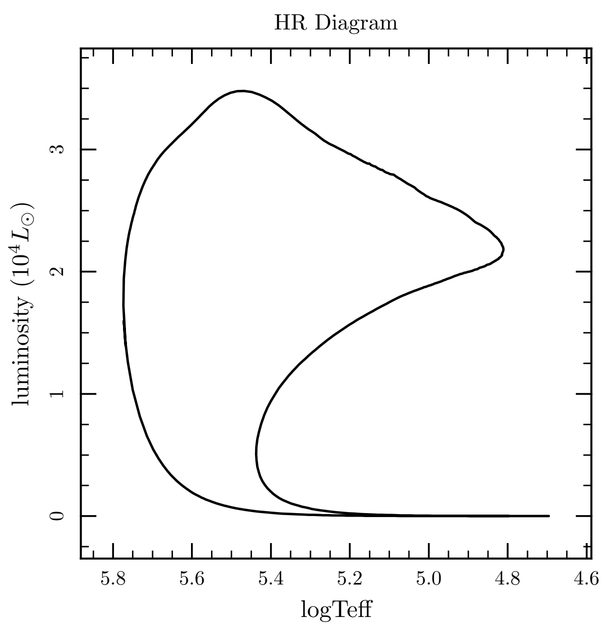

Figure 1: HR-diagram shows loop during novae

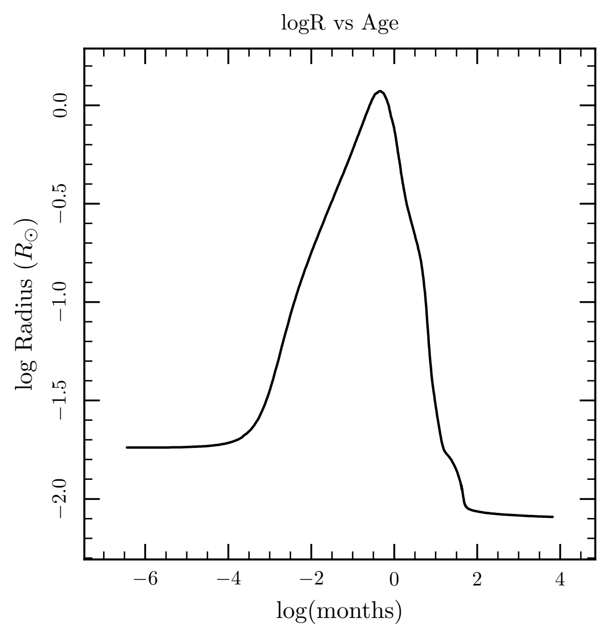

Figure 2: Radius plot shows expansion during novae

The nuclear burning during the novae, characterized by the burning rate profile, 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, to the left (figure 3), is dominated by the CNO cycle. The plot to the right (figure 4) shows that the amount of mass loss during this novae is slightly more than the mass of the hydrogen envelope at the start of the run.

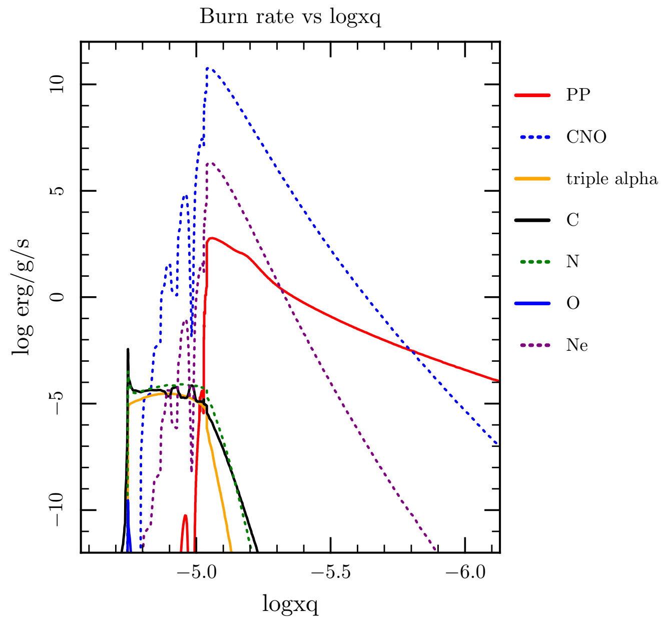

Figure 3: Burning rate profile during the novae, dominated by CNO

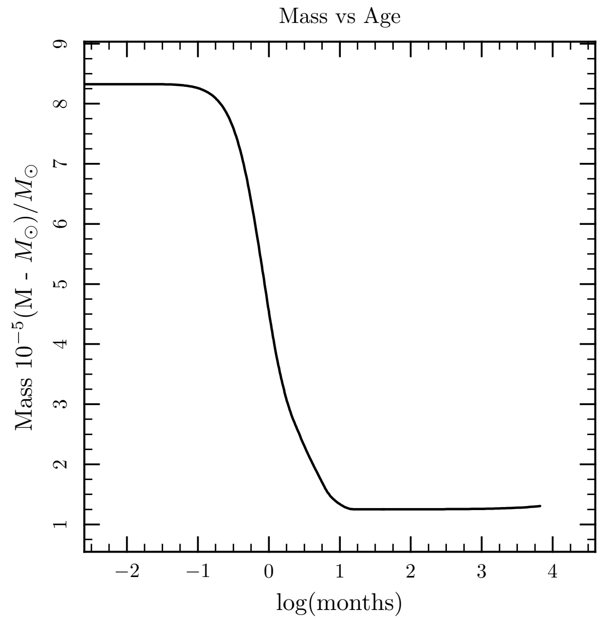

Figure 4: Mass plot shows only small fraction of mass is lost

Below is a video showing changes in abundances of elements plotted against logP. The number at the top-right is the model number. Click the figure to begin the video, double click to replay (must be using adobe reader to view movie). Below that are two abundance profiles, at the start of the novae to the left (figure 5) and after the novae to the right (figure 6), to show what elements were consumed and what elements were produced during the novae. (Note: The Ne20 shown here actually represents Ne22, this is because `MESA` is using a simplified nuclear reaction network.)

(Loading Video...)

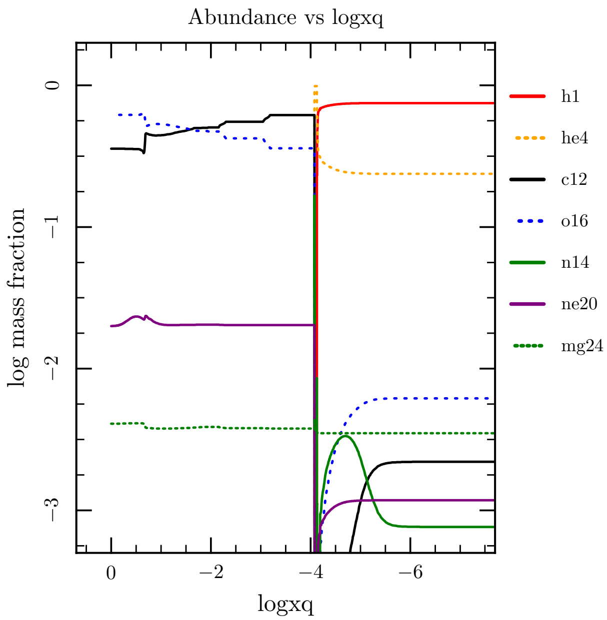

Figure 5: Abundance profile before the novae

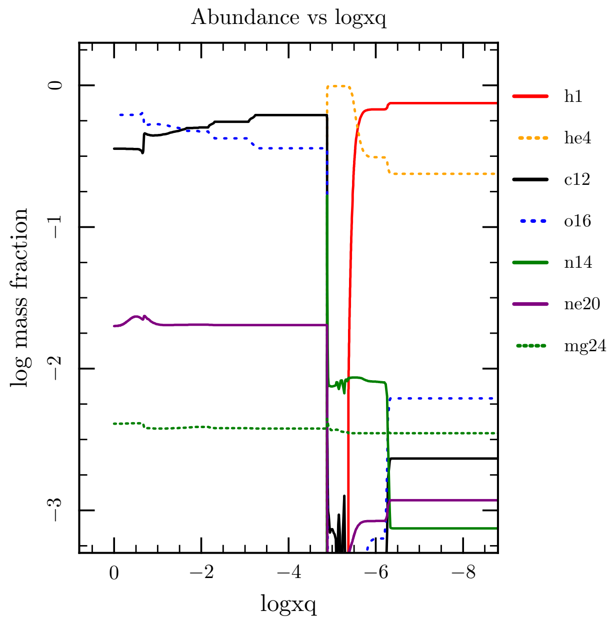

Figure 6: Abundance profile after the novae

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.

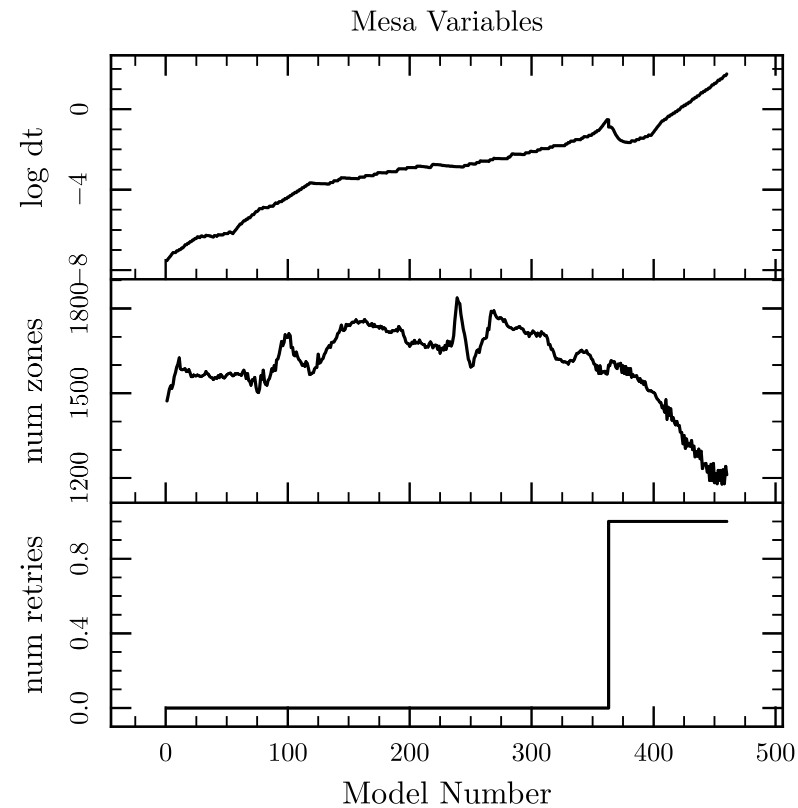

Figure 7: MESA variables plotted against model number show how hard MESA is working