
Minilab 3: Evolution along the Main Sequence

1 Reporting Quantities near the TAMS

We now want to watch evolution along the Main Sequence. Previously, you saved a ZAMS model of your selected mass. Time to put that model to use!

Using the same `inlist_project`, `inlist_pgstar`, `history_columns.list`, and `run_star_extras`, modify the `&star_job` section of your `inlist_project` to tell the model not to start on the pre-main sequence, but rather to load in your saved model:

```
create_pre_main_sequence_model = .false.  
load_saved_model = .true.  
saved_model_name = '<your selected mass between 3 and 100>ZAMS.mod'
```

and, for good measure, set

```
save_model_when_terminate = .true.  
save_model_filename = '<your selected mass between 3 and 100>TAMS.mod'
```

so that you do not overwrite your ZAMS.mod file.

We want to observe evolution along the Main Sequence, so we will update the stopping condition:

```
stop_near_zams = .false.
```

For consistency among our crowd-sourced runs, we will define our new stopping condition (in the `&controls` section of your `inlist`) as the time when the central hydrogen fraction of the model falls below 30%, setting:

```
xa_central_lower_limit_species(1) = 'h1'  
xa_central_lower_limit(1) = 0.3
```

Run (`./rn`) the model, and at the end of the run, report all the same quantities as before in your row of the Bildsten tab of the MESA Summer School [Spreadsheet](#).

To reiterate, record the the **surface luminosity** (L , luminosity) in units of L_{\odot} , **stellar radius** (R , radius) in units of R_{\odot} , **central temperature** (T_c , center_T) in K, **central density** ρ_c (T_c , center_Rho) in g/cm^3 **mass of the convective core** (M_c , mass_conv_core) in M_{\odot} , for your selected mass model **when** $X_c(\text{h1}) = 0.3$. Also report the **ratio of the radiation pressure to the total pressure** (P_{rad}/P) **at the half-mass coordinate** (which you calculate in `run_star_extras`), at the termination of your run when $X_c(\text{h1}) = 0.3$ in your model.

Also, stare at the HR diagram, $P - \rho$, and $T - \rho$ pgstar profiles! What do you notice?