Stars and Stellar Evolution (WS11-12) Computer Practicum with WTTS

Exercise 5 (16/12/11)

<u>NOTE</u>: Please find the **ZAMS** folder in your **SSE_WTTS#** directory (**mention it as your subject** if you are emailing answers) and start WTTS (**/vol/software/software/astro/wtts/wtts**) from inside it to load a set of zero age main sequence models (**DO NOT EVOLVE!**).

8. Using the **HRD tab**, create the HRD for the ZAMS models labelled by the mass (play around with colours, line width, label spacing). Answer the following questions :

    1. What colour are the low mass and high mass main sequence stars ?

    2. What was the temperature of the Sun when it was born?

9. Using the **Structure tab**, estimate expressions for luminosity and radius as a functions of mass in the forms $L \propto M^n$ and $R \propto M^m$.

10. Go to the **Kippenhahn tab**. Chose $Mass(Log10)$ as x-axis, $M/Mass(linear)$ as y-xis and $Convection(Log10)$ as z-axis. Plot and compare with Figure 2, from Kippenhahn & Weigert (K&W).

  1. What is the minimum mass for a star to have a convective core on the ZAMS?

  2. What is the maximum mass for a star to have a surface convective region?

  3. Plot $logT$ instead of convection (Hint: reset z-range to get better contrast). Why are the higher mass stars hotter?

  4. Plot rho as z-axis (also reset z-range appropriately). Explain what you observe in this plot.
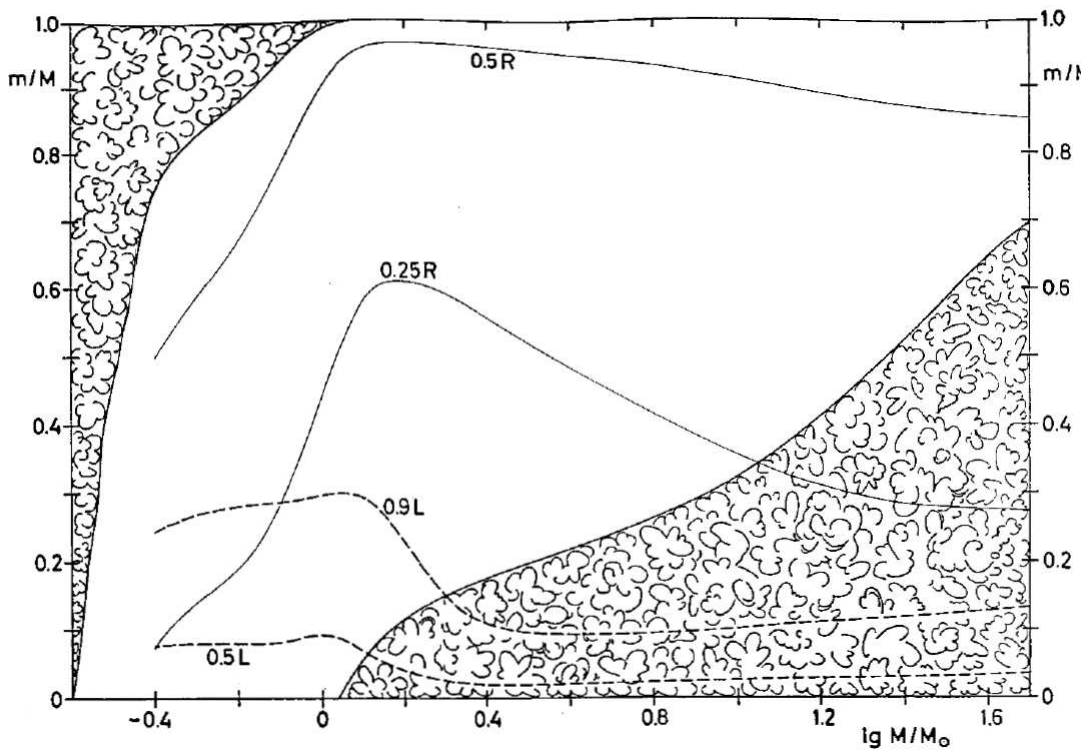
Figure 2 : Convective zones (cloudy areas) in main sequence models (K&W Fig 22.7)