Discussion on semiconvection

Reading material

Chapter 6.2 from Maeder's book

The introductory section

Section 6.2.1 (main points only)

Section 6.2.2 (main points only)

Papers

- Zaussinger, F., & Spruit, H. C. (2013). *Semiconvection: numerical simulations.* Astronomy & Astrophysics, 554, A119.

  https://arxiv.org/pdf/1303.4522

- Silva Aguirre, V., Ballot, J., Serenelli, A. M., & Weiss, A. (2011). *Constraining mixing processes in stellar cores using asteroseismology: Impact of semiconvection in low-mass stars.* Astronomy & Astrophysics, 529, A63.
  https://www.aanda.org/articles/aa/abs/2011/05/aa15847-10/aa15847-10.html

- Sofia, S., Howard, J. M., & Demarque, P. (2000). *The Evolution of Rotating 15 M$_\odot$ Stars: Semiconvection and the Blue to Red Supergiant Ratio.* In *Stellar Evolution and Convective Boundaries* (Cambridge University Press).
  https://www.cambridge.org/core/services/aop-cambridge-core/content/view/F9B8BB7F4C8CCD8C4F529F1CD0387031/S007418090021471Xa.pdf/the-evolution-of-rotating-15-m-stars.pdf

- Hainich, R., et al. (2017). *Wolf–Rayet stars in the Small Magellanic Cloud: a comprehensive analysis and the role of semiconvection. Astronomy & Astrophysics*, 606, A29.
  https://www.astro.physik.uni-potsdam.de/~ftp/hainich/smc-wn-rhainich.pdf

- Constantino, T., Campbell, S. W., Lattanzio, J. C., & van Duijneveldt, A. (2015). *The treatment of mixing in core helium burning models – II. Constraints from cluster star counts. Monthly Notices of the Royal Astronomical Society*.
  https://arxiv.org/pdf/1512.04845

<u>Assignment</u>

- You should read first the material from Maeder.
- Then choose one of the papers listed to present in a short 10-15 min presentation.

- Make sure different papers are selected by different students

Presentation Guidelines (10–15 minutes)

Your presentation should cover:

1. **Scientific context**
   - What problem is being addressed?
   - Why is semiconvection relevant?
2. **Method**
   - Simulations? Observations? Stellar models?
   - Key assumptions?
3. **Main results**
   - What is learned about semiconvection?
   - How strong are the constraints?
4. **Critical discussion**
   - Limitations?
   - Degeneracy with overshooting or rotation?
   - What remains uncertain?