Uncertainties on near-core mixing in red-clump stars: effects on the period spacing and on the luminosity of the AGB bump.

Diego Bossini*[1], Andrea Miglio[1], Maurizio Salaris[2], Leo Girardi[3], Josefina Montalban[4], Alessandro Bressan[5], Paola Marigo[6], and Arlette Noels[7]

[1]School of Physics and Astronomy, University of Birmingham – Edgbaston, Birmingham B15 2TT, UK, United Kingdom

[2]Liverpool John Moores University – United Kingdom

[3]INAF - Osservatorio Astronomico di Padova/Astronomical Observatory of Padova (INAF/OAPD) – Italy

[4]Free Lance (Free Lance) – Belgium

[5]Scuola Internazionale Superiore di Studi Avanzati / International School for Advanced Studies (SISSA / ISAS) – via Bonomea, 265 - 34136 Trieste - Italy, Italy

[6]Dipartimento di Fisica e Astronomia Galileo Galilei, Universita' di Padova – Italy

[7]Institut d'Astrophysique et de Géophysique, Liège University – Belgium

Abstract

The efficiency of convection in stars affects many aspects of their evolution and remains one of the key-open questions in stellar modelling. In particular, the size of the mixed core in core-He burning low-mass stars is still uncertain and impacts the lifetime of this evolutionary phase and, e.g., the C/O profile in white dwarfs.
One of the known observables related to the Horizontal Branch (HB) and Asymptotic Giant Branch (AGB) evolution is the AGB bump. Its luminosity depends on the position in mass of the helium-burning shell at its first ignition, that is affected by the extension of the central mixed region.

In this poster we present evidence for the AGB bump in Kepler's giants, and how its use as an estimator of the overall size of the mixed core in He-burning stars. In our preliminary work we use the MESA code (Modules for Experiments in Stellar Astrophysics, Paxton et al. 2013) to study the treatment of central mixing, by considering the effects of different amounts of overshooting. We show how various assumptions on mixing and thermal stratification in the overshooting region affect the seismic observables, in particular the period spacing. We also investigate the effects of glitches in the structure (e.g due to of partial mixing in the "semiconvective" region) on the detailed properties of the period spacing.
We plan to extend this study using results from other stellar evolution codes, i.e. PARSEC (Bressan et al. 2012), BASTI (Cassisi et al. 2006), and ATON (Ventura. D'Antona & Mazzitelli 2008).

*Speaker