Core Overshooting and Extra Mixing in Two Kepler SPBs
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(1) Observations
KIC 10526294
(3.25 M_☉)
_v sin i = 7 km sec^-1, 19 g-modes: l=1, m=0

KIC 7760680
(3.25 M_☉)
_v sin i = 62 ± 5 km/s, 36 g-modes: l=1, m=±1

For more recent SPBs, see Poster PA S7.27

What's missing here?

(2) Mode Trapping
Exponential overshoot works much better than the step-function overshoot!

Exponential overshoot

KIC 7760680: The overshoot width is just 1% of star radius, and ~8% of the whole star mass.

What overshooting "width" reproduces the observations?

(3) Simple SPB model with "MESA"

KIC 7760680: The overshoot width is just 1% of star radius, and ~8% of the whole star mass.

We also vary diffusive mixing in the radiative envelope, from zero to ... a lot.

(4) Agreement with Numerical Simulations

For KIC 10526294: f_0 = 0.017 ± 0.001, and log D_{mix} = 1.75 ± 0.25 cm^2/sec.
For KIC 7760680: f_0 = 0.024 ± 0.001, and log D_{mix} = 0.75 ± 0.25 cm^2/sec. It rotates at 26% Roche break-up frequency.
For KIC 7760680 which rotates faster, higher overshoot was needed, perfectly agreeing with 3D simulations of Browning et al. (2004, ApJ).

(5) Plans for the Future

- Modelling the new Kepler SPBs (Poster PA S7.27)
- Computing a large grid of massive stars, and modelling all SPB + β Cep stars in the literature.
- Does core overshooting and diffusive mixing depend on stellar mass? on age, or on rotation rate?
- Do our findings agree with 2D/3D simulations?
- Can we calibrate 1D evolutionary tracks?

(6) More Info?

Please, help yourself with a free copy of: KIC 10526294 paper and KIC 7760680 paper.

With ASAMBA, we share our opacity tables, and seismic models with you. Just scan this QR code and get started ...

ASAMBA (AsteroSismic Approach towards understanding Massive B stars) is a Marie Curie FP7 funded project, hosted by KU Leuven, Belgium.

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