

Convective overshooting in hydrodynamic simulations of the F-type eclipsing binary BW Aquarii

Mary Geer Dethero

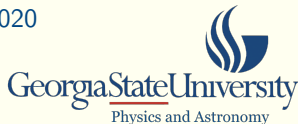
Thanks to my collaborators:

Jane Pratt (GSU)

I. Baraffe (Exeter, ENS Lyon) & the MUSIC developers team

Royal Astronomical Society Early Career Poster Exhibition

September 14-28, 2020



Convective overshooting in hydrodynamic simulations of the F-type eclipsing binary BW Aquarii

Mary Geer Dethero

Global stellar simulation of BW Aqr

Convective overshooting measurements

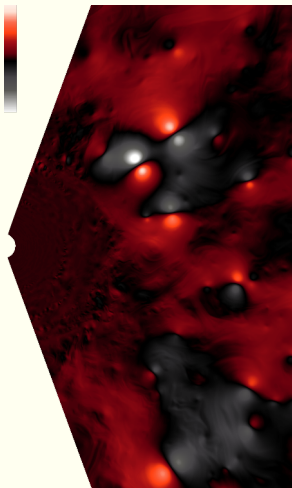
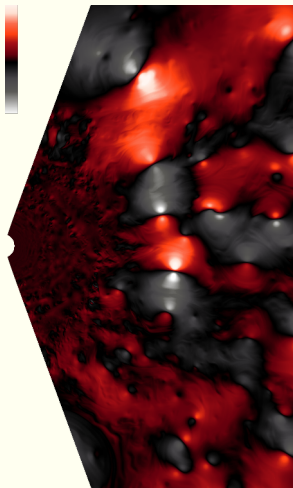
Size and structure of convective flows near boundary

A Star

$$M_A = 1.365 M_{\odot}$$
$$L_A = 9.836 L_{\odot}$$

B Star

$$M_B = 1.483 M_{\odot}$$
$$L_B = 12.74 L_{\odot}$$



Radial velocity (red outward, grey inward, black zero) overlaid with high vorticity magnitude (white).

Convective overshooting in hydrodynamic simulations of the F-type eclipsing binary BW Aquarii

Mary Geer
Dethero

Global stellar simulation of BW Aqr

Convective overshooting measurements

Conclusions and References

- ▶ Preliminary results show that for the binary stars in BW Aquarii at the first dredge-up there is a difference in overshooting of $0.2H_p$ (A star) vs $0.7H_p$ (B star). This difference is slightly less than a factor of 4, which is the difference in overshooting programmed in the MESA model.
- ▶ In this work, BW Aquarii is modeled as two single stars. Next, we plan to include aspects of binary interactions in the multi-dimensional fluid simulations and see how the overshooting changes.
- ▶ MUSIC webpage: http://www.astro.gsu.edu/~jpratt/music_webpage/music.html.
- ▶ References:
Pratt, Baraffe, et al (2020). Comparison of 2D and 3D compressible convection in a pre-main sequence star. *Astronomy Astrophysics*, 638, A15.
Baraffe, Pratt, et al (2017). Lithium depletion in solar-like stars: effect of overshooting based on realistic multi-dimensional simulations. *ApJ Lett.*, 845(1), L6. .

Convective overshooting in hydrodynamic simulations of the F-type eclipsing binary BW Aquarii

Mary Geer
Dethero

Global stellar simulation of BW Aqr

Convective overshooting measurements