Title: The role of convection in determining the ejection efficiency of common envelope interactions for massive stars

When a star in a binary system evolves off the main sequence, reaching the end of its life, one star may engulf the other, resulting in a common envelope. The ejection efficiency parameter (alpha), defined as the energy transfer from the shrinking orbit to the envelope , can be used to predict the outcome of the system. Typically, alpha is a set constant based on observations of common envelope systems. Correctly estimating alpha can be difficult, as it requires knowledge of the star’s interior. Using numerical models, we find profiles for the interior of massive stars at their maximum radius. We then use the profiles to determine convection zones of the star and the corresponding ejection efficiency. Convection zones are areas within the star where the movement of molecules allows energy to be transported to the surface of the star and then radiated away. We expect that the convection carries released energy away from the system, lowering the ejection efficiency. These systems form the progenitors of gravitational-wave driven mergers of neutron star and black hole binaries.

Emily’s notes:

* Changes in red
* When I do abstracts like this I usually use “alpha” rather than “a\_eff”
* \* Don’t forget the parts about convection! We assume that convection carries released energy away from the system, thereby lowering the ejection efficiency.
* You can use your convective zones plot to draw some conclusions – compare them to the regions on Wilson & Nordhaus 19. We can talk about this Friday

Nordhaus

When one star in a binary system reaches the end of its life, it swells in size and can engulf the other star in a common envelope.  During a common envelope phase, the orbital separation decreases substantially as the engulfed star encounters hydrodynamic drag.  The efficiency, a\_eff, of energy transfer from the shrinking orbit to the envelope dictates the final separation of the system at the end of the common envelope.  Using numerical models of the interiors of massive stars, we calculate the ejection efficiency when the effects of convection in the common envelope are incorporated.  These systems form the progenitors of gravitational-wave driven mergers of neutron star and black hole binaries.