

Discussion about collisions at MODEST-4

Outline

- Relevance (when, where), i.e. who cares?
- Evolving collision products
 - Kindly request somebody from Geneva Stellar Evolution Group to talk about this.
- Collision in high v environments
- Importance of realistic star models
- Including collisions in full cluster simulations
- Numerical techniques (improvements, limitations, new physics)

Evolving Collision Products

- (MS-MS) Main unknown: Role of rotation, braking mechanism
- Collision with compact object(s)
 - CO-MS: smothered CO. Accretion on to compact object?
 - Encounter with (I)MBH, role of tidal compression
- Run-away formation of very massive star ($\gg 100 M_{\text{sun}}$)
 - Are they IMBH progenitors (role of Z)?
 - Formation of clusters at very low Z ?
 - Result of collision for $m \ll M$ (transparency problem)

Collisions in high- V environments

- Possibility of growing massive stars (role of M-R relation, concentration)
- Collisions with giants
 - Relatively more likely
 - Less studied (given larger parameter space)
- Large $M_1:M_2$ ratio (treat the small star as a point mass?)

Role of realistic stellar structures

- (evolved) MS stars not well modelled by polytropes of any degree
 - Outcome of collision simulation for polytrope vs. realistic model does differ quantitatively (spurious mixing in 0.4-0.8 M_{sun} merger)
- Fluid sorting works well for low-M ($< 10 M_{\text{sun}}$?), low-V collisions.
 - How to extend to high M (role of P_{rad})?
- Radiative losses are negligible
- EOS: ideal gas + P_{rad} sufficient for hydrodynamics and structure of product