Star Cluster Assembly Induced by Cloud-Cloud Collisions

○Jeremy Karam[1] Michiko Fujii[1] Rachel Friesen[2] Alison Sills[3] Kazunari Iwasaki[4] (1.The University of Tokyo 2.The University of Toronto 3.McMaster University 4.National Astronomical Observatory of Japan)

Collisions of both atomic and molecular gas clouds have been suggested as key processes in inducing star and star cluster formation within galaxies. However, the process by which colliding clouds evolve to form star clusters remains unclear. We perform star-by-star simulations of star cluster formation inside colliding gas clouds using a combination of the ATHENA++ and ASURA+BRIDGE codes. We first simulate collisions of atomic gas with varying collision velocities, gas densities, and magnetic field properties using ATHENA++ to study the evolutionary parameters of the molecular gas filaments that form inside the shock front. We then zoom into the shock front of each simulation and simulate the build up of a star cluster while resolving the formation of each individual star using ASURA+BRIDGE. By comparing the dynamics of our star clusters directly with Gaia observations, our simulation suite is used to determine the collision parameters required to produce star clusters similar to the ones we see throughout the Milky Way and to predict cluster formation histories from observations. We also perform separate simulations of colliding molecular clouds with varying collision parameters to study how angular momentum is transferred from the cloud scale down to the forming star cluster to constrain the origin of the angular momentum signatures being observed in star clusters of all ages.