Stellar Mergers in the Galactic Center

Hyung Mok Lee
Department of Earth Sciences, Pusan University

Dynamical evolution of dense stellar systems is followed by integrating Fokker-Planck equation including successive mergers between stars. We have assumed that all the tidal captures lead to mergers. The initial cluster is assumed to be a single component Plummer model with mass of individual stars being 0.7M⊙. The highest mass that is allowed to form through successive mergers in our model is 32 x 0.7M⊙ =22.4 M⊙. The stellar evolution is simulated by removing stars from the cluster assuming that the stellar material escapes as the star finishes the evolution. We have estimated the number of stars that evolve off per unit time using 'evolution function' that depends on the mean age and lifetime. The mean ages are estimated from the rates of formation of stars (through merger). While the formation of massive stars leads to the acceleration of core collapse through mass segregation, the indirect heating effect due to stellar evolution makes the core collapse slow. The net effect depends on the initial conditions. The number of high mass stars depends sensitively on the cluster parameters. Core collapse is usually found to be terminated by the indirect heating effect of evolution of moderate mass stars (mainly 2.8 or 5.6 M⊙ in our models). The maximum number stars in highest mass bin (i.e., M =22.4M⊙) varies from unity to an order of 10^1 depending on exact initial conditions for the models appropriate for the Galactic center. These numbers are too small to explain the observed HeI emission line stars which are interpreted as envelope stripped high mass (20~40M⊙) stars. However, if the ejected material from the final stage of stellar evolution can form stars efficiently instead of escaping from the potential well of the stellar system, more high mass stars can be found. The presence of massive black hole in the center would also boost the merger rates.

A Study of an Intermediate-Velocity Molecular Cloud G135+54; I. CO Observations and FIR Analyses

Lee, Youngung
Korea Astronomy Observatory

We have mapped an intermediate-velocity could (IVC) G135+54 in the transitions of ^{12}CO J=1-0, and ^{13}CO J=1-0 with high resolution and high sampling rate. 50″ respectively, covering 40′×25′ region centered on (α = $11^h50^m00^s$, δ = 61° 35′00″). The velocity of molecular emission ranges from -47 to -43 km s^{-1}, which is the highest negative velocity ever known for IVCs observed. The CO emission (T (peak) = 2K) is found to be well extended and it shows a filamentary and clumpy structure. No dramatic velocity field is found.

G135+54 is clearly detected in all 4 far-infrared bands, and is located on the edge of a large shell-like complex. It is found that(S_{100}/S_{60}) has stronger correlationship with CO emission, and that the color is quite different from those of normal dark clouds, which implys that it has a different dust distribution.