[IM-05] Dynamical Evolution of Supernova Remnants near Edge of Molecular Clouds

Wankee Cho[1], Jongsoo Kim[2], Bon-Chul Koo[1]
[1]*Astronomy Division Department of Physics and Astronomy, the Graduate School, Seoul National University*
[2]*Korea Astronomy and Space Science Institute*

We have calculated three-dimensional hydrodynamic simulations with HLL code for supernova remnants near the edge of molecular clouds. Various cases are presented with two parameters; a)the explosion site within the cloud and b) the density contrast between cloud and intercloud medium. For describing radiative shell and its related dynamics, cooling function is modified which covers wide temperature range(10~10^9 K).

Two basic models are shown; one is the case that the breakout of SNR is occurred after the formation of the radiative shell and the other is the case that the breakout is occurred before that. The effect of density ratio is also considered with basic models. We have focused on the time dependence of the radius of SNR. The slopes of logarithmic plot of radiuses and ages are converged to 0.6 ~ 0.75 on the shocks toward intercloud medium.

We discuss the estimation of the age of breakout SNR and the origin of the multi-layer structure which is appeared in the elongated shell. Finally high resolution experiment describes the detail hydrodynamics of various instabilities of thermal, Kelvin-Helmholtz and Rayleigh-Taylor.

[IM-06] Feedback from Multiple Supernova Explosions inside a Wind-Blown Bubble

조현진, 강혜성
부산대학교

We study the evolution of multiple supernova explosions inside a pre-exiting cavity blown by winds from massive progenitor stars. Hydrodynamic simulations in one-dimensional spherical geometry, including radiative cooling and thermal conduction, are carried out to follow first the development of the wind-blown bubble during the main sequence and then the evolution of the SN-driven bubble. We find the size and mass of the SN-driven bubble shell depend on the structure of the pre-existing wind bubble as well as the SN explosion energy $E_{SN} = N_{SN}\ 10^{51}$ ergs. For an association with 10 massive stars in the average ISM, the SN-driven shell has an outer radius of $R_{ss} \sim 85\mathrm{pc}\ N_{SN}^{0.1}$ and a mass of $M_{ss} \sim 10^{4.8} M_{\odot}\ N_{SN}^{0.3}$ at 10^6 years after the explosion. By that time most of the explosion energy is lost via radiative cooling, while $\leq$ 10% remains as kinetic energy and ~ 10% as thermal energy. We also calculate the total integrated spectrum of diffuse radiation emitted by the shock-heated gas of the SN bubble. Total number of H Lymann-limit photons scales roughly as $\Phi_{13.6} \sim 10^{61} N_{SN}$ and those photons carry away 20 - 55 % of the explosion energy. We conclude the photoionization/heating by diffuse radiation is the most dominant form of feedback from SN explosions into the surrounding medium.