GLOBAL STRUCTURE OF INTERSTELLAR MEDIUM AND STAR FORMATION RATE

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Assuming that the interstellar medium (ISM) is composed of the hot ionized medium (HIM), the warm ionized medium (WIM) and the cold neutral medium (CNM), we examine the interchange processes among them by supernova remnants. These are the evaporation of CNM, the shock heating of WIM and the cold shell formation at the shock front. Calculating the time variation of each component, the timescale and evolutionary characteristics till attaining a steady state are deduced. Generally speaking, the final steady state is classified to two types.

One is that a considerable fraction, f_h (0.6∿1.0), is occupied by a hot ($\gtrsim 10^{5.3}$ K) and rarefied ($\leq 10^{-2}$ cm^{-3}) gas. Even if the supernova explosions are so rare as 10^{-3} SNe y^{-1}, this steady state is maintained because the supernova remnants can expand greater than 200 pc and heat up the hot gas. The cloud abundance is so low as $\lesssim 10^{-4}$ clouds pc^{-3} that the star formation is inhibited.

The other type of ISM is so-called two-phase model. The interstellar space is almost occupied by WIM and the cloud abundance is as high as $\gtrsim 10^{-2}$ clouds pc^{-3}. The ejected energy from supernovae is not used to heat up the ambient medium, but is emitted away by radiation at the dense shell.

In relation to the star formation at the shocked region of a molecular cloud, we discuss the sequential formation of stars. As its observational evidence, we consider the superbubbles, which are observed in Cygnus region, Gum nebula and Eridanus-Orion region, and the supershells, which seem to associate with O, B associations. These huge loops extend with the diameters 500∿1 x 10^3 pc. We study the expansion laws and their structures under the assumption that a chain of supernova explosions at every 10^6 years have occurred. In the case of Cygnus superbubble, about 30 supernovae are necessary for its exptension and X-ray emission. These phenomena are expected when many massive stars are formed at once as an OB association, and OB associations are formed sequentially.

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