HARD EMISSION AND LIGHT ELEMENT PRODUCTION IN SUPERBUBBLES

A.M. Bykov (1), M.Yu.Gustov (2) and M.V.Petrenko (3)
(1) A.F.Ioffe Institute of Physics and Technology, St.Petersburg, 194021, Russia, (2) State Technical University, St.Petersburg, 195251, Russia, (3) State Technical University, St.Petersburg, 195251, Russia.
byk@astro.ioffe.rssi.ru

We discuss a collective effect of both stellar winds of massive stars and core collapsed supernovae as particle acceleration agents. Collective supernova explosions with great energy release in the form of multiple interacting shock waves inside the superbubbles are argued as a favourable site of nonthermal particle acceleration. The acceleration mechanism provides efficient creation of a nonthermal nuclei population with a hard low-energy spectrum, containing a substantial part of the kinetic energy released by the winds of young massive stars and supernovae. We discuss a model of temporal evolution of particle distribution function accounting for the nonlinear effect of the reaction of the accelerated particles on the shock turbulence inside the superbubble. The model illustrates that both the low-energy metal-rich nonthermal component and the standard galactic cosmic rays efficiently generated by superbubbles at different evolution stages can produce observable fluxes of γ-ray emission. The nonthermal nuclei interactions with the ambient medium in the vicinity of active starforming regions can be responsible for the observed variations of light element abundances.