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Re-examination of the Expected Gamma-Ray Emission of Supernova Remnant SN 1987A

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A nonlinear kinetic theory of cosmic ray (CR) acceleration in supernova remnants (SNRs) is employed to re-examine the nonthermal properties of the remnant of SN 1987A for an extended evolutionary period of 5-50 yr. This spherically symmetric model is approximately applied to the different features of the SNR which consist of a Blue Supergiant (BSG) wind and bubble, and the swept-up red Supergiant (RSG) wind structures in the form of an HII region, the "Equatorial Ring" (ER) and the "hourglass" region, all of which are part of a RSG wind whose mass loss rate significantly decreases with elevation above the equatorial plane. The model adapts recent three-dimensional hydrodynamical simulations by Potter et al. (2014). The SNR shock has recently swept up the ER which is the densest region in the immediate circumstellar environment. Therefore the expected gamma-ray energy flux at TeV-energies at the current epoch has already reached its maximal value $\sim 10^{-13}$ erg cm^{-2}s^{-1}. The general nonthermal strength of the source is expected to decrease roughly by a factor of two over the next 10 yrs.

Collaboration

– not specified –

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