
Cosmic rays and superbubbles

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Abstract

The nearby Orion-Eridanus superbubble may impact the local cosmic rays because of the large level of magnetic turbulence induced by stellar activity in the Orion OB associations (supernovae and stellar winds). In order to measure the cosmic-ray spectrum in the superbubble, we have used nine years of gamma-ray data obtained above 250 MeV with the Fermi Large Area Telescope. We have modelled the gamma radiation from hadronic interactions using multi-wavelength tracers for the gas column densities in the atomic, molecular and ionised gas phases, and using the gas distribution in space and velocity to separate the superbubble medium from its foregrounds and backgrounds. The model also includes ancillary components such as the Galactic inverse-Compton emission and point sources. We find that the atomic clouds along the rims of the superbubble exhibit a slightly lower gamma-ray emissivity above a few GeV than the nearby clouds located outside the superbubble. We will discuss the superbubble relation to the Local Bubble and to the Gould Belt to place the results into context and to explore possible options to explain a cosmic-ray softening for particle momenta above a few tens of GeV/n in this large superbubble.

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