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Origin of Cosmic Rays (E1.6)
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ANOMALOUS TRANSPORT OF HIGH ENERGY COSMIC RAYS IN GALACTIC SUPERBUBBLES

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High-energy cosmic rays may exhibit anomalous transport as they traverse and are accelerated by a collection of supernovae explosions in a galactic superbubble. Signatures of this anomalous transport can show up in the particles' evolution and their spectra. In a continuous-time-random-walk (CTRW) model assuming standard diffusive shock acceleration theory (DSA) for each shock encounter, and where the superbubble (an OB stars association) is idealized as a heterogeneous region of particle sources and sinks, acceleration and transport in the superbubble can be shown to be sub-diffusive. While the sub-diffusive transport can be attributed to the stochastic nature of the acceleration time according to DSA theory, the spectral break appears to be an artifact of transport in a finite medium. These CTRW simulations point to a new and intriguing phenomenon associated with the statistical nature of collective acceleration of high energy cosmic rays in galactic superbubbles.