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Recent X-ray observations of Galactic PeVatrons

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The recent discovery of over 40 ultra-high-energy (UHE; > 100 TeV) gamma-ray sources and neutrino emission in the Galactic Plane has provided strong evidence for the existence of Galactic PeVtrons, which are capable of accelerating particles to PeV energies. As demonstrated by previous studies of TeV gamma-ray sources, X-ray observations play a crucial role in identifying these extreme particle accelerators by detecting synchrotron emission from primary and secondary TeV-PeV electrons. In particular, a combination of broadband spectral energy distribution (SED) and morphological data in the X-ray and TeV bands serves as a powerful tool for probing their particle acceleration and emission mechanisms. This presentation will review the latest multi-wavelength studies of Galactic PeVatron candidates, primarily focusing on X-ray observations in conjunction with radio, GeV, and TeV data. I will highlight (1) multi-epoch NuSTAR hard X-ray observations of young supernova remnants, (2) multi-wavelength observations of pulsar wind nebulae associated with UHE sources, (3) X-ray investigations of new PeVatron classes (e.g., microquasar jets), (4) X-ray surveys of the Galactic Center, and (5) searches for X-ray counterparts of unidentified or dark Galactic PeVatrons. Finally, I will discuss the future prospects of X-ray astrophysics in advancing our understanding of Galactic PeVatrons.

Summary

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