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Constrain the ISM density in the G106.3+2.7 cavity

We constrain the density of the interstellar medium (ISM) around the hadronic PeVatron candidate, supernova remnant (SNR) G106.3+2.7, based on X-ray and γ -ray observations. The purpose of this investigation is to understand the influence of the gaseous environment on this SNR as a proton PeVatron candidate. By modelling the self-regulated propagation of the CRs injected from the SNR, we calculate the γ -ray emission of CRs via the hadronuclear interactions with the molecular cloud and the ISM, and use the measured γ -ray flux to constrain the ISM density around the SNR. Our results support the picture that the SNR is expanding into a low-density cavity of $n < 0.05 \text{ cm}^{-3}$, enabling the SNR to be a potential proton PeVatron despite that it is not in the very early phase.

Summary

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