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Star-forming regions as potential contributors to Galactic cosmic rays: the case of NGC 3603

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Abstract: The identification of major contributors to the observed Cosmic Rays (CRs) is a prime objective to resolve this long-standing puzzle. Star-forming regions (SFRs) may be one of these potential contributors, in fact, the detection of gamma rays from the Cygnus Cocoon indicates the existence of freshly accelerated high-energy particles in the region, making it the first case of a firm detection of CR acceleration in SFRs. However, the limited number of such gamma-ray detections is preventing any conclusion about the prevalence of SFRs as CR sources. In this talk, we present a detailed morphological and spectral study of a the unidentified source 4FGL J1115.1−6118 using about ten years of data above 10 GeV taken with Fermi-LAT. This source is positionally coincident with the young massive stellar cluster NGC 3603, which makes it one of the few studies of gamma rays from SFRs. Our analysis allows us to derive physical properties of the region, and helps in the understanding of the emission mechanisms and nature of this source class. These are the first steps towards potentially establishing SFRs as fundamental CR emitters.

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