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Radial gradients in cosmic-ray transport: Implications for TeV gamma and neutrino astronomy.

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The Fermi-LAT measurements of the diffuse Galactic gamma-ray emission reveal a hardening of the cosmic-ray (CR) spectrum with decreasing Galactocentric radius. This result can be the signature of different CR trasport properties in the inner Galaxy, and in particular a harder rigidity scaling of the diffusion coefficient. We model this effect with DRAGON and we provide a good description of both Fermi-LAT gamma-ray data in the most relevant sky windows and local cosmic-ray measurements by PAMELA, AMS-02 and CREAM.

Our model is in remarkably good agreement with the gamma-ray flux measured by MILAGRO at 15 TeV from the inner Galactic plane region, and with H.E.S.S. data from the Galactic ridge.

On the neutrino side, we show that our scenario provides an explanation for a significant fraction of the astrophysical flux measured by IceCube above 25 TeV; moreover, we discuss how the neutrino telescopes in the Northern hemisphere (ANTARES and the future KM3NeT), better positioned for the observation of the Galactic Ridge, will be able to confirm or constrain our picture.

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