

Review of: "Slow diffusion around pulsar γ -ray halos and its impact on cosmic rays propagation"

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This article overviews the particle diffusion model around middle-aged pulsars and discussed the implication for the origin of the cosmic-ray positron excess, based on recent studies of the author. I think the article in general is interesting and well organized. I just have a few comments as follows:

1. When the author claimed the bad fitting of the ballistic-diffusive model to the surface brightness profile of LHAASO J0621+3755, it should be noted that the calculation is based on a pseudo pulsar distance of 1.6 kpc which is derived from an empirical relation between gamma-ray luminosity of pulsars and the spindown power of pulsars. The true distance of the pulsar could be different and hence the resulting gamma-ray profile and the pair conversion efficiency could be different.
2. In Section 4, the author suggested that the dark matter annihilation could be possible origin of the cosmic-ray positron excess when considering the slow-diffusion disk. However, it seems that the calculation did not consider the contribution from nearby pulsars as the author argued in Section 3. If positrons from these nearby pulsars already produce a large fraction of the observed positron flux, the available parameter space for the dark matter annihilation would be further shrunk or probably already excluded. Note that, the slow-diffusion disk is hinted by the existence of pulsar halos, which implies release of a large amount of positrons into the ISM from pulsars. In this case, for the sake of self-consistency, the positrons from pulsars need be taken into account when dealing with positrons from the dark matter annihilation.