

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

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Potential competing interests: No potential competing interests to declare.

This manuscript presents a brief overview of some recent works by the author and his collaborators on several topics related to slow diffusion around pulsar gamma-ray halos, including a comparison of the two-zone cosmic ray diffusion model with the ballistic diffusion model, using a two-zone model to explain the AMS-02 positron excess, and a model of dark matter annihilation to explain the positron excess in the slow diffusion disk model. The manuscript is very useful for researchers in and outside this field to learn about these recent interesting progresses. I have several minor comments on the underlying science and presentation of the manuscript, which may help the author to improve this work.

(1) The efficiency of the pulsar spin-down energy transferring to high energy electrons and positrons (η) first appears in Figure 2 in the manuscript. It would be much better to provide the definition of this important parameter in the second paragraph of Section 2.

(2) In Section 3, the author uses the pulsar B1055-52 to explain the positron excess. From my understanding, all the pulsars shown in Figure 6 would contribute to the positron excess detected at the Earth. If adding all the contributions to the positron spectrum from all the pulsars in Figure 6, it seems to me that the model would significantly over-predict the positron flux, thus becoming inconsistent with the latest AMS-02 data.

(3) In Section 4, the author uses the dark matter annihilation model to explain the positron excess in the slow diffusion disk model. While fitting the AMS-02 data, the contributions to the positron spectrum from nearby Galactic pulsars should also be considered, as studied in Section 3. It would be interesting to know the possible dark matter contribution to the positron flux in this model.

(4) For the two-zone model and the general slow diffusion model, it would be very useful if the author provides a brief introduction on the works done by other researchers in the literature. This would greatly help the readers to have a more complete picture on this topic.