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

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Potential competing interests: No potential competing interests to declare.

Dear Professor Xiao-Jun Bi,

I have carefully read your manuscript on diffusion around Pulsars, and I must say it is very well-written and clear.

I could see that it is a synthesis of other works, reaffirming the slow-disk diffusion process as the most significant in fitting experimental data, particularly concerning Geminga and LHAASO J0621+3755 Pulsars. Furthermore, there is a brief discussion of the dark matter scenario to account for the positron flux in the slow-disk diffusion model.

While I am not an expert in pulsars myself, I work with space plasmas and astrophysics, mainly in non-equilibrium thermodynamics. In this regard, analyzing your reference [8], I noticed that the relativistic corrections to the Green's function, to avoid superluminal particles, start from the classical Maxwell-Boltzmann distribution.

Wouldn't it be interesting, perhaps, to use a non-equilibrium distribution like the kappa distribution instead of the classical one? This is because plasmas of this nature often support suprathermal particles. I have recent work on suprathermal particle diffusion in the solar wind [Phys. Rev. E 107, 055212] (I imagine the algorithm suggested I review your article for this reason).

Using a suprathermal (kappa) distribution for electrons may help fit the experimental data without the need to search for a diffusion coefficient that minimizes the chi-squared function, in other words, the chi-squared function will be minimized for the most appropriate spectral index. Perhaps there is room for investigation in this direction.

Thank you very much.

Sincerely,