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# How do the dynamics of the Milky Way - Large Magellanic Cloud system affect gamma-ray constraints on particle dark matter?

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The most massive satellite galaxy of the Milky Way (MW) is the Large Magellanic Cloud (LMC) at a distance of roughly 50 kpc. Parent and satellite galaxy form a dynamical system in which gravitational interactions induce non-equilibrium effects and features that alter the equilibrium expectations for the morphology of the dark matter (DM) halos hosting the baryonic components of both objects. The dynamical response caused by the passage of the LMC through the MW hence affects the prospects for direct and indirect searches for DM. Utilising a set of state-of-the-art numerical simulations of the evolution of the MW-LMC system, we derive the DM distribution in both galaxies at the present time based on the Basis Function Expansion formalism. Consequently, we build $J$-factor all-sky maps of the MW-LMC system in order to study the impact of the LMC passage on gamma-ray indirect searches for thermally produced DM annihilating in the outer MW halo as well as within the LMC halo standalone. We conduct a detailed analysis of 12 years of Fermi-LAT data that incorporates various large-scale gamma-ray emission components and we quantify the systematic uncertainty associated with the imperfect knowledge of the astrophysical gamma-ray sources. We find that the dynamical response caused by the LMC passage can alter the constraints on the velocity-averaged annihilation cross-section for weak scale particle DM at a level comparable to the existing observational uncertainty of the MW halo's density profile and total mass.

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