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Stochastic modelling of cosmic ray sources sped up

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Cosmic rays can be probed via direct detection at the Earth's position or indirectly through diffuse emissions of gamma-rays and neutrinos produced by the interaction of cosmic rays with the interstellar medium in other parts of the Galaxy. It is commonly assumed in the modelling of galactic cosmic rays that the source density is smooth and steady. However, supernova remnants, the likely sources of cosmic rays, have a point-like and burst-like nature. This renders our predictions very sensitive to the precise positions and times of the sources. Yet observationally, those parameters are not accessible such that the source modelling must be done probabilistically. The computation of contributions to the total cosmic ray flux from individual sources is inherently parallelisable and suitable for the use of GPUs to speed up simulations. We demonstrate how these simulations can be used to constrain the energy dependence of escape from the cosmic ray accelerators and to study the energy-dependent morphology of the diffuse emission sky, relevant for observations with LHAASO, Tibet AS-gamma, IceCube and the upcoming SWGO.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

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