Propagation of UHE Protons through Magnetized Cosmic Web

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If ultrahigh energy cosmic rays (UHECRs) originate from extragalactic sources, understanding the propagation of the charged particles through the magnetized large scale structure (LSS) of the universe is crucial in the search for astrophysical accelerators. Based on a novel model of turbulence dynamo, we estimate the intergalactic magnetic fields (IGMFs) in cosmological simulations for the formation of the LSS. Under the premises that the sources of UHECRs are strongly associated with the LSS, we consider a model in which protons of $E > 10^{19}$ eV are injected by AGN-like sources located inside clusters of galaxies. With the model IGMFs, we then follow the trajectories of protons, while taking account of the energy loss due to interactions with the cosmic background radiation. For observers located inside groups of galaxies like us, about 70% (35%) of UHECR events above 60 EeV arrive within $\sim 15^{\circ}$ ($\sim 5^{\circ}$) from the source position with the time delay less than $\sim 10^7$ years. This implies that the arrival direction of super-GZK protons might show a correlation with the distribution of cosmological sources in the sky. In this model, nearby sources within 10-20 Mpc should contribute significantly to the particle flux above $\sim 10^{20}$ eV.