LARGE SCALE ANISOTROPY OF TEV-BAND COSMIC RAYS

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The expected anisotropy in the 1 to 10^4 TeV energy range is calculated for Galactic cosmic rays with anisotropy in the diffusion tensor and source discreteness both taken into account. We find that if the sources are distributed radially (but with azimuthal symmetry) in proportion to Galactic pulsars, the expected anisotropy almost always exceeds the observational limits by one order of magnitude in the case of isotropic diffusion. If the radial diffusion is more than an order of magnitude smaller than the azimuthal diffusion rate, the radial gradient of the sources can be accommodated about 5 percent of the time. If the sources are concentrated in the spiral arms then the anisotropy depends on our location between them, but in some window roughly equidistant from adjacent spiral arms the observational constraints on anisotropy are obeyed roughly 20 to 30 percent of the time for extremely anisotropic diffusion. The Solar System is in that window less than 10 percent of the time, but may be there now. Under the assumption of isotropic diffusion, nearby supernovae are found to produce a discreteness anisotropy that is nearly two orders of magnitude in excess of the observational limit if all supernovae are assumed to contribute equally with a source rate 1 in every 100 years.