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3D simulations of heliospheric propagation of heavy-ion solar energetic particles

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In recent years, a wealth of spacecraft measurements of heavy ion solar energetic particles have become available, thanks to data from the ACE and STEREO spacecraft. Interesting features in heavy ion time intensity profiles, such as the decay of the Fe/O ratio over time in some events, have been observed. Heliospheric propagation effects have been invoked in the literature as a possible cause of Fe/O decays. Recent modelling work has shown that drifts due to the gradient and curvature of the large scale Parker spiral magnetic field, are a significant source of perpendicular transport for partially ionised heavy ions. Modelling these effects requires a fully 3D description. Here we present results of 3D test particle simulations of heavy ion SEP propagation in the heliosphere, for a Parker spiral magnetic field in a variety of scattering conditions. We simulate intensity profiles of heavy ions as would be observed at 1 AU, and compare them with recent data from STEREO and ACE.

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