Geophysical Research Abstracts, Vol. 8, 06298, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06298

Particle acceleration at shocks propagating in inhomogenous magnetic fields

A. Sandroos (1), R. Vainio (2)

(1) Finnish Meteorological Institute, P. O. Box 503, FI-00101 Helsinki, Finland, (2) Department of Physical Sciences, P. O. Box 64, FI-00014 University of Helsinki, Finland

A requirement for efficient shock acceleration is that the accelerating particles must be able to encounter the shock front many times. Much attention has been paid to the effect of turbulent plasma conditions ahead of the shock in quasi-perpendicular geometries. For instance, particles propagating along magnetic field lines which meander across the shock front can cross the shock multiple times. The meandering can be produced by large amplitude, long wavelength Alfven waves propagating in the background plasma.

However, inhomogeneities at large spatial scales in ambient magnetic field can also make the incident particles encounter the shock multiple times and thus lead to efficient acceleration. This requires that the ambient field has sufficiently large intensity gradients, curved field lines or both. The acceleration mechanisms operating in these inhomogeneities lead to different properties of the observable high energy particles, e.g. that the resulting energy spectra are not necessarily power laws.

Suitable magnetic geometries can be found, for instance, in the helmet streamers in solar corona or interacting coronal mass ejections. This paper considers non-relativistic scatter-free particle acceleration at such geometries, but the acceleration mechanisms operate at relativistic energies as well.