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## Pitch-angle Scattering vs. Magnetic Confinement in Flare Loops

Accelerated particles in flaring loops are confined by both pitch-angle scattering and the converging of magnetic fields to the loop endpoints, i.e. magnetic mirroring. This confinement, together with the initial pitch-angle distribution of the injected particles, govern the average escape time of particles from the loop. The escape time can give an estimate of the particle spectrum as it indicates how much time is available for acceleration and energy losses to occur. Pitch-angle scattering is caused by both Coulomb collisions and magnetic turbulence, but the two processes have different pitch-angle and energy dependencies, and could therefore yield different escape times. The hard X-rays produced by escaping particles are sensitive to the temporal profile and pitch-angle distribution of escaping particles and not the average escape time. We investigate the effect of a spatially varying magnetic field and anisotropic scattering on the escape time. We find that these considerations only yield a factor two difference in the escape time compared to isotropic scattering in a uniform magnetic field with a loss cone specified at the endpoints. The temporal profile and pitch-angle distribution of escaping particles is also investigated. We find that the time when the bulk of the particles escape can be quite different from the average escape time and that periodic ‘waves’ of escaping particles are found under weak scattering conditions. The pitch-angle distributions of escaping particles are found to be generally neither isotropic nor beamed, and critically depend on either the scattering regime or the injected distribution.

### Apply to be considered for a student ; award (Yes / No)?

Yes

### Level for award;(Hons, MSc, PhD, N/A)?

PhD

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