

## Proton beam kinetics in flaring atmospheres with density gradients

V.V.Zharkova (1) and M.Gorodvskyy (2)

- 1. Department of Computing, University of Bradford, Bradford BD7 1DP, UK (v.v.zharkova@brad.ac.uk);
- 2. Department of Applied Mathematics, University of Sheffield, Hicks Building, Sheffield S3 7RH, UK.

The numerical solutions of the time-dependent kinetic Fokker-Plank equation with energy and pitch-angular diffusion are presented for fast protons injected into a flaring atmosphere from the corona and precipitating into a loop with a converging magnetic field. The protons are assumed to lose their energy in Coulomb collisions with particles of the partially ionized ambient plasma, Ohmic heating owing to the self-induced electric field and generation of kinetic Alfven waves.

Energy and pitch-angular distributions of precipitating protons and accelerated ambient electrons along with the precipitating beam abundances, energy fluxes and resulting hard X-ray bremsstrahlung (photon) spectra generated by the accelerated ambient electrons are presented at various atmospherics depths. The results are compared with those for electrons beams.