Energetic Particle Scattering in Solar Flares

N. Vilmer[1]

[1]*LESIA, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universités, UPMC Univ. Paris 06, Univ.Paris Diderot, Sorbonne Paris Cité, 5 place Jules Janssen, 92195 Meudon, France*

Nicole.vilmer@obspm.fr

Efficient particle acceleration is produced in association with solar flares. These particles play a major role in the active Sun because they contain a large amount of the magnetic energy released during flares. Energetic electrons and ions interact with the solar atmosphere and produce high-energy X-rays and γ-rays. Energetic particles can also escape to the corona and interplanetary medium, produce radio emissions (electrons) and may eventually reach the Earth's orbit. It is currently admitted that solar flares are powered by magnetic energy previously stored in the coronal magnetic field and that magnetic energy release is likely to occur on coronal currents sheets along regions of strong gradient of magnetic connectivity. In this talk, I will review our current understanding of particle acceleration and transport in solar flares and comment on the role of scattering in these processes. I will also present recent results on the transport of energetic electrons in the solar corona obtained from X-ray and radio (gyro-synchrotron) imaging spectroscopy and will show how these observations support electron diffusive transport in the corona.

Radio emissions from escaping electron beams (known as type III bursts) result from the interaction of the beams with the background plasma resulting in the excitation of Langmuir waves and subsequent production of electromagnetic radiation. Recent results on the simulations of these emissions and on the relation between escaping electrons that generate radio emissions in the corona and in the interplanetary medium and electrons confined to the lower atmosphere of the Sun that produce HXRs will be discussed. I will finally describe how these studies can be continued in the future using measurements from the new solar and heliospheric missions.