Geophysical Research Abstracts,
Vol. 11, EGU2009-2810, 2009
EGU General Assembly 2009

Radio diagnostics and the origin and propagation of solar energetic particles

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High-energy particles from the Sun are an excellent source of information on particle acceleration in astrophysical plasmas, because we can study them by a combination of observational tools which measure particle properties and the environment where the particles are accelerated. Solar energetic particles (SEP) are also an important element of solar effects on spacecraft and aircraft. The ability to predict transient enhancements of particle fluxes is therefore of major interest. It requires an understanding of those mechanisms which accelerate particles in the solar corona and govern their propagation to and within interplanetary space. This talk will address the contribution of radio diagnostics from ground and space to such investigations.

Type III radio bursts are emitted by electron beams that we can track from the low corona to Earth, using combined ground-based and spaceborne observations. It will be shown how radio diagnostics allow us to investigate the conditions for confinement in or escape from the corona imposed by the magnetic field configuration of active regions. This shows that particles accelerated in active regions can get access to the Earth even when the active region is far from the nominal interplanetary Parker spiral, but they can also be prevented from escaping even though the active region may be nominally well connected. The modification of the large-scale coronal magnetic field may be a key role played by coronal mass ejections in SEP events.