



CME-related particle acceleration regions during a simple eruptive event near solar minimum

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An intriguing feature of many solar energetic particle (SEP) events is the detection of particles over a very extended range of longitudes in the Heliosphere. This may be due to peculiarities of the magnetic field in the corona, to a broad accelerator, to cross-field transport of the particles, or to a combination of these processes.

The eruptive flare of the 26th of April 2008 offered an opportunity to study relevant processes under particularly favorable conditions, since it occurred in a very quiet solar and interplanetary environment. This allowed us to investigate the physical link between a single well-identified Coronal Mass Ejection (CME), electron acceleration as traced by radio emission, and the production of SEPs.

We conduct a detailed analysis combining radio observations (Nançay Radioheliograph and Decameter Array, Wind/WAVES spectrograph) with remote-sensing observations of the corona in extreme ultraviolet (EUV) and white light as well as in-situ measurements of energetic particles near 1AU (SoHO and STEREO spacecraft). By combining images taken from multiple vantage points we were able to derive the time-dependent evolution of the 3-D pressure front developing around the erupting CME.

Magnetic reconnection in the post-CME current sheet accelerated electrons that remained confined in closed magnetic fields in the corona, while the acceleration of escaping particles can be attributed to the pressure front generated ahead of the expanding CME. The CME accelerated electrons remotely from the parent active region, due to the interaction of its laterally expanding flank, traced by an EUV wave, with the ambient corona. SEPs detected at one STEREO spacecraft and SoHO were accelerated later, when the frontal shock of the CME intercepted the spacecraft-connected interplanetary magnetic field line. The injection regions into the Heliosphere inferred from the radio and SEP observations are separated in longitude by about 140° .

The observations for this event show that it is misleading to interpret multi-spacecraft SEP measurements in terms of one acceleration region in the corona. The different acceleration regions are linked to different vantage points in the interplanetary space.