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Electrons and protons acceleration during the first GLE event of solar cycle 24

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High-energy particles were recorded by the near-Earth spacecraft particle detectors and ground-based neutron monitors (NMs) on 2012 May 17. This event was the first Ground Level Enhancement (GLE) of solar cycle 24. In present study, we try to identify the acceleration source of solar energetic particles (SEPs) by combining in-situ particle measurements from $WIND$/3DP, ACE/EPAM, $GOES$, and solar cosmic rays (SCRs) registered by several NMs, as well as the remote-sensing solar observations from SDO/AIA, $SOHO$/LASCO, and $RHESSI$. We derive the path length (1.25 $\pm$ 0.05 AU) of SEPs in the interplanetary magnetic field (IMF) and solar particle release (SPR) time (01:29 $\pm$ 1 UT) of the first arriving electrons by using their velocity dispersion and taking into account the contamination effects. It is found that the electrons impulsive injection phase, indicated by the dramatic change of spectral index, is consistent with the flare non-thermal emission and type III radio bursts. The potential field source surface (PFSS) modeled open-field lines rooted in the active region (AR) provide escaping channels for flare accelerated electrons. Meanwhile, relativistic protons are found to be released $\sim$10 min later than the electrons, assuming their scatter-free travel along the same IMF path length. Combing multi-wavelength imaging data on the prominence eruption and coronal mass ejection (CME), we obtain some evidence of that GLE protons, with estimated kinetic energy of $\sim$1.12 GeV, are probably accelerated by the CME-driven shock when it travels to $\sim$3.07 solar radii.