Relativistic electron microbursts during different solar wind drivers

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Relativistic electron microbursts are short-lived and bursty precipitations of relativistic electrons due to pitch angle scattering by discrete whistler mode emissions known as chorus [e.g., Lorentzen et al., 2001]. They are frequently observed during storm-time conditions [e.g., O'Brien et al., 2003] and high-speed solar wind stream (HSS) events [e.g., Blum et al., 2015], while important solar wind drivers for the frequent microburst precipitations have not been well understood. Using the data obtained by SAMPEX, we perform a superposed epoch analysis of the microburst occurrence during geomagnetic disturbances caused by two different solar wind drivers: HSS and the coronal mass ejection (CME). The HSS events are further categorized by considering the polarity of interplanetary magnetic field and solar wind speed according to the method used by Miyoshi and Kataoka (2008). In case of the HSS events, we find the most frequent microburst precipitations during the higher-speed solar wind streams with a southward offset of IMF (SBZ-fast HSS events). The microburst activity during the fast SBZ-HSS events is identified at L value range from 4.0 to 6.0 and lasts for several days after the arrival of stream interface. On the other hand, during the CME-driven geomagnetic storms, microbursts are frequently observed at L-value range from 3.5 to 5.0 and its activity continues for about 12 hours after the minimum in the Dst index. This indicates that resonant interaction between chorus and relativistic electrons more frequently and continuously takes place during the SBZ-fast HSS events than during the other HSS events and CME-driven storms. Since fluxes of radiation belt electrons largely increase during the SBZ-fast HSS events [Miyoshi and Kataoka, 2008; Miyoshi et al., 2013] and microburst activity coincides well with local acceleration by chorus [Kurita et al., 2016], the result gives observational support that relativistic electron microbursts are a proxy of acceleration of MeV electrons by chorus as suggested by Kurita et al. [2016]. We propose that highly relativistic electrons are preferentially produced during the SBZ-fast HSS events via resonant interaction with chorus which causes relativistic electron microbursts.