Relativistic electron microbursts and local acceleration of MeV electrons by chorus: SAMPEX and Van Allen Probes observations

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It has been suggested that whistler mode chorus is responsible for both acceleration of MeV electrons and relativistic electron microbursts through resonant wave-particle interactions. Relativistic electron microbursts have been considered as an important loss mechanism of radiation belt electrons. Here we report on the observations of relativistic electron microbursts and flux variations of trapped MeV electrons during the 8-9 October 2012 storm, using the SAMPEX and Van Allen Probes satellites. Observations by the satellites show that relativistic electron microbursts correlate well with the rapid enhancement of trapped MeV electron fluxes by chorus wave-particle interactions, indicating that acceleration by chorus is much more efficient than losses by microbursts during the storm. It is also revealed that the strong chorus wave activity without relativistic electron microbursts does not lead to significant flux variations of relativistic electrons. We also find that the microburst occurrence rate during the acceleration event has a peak around which the phase space density peak is identified by the Van Allen Probes satellites. We conclude that effective acceleration of relativistic electrons is caused by chorus that can cause relativistic electron microbursts, and that microbursts can be a proxy of internal acceleration of MeV electrons by whistler-mode chorus.

Keywords: radiation belts, chorus waves

