RELATIVISTIC MICROBURST STORM CHARACTERISTICS: COMBINED SATELLITE AND GROUND-BASED OBSERVATIONS

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Abstract

We report a comparison of SAMPEX detected relativistic electron microbursts and short-lived subionospheric VLF perturbations termed FAST events, observed at Sodankylä Geophysical Observatory, Finland, during 2005. The observed FAST event perturbation decay times were consistent with ionospheric recovery from bursts of relativistic electron precipitation. Our study strongly suggests that the region over which microbursts occur during storm event periods can be at least ~90° in longitude (~6 hours in MLT). This confirms earlier estimates of microburst storm size, suggesting that microbursts could be a significant loss mechanism for radiation belt relativistic electrons during geomagnetic storms.

Background Information

In this talk we will report on a comparison of SAMPEX detected relativistic electron microbursts and short-lived subionospheric VLF perturbations termed FAST events, observed at Sodankylä Geophysical Observatory, Finland, during 2005. We show that only strong geomagnetic disturbances can produce FAST events, which is consistent with the strong link between storms and relativistic microbursts. Further, the observed FAST event perturbation decay times were consistent with ionospheric recovery from bursts of relativistic electron precipitation. However, the one-to-one correlation in time between microbursts and FAST events was found to be very low (~1%). We interpret this as confirmation that microbursts have small ionospheric footprints, and estimate the individual precipitation events to be <4 km radius. In contrast, our study strongly suggests that the region over which microbursts occur during storm event periods can be at least ~90° in longitude (~6 hours in MLT). This confirms earlier estimates of microburst storm size, suggesting that microbursts could be a significant loss mechanism for radiation belt relativistic electrons during geomagnetic storms. Although microbursts are observed at a much higher rate than FAST events, the ground-based FAST event data can provide additional insight into the conditions required for microburst generation and the time variation of relativistic precipitation.

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