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Conjugate LEP Events Observed at Palmer Station, Antarctica

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Extended Abstract

VLF remote sensing is used to detect and analyze a large number of lightning-induced electron precipitation (LEP) events that were simultaneously observed in both the northern and southern hemispheres in March 2015. LEP events were detected in the northern hemisphere using the VLF remote sensing method by tracking the NAA transmitter signal (24.0 kHz, Cutler, Maine) at Tuscaloosa, Alabama. In the southern hemisphere, the NPM transmitter signal (21.4 kHz, Laulaulei, Hawii) is tracked at Palmer station, Antarctica. In each case, the GLD360 dataset from Vaisala is used to determine the properties of the causative lightning flash. Due to the large number of events, many of the changes in VLF amplitude and phase were observed to overlap each other in time. We provide an experimental method to effectively remove the overlap, resulting in clear detection of more LEP events. Initially, removing overlapping events and unclear (or not well-defined) events, over 20 conjugate LEP events remain and are used to statistically analyze the hemispheric dependence of LEP onset time. After accounting for the overlap, an additional 20 conjugate LEP events are clearly detected and further analyzed.

In this paper, we compare and contrast the onset times and durations calculated using multiple different methods, with each method applied to the same number of conjugate LEP events. No matter which hemisphere the causative lightning was in, LEP was observed at Palmer Station before it was observed at Tuscaloosa, AL. Furthermore, LEP onset durations were observed to be longer in the northern hemisphere as a rule. We discuss the reasons for these differences in event properties and conclude that the asymmetry of the Earth's magnetic field is primarily responsible, due to the lower loss cone angle in the northern hemisphere at the longitudes under consideration.