



## Micro-second time scale VLF transmission disturbances associated with lightning

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### Extended Abstract

A VLF communications transmission was monitored at a 1 MHz sampling rate during a thunderstorm in the transmitter-receiver path. This study investigates the variability of the VLF transmission on micro-second long time scales which has not been reported before.

Several strong sferic signals (5-15 kHz) were detected during the monitoring period which coincided with disturbances in the VLF transmission. An event was captured where the disturbance on the VLF signal appeared to last >200s. Strong lightning discharges are known to cause changes in the lower ionosphere which show up as disturbances in VLF transmissions [1]. Typically, these events last 5-200s, however, a new class of such events have been identified which exhibit longer lasting effects. These events are termed “Long Recovery Early VLF” (LORE) events [2,3].

The effect of the LORE event is seen to be of different magnitude between the two main frequency components of the VLF transmission. This is possibly a wave propagation effect where the two frequency components propagate along slightly different paths [4].

Coincident with the LORE disturbance onset is a change in micro-second long variability in the VLF transmission. It has been suggested that the long-lasting effects in LORE events are due to different mechanisms compared to shorter events [5]. The micro-second variability measurement provides new data for consideration in the effort to understand such events.

It is proposed that the micro-second variability in VLF transmissions are associated with fast processes in the ionosphere. The ability to measure it provides a new parameter in discriminating effects with different causes for VLF remote sensing applications where this is notoriously difficult.

### References

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