

Lightning impact on micro-second long ionospheric variability

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Lightning discharges cause electron heating and enhanced ionisation in the D region ionosphere which disturb the transmission of VLF communications [Inan et al., 2010]. A disturbance of such nature was measured in a VLF transmission with a sampling rate of 1 MHz, enabling much faster ionospheric variability to be observed when compared to previous studies which typically report results with a time resolution >5-20ms.

The disturbance resembles “Long Recovery Early VLF” (LORE) events [Haldoupis et al. 2013, Cotts & Inan 2007]. LOREs exhibit observable ionospheric effects that last longer (>200s) than other lightning related disturbances. It was proposed that the mechanism behind the long-lasting effects of LOREs is different to shorter events [Gordillo-Vázquez et al. 2016].

The ionospheric variability inferred from the transmitted signal is seen to change dramatically after the lightning onset, suggesting that there are fast processes in the ionosphere affected or produced which have not been considered in previous research. The ionospheric variability inferred from the main two frequencies of the transmission is different. A possible explanation is a difference in the propagation paths of the two main frequencies of the transmission [Füllekrug et al., 2015].

References

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