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PLASMASPHERIC ELECTRON DENSITIES FROM SATELLITE OBSERVATION OF DUCTED VLF TRANSMITTER SIGNALS

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1. Extended Abstract

VLF measurements by the EMFISIS instrument onboard the Van Allen Probes satellite pair occasionally show signals from ground-based VLF transmitters. After looking at the typical locations of the two spacecraft when such signals are detected, we carried out measurement campaigns targeting specifically such signals. Here we present the latest results of this campaign. Based on the 6-channel measurements, we determined the Poynting vectors of the signals, which indicated ducted propagation. In cases when the transmitter signals undergo ducted propagation, they can be used to probe the plasmasphere and plasmaspheric electron densities can be determined by an inversion method. The concept is similar to how whistler inversion can be used to obtain plasmaspheric electron densities [1]. We carried out wave propagation inversion on the observed signal pulses. Our results show good agreement with electron densities obtained from other methods (in-situ upper hybrid resonances) as a reference. We also detected the 2-hop echoes of signals reflected from the ionosphere at the opposite hemisphere. The inversion results of these 2-hop signals were also in agreement with the reference measurement. As a conclusion, our method can serve as an alternative way of estimating plasmaspheric electron densities, especially where other methods such as upper hybrid resonances are out of the instrument range.

2. References

1. J. Lichtenberger, "A new whistler inversion method," *Journal of Geophysical Research*, **114**, July 2009, doi: 10.1029/2008JA013799.

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