Remote Sensing of the Plasmasphere: Lightnings and Whistler Propagation Paths

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Space weather models to improve specification and prediction capabilities are in the front of the recent research studies. One of the key region in space weather modeling is the Earth's plasmasphere. Whistlers are regarded as a cheap and effective tool since the early years of whistler research for monitoring the cold electron density variations in the plasmasphere. The traditional interpretation of whistler data assumed that the sources of whistlers (lightnings) and the receiver are located on magnetic conjugate areas and the waves are propagating along the field line connecting them.
Recent studies [1,2] show that this is not always the case, the source region and the receiver can be located not only at different magnetic latitudes (L-discrepancy), but at different magnetic meridians and even far away from the conjugate zones. The previous studies are based on statistical/probability approach using lightning data from World Wide Lightning Location Network (WWLLN, [3]) and whistler data from Automatic Whistler Detector and Analyzer system network (AWDANet, [4]). The enormous number of whistlers recorded at British Antarctic base, Rothera (~6 million traces/year) made it possible to pair lightnings from WWLLN with whistler data from AWDANet using a more direct approach. In this paper we discuss the possible propagation scenarios that strongly affect the way how the obtained electron density profiles can be incorporated into the plasmasphere models.

References

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