ABSTRACTS (MASTER THESIS)

Study of Fine Structure of Plasmaspheric Hiss

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We analyzed the observation data from the Electric and Magnetic Field Instrument and Integrated Science instrument (EMFISIS) on the Van Allen Probes mission using fast Fourier transform to investigate plasmasheric hiss. Plasmashperic hiss is an electromagnetic whistler mode emission which typically occurs in the frequency range from 100 Hz to several kHz. Recent report says plasmaspheric hiss can generate energetic particles. We examined the fine structure of plasmaspheric hiss which similar to small segments of rising tone and falling tone of chorus subpackets. By analyzing the high resolution data observed mainly in April 2013, we confirmed the characteristics and calculated wave normal angles, degree of polarization, Poynting flux and ellipticity to investigate the plasmaspheric hiss. From these properties, we made a study of generation and propagation of hiss emissions from the equator. We found the propagation often induced convective growth. Plasmaspheric hiss was found even during magnetically quiet periods and intensities during storms or sub storms. We checked if nonlinear wave growth theory of whistler mode chorus emissions can be applied to coherent hiss emissions. We compared the optimum amplitude and threshold amplitude from the nonlinear growth theory and the observational results of plasmaspheric hiss. While some cases show good agreement between the nonlinear theory and observation, we found some cases with discrepancies. We also found cases showing both hiss and chorus emissions as shown in Figure 1. This suggests that physical conditions necessary for hiss emissions may not be much different from those of chorus emissions, and that the nonlinear wave growth model with the threshold and optimum amplitudes for chorus emissions can also be applied to hiss emissions. However, further studies of these emissions along with analyses of energetic electron fluxes providing energy to the waves are needed for identification of necessary conditions for generation of hiss and chorus emissions.

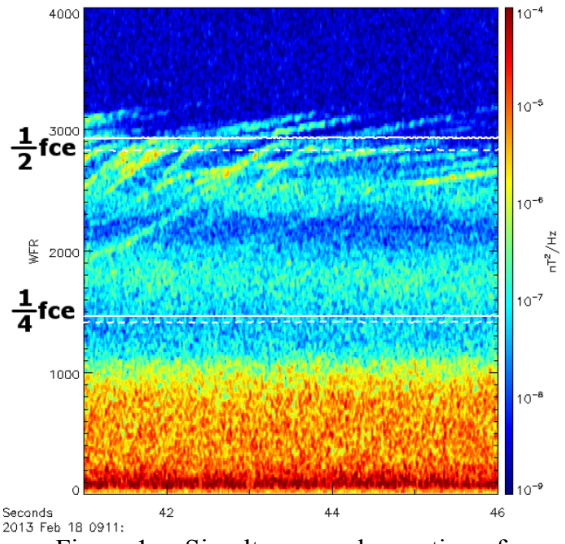

Figure 1. Simultaneous observation of whistler-mode hiss and chorus emissions.

Acknowledgements

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References

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