

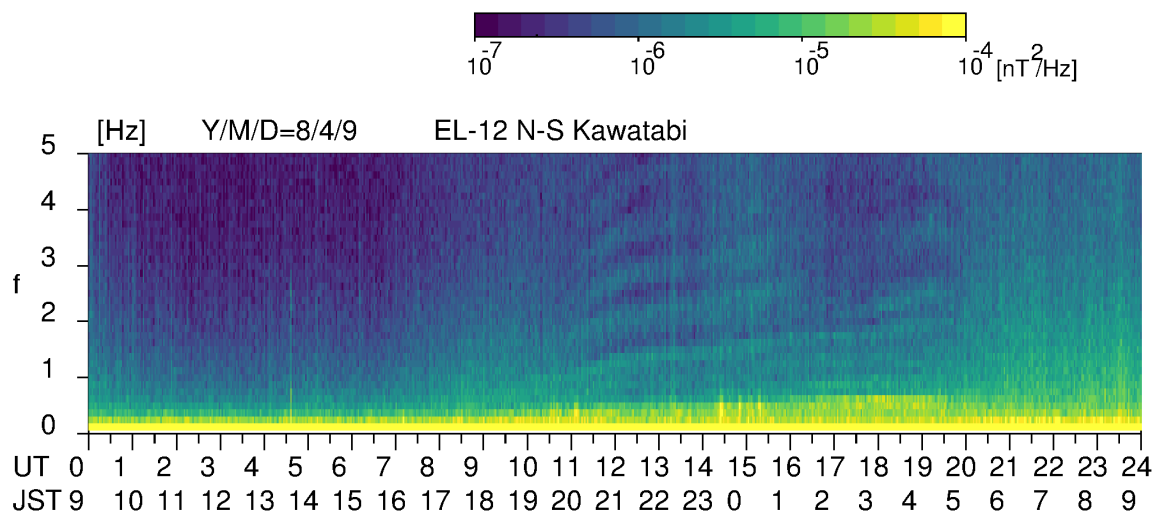
## Spectral Resonance Structure in 0.5-8Hz Magnetic Field Variations Detected at Kawatabi, Miyagi, Japan

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This paper reports spectral resonance structures in 0.5 – 8 Hz magnetic field variations found in the ELF magnetic field data obtained by an induction magnetometer EL-12 constructed by Tierra Technica Co. Ltd, placed in North-South direction at Kawatabi, Osaki, Miyagi prefecture Japan. The magnetic latitude of the observation site is N30 and the L value is about 1.3. The magnetometer detects magnetic field variations from 0.1 Hz to 44 Hz at a sampling frequency of 128 Hz. The observation started on December 11, 1997 and continued until February 12, 2020 although the data coverage was limited to 51%. The data were Fourier transformed every 8 second and averaged for 2 minutes to be displayed in the form of dynamic spectra at <https://www.ice.tohtech.ac.jp/nakagawa/elfdata/index.html>. Figure 1 shows an example.

In addition to clear enhancements at Schumann resonance frequencies at 8 Hz, 14 Hz, 21 Hz, 28 Hz, we can see structured enhancements approximately at 1 Hz, 2 Hz, 2.5 Hz, 3.5 Hz, 4.5 Hz. They are thought to be spectral resonance structures (SRS) generated by ionospheric Alfvén resonator which is an ionospheric cavity with minimum Alfvén velocity bounded by E layer and a steep gradient of the Alfvén velocity above the maximum of F layer [1-4]. In accordance with previous literatures, the occurrence of the spectral resonance structure in Kawatabi was restricted within the nighttime from 17 LT to 06 LT. The frequency rose from the evening toward the midnight. They were detected in rather quiet periods of geomagnetic activity. Two decades of observations show a clear anticorrelation between the occurrence of the spectral resonance structures and the sunspot number, indicating a solar control of the low-latitude ionosphere.



**Figure 1.** An example of dynamic spectra of magnetic field variations in North-South direction detected at Kawatabi, Miyagi Japan on April 9, 2008. The abscissa is given in Universal Time and Japan Standard Time. From the local evening (20 JST) to the morning (05 JST), spectral resonance structures were observed.

### References

- [1] T. Bössinger, et al., *J. Geophys. Res.*, **107**, A10, 1281, 9 October 2002, doi:10.1029/2001JA005076.
- [2] A. G. Yahnin, et al., *Annales Geophysicae*, **21**, 2003, pp.779–786.
- [3] V. V. Surkov, et al., *J. Geophys. Res.*, **111**, A01303, 31 January 2006, doi:10.1029/2005JA011320.
- [4] M. Nosé, et al., *J. Geophys. Res., Space*, **122**, 05 July, 2017, pp.7240-7255, doi:10.1002/2017JA024204.