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SHORT NOTES

POLARIZATION OF VLF-ELF HISS AT SYOWA STATION, ANTARCTICA

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Abstract

The polarization of VLF-ELF hiss observed at Syowa Station in 1970 has been studied. The frequency swept polarimeter was used for the detailed study of ELF hiss and the obtained results are shown.

1 Introduction

Since 1967, at Syowa Station (−69.6° geomagnetic latitude) we had been observing the polarization of VLF-ELF hiss with a polarimeter system (Iwai & Tanaka 1968, Tanaka et al. 1970). It is indicated that the polarizations of VLF hiss may be slightly different at 12 and 25 kHz (Nishino & Tanaka 1969, Tanaka et al. 1970). In 1970, the observation of polarization at 50 kHz was added in order to examine the existence ef significant differences on the values of right-handed polarized (R-) components to left-handed polarized (L-) components in the receiving frequencies.

As to ELF hiss usually appearing in the daytime in summer, the observation of polarization with a frequency swept polarimeter was carried out in 1970.

In this paper, we will introduce the observing method and show the sweep receiving datum obtained.

2 Observed results

The typical data of polarizations at 12, 25 and 50 kHz are shown in Fig. 1. Fig. 2 represents the ratios of R-components to L-components of VLF hisses at 12, 25 and 50 kHz. It is found in Fig. 2 that R/L values at 25 and 50 kHz are, statistically,

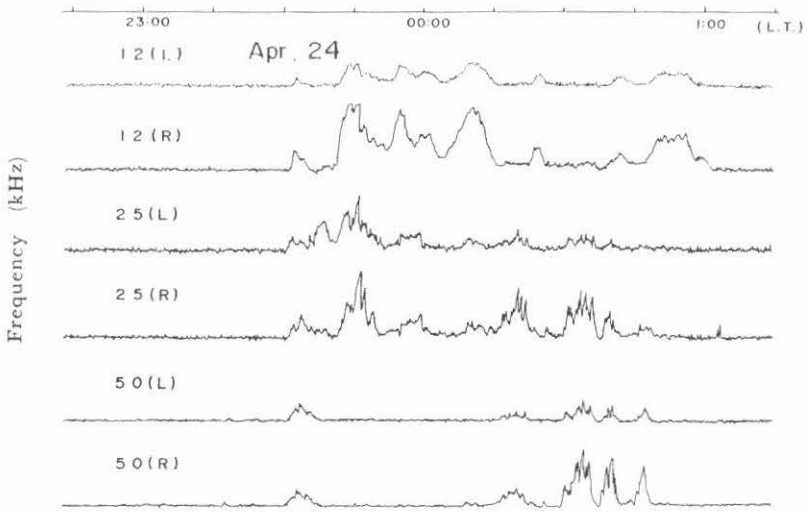

Fig. 1. Examples of polarizations at 12, 25 and 50 kHz.

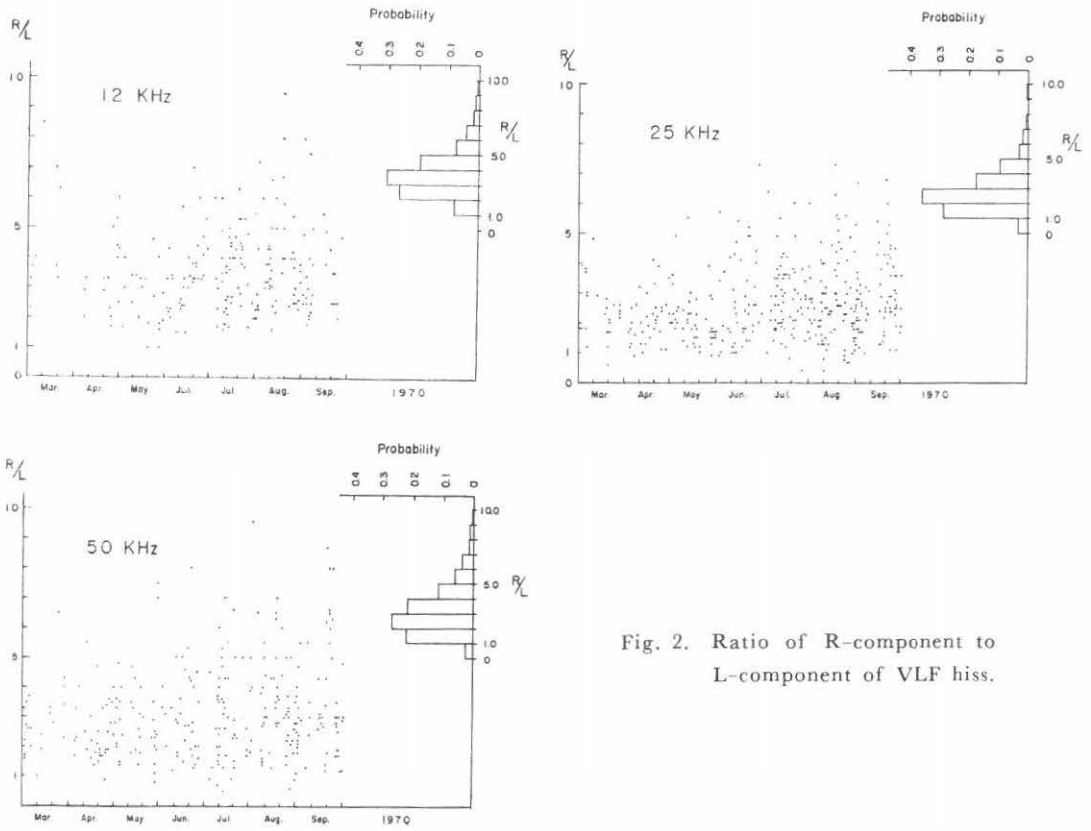

Fig. 2. Ratio of R-component to L-component of VLF hiss.

lower than those at 12 kHz. So, the result given in Fig. 2 seems to confirm the suggestion that there are slight differences on R/L values in the receiving frequencies. The differences on R/L values between 25 and 50 kHz, however, are supposed to arise in the data reduction and to be insignificant at all. While, it may be recognized that the differences between 12 kHz and the other frequencies (25, 50 kHz) are essential and they are caused by the propagation conditions. Therefore, it seems to be suggestible that the consideration of wave couplings in the lower ionosphere are necessary under the discussion on the propagations of auroral hisses at LF range.

Fig. 3 shows some data of the polarizations of ELF hisses at 750 Hz. Fig. 4 represents R/L values at 750 Hz. ELF hiss at 750 Hz is shown to be slightly right-

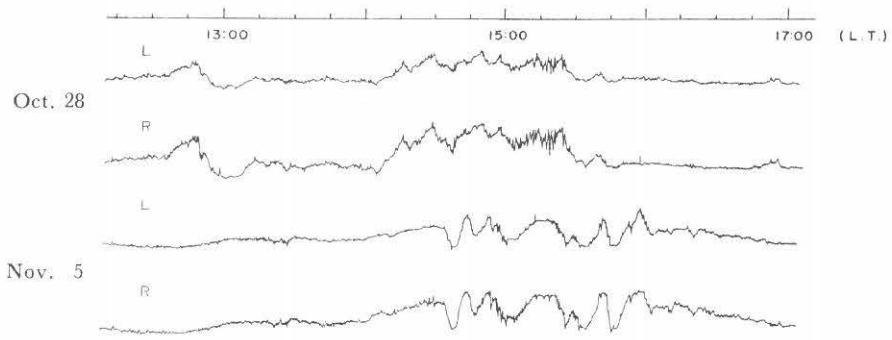

Fig. 3. Some examples of polarizations at 750 Hz.

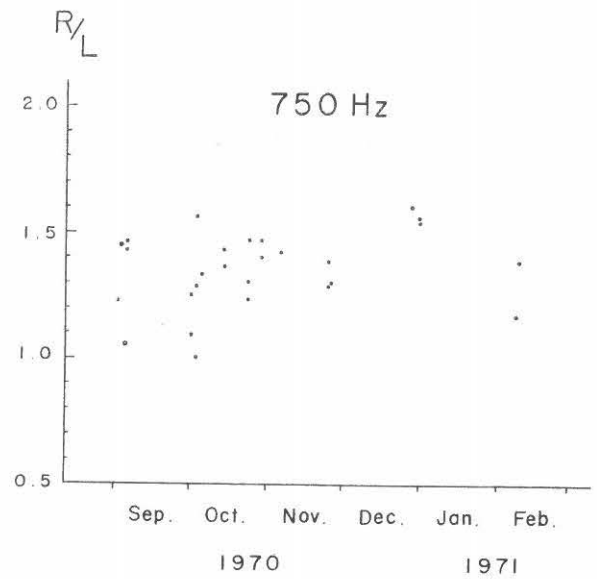

Fig. 4. Ratio of R-component to L-component of ELF hiss.

handed polarized. The results are of the same tendency as those previously obtained (Nishino & Tanaka 1969, Tanaka et al. 1970).

Fig. 5 gives the block diagram of the frequency swept polarimeter operated at Syowa Station in 1970. The signals received by N-S and E-W loop antennas are led to band pass filters. Each of the signals from 0.5 to 2 kHz through the filters, and an output from an oscillator sweeping from 4 to 5.5 kHz at a period of 60 seconds are supplied to the balanced modulator.

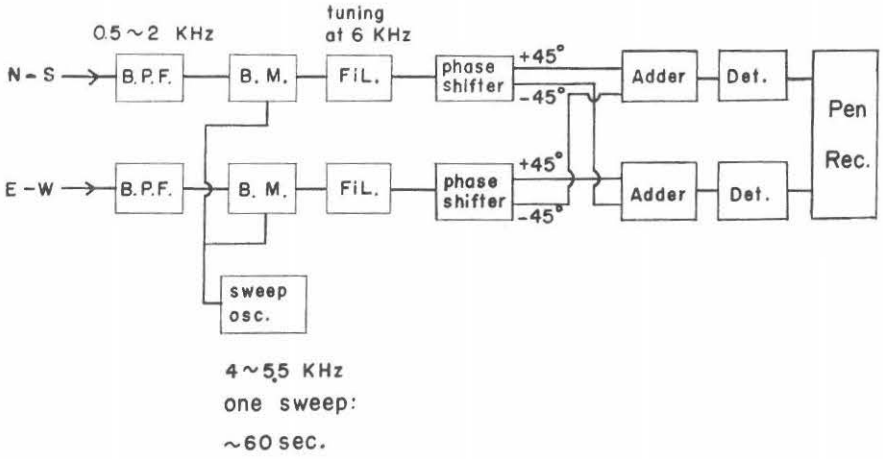

Fig. 5. Block diagram of frequency swept polarimeter.

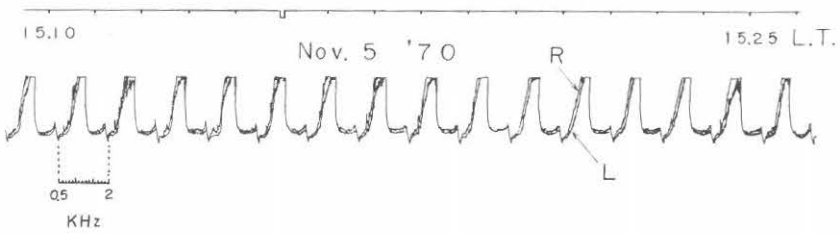

Fig. 6. Polarizations of ELF hiss obtained with the sweep polarimeter :
Curves with higher levels usually correspond to R-components.
Curves with lower levels usually correspond to L-components.

The output from the modulator is led to the filter tuning at 6 kHz and then introduced to a phase shifter. As the result, ELF hiss signals from 0.5 to 2 kHz are succesively divided into R-components and L-components, and recorded.

A typical sweep receiving datum is shown in Fig. 6. And the sweep receiving data obtained are almost similar. So, it is found that ELF hiss is slightly right-handed polarized and its frequency range is less than about 1.2 kHz.

Acknowledgement

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References

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