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Section 4. Whistlers and Related Phenomena

One of the important subjects concerned with the study of whistlers is to study the penetration characteristics through the ionosphere and another is to research the propagation features in the magnetosphere, deducing magnetospheric properties. Through many years of researching efforts, a lot of the problems have been solved. There are, however, some problems to be solved, namely, to clarify the nature of whistler ducts and then to confirm the duct formation theory, and to establish a unique observing method instead of the present routine observation with magnetic tape record for two minutes per hour.

Hayakawa and Iwai(1975) have shown the following results using the rocket measurement of wave normal directions of low-latitude sunset whistlers and theoretical ray tracing studies. The features of whistler wave normal directions are quite consistent with the concept of a trapping cone for ducted propagation. In addition, the wave normal directions of ionospherically transmitted whistlers lend further strong support to the ducted propagation of sunset whistlers. And the sunset duct can be deduced to have an enhancement factor of more than 100 percent and a scale of the order of a few tens of kilometers.

We have great expectations for the automatic recording of the occurrence rate, dispersion and diffuseness, which system is nearly completed. Since the experiments of direction finding of whistlers have proceeded well, the antenna system for the DF has been installed at Moshiri and then the DF experiments are to be successfully made, and we are eager for the continuous observations of the DF in the near future. The simultaneous observations of whistlers have been carried out at Moshiri and by the satellites of ISIS-1,2. The whistler data observed onboard the satellites have been received by DR T.Ondoh's group at Kashima Branch of Radio Laboratory Japan.

The crossed loop system is usually used for the direction finding of atmospherics at VLF. This system has the merit of simplicity of the equipment but its measuring accuracy severely depends upon the site

and polarization errors. A new direction finding system using the arrival time difference of the signal and being free from the abovementioned errors has been developed. The configuration of the observing points consists of a main station and two slave ones, which are situated far from the main station, in a certain distance of less than one wavelength in the observing frequency. Simultaneous observations are made at the three stations of atmospherics as well as of the NDT communication wave of 17.4kHz, which is used as a strict time reference. This newly developed DF system will be used for not only the observation of arrival direction but also that of incident angle. This new DF system has been planned to be applied to the observation of azimuthal and incidental angles of auroral VLF hiss at Syowa Station,Antarctica during International magnetospheric Study.

The evaluation of the fixing accuracy of atmospherics sources are made by comparing the equi-error curve calculated by a computer with the error curve based on the data obtained by the triangulation DF network. Both curves show similar tendencies with the exception of the baseline direction of the network.

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