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Section 4. Whistlers and VLF Emissions

As a part of the MONSEE (Monitoring of Sun-Earth Environment) program, the routine observations of whistlers and VLF emissions have been continued as before at Moshiri, Sakushima (whistler only), and Kagoshima (whistler only). But a serious trouble for the continuation of the observations happened at Kagoshima Observatory. The adjacent land of Kagoshima Observatory was purchased by a company, which is going to construct a big plant. Since it will generate heavy interfering noises for the observations, Kagoshima Observatory is compelled to move to a new site free from the artificial noises.

The storm-time variations were statistically studied of the occurrence rate, dispersion and diffuseness of whistlers observed at Moshiri from Jan. 1967 to Dec. 1970. Enhanced whistler activity and diffuseness, and depleted dispersion followed severe geomagnetic storms by 1–2 days. From this result, it is concluded that the enhanced diffuseness is attributed to the increase in the effective width of the duct region and the enhanced occurrence is due to the more stable condition of the duct region.

From the results of observations made at Moshiri during the IASY, it has been found that whistlers in a higher frequency range, extending up to about 30 KHz can possibly provide information about the path latitudes in the magnetosphere from their nose-effects, when the path latitude is not lower than 38 degrees in geomagnetic latitude.

In order to study the propagation characteristics of down-coming whistlers through the ionosphere, the measurements of the arrival direction, incident angle and polarization of whistlers have been planned. The measurements will be made at Takayama Seismological Observatory of Nagoya University, situated about 150 km NNW from Toyokawa. The principle employed in these measurements is the four-parameter method which is an improved one of Crary's method. This measurement will be commenced in Dec. 1972.

The high-latitude propagation of down-coming whistlers through the lower exosphere was discussed with the earth-ionosphere cavity taken into account. The most striking effects of the introduction of the idea of cavity are summarized as follows, (1) the reflection coefficients of the down-coming whistlers become nearly unity for the usually encountered collision frequency in the lower ionosphere, (2) there appear several characteristic minimums in the transmission coefficients at certain frequencies, which are closely related to the spacing of the cavity. Next, the equatorial penetration of up-going ELF and VLF waves is studied. The amount of wave penetration

is generally small due to the presence of the evanescent region. However, there exists a narrow band of possible tunneling transmission around 1 KHz. The frequency of maximum transmission is found to be dependent on the density gradient.

VLF hiss events observed at Moshiri from Jan. 1964 to Dec. 1968 were investigated. 56 percents of the events are associated with magnetic storms. The VLF hiss seems to be generated inside the plasmapause by drifting soft electrons accompanied with the ring current flowing at 3-4 Re geocentric distance. The remaining events show no correlation with magnetic storms. They may correspond to the equatorial VLF hiss observed around the equatorial region of very low L values during geomagnetically quiet periods.

The REXS satellite was launched into an elliptical orbit on Aug. 19, 1972. The operation of the satellite in orbit was satisfactory during several revolutions. However, on the third day after the launching, the telemeter system was damaged by accident, and no available data have therefore been sent from the satellite. Details of the PWP (plasma wave probe) experiment and its preliminary results are reported in this volume.

The routine observations for locating the distant atmospheric sources by the triangular network (Moshiri, Sakushima and Kagoshima) have been continued. However, the observation schedule has been changed to the following two modes since Nov. 1, 1972. The observation by the first mode starts at noon and continues for five minutes every day except Saturday and Sunday and the observation by the second one is made during five minutes every three hours on five days of the second week every month.

A test observation by the crossed-loop antenna system in the LF band was carried out at the two stations Sakushima and Kagoshima to locate the atmospheric sources in a shorter range. It has been found that fixed positions correspond well to meteorologically active regions lying in and around Japan. A report of this observation is presented in this volume.

Another test observation by a new spaced-loop direction finder was made and the results indicate that it is necessary to improve the system for practical use. The development of the direction finder for measuring near thunderstorms is a future problem.

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— Akira IWAI —

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