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ACTIVITY REPORT

Section 1. Propagation of Atmospherics and VLF, ELF Radio Noise

Efforts are being devoted to improve the function of the Single Station Locator which we developed a few years ago. For this purpose, since it is necessary to investigate both variations of the nature of the lower ionosphere and those of radiated pulses of lightning discharges, characteristics of wave impedance at a frequency of 250 Hz computed from the electromagnetic field of ELF atmospherics are being studied to obtain the information of the height and conductivity variations of the lower ionosphere. To obtain the variations of the radiated pulses of lightning discharges, we are planning to record and analyze every waveform of ELF atmospherics.

The arrival direction of atmospherics is disturbed by various types of errors. One of these errors is produced by the refraction effect at sea-land boundary. The bearing errors due to the refraction for 10 kHz and ELF waves are investigated theoretically as a function of propagation distance. It is found that the bearing error at 10 kHz changes randomly corresponding to the propagation distances over sea and land respectively, because of the higher order modes interference. On the other hand, the bearing error for ELF remains constant irrespective of the propagation distance, because there exists only a TM-zero order mode propagation.

In the field of Schumann resonance, a method for detecting line splitting from ordinary observed data has been investigated. The method includes spectral smoothing and chirp z-transform. The obtained mean frequency separation between adjacent peaks is 0.95 ± 0.2 Hz and Q-values derived are about 8 for the first order mode. The amplitudes of subpeaks are rather larger than the theoretically expected values. The importance of those results lies in the point that the splitting can be obtained from all observed data. The diurnal variation of the resonance frequency has been investigated. This work has developed a new idea that intrinsic variations are caused by the geometric relation between the asymmetric ionosphere and the

standing wave pattern of the field. It has been shown that the intrinsic variations have two cycles a day and that of the first mode is in antiphase with those of the other modes. Calculated resonance frequencies and obtained data are more in agreement for the first mode than the second mode.

The active experiment for the artificial excitation of plasma waves in the ionospheric plasma was carried out by a Japanese sounding rocket K-9M-53 on August 26, 1975 at Kagoshima Space Center, which belongs to the Institute of Space and Aeronautical Science of the University of Tokyo. Artificially-stimulated plasma waves in the HF and VLF ranges were observed.

As one of the IMS project in Antarctica, payloads for rocket experiments on the wave-phenomena in the antarctic ionosphere were constructed by the Wave-project Group which consists of the Kyoto, Tohoku and Nagoya Universities. The rocket experiments will be carried out by the 17th Japanese Antarctic Research Expedition party which departed from Japan November 1975.

We have continued with the phase-height measurement for VLF radio waves of 22.3, 17.4 and 13.6 kHz.

Theoretical works to investigate the nonlinear wave-wave and wave-particle interaction in the magnetospheric plasma were made for the provision of EXOS-B satellite experiment which is planned for launch in 1978.

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