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ACTIVITY REPORT

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

Fluctuations of Deccometer (phase differences of the Decca hyperbolae) are discussed in terms of the atmosphere refractive index from results of observation of the Kita-Kyushu chain at a fixed point. This is aimed at the study of the nature of the ground wave propagation. In it, it is mentioned that the humidity would be important in our country to make clear the phase fluctuation of the ground wave. In connection with this, continuous recordings of the Deccometer were initiated also at the Institute to study the meteorological influences on the ground wave propagation in more detail, because Decca services by the Kanto chain were newly started from spring 1980.

Meetings were held two times last year by the national working group on the natural noise from lightning corresponding to the same group as the URSI Commission E. In the session on the natural electromagnetic noise cooperated by the ICAE, Japan, seven papers were presented on 17 Jan. 1980. Another meeting was held on 17 Oct. 1980 in which discussions were made mainly being centered on international conferences (VIth ICAE, 5th EMC etc) reports by the attendants.

Researches on the wave-impedance of electromagnetic wave in the earth-ionosphere waveguide by ELF atmospheric were supported by a special grant for three years from 1978 to 1980. The observations of atmospheric were carried out on July 4 ~ 10 and November 28 ~ December 4, 1980 at Nakashibetsu-cho, Hokkaido. The site was suitable to detect small signals of the atmospheric free from the interference noise of the power lines. In 1979, the ELF components of the vertical electric and horizontal magnetic fields of atmospheric at the single station were observed to obtain the wave-impedance through their ratio. In 1980, the simultaneous observation of the ELF and VLF atmospheric and the direction finding were also done to obtain propagation constants of electromagnetic wave with the wide frequency range from 10 Hz to 10 kHz depending on the propagation direction and to study origins of the slow tails. The observed waveforms of atmospheric were recorded in an analogue data recorder and statistical analyses have

been carried out by using the computer through the digital data conversion.

Computer simulation on the spherical and cylindrical ion-acoustic solitons in plasmas were performed by using a fluid model to compare with the experimental results. This work was made as the cooperation with Associate Professor Nakamura, Tokyo University. From the comparison, the transformation from linear to nonlinear stages became clear depending on the reflection at the center. Another interests on the computer simulation are in the equilibrium and stability analyses of a toroidal plasma system. In order to obtain equilibria of the toroidal plasma with an anisotropic pressure, a two dimensional MHD model was made, where the anisotropic pressure and MHD equations are explicitly solved in time. The MHD model is also aimed to simulate the equilibrium and stability of the terrestrial magnetosphere.

In order to investigate the behavior of the D region, we have continued with the phase measurements for waves of 22.3 kHz (NWC), 18.6 kHz (NLK), 11.3 and 10.2 kHz of four OMEGA stations at Aldra, Haiku, Reunion and N. Dakota. Sudden phase anomalies (SPA) observed at Toyokawa were reported every month at Solar Terrestrial Environmental Research Meetings and also reported to the World Data Center A at Boulder, U.S.A.. In 1980, we mainly engaged in developing a method of a computer treatment of phase and amplitude data.

The Japanese-Swedish International balloon campaign sponsored by the National Institute of Polar Research has been carried out at arctic region. We have jointed a group for the natural wave phenomena to investigate the relationship between auroral arcs and precipitating particles. Two test flight were carried out with great success from Esrange at Kiruna, Sweden. The campaign is continued for four years during MAP period.

We have continued with the observation of stimulated plasma waves in the magnetosphere by the Japanese scientific satellite "JIKIKEN" and so, many interesting and valuable results are obtained.

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