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Section 7. Magnetospheric Radio Emissions

Routine observations of VLF/ELF emissions and related phenomena have been continued at our observatories, Moshiri, Sakushima and Kagoshima. Temporal measurements have been made on the direction finding and polarization for magnetospheric VLF waves.

The data from European VLF campaign made several years ago are being analysed. Characteristics of mid-latitude VLF hiss emissions which take place in the dawn sector, being associated with substorms and exhibit interesting frequency drifts have been interpreted in terms of the quasi-linear electron Cyclotron instability. The direction finding data for auroral VLF emissions aboard a rocket and also on the ground at Syowa, Antarctica, are being analysed.

We emphasize the following two directions of research; (1) Direction finding for magnetospheric plasma waves on board spacecrafts in order to elucidate their generation and propagation mechanism, and (2) Study of wave-particle interactions by means of an active experiment. As for the first subject, we have carried out the measurement of wave normal directions for various types of VLF/ELF emissions. We have found that the chorus in the lower band ($f < f_{He}/2$) are generated by electromagnetic electron loss-cone instability by substorm electrons. The upper band emissions ($f > f_{He}/2$) is identified as being a quasi-electrostatic whistler-mode, and its generation mechanism has been proposed. Wave normals of plasmaspheric ELF hiss observed on GEOS 1 have been determined, which has yielded that the waves are generated by large θ angles on majority of cases. The generation of waves with large θ angles is very consistent with the ground-based polarization measurement at Moshiri ($L=1.6$). Furthermore, the ELF hiss in a detached plasma region of the magnetosphere has been analysed. The collaborative work on Arcad project is being continued and we have discovered an interesting phenomenon; Doppler broadening of the VLF transmission signal and the associated side-band structures, resulted from the nonlinear wave-wave interaction in the ionosphere. Recently we have started the direction finding for geomagnetic pulsations observed in the space. As for the forthcoming Japanese satellite experiments, we are res-

posible for the measurement of electric fields by double-probe method and we are now engaged in designing the electronics and the development of signal analysis system to be installed on the EXOS-D and GEOTAIL satellites.

As for the second subject,we carried out the conjugate measurement on the reception of whistler-mode signal from the DECCA signal transmitted from Hokkaido, at its conjugate point,Birdsville,Qld,Australia in June-September,1984. We have succeeded in detecting the whistler-mode signals especially during sunset and sunrise and furthermore an enhancement of signal intensity by more than 20 dB is noticed during geomagnetic disturbances,being indicative of an amplification phenomenon. An additional interesting fact is the amplitude modulation with the periods of the order of a few seconds and a few minutes. Detailed analyses on these points are being made. Moreover,we made the reception of whistler signal and the associated triggered signals from a high-power VLF transmitter at Komsomolskmur,USSR at its conjugate point,Ceduna. Data are being analysed. Natural plasma waves including VLF/ELF waves and geomagnetic pulstions are also studied. In order to incorporate with these experimental studies, theoretical studies have been made on the electron Cyclotron resonance interaction between LF waves and electrons with quasi-relativistic energy in the inner radiation belt, and are being continued.

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- Jinsuke OHTSU -
- Masashi HAYAKAWA -

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