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Section 4. Whistlers and Related Phenomena

The routine observations of whistlers and VLF/ELF emissions have been continued by means of magnetic tape recording in two minutes every hour at our observatories, Moshiri(L=1.6), Sakushima(1.3) and Kagoshima (1.2). VLF/ELF emissions have been continuously observed, using valley antennas at Moshiri and Kagoshima, and then hiss type emissions are identified by means of hiss recorders.

The simultaneous observations of low-latitude whistlers were carried out during January 19-25, 1985 at Sakushima and Yamaoka, being ∿70 km distant from Sakushima, in which two horizontal components of magnetic fields and a vertical component of electric fields were recorded on PCM recorders. The observations aim to investigate the spatial distribution of the ionospheric exit points of whistlers, the size of each exit(duct), duct lifetime and the relation between the incident angle and the wave polarization. Forthcoming detailed analyses of the obtained results are expected to establish the usefulness of our 'field-analysis' direction finding method.

A computer-aid data analysis system is being developed for synthetic analyses of VLF data : (1) data compilation, (2) some kinds of physical analyses, and (3) comparison of VLF data with data of related phenomena. The analysis system will be powerful for the reduction of a great quantity of the data aquired on the forthcoming satellites, Exos-D and Geotail.

The propagation characteristics of the daytime whistlers at low latitudes are deduced on the basis of the data obtained by a newly developed automatic direction finding measurement at Yamaoka and the synoptic routine data from the multistation network of Kagoshima, Sakushima and Moshiri. It is found that the ionospheric exit points determined by the direction finder at Yamaoka remain very stable for less than 2 hours, being of the same order as the duct lifetime of ∼1 hr deduced from the data from the real time whistler analyzer at Moshiri. And the experimental results are likely to suggest the ducted propagation of the daytime whistlers. The propagation characteristics are

also studied by computations of ray tracing and wave absorption. The computation results suggest that the daytime whistlers are attributed to propagation trapped in field-aligned ducts with a small dimension of 10-50 km width and a large enhancement factor 100-300% either present within or superimposed on the high-latitude flank of the equatorial anomaly, and that there is a low-latitude cutoff of occurrence of the daytime whistlers at a geomagnetic latitude of ∿20° as experimentally established.

Supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education of Japan, the conjugate measurements were successfully carried out for the years of 1983 and 1984, in order to detect the whistler-mode waves of the Decca signal from Biei, Hokkaido at its conjugate pint, Birdsville, QLD, Australia, and to identify wave-particle interactions in the low-latitude magnetosphere. Then, we are preparing the long-term reception of the whistler-mode waves of the Decca signal transmitted from Port Hedland, Australia at Kagoshima observatory, in order to investigate the seasonal variation of the whistler-mode propagation and wave amplification during geomagnetic storm-times.

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