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Section 4. Whistlers and Related Phenomena

The routine observations of whistlers have been continued by means of magnetic tape recording in two minutes every hour at Moshiri (L=1.6), Sakushima (1.3) and Kagoshima (1.2).

The data from the real time whistler analyzer at Moshiri during four months from November 1977 to February 1978 are used to study the formation and decay of whistler ducts at lower latitudes. A close examination during the whole period has indicated that fundamental bursts whose temporal variations were well approximated by Gaussian shapes are the primary unit during relatively low whistler activities, and, further, they are present even during prolonged activities, and that each fundamental burst is indicative of the formation and decay of a single duct. It takes less than one hour for a duct to be formed, and it may persist for the same order.

Digital analyses of the polarizations of ground-recorded whistlers have been carried out by means of simultaneous MT recording of wide-band signals on the two orthogonal loop antennas at Moshiri. Right-handed polarization has been indicated over a wide frequency range for whistlers exited the ionosphere very close to the station, while nearly linear polarization is indicative of whistlers propagated over great distances in the Earth-ionosphere waveguide after leaving the ionosphere.

It is predicted from computation of ray tracing and wave absorption that the daytime whistlers frequently observed in the late afternoon at low latitudes are attributed to the propagation trapped in field-aligned ducts with a width of 10-50 km with enhancement factor of 100% order superimposed on the outer (high-latitude side) flank of the highly developed equatorial anomaly. Then, the propagation characteristics of daytime whistlers have been discussed by the data from the automatic direction finding at Yamaoka(L=1.3) and the synoptic routine data at our three whistler stations. The ionosphere exit points are distributed within a small region with its diameter less than several tens km on an ionospheric level, and

whistlers emerged near Yamaoka and Sakushima tend to propagate in the Earth-ionosphere waveguide toward higher latitudes. This experimental fact as well as the above theoretical prediction are well indicative of the ducted propagation of daytime whistlers.

A Riometer system at Moshiri is composed of two pairs of the corner-reflector antennas at 30 and 60 MHz ; directed toward the Pole star and the Earth's magnetic field line intersecting Moshiri. VLF emissionss observed in the early morning with gradual amplitude variations are correlated with cosmic noise absorption(CNA) with the magnitude of ~0.1db at 30 MHz on the geomagnetic field directed antenna, while impulsive type VLF bursts observed during the daytime are associated with the variations of CNA levels at 30 and 60 MHz on the both antennas.

23 February 1984
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