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Section 5. Atmospheric Radio Noise and Thunderstorms

A statistical study on the change of vertical electric-field-intensity near the source of atmospheric has been made since 1969 at Imaichi Observatory. The changes of electric-field-intensity near the source were measured at three different frequencies of 3, 50 KHz and 5 KHz in summer, 1971 and at four different frequencies of 2.5, 3.5, 5 and 8 KHz in VLF band in summer, 1972. The four statistical parameters, APD, CRD, OTID and PWD, have been obtained from the field-intensity-change data observed in 1971 and the results of analysis are reported in this volume. From the results of analysis of the data of the electric-field-change obtained in 1971, it has been found that there is a fair resemblance especially among the three different frequencies, 2.5, 3.5, and 5 KHz with respect to the amplitude-statistics.

A kind of amplitude distribution measuring apparatus is being developed with different four receiver units, their center frequencies are 2.5, 3.5, 5 and 8 KHz respectively. By using the apparatus only the low probability high field intensity region ranging from 3 to 0.05 % can simultaneously be measured with the four frequencies, so that the relative field strength with these frequencies for a constant percent of the time such as 0.5 % can be obtained from the data. The relative field strengths or the statistical frequency spectrum in a small frequency region can be used to provide an information about the relationship between the ionospheric condition and the geographical distribution of sources of atmospheric.

The statistical parameters, APD, CRD, PWD and OTID, by using the simulation method, have been obtained based on the model of the atmospheric noise proposed by Nakai (1966) and it has been found that the CRD curves as well as APD curves are in agreement with the experimental data, but there is a remarkable difference between the theoretical- and experimental- curves especially with respect to the statistical parameter OTID. Then it has become more evident than ever that it is necessary to introduce the time-statistics consistent with the OTID data observed near the source of atmospheric, in place of the Poisson law assumed before on the occurrence time interval of pulse, in order to establish a complete model of the atmospheric noise.

In this year thunderstorms were studied by our members at so many places as follows.

1) Imaichi station: In this summer electrostatic-field changes caused by lightning discharges and thunders were observed. Recoveries of the field changes after discharges are in process of analysis for the study of charge generation in thunderclouds. The analysis of thunder-data obtained by using four microphones shall be made for the study of lightning channels in thunderclouds.

2) Unoke near Kanazawa: The first observation on winter thunderstorm was made during winter 1972/73 and the results will be reported (Takeuti, Nakano, Nagatani and Nakada). A similar observation shall be made during winter 1973/74.

3) Europe: Records of current waveforms of lightning discharges struck at the towers on the top of Monte San Salvatore, Switzerland, and that at Weissenau, Germany of spheric waveforms originated from those discharges, were due to the helps by University of Tübingen and Technical University of Zürich. The study of an exact relationship between discharge and sferics soon shall be made from those data.

4) Toyokawa, Research Institute: Co-observation for global thunderstorm activity with Germany, USA, and Argentina is continued and the activity of 1971 soon shall be reported. Lightning discharges in typhoons and Hurricanes were observed with Atmospheric Analyzer at Toyokawa, Berlin, and Washington. The results shall be published (Takeuti and Heydt).

5) Research ship Hakuohmaru: The following two projects were made on board in this summer. One is the study on characteristics of tropical lightning discharges observed at Guam and Cebu, Philippine and the other is the study on frequency distributions of lightning discharges on the West Pacific region.

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— Taketoshi NAKAI —

— Toshio TAKEUTI —

Publications

- Nakai, T., M. Nagatani and M. Nakano: Statistical Parameters of the Electric-Field-intensity-Change At the Source of Atmospherics, Proc. Res. Inst. Atmospherics, Nagoya Univ., (this Volume).
- Sao, K., A. Iwai, T. Takeuti, and T. Kamada.: Present Status of the study on Direction Finding and Location of Atmospherics at the Research Institute of Atmospherics. Naval Research Laboratory Report. in printing.
- Takeuti, T., M. Nakano., M. Nagatani and H. Nakada; On lightning discharges in winter thunderstorms. Journal of the Meteorological Society of Japan; in printing.
- Takeuti, T. and G. Heydt; Beobachtungen von VLF-Atmospherics beim Auftreten grossräumiger Wirbelstrume. Technischer Bericht, Heinrich-Hertz-Institut für Schwingungsforschung Berlin-Charlottenburg. in printing.
- Takeuti, T.; Results Obtained with Atmospherics Analyzer at Toyokawa; Naval Research Laboratory Report; in printing.