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Section 5. Atmospheric Radio Noise and Thunderstorms

The occurrence time interval distribution (OTID) and the crossing rate distribution (CRD) were analyzed as a function of the threshold voltage. They are based on the magnetic tape-data in the past few years of the electric field intensity near the source of atmospheric. Out of these OTID curves obtained, an attempt has been made to find out the curves that most likely involve the informations about the time intervals between strokes of a discharge, as well as between strokes of two different discharges appearing one after another. An average OTID (1) has been obtained in a form of graphically drawn curve being constructed out of a few ten curves which have been proved to satisfy a criterion based on Schonland's interval data. In addition, one more average OTID (2) has also been obtained in a form of graphically drawn curve. This has been obtained from OTID curves corresponding to a threshold voltage 20 dB lower than that of each of OTID curves found to be of use for constructing the average OTID (1). The conclusion is that the time and amplitude properties of the electric field strength near the source of atmospheric can be described by nearly identical OTID and CRD curves in the frequency range between 3 and 50 KHz and for the crossing rate range less than some 0.8. In addition, as to the range between some 1 and 10 or more, they can be described by frequency-dependent, though not so largely different, OTID and CRD curves.

Using the Atmospheric Analyzer developed by Heinrich-Hertz-Institute, the observations of source location in the world are being made at several observing sites Germany, America, Japan etc.. The principle of this apparatus is the use of dispersion in the propagation of VLF components of atmospheric. A large scatter of observed values in measuring GDD (group delay difference time) makes it very difficult to define the realistic distribution of the sources. An attempt has been made to estimate the expected magnitude of scatter of GDD for a single source. A model of return stroke current has been proposed, which is composed of three different elementary currents. The parameters defining its wave-shape are two different amplitude ratios, two different time delays and

total six, two different time constants defining the waveshape of each elementary current. GDD has been calculated for randomly varying values of amplitude ratios, time delays and time constants. Cumulative distributions of GDD near the source of atmospheric have been calculated, some of which have been found to agree with experimental data of GDD values, i.e., experimental cumulative distributions of GDD.

The observations of statistical frequency spectrum of atmospheric are being made at the Sakushima Observatory. Statistical parameters V_n 's are measured on four frequencies of 2.5, 3.5, 5 and 8 KHz, which are the voltages exceeded by the atmospheric noise envelope at each frequency with the percent of n . n is usually taken 0.1, 0.5 or 1. The voltage V_n defined by such a low value of percent largely concerns atmospheric of high amplitude and it may give informations on the activity of the nearest source. It has been found that the statistical frequency spectrum has a characteristic shape when the thunderstorms occur near the measuring site, i.e., within the distance of some 100 km. The variation in the frequency spectrum shape has also been found to be correlated with the change of ionospheric conditions, particularly at sunset and sunrise. Appreciable response to the variation of the ionospheric condition caused by a sunburst has been found, though data are not yet scarce. These data are going to be investigated.

The winter thunderstorms have been again observed at Unoke near Kanazawa during the winter 1973/74 and the fact that most of cloud to ground discharges in the winter storms bring down positive charges to earth has been reconfirmed.

Measurements of lightning activities with 3 KHz sferics counters have been made on board of two ships, Hakuho-Maru during February to March and Taisei-Maru during July to August in the Pacific. Some correlations between lightning activities and meteorological conditions have been obtained from the analysis of both the data obtained in the above cruising and those in the cruising in the last year.

The coobservations with Germany, U.S.A., and Argentina have continually been done and the results observed were reported as seen in the following publications.

A good correlation between the electric-field recovery rate for the close discharge and the flash-frequency has been found. The regeneration rate of the electric charges in clouds has also been found to be 1-10 coul./sec. from the analysis of close discharge data. The result will be submitted to J. Met. Soc. Japan.

A 5 cm radar for thunderstorm observation is now under construction, and it will be used in observing atmospheric in 1975.

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