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Section 5. Atmospheric Radio Noise and Thunderstorms

The relationship between the noise statistics near the sources of atmospherics and that at the output of narrow-band receiver at a measuring site is under investigation. We have some technigue of deriving the characteristics of output noise from given characteristics of input noise for narrow-band receivers considering the influence of receiver response. The input noise can also be calcuated under prevailing propagation conditions with knowledge of the noise statistics near the source and geographic location of sources.

The statistical frequency spectrum (SFS) in ELF-VLF bands can be treated along the line of thought above, which is measured with a number of narrow-band receivers tuned to different frequencies. It has been found to be adequately describable in terms of a particular parameter related to CRD (crossing rate distribution) of the vertical electric field. The parameter can be taken the voltage exceeded with one per second by the envelope voltage at the receiver-output. The expression for SFS in the existence of a solitude source has been derived, which is a function of the frequency, the electric field intensity near the source, attenuation factor and the distance from source. What is to be noted here is that the expression derived has the same meaning as what was proposed by Watt and Maxwell before. A modification has been made for the expression to be applicable to more general situation with respect to geographic location of sources. The result of analysis has shown that SFS for the existence of a number of sources is given by a function of a few parameter,i.e., distances of sources,activities of sources, attenuation factor and the power index defining a crossing rate distribution. Comparisons between the observed data and calculated result for SFS are under investigation.

The scatter of GDD (groupe delay difference time) and SAR (spectral amplitude ratio) have been investigated using the model of return stroke proposed by one of the authors before, which is composed of three different elementary currents. Much emphasis in this analysis has been placed on the effects of variation of the velocity of tip streamer in return

stroke and of variation of measuring frequencies on the scatters of GDD and SAR. The results of calculation show that there is a tendency of agreement between the observed- and calculated-scatters in spite of different choice of probable range of each of ten random variables,i.e., two different amplitude ratios,two different time delays and total six, two different time constants definning the waveshape of each elementary current. The result obtained in this analysis will be published as sooner as possible including what was to be published in 1975.

The winter thunderstorm observation at Unoke in Hokuriku were done as usual during the winter season 1974/75. Some discussions about lightning discharges in winter were made together with prof. Brook, New Mexio Institute of Mining and Technology USA, during his stay at our Institute and we are now discussing about the plan of co-observations for the winte thunderstorms at Unoke.

Field changes due to lightning discharges were measured at Fukui in Hokuriku about 100 km southwest from Unoke in this summer, with help of Mr. Y. Yamamoto, Michimori High School. This shall be repeated again in this winter in parallel with the observations at Unoke, the purpose of which is to find out whether the unusual discharges in winter observed at Unoke is local ones or not.

Cloud-to-sea discharges were observed with a field meter and a video camera on the board of the research vessel Ryofu-Maru on the Solomon Sea and further similar observations shall be made during January and April 1976 on the research vessel Hakuho-Maru.

Lightning channels in thunderstorms were determined from records of thunders and some relationships between the inclinations of channels in the clouds and meteorological conditions have been cleared up.

A thunderstorm-radar with about 5 centimeters wavelength and 60 kw peak power has been constructed. A three dimentional features of thunderclouds can be observed with the radar using simultaneous scanning both in horizontal and vertical directions. As the radar can easily be moved with a car, we will use it in the thunderstorm-observations at Unoke in this winter

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