Section 2. Sources of Atmospherics

Atmospheric Source problems are closely related to many topics in the research field of atmospheric and space electricity. There are, for example, micro-meteorology of thunderstorms, electricity of thunderstorms, lightning discharge mechanism, electromagnetic effect of atmospheric discharge phenomena, Schuman resonance, global electric circuit of the atmosphere, the electrical state of the free atmosphere.

Our research activity has mainly been and will be directed toward the study of radiation of electromagnetic waves from lightning discharges, with special interest in ELF atmospherics generation and in atmospheric source signals in HF through VHF.[2][3][11][12]

Frequency spectral characteristics of atmospheric source signals have been studied, using a mobile field site shown in Fig. 1, to see the effect of a definite discharge mechanism involved in a lightning flash (e. g., leader, return stroke, etc.) on the nature of spectral distribution of the source signal peak intensity in HF and VHF bands to respond to possible demands in the space age.[12]

Simultaneous electric field change measurement of individual lightning discharges at three field sites contributed to the thunderstorm electricity research.[5][6][7][8]

A joint ELF atmospherics research program was started in the summer storm season in 1965 and has been continued this summer in cooperation with Geomagnetic Observatorys, Meteorological Agency at Kakioka and Memanbetsu. ELF atmospheric waveform observations have been carried out at four field sites Tottori, Kakioka and Memambetsu, including the source signal measurement at Imaichi to study the genesis of ELF atmospherics. In this way, the ELF electromagnetic effect of a particular lightning discharge could be recorded at four different places, i. e., within 10 km and at 80, 600 and 900 km from a lightning discharge.[11]

Atmospheric electricity in the upper atmosphere below the E ionosphere is of special interest to us in relation to the global electric circuit of the atmosphere and to the nature of the D region ionosphere which controls the propagation of atmospheric radio waves in VLF and ELF. A preliminary drop sonde

Fig. 1. Mobile field site at Imaichi, Tochigi, working for the atmospheric source signal study in 1966.

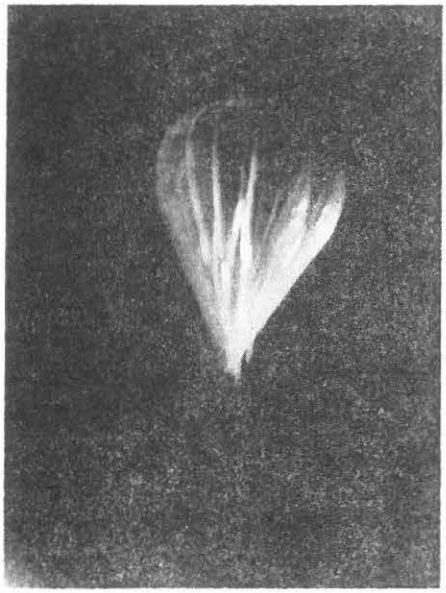

Fig. 2. Atmospheric electricity balloon ready to launch in the evening hour in September 1966

measurement of ion density and ion mobility has been made in April 1966 using a rocket borne Gerdien condenser, aiming the final goal of future investigation of the electric state in the transitional region of atmosphere.

A balloon measurement of atmespheric electricity above the exchange layer is also of our interest, and is pursued along with the drop sonde probing. The first balloon borne Gerdien condenser measurement of negative ion density has been carried out as shown in Fig. 2 in September 1966 with the expectation that in future we could measure the diurnal variation of the ion density in the free atmosphere.[10]

—Haruji ISHIKAWA—

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