

## Section. 2 Source of Atmospherics and Atmospheric Electricity

The Fourth International Conference on the Universal Aspects of Atmospheric Electricity was held in Tokyo, May 1968. It involved the following eight topics : simulation of atmospheric electrical phenomena, thunderstorm charging mechanism, physics of lightning, monitoring of global thunderstorm activity, planetary atmospheric electricity, planetary atmospheric electricity measurements, tropospheric ionization and fair weather electricity. The trend of activity in this section has a close relation to these topics, which are all connected with lightning discharges as a generator of atmospheric disturbances and of global atmospheric electrical circuit. By the staffs of this section three papers were submitted to the conference, which were the studies on ELF genesis (Ishikawa, Iwata and Takagi, 1968), VHF radiation from ground discharges (Takagi, 1968) and balloon observation of ion density and conductivity of the stratosphere (Ishikawa et al, 1968).

In summer 1968, a thunderstorm observation was carried out as it was done in other years at Imaichi, Tochigi Pref., where a new small prefabricated house was installed in addition to the mobile station for the observation. This is to solve the limited space problem on a mobile station and to aim at the further development and the increment of subjects to be measured in this field. One of the main objects this year was to study the frequency spectral characteristics of atmospheric source signals in the range VLF through UHF. The study is to see the mechanism of a particular discharge within and around thundercloud, and at the same time it would involve a possibility to bring us a knowledge as to the formation of local heavy shower connected with electrical activity in the cloud.

The problem of ELF genesis was also included in thunderstorm observation by



Fig. 1. Imaichi observatory and mobile station for atmospheric source signal research.

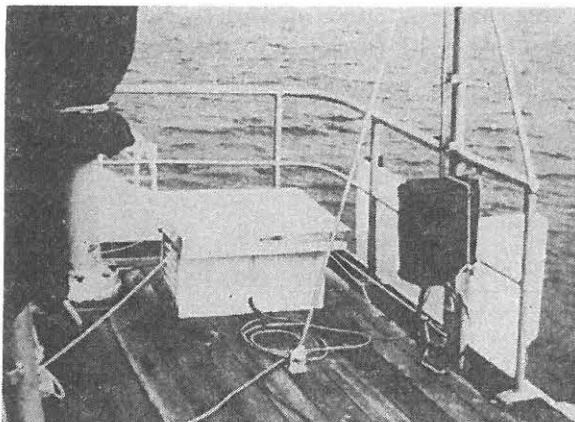


Fig. 2. Instrument for air-earth current density operating on the research vessel, Tansei-Maru.

means of a linked recording of ELF atmospheric elements at two places of different separation from its origin. The data are now being processed.

"Atmospheric Electricity Ten-Year Program" has been proposed by the Joint Committee on Atmospheric Electricity of IAMAP and IAGA, IUGG to approach the general solution of a number of old problems, mostly related to the global circuit, as well as of a number of recent problems in atmospheric and ionospheric physics. One of the best observation places to realize this on the ground level is on the ocean. Last year we had two chances of measuring atmospheric electric elements on vessels, Ryofu-Marun of Japan Meteorological Agency and Tansei-Marun of Ocean Research Institute, University of Tokyo (Takagi and Kanada, 1969). This year one of our staffs is on board a long cruise to the South Pacific Ocean by Hakuho-Marun of Ocean Research Institute, University of Tokyo, from November to March 1969. We would expect that the cruise brings sufficient information to approach the general understanding of the global atmospheric electricity, because it would encounter various kinds of geographic and meteorological conditions which affect atmospheric electricity. The later half of the cruise fortunately coincides with a partial period of the Atlantic Expedition conducted by Prof. Mühleisen, and the cooperative program is being set forward.

The other important problem on upper atmospheric electricity is studied by a direct measurement by the use of space vehicle. Unfortunately, a rocket borne Gerdien condenser measurement of atmospheric ion density and electric conductivity resulted in failure because of a defect of separation mechanism from nosecone, though it was again carried out in September 1968 after a long suspension of rocket experiment. On the other hand, a balloon measurement of atmospheric ion above the exchange layer made in fall 1967 was analyzed in detail in relation to the effect of aerosols in the stratosphere (Morita and Ishikawa, 1969). In addition to this, a new balloon experiment was done in

fall 1968 as to ELF electromagnetic effect of world-wide thunderstorm activity. Though it was not always satisfactory in obtaining undisturbed signal because of unwanted vibration and instrumental noise, it gave a possibility of measuring ELF phenomena within D-region by the use of a small rocket.

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### Publications (1968-1969)

- Ishikawa, H., A. Iwata and M. Takagi : Experimental Study of the Origin of ELF Atmospherics. Proc. Res. Inst. Atmospheric, Nagoya Univ., **15**, 57-61 (1968)
- Ishikawa, H., Y. Morita, and M. Takagi : Balloon Observation of Atmospheric Electrical Conductivity up to 24 KM in Altitude. Short Paper for the Fourth International Conference on the Universal Aspects of Atmospheric Electricity, Tokyo (1968)
- Ishikawa, H., Y. Morita, M. Takagi and A. Iwata : Balloon Observation of Small Ion Density and the Electric Conductivity in the Stratosphere. (this volume, 1969)
- Morita, Y. and H. Ishikawa : Estimation of Rate of Airflow Streaming through a Gerdien Condenser in the Upper Atmosphere from a Simulation Experiment. (this volume, 1969)
- Takagi, M. : VHF Radiation from Ground Discharges. Short Paper for the Fourth International Conference on the Universal Aspects of Atmospheric Electricity, Tokyo (1968)
- Takagi, M. and M. Kanada : Preliminary Observation of Atmospheric Electric Field on the Sea Surface. (this volume, 1969)
- Morita, Y. and H. Ishikawa : Influence of the Atmospheric Aerosols on the Ion Density profile up to 30 km Altitude. (this volume, 1969)