

Section 2. Source of Atmospheric and Atmospheric Electricity

The present study in this section aims at a comprehensive understanding of electrical aspects of the atmosphere from the ground surface up to the lower ionosphere, the range sometimes called the 'electrosphere'. Although the electrical state of the atmosphere is naturally conditioned by ionization process, it is closely correlated with the content of submicron aerosols and minor elements of the atmosphere, which are coming to have a progressive importance on the environment and human survival. These considerations were discussed in the activity report in the preceding issues, so the practical activities in 1973 are described in the following.

(1) In March 1973, the observation of atmospheric electric conductivity and aerosols was carried out for two weeks at Chichi-jima, Ogasawara to find the effect of pollutions spreading from the main land of Japan over to the Pacific Ocean in the seasonal westerly wind. In the same month, the density and size spectrum of aerosols in the level of 1500 meters were also investigated by the use of airplane, which covered the area up to about 200 kilometers from Nagoya district over the Pacific Ocean. These observations give us some of fundamental knowledges on the physical behavior of aerosols during transport with air stream.

(2) From July to September 1973, Iwata of this section and Takeuti of section 5 had stayed at Tübingen University, Weissenau, Germany and at Monte San Salvatore near Lugano, Switzerland under the International Cooperative Research Program by the aid of Japan Society for the Promotion of Science. This was scheduled for the second year of the research on 'atmospheric electricity in the free atmosphere over mid-Europe'. One of the aims in this year is to understand the longitudinal difference in the ionospheric potential in Germany and in Japan. For this purpose small size rubber balloons equipped with electric field sondes, which were callibrated with each other in the last year program, were launched simultaneously at Weissenau and here in Toyokawa. Though it was in partial success because of unwanted weather, it would be an effective step for the following year to see structure of the global atmospheric electric circuit.

Another research work was done on the fine structure of atmospheric in direct relation with the nature of lightning at their origin. The lightning current hit the tower on Monte San Salvatore was measured, and at the same time the waveform of atmospheric radiated from this lightning was recorded at Weissenau 200 kilometers distant from the origin. The comparison of both records gave in detail how the process of lightning affected on the structure of atmospheric.

(3) A 5000 cubic meters balloon was launched at Sanriku Balloon Center, Research Institute of Space and Aeronautics, University of Tokyo in October 1973 for the observation of stratospheric electricity. The balloon reached the level of 26 kilometers and gave the vertical profile of electric conductivity in ascent and the mobility spectrum of positive small ions in level flight. A part of the experiment was for the research on 'pollutant distribution in the stratosphere' under the Japan-US Cooperative Science Program by the aid of Japan Society for the Promotion of Science. The density of aerosols larger than 0.3 micron radius and ozone and water-vapor content were measured by members of Wyoming State University by use of the same balloon with our measurement. The analysis of results is going on.

(4) Continuous observation of atmospheric electrical parameters and meteorological elements are fairly under way at Sakushima Observatory. Some of the processed data are sent to World Data Center at Leningrad, USSR. This kind of measurement is necessary to be in accumulation over long range in order to see the effect of solar activity or of the deterioration of environment as well as to be solved into basic relationship between complicated behavior of elements.

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