

Proceedings of the Research Institute of Atmospheric,
Nagoya University, vol.23 (1976) —Activity Report—

Section 2. Sources of Atmospheric and Atmospheric Electricity

Studies on atmospheric electricity are continued in this section with a special interest in the progressing importance on the environment and human survival.

Aerosols or particle pollutants, which have originated from human activities and scattered about wide area, make an appreciable change in the electrical nature of the atmosphere. In order to see the relationship between the vertical and horizontal distributions of aerosols and the physical state of the atmosphere, several kinds of observations were made in 1975.

In March, the densities of particles larger than $0.3 \mu\text{m}$ and of condensation nuclei were measured by the use of an airplane. The radon concentration was also measured with a help of Department of Nuclear Engineering, Nagoya University to estimate the history of sampled air mass. The observation covered the area of about 100 by 250 km from the Mikawa and Ise Bays toward east-south-east over the Pacific Ocean. The contour maps obtained of the densities of aerosols at the level of 1000 m clearly show the extension of land pollution toward the sea. However, the patterns of large and small size aerosols are more or less different with each other, especially over the sea where the densities are coming considerably low, and suggest that the aerosols are qualitatively as well as quantitatively changing through the transport in the air stream.

In May to June, Ishikawa, Takagi and Toriyama visited U. S. A. to carry out balloon measurements scheduled in the research project "Particle pollutant distribution in the stratosphere" under the Japan-U. S. Cooperative Science Program sponsored by the Japan Society for the Promotion of Science. At Laramie, Wyoming, the ion density and electric conductivity from the ground up to 26 km were measured along with condensation nuclei and large particles which were planned and practiced by University of Wyoming. The large-particle counter designed by us was also launched to compare the performance in detail with the U. S. counter. At Hilo, Hawaii, balloon measurements of ion density

and conductivity were made by the aid of Cloud Physics Observatory, University of Hawaii. The data obtained through these cooperative observations give important informations of understanding the present state in the stratosphere of the spatial distribution of aerosols and, at the same time, of investigating the fundamental processes interacted between particles and atmospheric ions.

The vertical profile of electric field and the ionospheric potential were also measured in this occasion. Because of the weather condition, simultaneous observations were succeeded only two times, once between Laramie and Toyokawa, and the other time between Toyokawa and Weissenau in Germany. The results showed the fairly good coincidence in the ionospheric potential values to evaluate the global circuit.

In October, a 5000 m³ plastic balloon was launched at Sanriku Balloon Center, University of Tokyo to measure the vertical profiles of large particles, ion density and conductivity up to the altitude of 24 km and the mobility spectrum of small ions in the level flight at 18 km. The data are analyzed in view of evaluating the processes of recombination and attachment between ions and aerosols and then finding if there is some difference between the construction of ions at the ground level and in the stratosphere.

At Sakushima Observatory, observations of atmospheric electric parameters, such as electric field, air-earth current, conductivity, large and small ions, large and small aerosols, are succeeded. The monthly-averaged diurnal variation of electric field in winter shows the pattern similar to the world-wide universal variation, but in summer it much suffers disturbance from local effects. The conductivity in winter shows the very good correlation with wind velocity. The result suggests that the strong westerly seasonal wind in winter dilutes aerosols and keeps the conductivity high.

This year members in this section went abroad to participate in two international meetings. In February, Ishikawa and Morita attended the Fourth Conference on the Climatic Impact Assessment Program held at Boston, Massachusetts, U. S. A. to discuss the present and future of the stratosphere. In August to September, Ishikawa attended the XVI General Assembly of International Union of Geodesy and Geophysics held at Grenoble, France. After the Assembly he visited University of Paris and the balloon site at Aire sur l'Adour to discuss the plan of cooperative balloon measurements between Japan and France.

December 1, 1975

- Masumi TAKAGI -

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