

Proceedings of the Research Institute of Atmospherics,
Nagoya University, vol. 18 (1971)

ACTIVITY REPORT

Section 1. Propagation of Atmospherics and ELF Radio Noise

No cooperative observations of ELF atmospherics between researchers in the U. S. A. and ourselves have been made this year. Studies concerning slow tail characteristics and ELF propagation were continued on a limited basis using data obtained during prior years.

Funds were granted last year for holding seminars as a part of the activities of Commission VIII of the URSI national committee. A paper entitled "Terrestrial radio waves (proceedings of the symposia held at R. I. A., K. D. D. and C. I. T.)" was published.

Studies on the variation of the Schumann resonance frequency are being continued using apparatus for tracking the resonance frequency. The results obtained are investigated by comparing the frequency spectra resulting from the mathematical analysis of waveforms observed, simultaneously taking the line-splitting effect into consideration. In connection with the Schumann resonance, our interest is in the waves between Schumann resonance and Pc 1 of the micro-pulsation as well. Tentative observations are being made at Tottori Observatory employing a very large, horizontal loop aerial.

Studies on the tweek atmospheric are being made for the purpose of accumulating informations concerning its direction of arrival and its occurrence frequency relative to the time of observation. Since propagation characteristics of the tweek are needed for all seasons of the year, an apparatus was constructed to record the occurrence frequency continuously.

Propagation distance of an atmospheric can be estimated by measuring the time separation between the onset of the VLF component and the maximum of the slow tail component. An apparatus for measuring the separation of respective atmospherics and for displaying the statistical location of atmospherics was constructed by the financial support of the TORAY Science Foundation. Technically, it is not difficult to measure separation for atmospherics, but it is very difficult to reliably estimate propagation distances for atmospherics containing background interference from noise and other atmospherics.

Observation of the propagation characteristics of radio waves in the frequency range from 0.5 to 5 MHz in the ionospheric plasma was carried out by the use of

the Mother and Daughter type sounding rocket K-9M-29 at Kagoshima Space Center. Characteristic frequencies of ionospheric plasma, plasma frequency, gyrofrequency and cutoff frequency, were detected at altitudes from 100 to 200 km. From these data, the electron density distribution as a function of altitude could be derived. The same scientific project is being planned by a K-9M-35 sounding rocket to be launched in Feb. 1971. An investigation of VLF radio noise in the aurora is also being planned by a S-210-JA2 sounding rocket to be launched in May 1971 at Showa Antarctic Station.

Theoretical work has been done on the propagation of electro-kinetic waves in the ionosphere and the excitation mechanism of a moving body at super-sonic speed.

Measurements of the whip antenna impedance and waves in a weakly ionized plasma have been made by the use of the space chamber of the Institute of Space and Aeronautical Science of the University of Tokyo.

Atmospherics associated with low atmospheric pressure in polar regions are now being observed from relatively close range at Showa Base in Antarctica. This work will be continued until Jan. 1972.

Routine observations of the intensity of VLF atmospherics are being continued at Sakushima Observatory. Observations of Sudden Enhancement of Signals have been also carried out since April 1970.

December 1, 1970

— Kazuo SAO —

— Tetsuo KAMADA —

Publications (1969-1971)

- Yamashita, M.: Ionospheric Reflection Coefficients of the ELF Radio Waves Taking the Existence of the Ion into Consideration, *J. Atmosph. Terr. Phys.*, **31**, 281-288 (1969).
- Yamashita, M.: The Conductivity of the Lower Ionosphere Deduced from SES Phenomena on VLF Transmissions, *J. Atmosph. Terr. Phys.*, **31**, 1049-1057 (1969).
- Sao, K., M. Yamashita, S. Tanahashi and W. L. Taylor: Genesis of Slow Tail Atmospherics Deduced from Frequency Analysis and Association with VLF Components, *J. Atmosph. Terr. Phys.*, **32**, 1147-1151 (1970).
- Sao, K., M. Yamashita, S. Tanahashi, H. Jindoh and K. Ohta: Sudden Enhancements (SEA) and Decreases (SDA) of Atmospherics, *J. Atmosph. Terr. Phys.*, **32**, 1567-1576 (1970).
- Kamada, T.: An Artificial SEA Phenomena Due to the High Altitude Nuclear Explosion, *The Journal of the Institute of Electrical Engineers of Japan (in Japanese)* **88-11**, 195-201 (1969).
- Kurahashi, K. and T. Kamada: Effect of Ion and Temperature on the Refractive Index of VLF Radio Waves in the Lower Ionosphere, *Proc. Res. Inst. Atmospheric, Nagoya Univ.*, **16**, 175-181 (1969).
- Kamada, T.: An Instrument Loaded on K-9M-26 Rocket for the Investigation of VLF Radio Noise in the Ionosphere, *Proc. Res. Inst. Atmospheric, Nagoya Univ.*, **17**, 75-81 (1970).

- Kamada, T. and S. Tokuda: An Apparatus for the Measurement of Arrival Direction and Occurrence Frequency of Atmospherics in Operation at Showa Station in Antarctica, Proc. Res. Inst. Atmospherics, Nagaya Univ., 17, 23-27 (1970).
- Kurahashi, K.: Propagation of VLF and ELF Radio Waves with Mode Coupling in the Inhomogeneous Stratified Ionosphere, Proc. Res. Inst. Atmospherics, Nagoya Univ., 17, 129-132 (1970).
- Sao, K., M. Yamashita, S. Tanahashi, H. Jindoh and K. Ohta: SEA Phenomena in ELF Atmospherics, The Transactions of the Institute of Electronics and Communication Engineers of Japan (in Japanese), 53-B, 10, 576-581 (1970).
- Terrestrial radio waves (Proceedings of the symposia held at R. I. A., K. D. D. and C. I. T.) (1969).

