

Proceedings of the Research Institute of Atmospheric,
Nagoya University, vol. 20 (1973) —Activity Report—

Section 3. Radio Astronomy

A radioheliograph for a wavelength of 8 cm is now being constructed. Figs. 1 and 2 are the pictures of the 17-element north-south array under construction. Devices for controlling phase shifters according to a program corresponding to various operational modes, and those for data processing including phase-error corrections, are expected to be constructed in early spring 1974.

Regular observations of the sun on microwaves have been made as a part of the National MONSEE Program of Japan corresponding to the international MONSEE Program of SCOSTEP (former IUCSTP). Emphasis is put on the high-resolution observations on 3- and 8-cm wavelengths.

URALS messages which are to be used as a material for the short-term forecasting of proton flares have been sent daily through the network of IUWDS. The content will be changed according to a revised instruction which is expected to be distributed soon. In the new code, flux values are all 'absolute' values, so that the flux ratio 3-cm/8-cm will become higher than before by a factor of 1.15. In addition, information on polarization will be included based on a recent result of research as follows.

Tanaka and Énomé found that, when an active region shows 'P-type' polarization corresponding to a strong magnetic field with opposite polarity on both sides, a proton flare can be expected with high probability. They also found that, when an active region shows 'E-type' polarization corresponding to bipolar magnetic field, a big flare may occur but the situation is unfavorable for expecting a proton flare, and that, 'S-type' polarization corresponding to unipolar magnetic field is unfavorable for expecting big flares even though the flux ratio 3-cm/8-cm is large. A paper is under preparation.

The WDC-C2 Toyokawa, a special analysis center for solar radio emission, has now become active. The 'Solar Activity Charts' for 1970 and 1971 were published in February and November 1972 respectively. Since the beginning of 1972, the center has taken over responsibility of preparing radio materials for 'Quarterly Bulletin on Solar Activity' (QBSA) from Utrecht Observatory. The contents have been changed, however, to avoid duplication with 'Solar Geophysical Data' (SGD), NOAA, USA, and more analyzed tables and charts are included. This change has been made through discussions among the members of the 'Working Party on the Improvement of Solar Radio Patrol Data Publications' of IAU Commission Xa, Tanaka being the convener. The important improvements are as follows. (a) Correction factors are

shown to convert daily observed values into absolute ones based on the conclusion of URSI Commission V mentioned far below. (b) Solar Activity Charts, which have been published from WDC-C2 Toyokawa, are adopted here with some improvements. These microwave charts are shown in parallel with the charts of Meudon, which show the activity at 169 MHz. (c) The table of distinctive events has been simplified, but includes most of the important information; times, spectrum on microwaves, low-frequency spectral data, peak flux and integrated flux on 10 cm and on a wavelength of peak or maximum intensity, associated flare and its position, etc..

As the convener of the Working Group on the Absolute Calibration of Solar Radio Flux Density, URSI Commission V, Tanaka prepared a final report and presented to the URSI General Assembly, Warsaw 1972. This working group was successfully terminated its work, and world-wide unification of calibration has now been achieved. Though the result will be published in the form of a joint paper in near future, copies of the final report are available at Toyokawa.

Tanaka made a contribution to the 'Catalogue of Solar Particle Events' 1966–1969, which is the final work of the former IUCSTP W. G. 2. This catalogue will be published soon in 'Astrophysics and Space Science', in which a new expression of solar radio events have been adopted. This expression has become the origin of the format of the event table in QBSA described far above. He attended the IUCSTP London meeting in March 1972 for final discussions.

Énomé attended the NASA Symposium of High Energy Phenomena on the Sun, held on September 28–30, 1972. He presented a paper on Microwave Structure of Proton Centers and the Associated Bursts, in which he described a new criterion of active regions for the proton-flare producibility as to whether or not active regions have a peculiar circular polarization distribution across the source, which we call 'P-configuration' as described far above. He suggested that the large scale magnetic field configuration of an active region may closely related with the acceleration of protons in the active region. He also described that the associated bursts consisted spatially of two or three components, which coincided with individual sunspots in the active region, and they are circularly polarized in the extraordinary sense at least on 3 and 8 cm. Each component had a diameter of 1 min. of arc or less and had its own activity of evolution, which suggests selective injection of non-thermal electrons into the regions of certain components or selective acceleration therein.

Ishiguro participated in the International Symposium on the Collection and Analysis of Astrophysical Data which was held at the NRAO in Charlottesville, Virginia, USA, on November 13–15, 1972. He presented a paper entitled 'Phase Error Correction in Multi-Element Radio Interferometer by Data Processing', in which he described procedures for estimating and correcting phase errors based on the following principle.

If observations are made concerning the same spatial Fourier component of the same radio source by different combinations of the antenna elements, it is possible to estimate the relative phase error between these elements. By removing these errors

through data processing, an improved image of the radio source can be obtained without any other supplementary calibrations of phase errors.

In conclusion, we would like to express our sincere thanks to the persons at many institutions in the world for their hospitality of having shown us their instruments and for having provided us with various facilities.

December 20, 1970

—Haruo TANAKA—

Publications (1972-)

'Solar Activity Chart' 1970, WDC-C2 Toyokawa, February (1972).

'Solar Activity Chart' 1971, WDC-C2 Toyokawa, November (1972).

Énomé, S. : Structure of Proton Centers and Associated Non-Thermal Bursts at Microwave Frequencies, to be published in Proceedings NASA Symposium on High Energy Phenomena on the Sun (1972).

Ishiguro, M. : Phase Error Correction in Multi-Element Radio Interferometer by Data Processing, International Symposium on the Collection and Analysis of Astrophysical Data, to be published in Suppl. Series Astronomy and Astrophysics (1973).

Tanaka, H. and C. Torii : Full Automatic Radiometer for Solar Patrol at 5 GHz, Proc. Res. Inst. Atmospherics, Nagoya Univ., **19**, 101 (1972).

Tanaka, H., J. P. Castelli, A. E. Covington, A. Krüger, T. L. Landecker, and A. Tlamicha : Absolute Calibration of Solar Radio Flux Density in the Microwave Region, Solar Physics **23**, 123 (1973), the same content was presented to URSI Gen Ass., Warsaw, August (1972).

Tanaka, H. and S. Énomé : Forecasting of Proton Flares, to be presented to COSPAR Gen. Ass., Konstanz, May (1973).

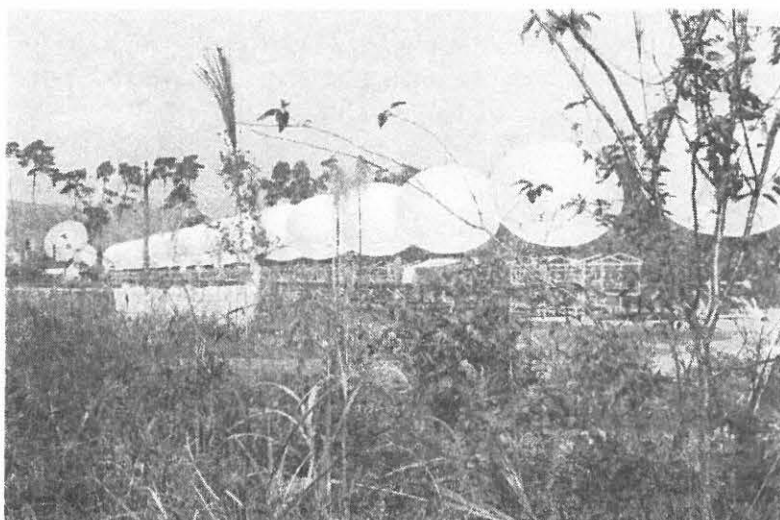


Fig. 1. Antenna site for N-S elements of 8-cm radioheliograph, picture taken in October 1972.

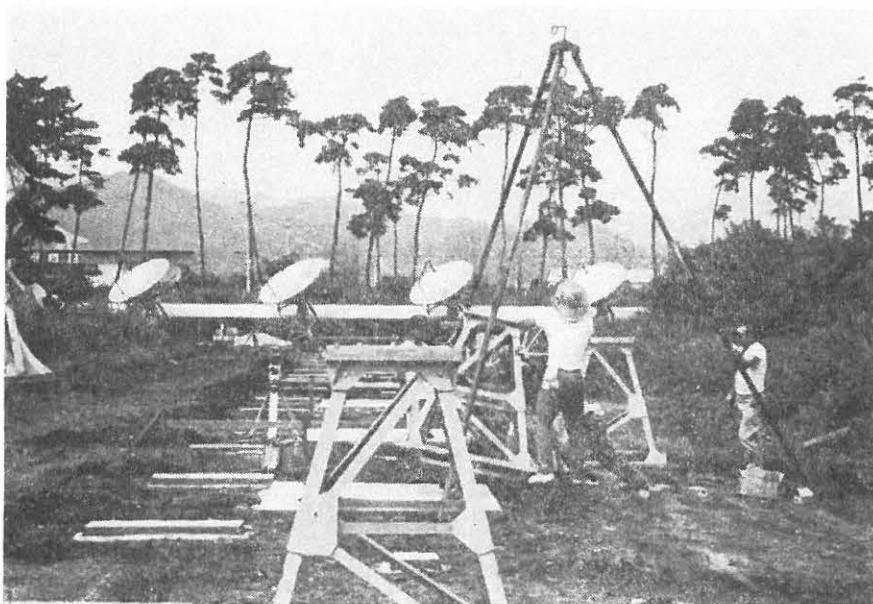


Fig. 2. N-S elements of 8-cm radioheliograph, picture taken in November 1972.

ERRATUM: Figs. 1 and 2 be exchanged. ††