Proceedings of the Research Institute of Atmospherics,
Nagoya University, vol. 21 (1974) —Activity Report—

Section 3. Radio Astronomy

A radioheliograph to be operated at a wavelength of 8 cm is under construction. The antenna system is similar to the existing T-shaped 3-cm radioheliograph, which has a minimum HPBW of 1.5 arc min. and 2.2 arc min. for unsmoothed and smoothed beams respectively. The 8-cm radioheliograph is composed of 32-element E-W array and 16-element N-S array with an additional element at the phase center. The last one is to be used for phase corrections. The E-W array is a part of the (32+2)-element compound interferometer which has been in operation since 1967.

The new 17 elements in N-S direction has been completed early in 1973, and now we are waiting for electronic devices, i. e. an additional receiver and a small computer. The small computer will be used to control the speed of rotary phase shifters for beam sweeping, and also for data acquisition and computation to produce radio maps of the sun. A brief feature of the hardware line-up is as follows: Central processing unit with floating point processor, core memory (64 KB), magnetic disk, two magnetic tapes, graphic display with hard copy unit, paper tape reader, teletypewriter and a degital clock synchronized with Rb frequency standard.

The first 8-cm map of the sun is expected to be obtained before summer 1974, and the interferometric and heliographic observations at Toyokawa will be able to contribute to the coming International Magnetosphere Study, 1976-78.

Though emphasis is put on high-resolution studies of the sun on 3 and 8 centimeters, regular total-flux observations at four fixed frequencies on the microwave region are being continued as a part of MONSEE program. The modernization of the equipment is going on slowly, one frequency every year, but it is expected to be finished in 1975.

The 'URALS' messages which have been sent daily from Toyokawa through the IUWDS network as a material for the short-term forecasting of proton flares will be changed to 'URALR' from January 1974.

The new code has appeared in 'IUWDS Synoptic Codes for Solar and Geophysical Data, Third Revised Edition 1973'. In the new code, flux values will be all 'absolute values' which are consistent with the values of 'Series 70' in the present Monthly Reports of single frequency observations. Since the factors 1.08 and 0.94 will be multiplied to the old calibration, the flux ratio 3-cm/8-cm will become higher than

before by a factor of 1.15.

The content of new message has been changed slightly. According to a recent research by Énomé and Tanaka, information on polarization distribution will be added. When an active region shows 'P-type' polarization distribution corresponding to a strong magnetic field with opposite polarity on both sides, a proton flare can be expected with high probability. On the other hand, when an active region shows 'E-type' polarization distribution corresponding to bipolar magnetic field, a big flare may occur but the situation is unfavorable for expecting a proton flare.

A simple 'S-type' polarization distribution corresponding to unipolar magnetic field is unfavorable for expecting big flares even though the flux ratio 3-cm/8-cm is large. When the flux ratio 3-cm/8-cm exceeds 100% (87% in old calibration), a degree of expectation for proton flare judged from radio data will be added, and when it is the highest, a group 'URGNT' will be put after key word 'URALR'.

The WDC-C2 Toyokawa has been performing its task of compiling radio part of the IAU Quarterly Bulletin on Solar Activity. Four issues of QBSA for 1973, i. e. NO. 177-180, have already been published. Unfortunately, this publication is being distributed to laboratories and not to scientists directly. If your laboratory has not been receiving a copy, write to Prof. M. Waldmeier, Eidgen. Sternwarte. Schmelzbergstrasse 25, 8006 Zürich, Switzerland.

The 'Solar Activity Charts' for 1969, 1970 and 1971 have been published with covers of different color, red, yellow and blue respectivly. A back number of this chart for 1968 with orange cover, which is the final issue of this series, has completed at the end of 1973. It is now being distributed.

At the General Assembly of IAU, Sydney 1973, Tanaka presented a report of Subcommission 10a (to be changed to Working Group on International Survey Programme), 'Radio Monitoring of the Sun'. Based on the discussion in Sydney, he circulated a letter to solar radio observatories asking for comments to a proposal on the format of tabulation, and also to a draft of the 'Revised STP Guides' for data exchange. The last one is being planned by MONSEE Steering Committee of SCOSTEP.

Énomé analized a proton flare on March 30, 1969, which is one of the most extensively observed proton flares by means of radiowaves, X-rays and particles. He showed that the Fermi process might have been very effective in this case with a large acceleration efficiency. He also presented a model of the acceleration region located in the corona. His model, which can well explain the observed phenomena, is much different in many points from Parker's, derived in connection with the February 26, 1956 event.

Tanaka is studying on the sensitivity of future radioheliographs with second-of-arc resolution. He showed that it is very difficult to obtain a minimum detectable

brightness temperature of less than 10% over the disk brightness temperature on a short cm region with a time resolution of a second.

Ishiguro has been studying about the feasibility of a super-synthesis telescope on a short wavelength region. This is a part of the national project to construct large radio telescopes in Japan. The outline of the system at present is as follows: Five 10-mϕ dishes move along a rail track of about 900m long in a minimum redundant way to complete a full-synthesis in 19 days; The resolving power will be 3 seconds of arc for the north polar sources.

Énomé will stay in Goddard Space Flight Center, NASA, U.S.A., for one year until October 1974 for the study of solar plasmas by analyzing observed data of electro-magnetic waves and particles.

December 15, 1973

—— Haruo TANAKA ——

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