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Section 3. Radio Astronomy

An 8-cm radioheliograph which has been under construction since 1972 is almost completed. It has a maximum resolving power of 1.5 arc min. and can be operated in various modes combined with the high-resolution compound interferometer. The minimum time necessary for taking a map is 40 seconds. This mode will be used by interrupting one-dimensional high-resolution quick scanning of a burst whenever necessary. Three modes are prepared for phase error corrections by computer processing (Ishiguro 1974). For the study of active regions, slower scanning modes are available together with 3-cm radioheliograph. A small computer with a 64-KB core memory, a disk and two magnetic tapes is used for control and data processing. Details are described in this volume.

A modernization project of total-flux equipments operating at frequencies of 9.4, 3.75, 2 and 1 GHz is still going on slowly, but at a speed a little higher than before. It is expected to be finished in summer 1975. The new equipments are to be placed in an area where a better time coverage will become possible.

The 'URALR' message of ursigram has been issued daily since January 1974. This message is the revised version of 'URALS' which started in May 1969. It contains useful information necessary for the short-term forecasting of proton flares. The information on polarization distribution across the active region has been added based on the recent result by Tanaka and Enome (1975). The point is that, 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 a high probability.

The remarkable first success of the forecasting through 'URALR' message was achieved in September 1974. At about 03UT on September 10, we observed a clear 'P-type' polarization distribution in an active region with 19 s.f.u. placed near the east limb (N07 E72). The flux ratio was 1.18, and the flux was variable. We issued a message at about 07UT containing the above information together with the degree of expectation '2' for proton flares in 0-3 grades. A 2B flare with

10-cm flux 5500 s.f.u. actually occurred at 2130 on the same day. No big flares were expected at WWA on that day, and 'MAJOR FLARE ALERT' was issued only after the above event.

As the work of World Data Center C2 for solar radio emission, radio materials for the Quarterly Bulletin on Solar Activity has been prepared regularly. Another big job was the publication of 'Instruction Manual for Monthly Report' to be used by solar radio observatories. This publication was planned in connection with the revision of STP Guides for data exchange which will be prepared by MONSEE Steering committee of SCOSTEP. The aim was the improvement of the relevant part of 'Solar Geophysical Data' which is being published by NOAA, U.S.A. After many discussions since IAU General Assembly in 1973 with scientists and observers, mainly on the expression of burst types, the Instruction Manual became available and distributed at the beginning of November 1974. The instruction is to become effective from January 1, 1975, the probable first year of the 21st solar cycle.

We are involved in the national project of constructing big antennas for non-solar studies. The antennas are composed of a 45-m telescope for mm-wave studies and a super-synthesis telescope for use at around 1 cm. Our group is responsible for the design of the latter telescope. It consists of five 10-m dishes movable along a baseline of about 1 Km long. The central part of the dishes will be designed to be usable down to 5 mm. The system will be adapted to an operational mode as a spectro-interferometer, but the polarization measurements will also be possible. The design work has started on the details of electronic devices including a phase lock system.

Shibasaki and Tanaka (in preparation) studied the source of S-component and GRF Bursts of solar radio emission by using high-resolution records on 8 cm together with optical observations. It has been confirmed that the source of S-component has a fine structure consisting of narrow peaks which coincide well with the umbras with strong magnetic fields. It is also found that S-component and GRF show similar center-to-limb variation of intensity suggesting the same emission mechanism. The curve of center-to-limb variation also suggests that the thickness of effective emission region is less than 6000 km.

Tanaka studied with a cosmic ray group (Kodama et al. 1974) the acceleration time of Gev protons in the vicinity of the sun by reexamining GLE events and associated flares. It is found that the effective acceleration time is not greater than 10 minutes. This value is similar to that of high-energy electrons derived from X-ray observations, or to that of Mev protons suggested by Gamma-ray observations.

Kiyoto Shibasaki, who had been studying the interplanetary scintillation of radio sources as a post-graduate student in Section 6, joined us as a research staff since April 1974. Shinzo Enome also joined us again since November 1974 after his one-year stay at Goddard space Flight Center, NASA, U.S.A., where he worked on solar X-ray and microwave emissions, as a research associate of NAS - NRC.

December 15, 1974

- Haruo TANAKA -

Publications

Instruction Manual for Monthly Report, ICSU- STP- IAU WDC-C2 for solar radio emission (1974).

Quarterly Bulletin on Solar Activity (radio part), Zürich Observatory, No. 181 - 184 for 1973, (1974).

Ishiguro, M.: Phase Error Correction in Multi-Element Radio Interferometer by Data Processing, Astron. Astrophys. Suppl. 15, 431 (1974).

Ishiguro, M., H. Tanaka, S. Enome, C. Torii, Y. Tsukiji, S. Kobayashi and N. Yoshimi: 8-cm Radioheliograph, Proc. Res. Inst. Atmospherics, Nagoya Univ., 22, (1975).

Kodama, M., M. Wada, K. Murakami and H. Tanaka: Time History of Acceleration and Propagation of Relativistic Solar Protons, Solar Phys., submitted (1974).

Tanaka H. and S. Enome: The Microwave Structure of Coronal Condensations and its Relation to Proton Flares, Solar Phys., 40, 1, 271 (1975).