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Section 6. Solar Emission and Related Terrestrial Phenomena

IPS observations at a UHF frequency (327 MHz) have been continued at three stations. However, we were forced to stop observations between March and June of 1986 because the UHF antenna at Sugadaira was seriously damaged by heavy snowfall. In spite of this accident, continuous efforts to improve the IPS observation system have resulted in increasing the number of observable IPS sources; Twenty five IPS sources were observed in 1985, and that was increased to 42 in 1986.

A cooperative work between the spacecraft SAKIGAKE observations and IPS observations has been continued. A two-dimensional solar wind speed distribution on the source surface for the period between March and April 1986 was derived: A low-speed region had a nearly flat configuration with respect to longitudinal direction, and high-speed regions in both hemispheres extended from high latitudes to low latitudes in a wide longitude range. The observations of SAKIGAGE during this period are explained using the above-mentioned solar wind structures (Kojima et al., this volume).

A joint work of pulsar observations has been continuing since last November with two groups from the Tokyo Astronomy Observatory, Tokyo University. The first observation was made successfully at the frequency of 2 GHz using a 64m antenna at Usuda, which is operated by the Institute of Space and Astronautical Science. We also succeeded in making pulsar observations at 327 MHz using the IPS antenna at Fuji.

Spacecraft Doppler scintillation observations were analyzed by Watanabe et al. (1987b). An enhancement in the Doppler scintillation level during the period of 5 to 7 February 1986 was attributed to the subsequent passage of interplanetary disturbances in association with a series of energetic solar flares. The degree of enhancement in electron density fluctuations within interplanetary disturbances was about 10 times as high as the ambient level.

The spatial structures of plasma micro-turbulence in the solar wind, observed by means of interplanetary scintillation, was discussed by Kojima and Kakinuma. They found that the scintillation patterns which represented the micro-turbulence structures were elongated in which represented the micro-turbulence structures were elongated in directions deviating systematically from the radial flow direction. This implies that these micro-turbulence elongations are occurring along the magnetic field line.

Large-scale propagation properties of a solar flare-associated interplanetary disturbance relevant to the geomagnetic storm on 22 March 1979 (CDAW-6) were discussed by Watanabe et al.. The degree of electron density fluctuations in the post-shock region was considerably higher than that in the shock driver with a magnetic-cloud configuration.

A new method to give an empirical model of an interplanetary disturbance on the basis of IPS and spacecraft observations has been proposed by Watanabe et al.. The model is based on comparison between the theoretically predicted time variation of the flow speed and the observed variation, under the assumption of weak scattering. This method was applied to three well-observed events in 1978-1981, specifically, two disappearing-filament-associated interplanetary disturbances (23 August 1978 and 22 April 1979) and one solar-flare associated disturbance (16 May 1981). It was shown that some interplanetary disturbances have oblate configurations.

The two-dimensional structure of the solar wind near the sun has been analyzed by the method of MHD simulation by Washimi et al.. A helmet-streamer configuration with a sharp boundary between the closed and open field regions has been reproduced. Due to the pressure-driven current in the plasma sheet, the coronal magnetic field, which has a dipole configuration at the photosphere, is found to behave like R^{-2} at the large distance, R, from the sun.

Numerical analyses of large scale and large amplitude electrostatic potential along magnetic field lines, both in auroral plasma and the solar atmosphere, have been performed by Washimi and Katanuma. It is shown that the potential profile, which is consistent with spacecraft observations, i.e., which increases very slowly near the plasma sheet and abruptly near the topside ionosphere, can be obtained by introducing a population of electrons which are trapped between the magnetic mirror and the electrostatic potentials . The parameter set for the case of solar impulsive flares (electron energy $\simeq$ 10-100 Kev, the number of energetic electrons $\simeq 10^{38}$, and flare rise-time $<$ 10 sec) has been found by Washimi and Nakajima to be satisfactory for the typical observed values of the plasma density $\simeq 10^{9-10}$/cc and the magnetic intensity 100 Gauss at the ambient of the plasma sheet in the solar atmosphere.

Physics held in Beijing, China last November (Kojima and Kakinuma 1986).

Dr. Z. Houminer (Radio Observatory, Haifa, Israel) visited us for two months, from last September to the end of October, on his sabbatical. He studied the radial evolution of enhanced scintillation regions using IPS data obtained at 327 MHz (Houminer et al., this volume).

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- Takakiyo Kakinuma -

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