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Section 6. Solar Emission and Related Terrestrial Phenomena

Observations of the interplanetary scintillation of radio sources at 69 MHz have been continued. The data-book of solar wind speed for 1981 has been published.

In addition to VHF Observations, we have carried out three-station IPS observations at 327 MHz, improving the receiving system described in the last proceedings, and some interesting results have been obtained.

(1) As reported before, VHF observations showed that the solar wind speed was very high (800 km/sec) at latitutes above 45 degrees and a part of this region extended to the equator in 1974-1976, and that this polar high speed region shrunk in 1978 and disappeared in 1979. UHF observations in April-July 1982 showed that the polar high-speed region reappeared, though it was small. It is interesting to note that this region extended to the equator near the same heliographic longitude as that in 1974. When we derive the solar wind speed or the electron density spectrum in the solar wind from IPS observations, we assume that the scattering is weak. This approximation is not valid for 70 MHz at solar distances less than 0.5 AU; on the other hand, it can be used for UHF to about 0.2 AU. Thus, as high latitude observations are at the same time small-distance observations for IPS technique, UHF observations give us more reliable information about the solar wind at high latitudes.

(2) From 3C138 and 3C161 observations in June 1982, we have derived the speeds of the solar wind from the source region at 40°S latitude and 120° longitude at two different solar-distances, 0.2 AU and 0.6 AU. The result shows that the acceleration of the solar wind in this range seems to be larger than that expected from the Parker's model with 10^6 K coronal temperature.

(3) Observations of 3C48 and 3C147 in April-June 1982 again show that the electron density spectrum is best described by a single power law. It appears to be important to take into account the distribution of solar wind speed along the line of sight, when we estimate the density

spectrum from the observed temporal spectrum.

Analyses of the structure of the heliomagnetosphere by computer simulations have been continued. We have used an MHD 2-step Lax-Wendroff code. The main results are as follows.

(1) Stationary solutions of the solar wind near the sun ($< 11\ R_{\odot}$) under the dipole or hexapole magnetic field configurations at the photosphere have been obtained. Each solution shows supersonic flow at all latitudes and magnetic neutral sheet configuration at the equatorial region. It has been confirmed by our studies that (i) the flow at the open field region, such as polar region and coronal hole region, is faster than that at the closed field region, but (ii) the flow is slower than the high-speed flow which has been obtained by observations. This result suggests that some additional accerelation must work in the solar wind near the sun.

(2) The stationary shock structure at the heliosphere-interstellar space boundary has been shown under the assumption of the cylindrically symmetric supersonic flow in the heliosphere. The effects of the magnetic field have been neglected. Parker's incompressible flow process has been confirmed, i.e., beyond the shock region, the cylindrically symmetric subsonic flow is swept away by the interstellar gas, while the density remains constant.

M. Kojima will stay at The University of California, San Diego until November 1984 for the study of interplanetary space science.

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