Solar Modulation and Interplanetary Gradients of the Galactic Electron Flux 1977-1984

S. P. Christon, A. C. Cummings, and E. C. Stone

California Institute of Technology, Pasadena, CA 91125 USA

W. R. Webber

University of New Hampshire, Durham, NH 03824 USA

Previously, only one measurement of electrons at a location remote from earth has been reported [*Eraker,* 1982]. That measurement was made with a cosmic ray instrument on board the Pioneer 10 spacecraft during the period from 1972 - 1980, when Pioneer proceeded outward from 1 to 21.5 AU. Electrons of 1.75 - 25 MeV were observed. This energy range appears to be dominated by Jovian electrons, and no significant temporal or radial effects due to galactic electrons were observed.

In this paper we report on the flux of electrons with energy from ~ 10 - 180 MeV measured with the electron telescope on the Voyager 1 and 2 spacecraft [*Stone et al.,* 1977] in the heliocentric radial range 1 - 22 AU between 1977 and 1984. Jovian electrons were clearly observable between 1978 and 1983 (radial range 2 - 12 AU) at energies below ~ 50 MeV [*Christon et al.,* 1985]. Above ~ 50 MeV the electron intensity exhibited temporal variations generally related to the 11 year modulation of protons > 75 MeV. The overall magnitude of the electron intensity changes between the maximum intensity observed in 1977 and the minimum intensity in 1981 was a factor ~ 2, also comparable to that observed for > 75 MeV protons. By early 1985 the electron intensity had apparently recovered to the level observed in 1977 whereas the proton intensity was still about 20% lower. A detailed interpretation of these electron variations in all energy channels depends on an accurate subtraction of background induced by energetic protons of a few 100 MeV. This subtraction is facilitated by calibration results at several energies. Further results on these temporal variations and limits on possible interplanetary gradients will be reported.

This work was supported in part by NASA under contract NAS 7-918 and grant NGR 05-002-160.

References.

Christon, S. P., A. C. Cummings, E. C. Stone, and W. R. Webber, *19th Internat. Cosmic-Ray Conf., La Jolla,* paper SH1.5-18, 1985.

Eraker, J. H., *Ap. J., 257,* 862, 1982.

Stone, E. C., R. E. Vogt, F. B. McDonald, B. J. Teegarden, J. H. Trainor, J. R. Jokipii, and W. R. Webber, *Space Sci. Rev., 21,* 355, 1977.