Magellan Radio Scattering Measurements In The Solar Wind

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Radio propagation measurements are useful for examining the structure of corona and solar wind electron density fluctuations near the sun. The Magellan S (13 cm wavelength) and X (3.5 cm wavelength) band radio signals are analyzed to estimate the electron density fluctuation] power spectrum and to determine its temporal and spatial variations. The data were from observations made during the superior conjunction of 1 993-1 994, and cover the heliocentric distance range of 2-118 1{.., Measurements from the two frequency bands are combined to generate an observable which depends only on charged particles along the ray path. The phase power spectra are found to be well described by a two-component model. At low frequencies (less than ≈ 0.1 Hz) a power law dependence (1 /f') was found to yield a good fit with the mean α= 2.69, very close to the Kolmorgrov value of 8/3. The high frequency component was found to be much flatter, effectively white noise like. The break or inflection point was found to be strongly dependent upon the heliocentric distance. At 2 R_s the break was measured to have all average value of ≈0.3 Hz while at 118 R_s it d(:cl'cases to ≈.05 Hz. Recently, this break has been interpreted [R. Woo, *Nature*, vol 379, 1996, pp 321-322] as the transition from the low-frequency regime, dominated by filamentary structures which corotate with the Sun, to the high-frequency regime comprising Kolmogorov turbulent fluctuations convected along with the solar wind.

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