SOLAR PHYSICS DIVISION ABSTRACT FORM

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Ultra Pine-Scale Structure in the Inner Corona

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Over the past four decades. radio observations based on scattering from electron density fluctuations. e.g., angular broadening, intensity scintillation. phase/Doppler scintillation and spectral broadening, have served as an invaluable source of information on small-scale electron density fluctuations in the solar corona. These fluctuations have generally been thought to represent random irregularities convected along with the solar wind. In this paper, we show that Doppler <scintillation measurements are directly related to solar eclipse and coronagraph pictures that **have been enhanced to reveal a variety of** ray like structures. and that radio scattering measurements are consequently observing filamentary structure much of the time. By combining results from angular broadening, spectral broadening and phase scintillation measurements inside 10 R. we find that the smallest ray-like structure consists of flux tubes within coronal holes that are $\sim 10^{-3}$ arcsec (1 km) at the Sun — three orders of magnitude smaller than the smallest filamentary structure seen so far in measurements by X-rays, UV, EUV and visible white-light — and that yet smaller flux tubes pervade coronal streamers. Across the flux tubes the raylike density structure has a spectrum that is inverse power-law with a spectral index that is 5/3 (Kolmogorov), while the spectrum of the turbulence inside the flux tubes is substantially flatter with a spectral index of approximately one. Confirmation of the ubiquitous ultra fine-scale coronal structure improves our understanding of the origin and evolution of interplanetary fluctuation and makes it possible to investigate the role of small-scale coronal structure in heating and acceleration of the solar wind.

This work was carried out at JPL, Caltech, under a contract with NASA.

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