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RADIO OCCULTATION MEASUREMENTS OF PLUMES AND RAYLIKE STRUCTURES

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Plumes or raylike structures have been observed in solar eclipse pictures since at least a century ago. Like white-light, radio occultation measurements observe path-integrated density of the solar corona. In this paper, we will present and summarize the radio observations of polar plumes, which have also been found in the low-latitude corona. We will discuss how the greater sensitivity and greater resolution of radio measurements complement white-light measurements, and reveal an outer corona permeated by a hierarchy of multi-scale low-contrast filamentary structures of spatial scales as small as a kilometer in addition to plumes. Rooted in small-scale features on the Sun, the contrast of these fine-scale structures is represented by a one-dimensional spatial wavenumber spectrum that is inverse power-law with a spectral index close to 5/3. Following open magnetic field lines from all over the Sun, these raylike structures thread their way around closed fields to carry the imprint of the base of the corona (polar coronal holes, quiet Sun, active regions, and bright points) approximately radially into interplanetary space. Observations of these filamentary structures provide evidence that rapid reconnection takes place at the base of corona all over the Sun.