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The Spectroscopic Footprint of the Fast Solar Wind

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We analyze a large, complex equatorial coronal hole (ECH) and its immediate surroundings with a focus on the roots of the fast solar wind. We start by demonstrating that our ECH is indeed a source of the fast solar wind at 1AU by examining in situ plasma measurements in conjunction with recently developed measures of magnetic conditions of the photosphere, inner heliosphere and the mapping of the solar wind source region. We focus the bulk of our analysis on interpreting the thermal and spatial dependence of the non-thermal line widths in the ECH as measured by SOHO/SUMER by placing the measurements in context with recent studies of ubiquitous Alfven waves in the solar atmosphere and line profile asymmetries (indicative of episodic heating and mass loading of the coronal plasma) that originate in the strong, unipolar magnetic flux concentrations that comprise the supergranular network. The results presented in this paper are consistent with a picture where a significant portion of the energy responsible for the transport of heated mass into the fast solar wind is provided by episodically occurring small-scale events (likely driven by magnetic reconnection) in the upper chromosphere and transition region of the strong magnetic flux regions that comprise the supergranular network.

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