CURRENT SHEETS IN THE CORONA AND THE COMPLEXITY OF SLOW WIND

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The origin of the slow solar wind has long been one of the most important problems in solar/heliospheric physics. Two observational constraints make this problem especially challenging. First, the slow wind has the composition of the closed-field corona, unlike the fast wind that originates on open field lines. Second, the slow wind has substantial angular extent, of order 30 degrees, which is much larger than the widths observed for streamer stalks or the widths expected theoretically for a dynamic heliospheric current sheet. We propose that the slow wind originates from an intricate network of narrow (possibly singular) open-field corridors that emanate from the polar coronal hole regions. Using topological arguments, we show that these corridors must be ubiquitous in the solar corona. The total solar eclipse in August 2008, near the lowest point of cycle 23 affords an ideal opportunity to test this theory by using the ultra-high resolution Predictive Science's (PSI) eclipse model for the corona and wind. Analysis of the PSI eclipse model demonstrates that the extent and scales of the open-field corridors can account for both the angular width of the slow wind and its closed-field composition. We discuss the implications of our slow wind theory for the structure of the corona and heliosphere at solar minimum and describe further observational and theoretical tests.

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