Latitudinal Variation of Solar Wind Speed and Mass Flux in the Acceleration Region of the Solar Wind During Solar Minimum Inferred From Spectral Broadening Measurements

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As a prox y for plasma measurements near the sun, observations of the radio scattering phenomenon of spectra] broadening using spacecraft radio signals can provide important information cm solar wind properties in a region of the solar wind that has yet to be probed directly. in this paper, wc use an aggregate of S-band 2,.3 GHz (13 cm) spectral broadening observations conducted during solar minimum conditions by the Mariner 4, Pioneer 1 (), Mariner 10, Helios 1 & 2., and Viking spacecraft to infer the first measurements of the latitudinal variation of solar wind speed anct mass flux in the acceleration region of the solar wind at 3-8 R_O.

These remote sen sing measurements indicate that spectral broadening bandwidth B decreases by a factor of about 50% from equator to pole. Spectral broadening bandwidth responds to both electron density fluctuations and solar wind speed, but since considerable knowledge about the electron density fluctuations is available from coherence bandwidth observations (Bourgois and Coles, 1992), information on solar wind speed can be inferred. Furthermore, by combining the solar wind speed results with measurements of mean electron density from white-ligh{ coronagraph observations, information on mass flux can also be deduced. We find that there is a latitudinal increase in solar wind speed, consistent with 1 1'S measurements farther from the Sun, and that there is a latitdinal decrease in mass flux, consistent with remote sensing measurements based on the Lyman α radiation emitted from interstellar hydrogen atoms passing through interplanetary space and relevant to the solar wine] near 1 AU.

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4. SH

5. (a) None
   (b) 2164 Solar wind plasma
   6969 Remote
   Sensing

7. ()%

8. $50 check enclosed

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