



Observations of Extended Emissions at Mercury by the STEREO Spacecraft

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Abstract

Images taken by wide-field (“white light”) cameras on the two solar-monitoring spacecraft, STEREO-A and -B, occasionally capture emissions extending from the planet Mercury. Here we report on observations made on 28 January 2009 that show a narrow anti-sunward tail. Analyses of the characteristics of the broadband filters used on both spacecraft indicate that the emission features are likely too bright to be from the planet’s escaping sodium exosphere, as the transmission is only between 1 and 2 percent at D line wavelengths. During these observations, the line of sight from STEREO-A and the Sun-Mercury directions differs by only 7 degrees, with the tail is pointed towards the spacecraft so that a large column density of particles is imaged. Calibrated brightness values at 12 arc-minutes from the disc are approximately 30 kilo-Rayleighs. Correcting for path length and projection, this corresponds to a cross-tail brightness of 7 kR at a distance of 430 planetary radii. In ground based measurements, typical sodium D brightness at this distance is between 100 and 200 Rayleighs for similar orbital phases.

Thomson scattering of solar coronal electrons is seen simultaneously throughout the HI-1 field during times when the tail feature is present. Whether this emission is due to scattering off of solar wind electrons or dust particles remains to be determined. The availability of space-based observing options for characterizing the Hermean system greatly extends the possibility of understanding long and short-term temporal variability patterns and their potential sources.