



The statistical derivation of the dayside magnetosheath X-ray emissions based on THEMIS and Cluster data

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The Solar wind Magnetosphere Ionosphere Link Explorer (SMILE) is collaborative mission between ESA and the Chinese Academy of Science. One of the main objectives is to study solar wind magnetosphere coupling by measuring in-situ plasma parameters and X-ray emissions in the magnetosheath and polar cusps. In preparation for this, we determine the X-ray emissions from the equatorial and polar dayside magnetosheath using THEMIS and Cluster data.

We utilize data collected by THEMIS between January 2008 and July 2015 to derive X-ray emissions from locally measured plasma properties. Based on these statistical observations, we generate statistical maps and cross-sectional cuts of the equatorial magnetosheath to: (1) investigate the dayside spatial distribution, (2) determine the location of the maximum X-ray emissions relative to the magnetosheath boundaries, and (3) identify possible solar wind dependencies. For the final point (3), we create subsets for low ($n_{sw} v_{sw} < 4.9 \times 10^8$ /cm²s) and strong ($n_{sw} v_{sw} > 4.9 \times 10^8$ /cm²s) solar wind flux; these data show that X-ray emissions are greatly enhanced during strong solar wind flux. We also plan to extend this study beyond the equatorial plane to map cusp properties by including Cluster data. Finally, we compare the experimental X-ray emissions to those derived based on MHD simulations for comparable upstream conditions.