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Ion properties of Mercury's northern cusp under extreme solar wind observed by MESSENGER

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Mercury's magnetic cusp allows solar wind plasma to precipitate into the magnetosphere, exosphere, and directly to the surface. This precipitation of solar wind leads to the production of neutrals in the exosphere and/or ions in the magnetosphere and thus it has an important role in shaping Mercury's space environment. Characterizing the ion properties in the cusp region is important for obtaining a better understanding of the Sun-planet interactions and assessing the solar wind penetration in Mercury's magnetosphere.

The MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft has observed the northern cusp regularly during its orbital phase. We have analyzed plasma data obtained by the Fast Imaging Plasma Spectrometer (FIPS) onboard MESSENGER under extreme solar wind events and compared the resulting ion properties in the northern cusp with those under non-extreme solar wind events for the first time. We found that (1) flux enhancement is confirmed under the extreme solar wind, and (2) the ion distribution in the cusp has a smaller kappa value than in the magnetosheath, suggesting ion acceleration occurs in the magnetosphere.