Energetic ion dynamics near the cusp region of Mercury

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Energetic ions in Mercury’s magnetosphere are very dynamic, just like in the magnetosphere of Earth. In this study, we have shown two energetic proton observations by MESSENGER near the cusp region of Mercury. For one case, we have observed large flux of energetic protons while the other case has almost no flux, indicating that the near cusp region may trap energetic particles under particular conditions. In order to understand that under what conditions the near cusp region of Mercury could trap energetic particles, we have traced the trajectories of single particle with different energies by using a modeled magnetic field, called KT17. Under different magnetic field geometry, the motions of single particle with various energies are different. The test particles can be trapped around the cusp region when the disturbance activity is strong, generating the magnetic field local minimum near the cusp region while the particles can’t be trapped and escape along the magnetic field through the dawn side cusp when there is little solar activity.