

Variation in Martian Crustal Magnetic Field Cusp Topology

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The Martian magnetic field environment is complex. Crustal magnetic fields interact with the incoming interplanetary magnetic field (IMF) to produce a dynamic topological system that in turn constrains the motion of charged particles. The inflow of energetic electrons and the outflow of ionospheric particles are both channeled through regions of vertically oriented field referred to as magnetic "cusps". These cusp regions are consequently host to a range of energetic processes including field-aligned currents and aurora, and may be the source of substantial quantities of ion escape at Mars.

Here we present an analysis of variability in crustal cusps, using electron pitch-angle distributions and energy distributions measured by MAVEN to study how cusp topology varies with upstream solar wind conditions. We find that increased solar wind pressure causes an increase in the spread of open cusp regions on both the dayside and nightside of the planet, and that changes in IMF direction control which cusps preferentially open to the solar wind. Finally, we then pair these results with direct measurements of particle flux to begin an analysis of energy deposition and ion outflow in cusp regions.

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