

Low electron temperatures observed at Mars by MAVEN on dayside crustal magnetic field lines

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The current Mars only has a thin atmosphere and little water on the surface, whereas Mars had a thick atmosphere in the past. This suggests that Mars has experienced significant atmospheric loss. The ionospheric electron temperature is particularly important for determining the neutral/photochemical escape rate from the Martian atmosphere. The Langmuir Probe and Waves instrument onboard MAVEN (Mars Atmosphere and Volatile EvolutionN) measures electron temperatures in the ionosphere of Mars. The current paper studies temperatures in the dayside for two regions where: (1) crustal magnetic fields are dominant and (2) draped magnetic fields are dominant. On average, the electron temperature is lower in the crustal-field regions, which we suggest is due to a closer connection along magnetic field lines between cold electrons at lower altitudes, where the neutral density and associated cooling rates are greatest, and the upper atmosphere. Electron heat conduction in the crustal-field regions could be altered due to the magnetic mirror force and/or the ambipolar electric field above 250 km altitude. Both effects should be considered for future simulation studies.