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Ion heating in the Martian ionosphere: observations from the MAVEN mission

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The Martian climate has changed substantially over the planet's history. Atmospheric loss to space is thought to have played a vital role in this change; escaping plasma is one possible path contributing to this loss. Typical ion energies in the lower ionosphere (<∼300 km) are too low for direct escape. Over the last decade low altitude ionospheric measurements and modeling have shown that the ionosphere is heated. The MEX mission has suggested, and the MAVEN mission has demonstrated, that at these low altitudes heating can be substantial. Heated ions can gain enough energy to move to higher altitudes where other processes can remove them from the planet. The heating can also be so substantial that escape velocity can be gained directly. Here we present observations of such heated ions and demonstrate that plasma waves are likely the source of heating in this region. Also, we show that the magnetic field topology can play a crucial role in determining the efficiency of this heating.