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Martian crustal magnetic fields: influences on the ionosphere

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Recent Mars Express and MAVEN observations have shown the extent to which Mars's crustal fields, though weak in absolute magnitude, nevertheless exert significant control over the structure of the ionosphere over a range of altitudes. However, quantifying this control remains challenging given the generally dynamic nature of the Mars solar wind interaction, and the therefore naturally varying densities and temperatures of the upper ionosphere in particular. In this study we examine MAVEN Langmuir Probe and Waves data, and show for the first time a very clear correspondence between the structure of the crustal fields and both the measured electron temperatures and densities. Electron temperatures are shown to be systematically lower in regions of strong crustal fields over a wide altitude range. We speculate on the origins of this deviation.