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## **Investigating the role of crustal magnetic fields on Mars' ionospheric dynamics with MARSIS-Mars Express**

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Mars does not currently have a global dipole magnetic field, and consequently, the atmosphere of the red planet is in direct contact with the incoming solar wind. However, there is a large presence of remnant crustal magnetic fields, of variable strength and direction, in the southern hemisphere and equatorial regions. Their subsequent, complex interactions with the solar wind as they themselves rotate with the planet produces a “hybrid magnetosphere”. The influence of these interactions is seen as complex dynamics that occur in the ionosphere. Thus, in this study, we use nearly 17 years of observations from the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) on board Mars Express to characterise the variability of the topside electron density profiles over the strong anomalies in the Southern hemisphere. The effect of numerous parameters, such as the solar zenith angle (and hence, local time), solar activity, Mars' season, crustal magnetic field inclination, and solar wind dynamic pressure are investigated. We also compare these observations with the empirical model NeMars to evaluate the degree of variability, as well as with profiles far from these crustal field regions.