



## **Oblique reflections in the Mars Express MARSIS data set: Stable density structures in the Martian ionosphere**

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The Mars Advanced Radar for Sub-surface and Ionospheric Sounding (MARSIS) on board ESA's Mars Express (MEX) spacecraft routinely detects evidence of horizontal plasma density structures in the Martian ionosphere. Such structures, likely taking the form of spatially-extended elevations in the plasma density at a given altitude, give rise to oblique reflections in the Active Ionospheric Sounder (AIS) data.

These structures are likely related to the highly-varied Martian crustal magnetic field.

In this study, we use the polar orbit of MEX to investigate the repeatability of the ionospheric structures producing these anomalous reflections, examining sequences of multiple orbits which pass over the same regions of the Martian surface under similar solar illuminations.

Presenting three such examples, or case-studies, we show that the signatures of these ionospheric structures are often incredibly stable over periods of many tens of days.

To further investigate the nature of these ionospheric structures, we use a 2D ray-tracing code to simulate MARSIS's response to a variety of anomalous ionospheric profiles.