An Introduction to Martian Ionospheric Irregularities

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Abstract: Mars is the proximity planet to Earth, having suitable environment which might support human settlement in future. But due to the absence of intrinsic magnetic field, the solar wind and radiation actively interact with the Martian upper atmosphere. This interaction creates a highly dynamic Martian upper atmosphere which leads to the generation of various local plasma instabilities, both electromagnetic and electrostatic in nature.

The characteristics of these instabilities are influenced by the surrounding magnetic field. In regions without a magnetic field, we observe electromagnetic gradient drift and Kelvin-Helmholtz instabilities, while some large-scale and layer like structures are present in the anomaly region where crustal magnetic field drives the local plasma dynamics. These instabilities contribute to the formation of ionospheric irregularities.

The ionospheric irregularities are density perturbations occurring over the background density. These irregularities create density structures of various scales that significantly affect radio propagation. These ionospheric irregularities can be observed through both remote sensing and in-situ observations. This presentation will explore about these topics.