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Preliminary Results of the Categorizing and Statistical Survey of Martian Ionospheric Irregularities

Xin Wan[1,2], Jiahao Zhong[1,2], Chao Xiong[3], and Jun Cui[1]
[1]Planetary Environmental and Astrobiological Research Laboratory (PEARL), School of Atmospheric Sciences, Sun Yat-sen University, Zhuhai, 519082, China
[2]Key Laboratory of Tropical Atmosphere-Ocean System, Ministry of Education, Zhuhai, 519082, China
[3]Department of Space Physics, College of Electronic Information, Luojia Laboratory, Wuhan University, Wuhan, 430079, China

A climatological survey of Martian ionospheric plasma density irregularities was conducted by exploring the in-situ measurements of the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. The irregularities were first classified as enhancement, depletion, and oscillation. By checking the simultaneous magnetic field fluctuation, the irregularities have been classified into two types: with or without magnetic signatures. The classified irregularities exhibit diverse global occurrence patterns, as those with magnetic signatures tend to appear near the periphery of the crustal magnetic anomaly (MA), and those without magnetic signatures prefer to appear either inside of the MA or outside of the MA, depending on the type and solar zenith angle. Under most circumstances, the irregularities have a considerable occurrence rate at altitudes above the ionospheric dynamo height (above 200 km), and the magnetization state of the ions seems irrelevant to their occurrence. In addition, the irregularities do not show dependence on magnetic field geometry, except that the enhancement without magnetic signatures favors the vertical field line, implying its equivalence to the localized bulge (Duru et al., 2006). Other similarities and discrepancies exist in reference to previous studies. We believe this global survey complements previous research and provides crucial research clues for future efforts to clarify the nature of the Martian ionospheric irregularities.