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Effect of the topography on the ionosphere: results from the Mars Express MARSIS experiment.

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Active Ionospheric Sounding (AIS) data acquired by the MARSIS instrument on board the Mars Express mission have been used to analyze the effect of the irregular Martian topography on the altitude of the main ionospheric peak. Besides basic parameters, such as heliocentric distance or season, solar activity or solar zenith angle that must be considered when the Martian ionosphere is analyzed, there are other factors that can influence the ionosphere behavior. One of them is the topography.

Topography seems to play a role on the Martian ionosphere when regional scale is considered. It has been observed that the main ionospheric peak altitude is higher over large volcanic edifices by as much as 20 km above surrounding areas and lower over impact basins by as much as 15 km below surrounding areas. This behavior, apparently only detected at sub-regional scale, has been found for the most prominent topographic features studied in this work. Correction for the solar zenith angle has been taken into account, in order to remove potential effect due to this parameter.

This work examines and evaluates the main variations of the main ionosphere peak altitude found in regions with particular topography. A statistical analysis of the ionosphere deviation over each selected structure is given and special attention is paid to the possible physical mechanisms that can explain this phenomenon. MARSIS data have been downloaded from the ESA planetary science archive and topographic information comes from MOLA instrument on board Mars Global Surveyor mission.