Response of Solar X-ray Flares on Mars: Modeling and Observations

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The effect of solar flare and Coronal Mass Ejection (CME) in the ionosphere is a key problem in all planetary atmospheres. Earth is the only planet for which we have continuous ground based observations that can measure the consequences of these events in the ionosphere. In this article we have used radio occultation data obtained from Mars Global Surveyor (MGS) for the period of 12 to 18 May to address the effect of X-ray flare and CME in Total Electron Content (TEC) of E region ionosphere of Mars during violent solar events that occur on 13 May. This flare caused enhancements in TEC by a factor of about 6. During this period sun emitted huge amount of energy in the forms of particle radiations that cause auroral displays on Earth at high mid-latitude. We have used analytical yield spectrum method to calculate TEC for this period. A 3-D kinetic, solar wind model (Hakamada -Akasofu - Fry Version 2(HAFV.2)) is also used to predict interplanetary shock arrivals at Venus, Earth and Mars. Mars and Earth were on the same side from the sun during this solar event. The composite shock has been predicted by HAFV.2 model to arrive at Mars after about 60 hours while the corresponding response on Earth is modeled several hours earlier. We report that solar flare caused enhancements in TEC of Mars for about one day, which is shorter that the duration of the corresponding effects on Earth.