

Effect of the Martian crustal magnetization and IMF to the structure of Martian ionosphere

Yasubumi Kubota[1]; Kiyoshi Maezawa[2]; Hidekatsu Jin[1]

[1] ISAS; [2] JAXA/ISAS

The global magnetic field of Mars is known to be very weak. However Mars Global Surveyor spacecraft (MGS) reported that there was a significant local magnetization on Mars. We have made a three-dimensional model of the crustal magnetization using spherical harmonics and estimated the effects of crustal magnetization on the interaction between the solar wind and the Martian ionosphere. The data used are from the MGS magnetometer from March, 1999 through August, 2000, covering the whole spherical surface at the height level of 370-438 km. Assuming the internal nature of the magnetization, we expanded spherical harmonics up to 60 degrees and estimated the distribution of field magnitudes at each altitude level. The result shows that the magnitude of the crustal magnetic field is not sufficient to explain the deficiency of ionospheric thermal pressure as observed by the Viking1 lander. Our 2-D MHD simulation results indicate that the penetration of IMF into the Mars ionosphere is a critical factor to resolve the overall pressure balance problem. When solar wind dynamic pressure is relatively large, IMF can penetrate into the sub-solar ionosphere and the magnetic field is transported by horizontal plasma flow to the solar zenith angle 44 degrees where Viking observation was made. We also report on the result of a 3-D MHD simulation code we are developing to study the night side magnetic structure and plasma flow.