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Distribution of currents and convection in the ionospheres of Venus and Mars.

Aleksey Kireev (1) and Alexander Krymskii ()
(1) Russian Federation (kiev1978@mail.ru), (2) Russian Federation (amkrym@list.ru)

One of the major results of Pioneer Venus Orbiter was discovery of difference in status of the venusian ionosphere depending on solar wind dynamic pressure during solar activity maximum. In the periods of low to moderate SW dynamic pressure in the days-side ionosphere large scale currents concentate on top of the venusian ionosphere near the ionopause while small-scale currents are associated with helical magnetic field structures which are scattered throughout the rest of the ionosphere. In the periods of high SW dynamic pressure and some time after there are local magnetic field enhancement in the bottom-side ionosphere and associated current layers. Those differences in the altitude magnetic field distribution indicate differences in the plasma convection pattern. As of today at Mars the only in situ data regarding the ionospheric plasma at altitudes less than 200 km were collected by Viking 1 and 2 landers. Therefore we use data obtained in the MAG experiment and radio science experiment onboard Mars Global Surveyor to study large-scale distribution of the magnetic fields, associated currents and plasma convection in the day-side ionosphere of Mars. Then comparing the altitude distribution of magnetic field pressure with existing one- and multi-dimensional numerical models of the ionosphere we assess plasma convection pattern. It is concluded that remnant magnetization of the Martian crust and lower density of the neutral atmosphere make the current systems and convection patterns at Venus and Mars essentially different. In particular, in contrast with Venus, at Mars a) the current layers are expected to be mainly associated with rotational dicontinueties and b) within the bottom-side ionosphere the plasma convection is essentially multi-dimensional and/or non-stationary.