

Collaborative study of Mars environment with Nozomi and Mars Express missions

Kiyoshi Maezawa[1]

[1] ISAS

The Mars Express mission and the Nozomi mission will arrive at Mars almost at the same time, i.e., in the period from late 2003 to early 2004. The orbital positions of Mars Express and Nozomi are complementary to each other, one to be placed in the polar orbit and the other in the near equatorial orbit. These conditions give excellent opportunity for scientific collaboration between Mars Express and Nozomi. The Nozomi team and the Mars Express team can collaborate in various ways, e.g. simply by exchanging data, or by exchanging research ideas on the basis of the data acquired by the two missions, and/or by proposing special requests for coordinated observations that are necessary and suitable for the new science emerging from the two missions.

In a broad sense of comparative magnetospherology, Mars is similar to Venus in that it does not possess strong magnetic field capable of playing a major role in the solar-wind-planet interaction. In the case of Venus, it has been established that the thermal pressure of the ionospheric plasma balances the solar wind ram pressure on the dayside and the boundary called the ionopause is created between the solar wind and the ionosphere. On the other hand, in the case of Mars, it has been argued that the dayside ionospheric pressure is not sufficient to withstand the solar wind ram pressure for majority of cases. Recently, MGS (Mars Global Surveyor) spacecraft brought us many new pieces of information about the Martian environment. Particularly, a strong (more than 1000nT) magnetic field of crustal origins has been discovered at low (~400km) altitudes, which is localized in the southern hemisphere and is latitudinally structured with alternating magnetic polarities. MGS is not equipped with plasma struments but the magnetometer and the electron reflectometer, so that the detailed interaction process between the localized magnetic field and the incoming solar wind remains uncertain. Furthermore, the question of pressure imbalance still remains for bulk of the ionosphere without crustal magnetic field. In this presentation, some of the interesting questions that will be addressed by Mars Express and Nozomi are reviewed and the strategy for answering these questions in the framework of collaboration between Mars Express and Nozomi is discussed.

Some of the interesting questions are as follows:

- (1) How does the solar wind interact with the neutral atmosphere of Mars on the dayside?
- (2) How important is the role of crustal magnetic field in the solar-wind-Mars interaction?
- (3) How are planetary ions accelerated in the magnetotail and how do they contribute to atmospheric loss
- (4) How does the solar wind mass-loading process occuuring upstream affect the structure of the bow shock?
- (5) What physical process is responsible for the sharpness of the magnetic pile-up boundary (MPB) as confirmed by MGS?