Contributions of Venus Express to the Aeronomy of Venus

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The launch of Venus Express provides a new opportunity to study the solar wind interaction with Venus. Although a wealth of knowledge about the interaction of Venus and the solar wind has been obtained from earlier missions, notably the long lasting PVO mission, Venus Express will greatly improve our view of the Venus plasma environment due to many unique characteristics of the mission such as the improved capability of the onboard instrumentation, the unique orbital trajectory and the solar minimum observations at a low altitude compared with PVO. Among many other instruments, it carries a magnetometer to investigate the Venus plasma environment. Since the Venus Express insertion into a highly elliptical polar orbit with a period of 24 h around the planet Venus, the magnetometer has operated continuously for about 5 years and obtained a wealth of data in the solar minimum at rather low altitude, which was not reached by earlier missions.

Although there is no intrinsic magnetic field at Venus, the convected interplanetary magnetic field piles up to form a magnetic barrier in the dayside inner magnetosheath. In analogy to the Earth's magnetosphere, the magnetic barrier acts as an induced magnetosphere on the dayside and hence as the obstacle to the solar wind. In the nightside, the induced magnetotail forms as a result of the atmospheric mass loading and subsequent draping of passing magnetosheath flux tubes that sink into the wake. Recent studies reveal that the atmospheric loss at Venus is mainly through the induced magnetospheric boundary layers in the wake. Thus understanding the response of the induced magnetosphere to various solar and solar wind conditions is crucial not only in studying planetary environments, but also in reconstructing the evolution of planetary atmospheres.

In this talk, we illustrate some of the magnetic field observations by Venus Express and we present the contributions of Venus Express to the aeronomy of Venus.