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Responses of the induced magnetosphere under extreme solar conditions

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Although there is no intrinsic magnetic field at Venus and Mars, 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. Understanding the response of the planetary environment to extreme solar conditions is crucial not only in space weather studies, but also in reconstructing the evolution of planetary atmospheres. Recent studies suggest that extreme solar events might play an important role in the evolution of Venus and Mars atmospheres and their water loss processes. In searching for clues to the nature and strength of atmospheric evolution, one has to develop models to simulate the solar wind interaction in ancient times. These models of necessity must be tested under present solar wind conditions. Since extreme solar events could provide conditions which might more resemble the ancient solar wind, it is important to study and gather information on these events which presently rarely occur. In this paper, we examine the responses of the induced magnetosphere of Venus and Mars under extreme solar conditions.