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Similarities and Differences Between the Mars and Venus Solar Wind Interactions

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The plasma environments of Mars and Venus have been explored by many spacecraft, such as Mars 2, 3 and 5 orbiters, Phobos 2, Mars Global Surveyor (MGS), Mars Express (MEX) for planet Mars and Venera 9 and 10, Pioneer Venus Orbiter (PVO), Venus Express (VEX) for planet Venus. Overall observations of plasma regions and their boundaries, in particular the bow shock, the magnetic pile-up boundary (MPB) and the magnetic tail, show the solar wind interaction with these two planets to be rather similar. Mars and Venus are both considered as non-magnetic planets, compared with the Earth, in a sense that they do not possess any significant intrinsic magnetic field that could play a significant role in their interactions with the solar wind. At most, the magnetic anomalies discovered at Mars by MGS are thought to slightly influence the lower regions of the Martian ionosphere. Therefore, both Venus and Mars have principally comet-like induced magnetospheres and magnetotails as a result of the atmospheric mass loading and subsequent draping of passing interplanetary flux tubes. Nevertheless, there are many differences between the characteristics and space environment behaviours of the two telluric planets. These differences include a greater width of the Martian bow shock associated with a greater width of magnetotail and a much larger O+ ion escape rate. The latter is related to a lower Martian gravitational field compared with those of Venus and the Earth, a larger extent of the exosphere, and efficient energizing processes. A relative insensitivity of the Martian bow shock to the solar cycle compared with the unquestionable Venus' bow shock variability has also been reported. The objectives of the presentation is therefore to compare the main characteristics of the Mars' and Venus' plasma environments and to highlight what are the main similarities and differences between the interactions of these two non-magnetic planets with the solar wind as a function of solar wind dynamic pressure, solar activity and, possibly, history.