



## Impact of Solar Wind Variability on the Magnetosphere and Ionosphere at Mars

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At planets with induced magnetospheres the coupling between the ionosphere, the small draped magnetosphere and the solar wind is very direct in comparison to Earth. On the other hand it is more complicated as the weak induced magnetosphere itself is created by and in its shape and strength dynamically depending on the prevailing Solar wind conditions.

In early 2010 Mars was located behind Earth in the Solar wind. And were able to utilize coordinated data from multiple near-Earth spacecraft (Stereo, ACE) to evaluate what kind of Solar wind disturbances have passed by Earth and might hit Mars consecutively (and when). Again during February to April, 2012, Mercury, Venus, Earth and Mars have been in perfect alignments - both radially and along the Parker spiral - to study the development of Solar wind variability in the inner heliosphere, and the corresponding space weather impact at all 4 terrestrial planets.

Apart from missions at Mercury - Messenger, Mars - Mars Express, Venus - Venus Express, and Earth - Cluster, Themis, SDO, ACE, Wind, SOHO... - even STEREO A and B were located at strategic locations, about 120 deg offset in either direction from SDO at 1 AU. In addition MSL contributes to this unique dataset with an operating radiation monitor en-route to Mars, located right between Earth and Mars for the period of interest.

During these two periods the Mars Express mission operated in an enhanced data mode, improving coverage from space plasma instruments like ASPERA, MARSIS and MaRS. We use plasma data from the ESA Mars-Express mission (mainly from the ASPERA particle instrument and the MARSIS topside ionospheric sounder) to investigate, for a number of isolated events, how the induced magnetosphere at Mars develops and decays in response to Solar wind variability in the magnetic field, density and velocity, and what kind of ionospheric dynamics are produced in association with such events.