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Investigation of planetary space weather effects at Venus observed by the ASPERA-4 particle analyzer and the magnetometer flying onboard of Venus Express Mission

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In this study we identified several coronal mass-ejections (CME's) interacting with the induced magnetosphere of Venus during 2010 and 2011 using STEREO observations and ENLIL simulations. Our purpose is to analyze the response of the induced magnetosphere and the ionosphere to these extreme conditions based on measurements made by the ASPERA-4 and MAG instruments on Venus Express. The parameters of the interplanetary magnetic field (IMF) during these solar events are also discussed.
Previously we investigated the effects of the May 2007 solar eruption on the induced magnetosphere of Venus in a poster publication (EPSC2013-266). During the analyzed solar event large scale rotation of the interplanetary magnetic field was observed and in the polar region, the altitude where planetary ions were present decreased compared to the average cases. Polarity reversal of the induced magnetosphere also took place, similar to the cases discussed by Edberg et. al (2011).
Several CME's interacted with Venus in November 2011. One of the largest lifted off on 3rd November and reached Venus on 5th November. The solar wind parameters showed large variations: the velocity peaked over 900 km/s, and the magnitude of the IMF suddenly increased threefold. The magnetic field reached 240 nT inside the induced magnetosphere, which is extremely high compared to normal conditions. The heavy ion density measured by VEX peaked over 1000 1/cm3 providing clear evidence for ionosphere crossing. Due to the orbit parameters it is possible to investigate the magnetic structure in the tail. The other selected solar eruptions caused similar changes including the sudden increase in the solar wind velocity and magnitude of the magnetic field in the magnetic barrier but due to the different orbital parameters other regions of the induced magnetosphere were investigated as well.
In conclusion the observed planetary space weather effects include that in the shocked solar wind we observed Increased velocity, ion density and thermal pressure. As a consequence of those, the ion outflow flux increased at the ion composition boundary; a stronger than usual magnetic barrier was observed. In the tail the magnetic field structure was modified and higher than usual ion outflow was indicated but these require further study.

References:
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