

## **Geo-effective solar flare events in December 2006 recorded close to Venus and Mars**

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In Dec. 2006, single sunspot region produced a series of proton solar flares, up to X9.0 level on 5 Dec 2006 10:35 UT. One unique feature of this X9.0 flare is that signature of solar energetic particle (SEP) events originated from this proton flare were detected (as increases of MCP background level) at Venus and Mars by Venus Express (VEX) and Mars Express (MEX), which are respectively located away from Earth by nearly  $+160^\circ$  and  $-160^\circ$  as viewed from the Sun. The timings of these enhancements were consistent with the estimated field-aligned travel time along the Parker spiral from the site of X9.0 flare to Venus and Mars. Corresponding to this increase, the Mars Express data indicate a one-order enhancement in the heavy ion outflow from the Martian atmosphere. Coronal mass ejection (CME) signatures that might be related to the proton flare were observed 46 hours later from the flare at Venus and 6 days later at Mars. Although these CME signatures are not necessarily the same as the one that is related to the X9.0 flare on 5 Dec 2006, they are most likely originated from the same sunspot region. These observation indicates that both CME and SEP activities on the invisible side of the sun may affect the terrestrial space weather as a result of traveling more than  $90^\circ$  in azimuthal direction in the heliosphere.