



Mars Express - Status and Science Highlights after Six Years in Orbit

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The Mars Express mission, launched on a Soyuz rocket from Baikonur in June 2003, has provided a comprehensive and multidisciplinary view of Mars, including the surface morphology, geology and mineralogy, the subsurface structure, the state of the interior, the climate's evolution, the atmospheric dynamics and composition, and the aeronomy. Originally planned for one Martian year (687 days), the mission has been extended several times and has led to the publication of over 400 peer-reviewed papers in international scientific journals.

A summary of the scientific highlights is presented:

The history of Mars has been completely revisited after the detection by the OMEGA mapping spectrometer of alteration minerals and phyllosilicates in particular. Phyllosilicates record an era of potential habitability. The presence of methane has been detected from orbit by the PFS spectrometer and its spatial and vertical distribution are being mapped. The High-Resolution Stereo Colour Imager (HRSC) has shown breathtaking views of the planet and provided new insights into the planet's topography, allowing a much better understanding of the formation and evolution of the surface geological features. In particular, the combination of digital terrain models with coverage at high resolution (better than 20 m/pixel) indicates very young ages for both glacial and volcanic processes, from hundreds of thousands to a few million years old, respectively. The North and South Polar Layered Deposits consist of nearly pure water ice, as deduced from the MARSIS radar data. Unique maps of H₂O ice and CO₂ ice in the polar regions have been produced by OMEGA. The analyser of space plasma and energetic atoms (ASPERA) has found that the solar wind is slowly stripping off the high atmosphere down to 270 km altitude, and measured the current rate of atmospheric escape of planetary ions. The composition of the escaping plasma has been precisely measured. The ultraviolet and infrared atmospheric spectrometer (SPICAM) has discovered the existence of nightglow, as well as auroras over mid-latitude regions linked to crustal paleomagnetic signatures. Very interesting results on the ionosphere have been obtained from the radio-science experiment: in the lower part where a layer created by meteoric burning was found, and in the upper part by detecting the ionopause. Phobos observations are also being closely coordinated, as Mars Express is flying at close distance of Phobos (less than 100 km), allowing to determine the mass of Phobos with great accuracy, to sound its interior with a radar for the first time, to obtain the sharpest images ever, to observe the satellite in the visible, UV and IR, and to monitor the solar wind interaction with Phobos. Finally, high-altitude CO₂ ice clouds have been detected in the equatorial region of Mars. Several years worth of scientific data are now in ESA's Planetary Science Archive. The data is being used all over the world, and several hands-on data analysis workshops have further stimulated its use. The spacecraft and the instruments are in good health, and thus the mission is expected to last for a significant number of years. Further details can be found at: <http://sci.esa.int/marsexpress> and <http://mars.esa.int>