Geophysical Research Abstracts
Vol. 14, EGU2012-5376, 2012
EGU General Assembly 2012

MARSIS Data Bad Time Stamp: Analysis and Solution of an Anomaly Event in a Space Mission

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Mars Express is Europe's first spacecraft to the Red Planet. The spacecraft has been orbiting Mars since December 2003, carrying a suite of instruments that are investigating many scientific aspects of this planet in unprecedented detail. The observations are particularly focused on martian atmosphere, surface and subsurface.
The most innovative instrument on board of Mars Express is MARSIS, a subsurface radar sounder with a 40-meter antenna. The main objective of MARSIS is to look for water from the martian surface down to about 5 kilometers below the surface. It provides the first opportunity to detect liquid water directly. It is also able to characterize the surface elevation, roughness, and radar reflectivity of the planet and to study the interaction of the atmosphere and solar wind in the red planet's ionosphere.
MARSIS Data are stored on the on-board memory and periodically sent to Earth ground stations.
Spacecraft Event Time (SCET) is the time an event occurs in relation to a spacecraft as measured by the spacecraft clock. Since it takes time for a radio transmission to reach the spacecraft from the earth, the usual operation of a spacecraft is done via an uploaded commanding script containing SCET markers to ensure a certain timeline of events.
Occasionally the generation time (SCET) of the MARSIS science packets recorded during an observation gets corrupted. This means that while some of the data have the correct SCET, some other data have a SCET not compliant with the effective generation time. For this reason with the standard procedure it is possible to retrieve only partial data.
In this paper we describe the cause of the anomaly occurrence and the procedures to be applied depending on the circumstances that arise. The application of these procedures is been successful and allowed to circumvent the problem.