AOGS 2005

The Martian Atmosphere as Observed by the Planetary Fourier Spectrometer on Mars Express Mission

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This work presents a review of the main atmospheric observations by the Planetary Fourier Spectrometer (PFS) on board of Mars Express (MEX).

Taking advantage of the unique characteristics of PFS spectra [1] (wide range and high resolution) we developed an analysis code able to retrieve in a self-consistent manner several elements of the state vector describing the conditions of the atmosphere [2]. In this work we focus on the vertical air temperature profile (up to 50km), the surface temperature and the integrated contents of dust and water ice. All these quantities can actually be computed from individual PFS measurements.

The non Sun-synchronous orbit of MEX allows to probe the atmosphere in a variety of local times in different seasons. Namely, extensive observations in twilight hours provides a first direct confirmation of the GCM's expectations [3] on air temperature fields in these conditions. Peculiar behaviors were observed on the topographic reliefs of Tharsis as well as at the rims of polar regions. PFS was also able to monitor the decay of a moderate dust storm and the onset of a global water ice cloud belt at equatorial regions, confirming the phenomena previously described on the basis of the TES dataset [4].

PFS has demonstrated to be a suitable investigation tools for atmospheric science at Mars. The full exploitation of its capability has however not yet been achieved and will require an extensive process of data assimilation in GCMs.

Keywords: Martian Atmosphere; Planetary Fourier Spectrometer; Mars Express

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