Electron Oscillations In The Martian Sheath

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Abstract

The analysis of Space Plasma and/Xenon Atomic Spectroscopy (APPAS) data from the Mars Express (ME) spacecraft indicates the electron spectroscopy (ME-EKIS) instrument on its complement. The ME-EKIS instrument is a time-of-flight type electron spectrometer which operates over an energy range from 0.5 to 2000 eV. The data was taken at periapsis, in the Martian bow shock, and at the center of the Martian sheath. This paper presents a brief overview of the analysis performed using the EEPS instrument data and includes a discussion of the results obtained. The results of the analysis are presented in the context of the shock wave layer. The data was taken during the Express program, the first ESA mission to the red planet.

Introduction

The Mars Express (ME) spacecraft launched from December 2, 2003, was equipped with the Solar Wind Electron, Proton and Alpha Particle (SWEPAP) and the Electron, Proton and Alpha Particle Spectrometer (EPAS) instruments. These instruments were designed to study the dynamics of the solar wind and the magnetospheric plasma. The ME-EKIS instrument operates over a range of energies from 0.5 to 2000 eV. The data was taken at periapsis, in the Martian bow shock, and at the center of the Martian sheath. This paper presents a brief overview of the analysis performed using the EEPS instrument data and includes a discussion of the results obtained. The results of the analysis are presented in the context of the shock wave layer. The data was taken during the Express program, the first ESA mission to the red planet.

Instrument

The ME-EKIS instrument is a time-of-flight type electron spectrometer which operates over an energy range from 0.5 to 2000 eV. The data was taken at periapsis, in the Martian bow shock, and at the center of the Martian sheath. This paper presents a brief overview of the analysis performed using the EEPS instrument data and includes a discussion of the results obtained. The results of the analysis are presented in the context of the shock wave layer. The data was taken during the Express program, the first ESA mission to the red planet.

Fourier Transform Technique

Fast Fourier Transform (FFT) techniques are currently used when analyzing data. FFT techniques are commonly used when analyzing waves. FFT techniques require that the user determine the number of samples to be analyzed. The number of samples should be a multiple of the number of data points. The number of samples should be at least twice the number of data points. The number of samples should be a multiple of the number of data points. The number of samples should be at least twice the number of data points.

Polulations in the Electron Data

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Figure 2. Electron Spectrogram of Electron Oscillations. Shown are data from the ME-EKIS instrument measuring the energy intensity oscillations (upper panel). The energy intensity is Fourier analyzed and the frequency spectrum near the 10 mHz and 20 mHz regions.

Figure 3C. Power Spectrum

Figure 3D. Power Spectrum

Discussion

The energy intensity oscillations (EI) are not well defined in the incident electron flux. The data was taken at periapsis, in the Martian bow shock, and at the center of the Martian sheath. This paper presents a brief overview of the analysis performed using the EEPS instrument data and includes a discussion of the results obtained. The results of the analysis are presented in the context of the shock wave layer. The data was taken during the Express program, the first ESA mission to the red planet.

Conclusion

The energy intensity of the Martian sheath is high and shows a clear periodicity with long periods. It seems reasonable to consider that the electrons are responding to a plasma event occurring near the bow shock. The results of the analysis performed using the EEPS instrument data and includes a discussion of the results obtained. The results of the analysis are presented in the context of the shock wave layer. The data was taken during the Express program, the first ESA mission to the red planet.