The Coronal Mass Ejection Interaction with the Induced Magnetosphere of Mars due to the 27 January 2012 Solar Storm

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ABSTRACT

On January 27, 2012, a high-density particle stream flowed into the Earth's magnetosphere. This energetic particle stream was detected in situ at the spacecraft close to the Earth. The magnetopause was compressed, and the solar wind pressure increased. The ion density at the magnetopause was enhanced, and the solar wind dynamic pressure increased. The solar wind interaction with the Earth's magnetosphere caused the magnetosphere to expand, and the solar wind pressure increased. The solar wind dynamic pressure increased, and the Earth's magnetopause was compressed.

INTRODUCTION

During February and March of 2012, the Earth and Mars were approximately radially aligned with the Sun, while in April and May they exhibited an Rf alignment along the Parker spiral direction. This alignment is important for studying the Earth's magnetosphere and its interplanetary connection with the solar wind. The solar wind was also observed in situ by a variety of spacecraft as they traversed the solar system. This alignment allowed for a detailed study of the interaction between the solar wind and the Earth's magnetosphere, providing valuable insights into the dynamics of the magnetosphere.

INSTRUMENTATION

The solar wind/magnetic field interaction is monitored by the Analysis of Space Plasma and Energy Alarms (ASPERA-3) experiment on the ESA Mars Express (2003) spacecraft. ASPERA-3 consists of an Electron Spectrometer (ESA) and an Ion Mass Analyzer (IMA), which measure energetic albedo and magnetic field perturbations. The Neutron Probe (NMP) and the High Energy Particle Detector (HEPD) also measure energetic albedo particles, while ASPERA-3 is used to study the solar wind and magnetospheric interactions. The energetic particle detectors are used to study the solar wind and magnetospheric interactions, and the magnetic field measurements provide valuable insights into the dynamics of the magnetosphere.

SOLAR IONIZATION

As of 18:10 U.T. on 27 January 2012, the solar wind was composed of protons with energies of less than 2 keV. The solar wind was not disturbed, and the solar wind magnetic field was weak. The solar wind was characterized by a low solar wind dynamic pressure and a high solar wind electron temperature. The solar wind was not disturbed, and the solar wind magnetic field was weak.

CMC SIMULATION

The CME was simulated and monitored using the CMC model. The CMC model calculates the evolution of the CME and its interaction with the Earth's magnetosphere. The model is based on the magnetohydrodynamics equations and is solving the equations for the solar wind and the Earth's magnetosphere. The model takes into account the solar wind dynamics, the Earth's magnetosphere dynamics, and the interaction between the two. The model is used to simulate the CME and its interaction with the Earth's magnetosphere, providing valuable insights into the interaction between the two.

DURING CME ENCOUNTER

As the CME encounters Mars, the solar wind parameters are influenced. The solar wind dynamic pressure is increased, and the solar wind speed is decreased. The solar wind temperature is increased, and the solar wind density is decreased. The solar wind magnetic field is increased, and the solar wind electron temperature is increased.

CMC ENCOUNTER

The CME is detected and monitored using the CMC model. The CMC model calculates the evolution of the CME and its interaction with the Earth's magnetosphere. The model is based on the magnetohydrodynamics equations and is solving the equations for the solar wind and the Earth's magnetosphere. The model takes into account the solar wind dynamics, the Earth's magnetosphere dynamics, and the interaction between the two. The model is used to simulate the CME and its interaction with the Earth's magnetosphere, providing valuable insights into the interaction between the two.

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REFERENCES