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References; 3 The Acceleration of Energetic Particles in Magnetic Reconnection; 3.1 Introduction; 3.2 Background Description of Numerical Simulations
3.2.1 Different Methods of Numerical Simulations3.2.2 GEM Magnetic Reconnection Challenge; 3.3 Simulation Results; 3.3.1 Interplanetary Magnetic Reconnection Driven by MC; 3.3.2 Acceleration of Energetic Electrons; 3.4 Discussion and Summary; References; 4 Proton and Electron Flux Variations in the Magnetic Cloud Boundary Layers; 4.1 Introduction; 4.2 The Velocity Distribution Function; 4.2.1 Definition of the Velocity Distribution Function; 4.2.2 The Moments of the Velocity Distribution Function; 4.2.3 Electron Velocity Distribution Function in Solar Wind; 4.3 Data Set Description
4.3.1 Instruments and Data4.3.2 Event Selection; 4.4 Statistical Results; 4.5 Explanations for the Flux Variations at Different Energy Bands; 4.5.1 The Core Electrons; 4.5.2 The Suprathermal Electrons; 4.5.3 Energetic Electrons; 4.5.4 Protons; 4.6 Discussion and Summary; References; 5 The Criterion of Magnetic Reconnection in the Solar Wind; 5.1 Introduction; 5.2 Event Selection; 5.2.1 The Reconnection Exhaust; 5.2.2 The MC-Driven Shock; 5.3 Statistical Results; 5.4 Explanations for the Flux Variations in Different Events; 5.4.1 The Magnetic Cloud Boundary Layer and Reconnection Exhaust
5.4.2 The MC-Driven Shock5.5 Discussion and Summary; References; 6 Summary and Outlook; References

Sommario/riassunto

This thesis focuses on magnetic reconnection processes in the boundary layer of the interplanetary magnetic cloud. Magnetic reconnection is an important and frontier topic in the realm of physics. Various physical phenomena can be observed during the reconnection process but lots of them are not fully understood. This thesis provides the first observational evidence of energetic electrons associated with magnetic reconnection in the solar wind and discusses the particle acceleration problems. In addition, after analyzing the particle flux variations in Magnetic Cloud Boundary Layer, the thesis proposes a possible new criterion for the identification of magnetic reconnection in the solar wind. These tantalizing results could be particular clues to understand the dynamical problems in magnetic reconnection processes.