Abstract

This dissertation is an attempt to understand the kinematics of coronal mass ejections (CMEs) as it propagates in the interplanetary medium. Particularly, our aim is to study the Earth-directed (halo and partial-halo) CMEs as these are of immediate concern as they can cause geomagnetic storms on Earth. These intense expulsions of magnetized plasma give rise to shocks that accelerate particles such as protons, electrons and few heavy ions. These accelerated particles are known as solar energetic particles (SEPs) and in the aspect of potential space weather impacts, these particles with high proton fluxes are the prime threats in causing disturbances of Earth's magnetosphere and upper atmosphere. On the contrary, SEPs are also responsible for the cause of Auroras. Hence, accurate prediction of SEPs can prepare us to know if we would face a threat or a beautiful marvel, sooner or later. The interdependence of the three most powerful phenomena on the Sun, i.e., the solar flares, CMEs and SEPs is one of our main objectives in the study. Eventually estimating their arrival times in the vicinity of Earth to evade space weather hazards is our scientific merit. In addition, we investigate the variation of two most important kinematic properties of CMEs, i.e., velocity and acceleration during the last two solar cycles, 23 and 24. The analysis were performed using mainly the data of Solar and Heliospheric Observatory/Large Angle and Spectrometric Coronagraph (SOHO/LASCO) and quadrature observations by Solar Terrestrial Relations Observatory/Sun Earth Connection Coronal and Heliospheric Investigation (STEREO/SECCHI) for CMEs, Geostationary Operational Environmental Satellites GOES-13 for SEP fluxes and GOES-14 for solar flare fluxes. All these results could be very useful for forecasting of space weather.