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Investigation of shock waves occured in interplanetary medium after solar coronal mass ejections

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Shock waves are the layers where the fluid equilibrium property turned into another equilibrium property. Shocks arise frequently in the cases where the velocity of the fluid is greater than the local sound speed, such as gas dynamics, fluid mechanics, aerodynamics, astrophysics, solar physics and space physics. They can be analyzed by means conservation laws called Navier-Stokes equations. These equations are nonlinear equations which characterize the fluid motion. It is suitable to solve them numerically since it is not possible to solve them analytically. The operation time, the quality and the resolution of the solutions are directly depended on the computer system used for computations. The corona is the outer part of the solar atmosphere. It rises above the solar chromosphere layer. The temperature jumps sharply from a few thousand to a few million Kelvins in it. It displays a variety of features including helmet streamers, coronal loops, coronal holes and coronal mass ejections (CMEs). These features have attracted solar physicists due to their complex natures. Essentially, there are two basic structural elements in the corona: magnetically closed and magnetically open structures. The interaction between the plasma and the magnetic field in the solar corona determine the kind of phenomena, which occur. The Sun produces a continuous outpouring of particles from coronal holes from magnetically open structures, which is called the solar wind. The closed magnetic field loops, which are located below the coronal helmet streamers, can start to expand and explosively eject solar particles into interplanetary space. Finally, a transient CME has occurred, which produces an enormous plasma cloud in the interplanetary space. As the high-speed solar particles collide with the atmosphere of a planet, it can create a shock wave in the sunward side. The shock arises, because solar wind particles are emitted from stars at about 350-700 km/s, while the speed of sound (in the interstellar medium) is about 100 km/s. In this talk, an investigation of the shock waves occurred after some CMEs will be done. Navier-Stokes equations including viscosity term are going to be used for this investigation. The probable effects of these shock waves on the Earth atmosphere and near-Earth space will be presented after an investigation using a realistic model included viscosity created by Cavus. As a result of such investigation, the contribution to more detailed research studies of the effects of this type solar activity on the Earth and its space environment will be given.

Biography

Huseyin Cavus has his expertise in fluid mechanics magnetohydrodynamics, plasma, solar and space physics. He has completed his Ph.D. at the age of 32 years from the Canakkale Onsekiz Mart University of Turkey. Harvard University and MIT - Massachusetts Institute of Technology. He is a full professor and vice chair of the Physics Department of the same university. He is the leader of solar and space physics studies research team in his university.

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