

MHD modeling for the global solar corona

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It is important to estimate changes of space environment when human beings are going into space. Especially, solar activities like flares and coronal mass ejections play a key role in space weather researches. Interplanetary disturbances will propagate from the solar surface to the earth and the disturbances will give various effects on the earth. Therefore it is necessary to understand how the disturbances will change its properties in the interplanetary space. The purpose of our present study is to simulate steady state corona by solving ideal magnetohydrodynamic equation. It is necessary to obtain the steady state corona as a background that propagates various disturbances from the Sun.

We have developed three dimensional spherical magnetohydrodynamic simulation code by using CIP-MOCCT method in order to investigate the properties of the global solar corona and solar wind. Some test simulations reveal the high performance of our algorithms. Next, we have implemented the simulations for the global corona including the solar wind until the steady state is obtained. As the boundary condition, we use magnetic field observation to make a simulation more realistic. Like other simulations, our results also show the qualitative properties of the solar wind structures. Finally, advanced treatment for the boundary conditions of the coronal base are discussed. The idea of characteristics of hyperbolic equations makes the numerical solutions more stable and physically consistent. Numerical techniques discussed here will help us incorporate observational data in the coronal models and improve them significantly. We believe that our simulations will be a quite efficient tool for the space weather researches.