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Three-dimensional MHD simulation of the solar wind from the solar surface to 400 solar radius using REPPU (REProduce Plasma Universe) code

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Three-dimensional MHD simulation code, REPPU (REProduce Plasma Universe) code, is developed for modeling of space plasma phenomena, and is utilized for the solar surface and the global solar wind structure. The distinguishing features of this code is the 3-D grid system, which has no polar singularity though it is able to fit the spherical structure. This grid system makes it possible to set fine grids on the inner boundary of the inner simulation region which corresponds to the solar surface. Magnetic field structure on the solar surface is significantly important for the solar disturbances because it determines the global structure of the solar wind. REPPU code achieved both the implementations for the fine grid structure on the inner boundary and for the wide range grids in global solar wind configuration. We extend the outer boundary to 400 solar radius, though the previous our model covered 200 solar radius. We split the simulation region at several 10 solar radius where the solar wind speed is super-sonic. The simulation model for the inner region is developed in a rotational frame and the observed magnetic field data are input on the solar surface as the inner boundary. The frame of the simulation model for the outer region is a fixed frame and simulation data in the inner region are set at the inner boundary of this code. This improvement made it possible to perform stable simulation in the outer region where rotational component of the solar wind velocity is high. We describe REPPU code and present several simulation results.

Collaboration

– not specified –

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