

3D High Resolution Simulations of Interplanetary Space using AMR

Tomoya Ogawa[1]; Mitsue Den[1]; Takashi Tanaka[2]; Kazuyuki Yamashita[3]

[1] CRL; [2] Kyushu University; [3] Edu., U. of Yamanashi

It is important to obtain an arrival time of a shock wave caused by a coronal mass ejection (CME) from the point of view of space weather. But it is difficult to simulate a shock wave propagation with sufficient resolution in a simulation box spanning the orbit of the earth, because computer resource is limited. Especially, it is difficult to realize such simulations in 3-dimensional (3D) space with a regular mesh structure.

The Adaptive Mesh Refinement (AMR) is the method of unstructured mesh which has high resolution in part of a simulation box and lower one in other regions. The extent, the position, and the figure of a high resolution region varies dynamically to adapt to a physical state in progress. That results in a high resolution simulation with small computer memory usage.

We performed 3D high resolution simulations of interplanetary space using AMR. We calculated a CME shock wave propagation from near the sun to the earth with the resolution of a few times smaller than the radius of the sun and the simulation box size of larger than 2AU.

We report the results and performance of our simulation, and comparison to observations.