

結合コンパクト差分法による高精度ダイナモシミュレーション

高橋 太 [1]
[1] JSPEC/JAXA

High-order and high-resolution geodynamo simulation using a combined compact difference scheme

Futoshi Takahashi[1]
[1] JSPEC/JAXA

We present an improved solution method for modeling thermally driven convection and dynamo in a rotating spherical shell. In this method we introduce a high-order three-point combined compact difference scheme (CCDS) on non-uniform grid points in radius, while spherical harmonic expansion is conventionally performed in the angular direction. The governing equations in the spectral form are time-stepped together with the implicit CCDS up to the second derivative. To improve stability of the scheme, a boundary closure scheme is developed on non-uniform mesh. Numerical comparison with a published benchmark solution at moderate Ekman and Rayleigh numbers demonstrates that accuracy and convergence of the CCDS is fairly good and superior to the existing finite difference scheme using more stencil. With this scheme, we could more accurately solve problems of convection and also dynamo action in planetary core with less grid points.