

A shallow-water model using the B-grid staggering on the spherical icosahedral grid

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A shallow water model using the hexagonal synchronized B grid (SB grid) is developed and tested on the spherical icosahedral mesh. The SB grid adopts the same variable arrangement as the ZM grid, but does not suffer from a computational mode problem of the ZM grid since an extra coupling of velocity fields through the nonlinear terms is excluded. Some standard tests are performed to examine the model. The model is almost second order accurate if the initial conditions and the surface topography are sufficiently smooth. The SB-grid model is superior to a hexagonal C-grid model regarding the convergence of error norms in a steady-state geostrophically balanced flow test, while it is inferior to that concerning conservation of total energy in a case of flow over an isolated mountain. An advantage of the new model is that both accuracy and stability are only weakly sensitive to whether a grid optimization is applied or not.