Application of 3-D Spherical Shell Adaptive Mesh Refinement to an Atmospheric Model with a Vertical Lagrangian Coordinate

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Adaptive mesh refinement (AMR) provides an attractive framework for atmospheric modeling since it allows improved spatial resolution in a limited region without requiring fine grid resolution throughout the entire model domain. Therefore, the model domain to be resolved with higher resolution is kept at a minimum, greatly reducing computer memory and speed requirements. Here we are present an application of a 3D AMR tool to a dynamical core embedded in an Eulerian spherical coordinate system in the horizontal direction and a Lagrangian coordinate in the vertical direction. The 3D AMR tool, named the ABLCarT, is an extension of our 2D adaptive mesh library on a sphere (known as the AB-library) enriched by introduction of a new v-scan routine, which allows conservation (while refining/coarsening) of the vertical integral of meteorological variables. We test the ABCarT performance using a tracer advection test.