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Abstract for an Invited Paper
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The spectral element dynamical core in the Community Atmosphere Model

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I will describe our work developing CAM-SE, a highly scalable version of the Community Atmosphere Model (CAM). CAM-SE solves the hydrostatic equations with a spectral element horizontal descritization and the hybrid coordinate Simmons & Burridge (1981) vertical discretization. It uses a mimetic formulation of spectral elements which preserves the adjoint and annihilator properties of the divergence, gradient and curl operations. These mimetic properties result in local conservation (to machine precision) of mass, tracer mass and (2D) potential vorticity, and semi-discrete conservation (exact with exact time-discretization) of total energy. Hyper-viscsoity is used for all numerical dissipation. The spectral element method naturally supports unstructured/variable resolution grids. We are using this capability to perform simulations with 1/8 degree resolution over the central U.S., transitioning to 1 degree over most of the globe. This is a numerically efficient way to study the resolution sensitivity of CAM's many subgrid parameterizations.