

Implement FVCUBED Dycore

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`$SVNREPO/cam1/branch_tags/fvcubed_cam4_9_02_tags/fvcubed08_cam4_9_02`

Motivation

The motivation of this project is to ensure that the CCSM is ready for the upcoming generation of petascale computing platforms, which are expected to have hundreds of thousands of processors. In the CCSM, one of the largest bottleneck to parallel scalability is due to the latitude-longitude grid based dycores in the atmospheric model. This grid a potential "pole problem". There are highly effective techniques to deal with this pole problem, but the current techniques all adversely impact parallel scalability.

This project aims to improve the scalability of the CCSM by the introduction of Finite-Volume cubed-sphere based dycores (from GFDL) the into CAM. FVCUBED (or FV³, for short) is an extension of the Lin-Rood finite-volume latitude-longitude dynamical core already in CAM. FV³ has been successfully validated at GFDL, and has already been integrated into GEOS-5 GCM at NASA.

Project Phases

- Phase 1: Integrate GFDL FV³ dycore into CAM, then run and validate test cases
 - o adiabatic-mode baroclinic wave test cases from [Jablonowki,Williamson]. Jan. 2009 – See results below.
 - o Produce validated simulations with the FVCUBED dycore using idealized physics forcings (Held-Suarez). Apr. 2009 – See results below.
 - o Other adiabatic-mode [Jablonowki,Williamson] test cases. May 2009.
- Phase 2: Consolidation with the latest GFDL version, exchange of scientific results and code. June 2010: GFDL version integrated, scientific tests ongoing
 - History output is interpolated to lat-lon coordinates off-line using the GeCore tool [Ulrich,Lauritzen].
- Phase 3: Run with full physics and chemistry. Upgrade to latest CAM trunk. Test runs and validation as discussed with scientific steering committee. 2010.

Outstanding Issues

- Initial data
 - o Initially read in cell-centered (A-grid) wind data, interpolated to D-grid (staggered) locations.
 - o Wind data read directly into D-grid grid locations (not clear if this is necessary only for test cases, or needed in general for initial data files.