Summary of Technical Details

Model Properties

General

Language

Release Date

Native Data Format of IO Data

Parallelization Approach

Dynamical Core

Dycore Generic class

Prognostic variables (moist setup with water vapor)

Specifics on spatial discretizations (keywords)

Specifics on temporal discretizations (keywords)

Temporal discretization (generic class)

Type of horizontal discretization

Type of vertical coordinate

Type of vertical discretization

equation_set

Tracer Advection Scheme

Tracer Advection Generic class

Tracer Advection: Type of horizontal discretization
Tracer Advection: Type of vertical discretization

tracer advection: Specifics on spatial discretizations (keywords)
tracer advection: Specifics on temporal discretizations (keywords)
Computational Grid and Grid Staggering
Additional grid design choices
Base computational grid
Grid projection
Horizontal grid staggering
Option for variable-resolution grid

Vertical grid staggering
Time Steps
Model nomenclature for approximate 1x1 degree grid spacing (110 km x 110 km)
Typical dynamics time step (in s) for approximate 1x1 degree spacing (110 km x 110 km)
Typical physics time step (in s) for approximate 1x1 degree grid spacing (110 km x 110 km)
Typical tracer advection time step (in s) for approximate 1x1 degree grid spacing (110 km x 110 km)
Conservation and Fixers (Horizontal and Vertical)

A-posteriori fixers

Built-in conservation property

Dissipation Mechanisms (Horizontal and Vertical)

Explicitly added dissipation mechanisms

Implicit (numerical) dissipation mechanisms

List of all dissipation coefficients

Coupling the Dynamical Core to Moist Physics

Physics-Dynamics coupling strategy

Please enter any information for this dynamical core

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FV3-GFDL

Hybrid (Fortran and C/C++)

NetCDF4

Hybrid: MPI and OpenMP, GPU under development

Finite-Volume, Horizontally Eulerian, Vertically Lagrangian

Total air mass, two local horizontal velocity components, virtual potential temperature, vertical velocity, layer thickness, water vapor mixing ratio

horizontal PPM, vertically-Lagrangian conservative cubic spline
Forward-in-time with backwards evaluation of pressure gradient force; semi-implicit nonhydrostatic solver

Fully explicit forward-in-time

Fully finite-volume, 4th order accurate

Hybrid-pressure on floating Lagrangian coordinate

Lagrangian vertical remapping

Shallow-atmosphere fully-compressible Euler equations

Eulerian in horizontal, Lagrangian in vertical

Finite Volume

vertical remapping (with floating Lagrangian coordinate)

horizontal PPM, vertically-Lagrangian cubic spline

Forward-in-time

Option for doubly periodic domain
Equidistant Cubed-sphere, equal angular optional
Gnomonic Cubed-sphere
Arakawa C- and D-Grid
Options for both stretching and nesting

Fully unstaggered; all prognostic variables co-located at full model levels as volume-mean

c96 (low-resolution version of upcoming AM4 model)

150

1800

1800

Mass-conserving, toal energy conserving via an optional fixer

Total energy fixer; vertical mass-conserving borrow-and-fill for positive-definite tracers

Mass of dry air, mass of tracer

2D second-, fourth-, sixth-, or eighth-order damping for divergence and (optionally) fluxes, with an option to add energy lost from damping as heat; energy-conserving 2-delta-dz vertical filter; energy-conserving Rayleigh damping of winds; sponge layer near model top with second-order damping of divergence, vertical velocity, and (optionally) fluxes

Optional PPM monotonicity constraint for horizontal fluxes and vertical remapping; upwind-biased advection

Dimensionless coefficients
between 0.1 and 0.16

time-split (a.k.a. sequential-split), including tracers