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Model Name and History:

- Long name: Distributed Hydrodynamic Aerosol-Radiation-Microphysics Application
- Acronym: DHARMA
- Short/conversational name: DHARMA
- Generic predecessor: HUSCI [Stevens and Bretherton, 1996] and successor [Stevens et al, 2002]

Model Type: 3D

Numerical Domain:

- Domain size in x-direction: 3200 m
- Domain size in y-direction: 3200 m
- Domain size in z-direction: 2000 m
- Number of grid points in x-direction: 64
- Number of grid points in y-direction: 64
- Number of grid points in z-direction: 96
- Grid size in x-direction: 50 m
- Grid size in y-direction: 50 m
- Grid size in z-direction: 20.833 m (uniform)
- Time step: dynamical time step of 5 s with occasional run-time reductions to keep Courant number < 0.8, microphysical time step reductions to a minimum value of 0.2 s depending upon processes operating in each grid cell, radiative quantities updated every 60 s

Numerical Technique:

- Numerical method: finite-difference
- Advection scheme and its order of accuracy: modified UTOPIA, 3rd-order
- Time scheme and its order of accuracy: forward-in-time, 2nd-order
- Dynamical equations: anelastic form [Ogura and Phillips, 1962]
- Numerical diffusion: n/a
- Lateral boundary conditions: fully periodic
- Upper boundary condition: sponge layer above 1750 m, timescale of 100 s
- Translation velocity of the reference frame: constant translation with specified winds
- Other information: n/a

Physical Parameterizations:

- Surface flux parameterization for heat, moisture, momentum: fixed heat and moisture fluxes, momentum fluxes using similarity theory for a neutral boundary layer and Charnock's relation for roughness height
- Longwave radiation parameterization: 2-stream, 18 bands [Toon et al, 1989]
- Shortwave radiation parameterization: 2-stream, 26 bands [Toon et al, 1989]
- How were radiative fluxes above the computational domain handled?: overlying layer with fixed water path of 0.55 mm (to match specified downwelling longwave above cloud) and climatological ozone and gases
- Microphysical parameterization: size-resolved microphysics, 3 groups (aerosol, liquid, ice), using modified Community Aerosol-Radiation-Microphysics Application (CARMA) code [Ackerman et al, 1995; Jensen et al, 1998]
- Turbulence closure scheme: dynamic subgrid-scale turbulence model [Kirkpatrick et al, 2006]
- Other information: manuscript in preparation describing additions to CARMA

Documentation:

- Documentation: brief documentation currently available [Ackerman et al, 2000; McFarlane et al, 2002]
- Documentation (predecessor): HUSCI [Stevens and Bretherton, 1996] and successor [Stevens et al, 2002]

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