Dynamical Core Model Intercomparison Project 2016

Introduction and Welcome

June 6th – 17th, 2016

Organized By

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Welcome to Boulder, Colorado

What is DCMIP?

- The DCMIP2016 summer school and workshop highlights the newest modeling techniques for climate and weather models.
- DCMIP2016 emphasizes non-hydrostatic global models, physics-dynamics coupling and variable-resolution modeling.
- DCMIP2016 includes:
  - A morning “summer school” that incorporates lectures and hands-on sessions for students, postdocs and researchers.
  - An afternoon “hands-on workshop” that gives participants the opportunity to work with operational modeling systesm from around the world.
  - An international dynamical core intercomparison to quantify difference in modern models.

What is DCMIP?

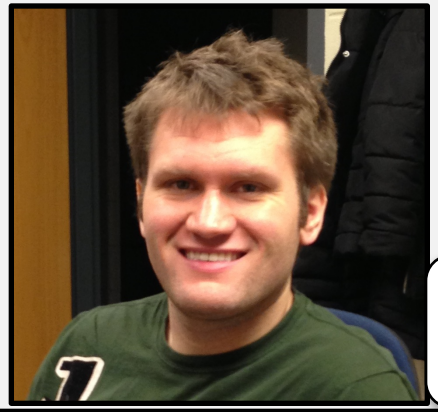
DCMIP2008: Building a first idealized test case suite for 3D global atmospheric models. Test cases included inertia-gravity waves, baroclinic instability, 3D Rossby-Haurwitz, mountain-induced Rossby gravity wave and solid-body rotation.

DCMIP2012: Focus on non-hydrostatic models. Advanced advection test cases (3D deformational flow, Hadley cell, flow over orography), steady-state orography test, mountain waves, non-hydrostatic gravity waves, baroclinic instability with EPV, idealized tropical cyclone.

DCMIP Organizers

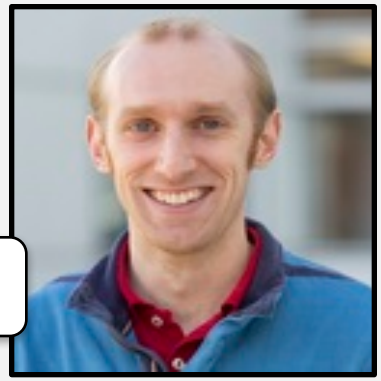
Paul Ullrich

Christiane Jablonowski



Colin Zarzycki

Kevin Reed



James Kent

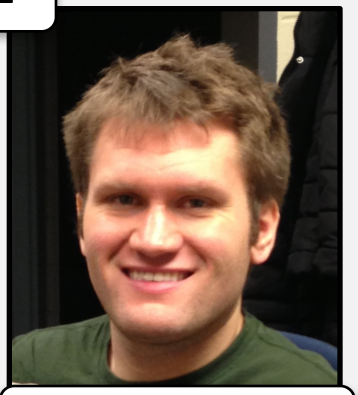
Peter Lauritzen

Ram Nair

DCMIP Model Mentors

HOMME-NH/CAM-SE

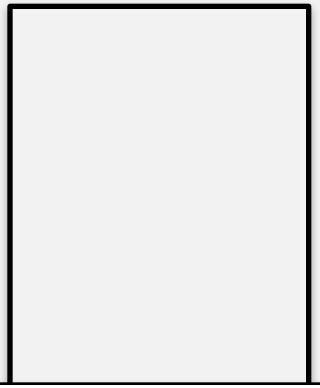
David Hall



Colin Zarzycki

NEPTUNE

Kevin Viner



Alex Reinecke

UZIM (CSU)

David Randall

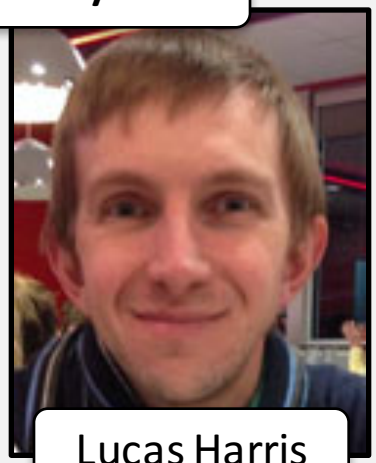
Don Dazlich

Celal Konor

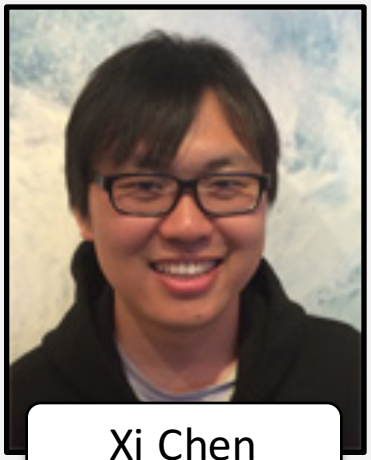
Ross Heikes

DCMIP Model Mentors

GFDL/FV3



Lucas Harris



Xi Chen

ICON

Daniel Reinert

Marco Giorgetta

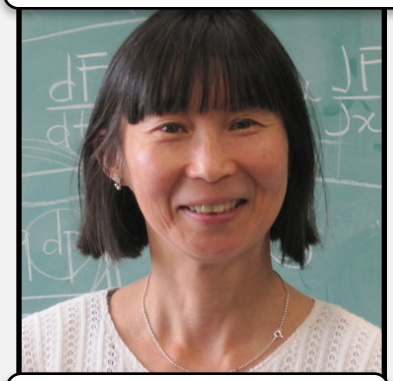
IFS/FVM (ECMWF)

Christian Kuehnlein

OLAM

Bob Walko

GEM



Vivian Lee

Abdessamad Qaddouri

DCMIP Model Mentors

NICAM

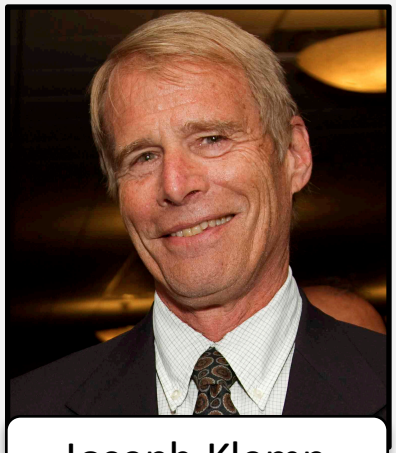
Ryuji Yoshida

Hiroaki Miura

Tomoki Ohno

MPAS

William Skamarock



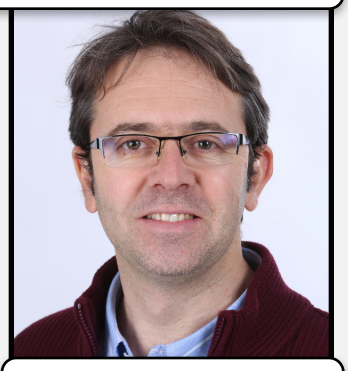
Joseph Klemp

Sang-Hun Park

DCMIP Model Mentors

(Intercomparison Only)

DYNAMICO



Thomas Dubos

TEMPEST

Paul Ullrich

ENDGame

Thomas Melvin

Modeling Groups

Thank You!

Logistics

Daily Agenda (Days 1-9) for Model Mentors

8:00am	Shuttle pickup at Homewood Suites
8:30am – 9:30am	Lecture 1
9:30am – 10:30am	Lecture 2
10:30am – 11:00am	Break
11:00am – 12:00pm	Lecture 3
12:00pm – 12:20pm	Model mentor presentation 1
12:20pm – 12:40pm	Model mentor presentation 2
12:40pm – 1:40pm	Lunch
1:40pm – 3:00pm	Workshop
3:00pm – 3:30pm	Afternoon science session
3:30pm – 3:45pm	Discussion and break
3:45pm – 5:00pm	Workshop
5:15pm	Shuttle pickup at CG, return to Homewood Suites

Logistics

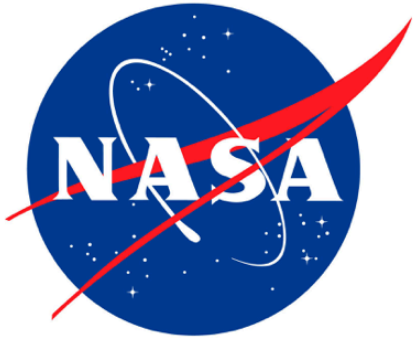
Many modeling mentors have also rented cars and will be driving to Center Green each day.

Please meet in the Homewood Suites lobby at 7:45am each day so we may organize transportation options.

DCMIP Sponsors

NCAR

Office of Science
U.S. Department of Energy



Research Computing

Modeling Groups

What do we need from you?

- Continued support for DCMIP activities from US agencies relies on the development of demonstrable products for dissemination of information to the broader community.

- One major complaint from the 2012 workshop was the lack of products (particularly peer-reviewed publications)

- Consequently, we have budgeted approximately $12,000 allocated for publication expenses associated with the workshop.

Modeling Groups

Four Peer-Reviewed Publications (Special issue of GMD)

- A review of modern technology underlying non-hydrostatic dynamical cores.
  https://github.com/DCMIP2016/DCMIP2016-Part1-Models

- Moist baroclinic wave test with Terminator chemistry
  https://github.com/DCMIP2016/DCMIP2016-Part2-BaroclinicWave

- Idealized tropical cyclone
  https://github.com/DCMIP2016/DCMIP2016-Part3-TropicalCyclone

- Idealized splitting supercell
  https://github.com/DCMIP2016/DCMIP2016-Part4-Supercell

Paper 1: Review of Modern Technology…

Underlying non-hydrostatic dynamical cores

We need from you a write-up of your model, containing:

- Model grids, describing the discrete representation of data on the sphere
- Equation sets, describing the various forms of the continuous fluid equations that can be employed
- Diffusion and stabilization, describing techniques for adding diffusion and stabilization to the model
- Filters and fixers, describing techniques for enforcing monotonicity, positive definiteness, mass and energy conservation
- Temporal discretization(s)
- A description of how the pieces from sections 3-7 come together in your dynamical core.

Paper 2: Moist Baroclinic Wave

With Terminator Chemistry

We need from you two model simulations:

- One with ONLY Kessler large-scale precipitation (161-preciponly).
- One with precipitation, boundary layer (Reed-Jablonowski) and surface fluxes (161)

- Daily output at 1 degree global resolution with 3D Qv, Qc, Qr, U, V, (W or omega), Theta, plus at least one of (Phi, T, Tv, Rho or P), QCl, QCl2, and 2D surface pressure and instantaneous and daily averaged precipitation. Stretched vertical levels. Please provide 30 days of simulation time in each case.

- Experiments: Higher resolution simulations (0.5 degree), variable resolution (information to follow this week)

Paper 3: Idealized Tropical Cyclone

We need from you two model simulations:

- Kessler microphysics, surface fluxes and boundary layer should be enabled for all simulations.
- One with Reed-Jablonowski boundary layer (162)
- One with modified Bryan boundary layer (162-bryanpbl)

- 6-hourly output at 0.5 degree global resolution with 3D Qv, Qc, Qr, U, V, (W or omega), Theta, plus at least one of (Phi, T, Tv, Rho or P), and 2D surface pressure and instantaneous and 6-hourly averaged precipitation. Please provide 10 days of simulation time in each case.

- Experiments: Higher resolution simulations (0.25 degree), variable resolution (information to follow this week)

Paper 4: Supercell Test

We need from you four model simulations:

- Kessler microphysics should be enabled for all simulations (no boundary layer or surface fluxes). X=120 scaling factor.
- Uniform horizontal diffusion is strongly encouraged (500 m^2/s for scalars, 1500 m^2/s for vectors), but if this is not an option you can try with available diffusion options.

- 5 minute output at (0.5,1.0,2.0,4.0) degree global resolution with 3D Qv, Qc, Qr, U, V, (W or omega), Theta, plus at least one of (Phi, T, Tv, Rho or P), and 2D surface pressure and instantaneous and 6-hourly averaged precipitation. Please provide 7200 seconds of simulation time in each case.

- Experiments: Different diffusion options, variable resolution (information to follow this week)

Other Papers?

In addition to the four “core” DCMIP publications, you are further invited to develop your own papers for submission to the special issue.

Visualization Scripts

Visualization scripts (NCL) are under continued development and will be uploaded to the DCMIP2016 webpage as they become available.

Please work with model mentors to tailor these scripts for your model and ensure data compliance.

Presentations

Every modeling group is also expected to produce a 20 minute presentation describing their model. The first presentation will be on Tuesday.

Tuesday, June 7th
12:00pm **NICAM**
12:20pm **GFDL/FV3**

Wednesday, June 8th
12:00pm **NEPTUNE**
12:20pm **MPAS**

Thursday, June 9th
12:00pm **HOMME**
12:20pm **TEMPEST**

Friday, June 10th
12:00pm **DYNAMICO**
12:20pm **FV-IFS / ECMWF**

Monday, June 13th
12:00pm **CSU**
12:20pm **GEM**

Tuesday, June 14th
12:00pm **OLAM**
12:20pm **ICON**

Wednesday, June 15th
12:00pm **Chombo**
12:20pm **ENDGame**

Total: 14 Models

Workshop

- Modeling teams will stay together for the two week period.
- The teams will be given the task of running idealized simulations on the NCAR Yellowstone Supercomputer.
- Teams will be given the option and ability to experiment with the models, with a focus on (a) physical parameterizations, (b) physics-dynamics coupling, and (c) variable-resolution.
- Teams will analyze and intercompare the data via GUI interfaces and prepared NCL scripts.
- Teams will disseminate model results to the DCMIP2016 website.
- Organizers will be present to assist with NCL, graphics, NCO, and NetCDF data formats.
- On Day 9 and 10 teams will present their findings at a short 15 minute presentation.

What happens on a typical afternoon?

- Teams have fun and interact
- Run test cases
- Suggest modifications of the test setups: for example, why not test a different diffusion coefficient, a variable-resolution setup, a different physics-dynamics coupling frequency
- Analyze your data, and intercompare the data with others
- Discuss your findings in your groups and with others
- Edit the DCMIP webpage, create new pages, upload figures and comment on them
- Help quality-control the netCDF data, as they need to comply with the DCMIP standards
- Produce plots for the eventual publication of our results.