

# CURRICULUM VITAE

**Ramachandran (Ram) D. Nair**

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## Contact Information

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## Education

Ph.D. (Numerical Weather Prediction)	Indian Institute of Technology (IIT),	Kharagpur (India), 1994
M.Tech. (Atmospheric Sciences)	Indian Institute of Technology (IIT),	Kharagpur (India), 1988
M.Sc. (Mathematics)	Calicut University (India),	1984

## Professional Appointments

- 5/2009 - Present: Scientist-III, National Center for Atmospheric Research (NCAR).
- 5/2005 - 5/2009: Scientist-II, National Center for Atmospheric Research (NCAR).
- 5/2002 - 5/2005: Scientist-I, National Center for Atmospheric Research (NCAR).
- 5/2009 - Present: Adjunct Associate Professor, Department of Marine, Earth and Atmospheric Science (MEAS), North Carolina State University (NCSU), Raleigh, USA.
- 11/1999 - 5/2002, Visiting Asst. Professor at Department of Mathematics, North Carolina State University (NCSU), Raleigh; Postdoctoral research scientist, Dept. of Marine Earth Sciences, NCSU, Raleigh.
- 10/1998-10/1999, Visiting research scientist, Max Planck Institute for Meteorology, Hamburg, Germany.
- 8/1997-10/1998, Consultant, RPN Montréal (Numerical Prediction Division, Environment Canada).
- 1995-97, Natural Science and Engineering Research Council of Canada (NSERC) Post-doctoral research fellow at RPN (Environment Canada), Montréal.
- 1994-95, Science and Technology Agency (STA) Japan, international research fellowship (1994-1995), at the National Institute for Earth Sciences and Disaster Prevention (NIED), Tsukuba, Japan.
- 1988-93, Research fellow, Indian Institute of Technology, Kharagpur, India.

### Student and Academic Program Advising

**Post-docs:** Peter Lauritzen (ASP, 2005-07, *Ph.D., University of Copenhagen, Denmark*),  
Vani Cheruvu (ASP, 2005-06, *Ph.D., IIT Madras, India*),  
Hae-Won Choi (SciDAC/CU, 2004-07, *Ph.D., University of Toronto, Canada*),  
Saroj Mishra (SciDAC/CU, 2008-10, *Ph.D., IISc Bangalore, India*)  
Christoph Erath (SciDAC/CU, 2010-13, *Ph.D., Austria*)  
Robert Kloefkorn (DOE/NCAR, 2012-14 *Ph.D., U. of Stuttgart, Germany*)

**Graduate Students:** Mike Levy, CU Boulder (*Ph.D. Thesis committee*)  
Matthew Norman, NCSU, Raleigh, (*ASP student visitor advisor, Ph.D. thesis co-advisor* ),  
Reghu Nathan, University of Wyoming (*Mentor 2008 SIParCS*),  
David Applehans, Colorado School of Mines (*Mentor 2009 SIParCS*),  
Kiran Katta, University of Texas, El Paso (*2012, Ph.D. thesis co-advisor*),  
Yifan Zhang, Applied Math., Brown (*Mentor 2010 SIParCS*)  
Wei Guo, U. of Houston, TX (*Mentor 2012 SIParCS*)  
Lei Bao, CU Boulder (*Ph.D. Thesis committee*)

### Journal Review

Reviewed over 100 research articles for the following journals:

*Monthly Weather Review, Quarterly Journal of Royal Meteorological Society, Journal of Computational Physics, Journal of Atmospheric Science, Journal of Applied Meteorology and Climatology, Computers & Fluids, International Journal for Numerical Methods in Fluids, Chemical Engineering Communication, Atmospheric Chemistry and Physics Discussions (EGU), GMD, Ocean Modeling, ICCS.*

### Editorial Position

- Associate editor for the *Monthly Weather Review*.
- Lecture Notes in Computational Science and Engineering: *Numerical Techniques for Global Atmospheric Models*, Springer.

### **Honors and Awards**

- Visiting Scientist fellowship awarded by Max Planck Institute for Meteorology, Hamburg, Germany (1998-99).
- Natural Science and Engineering Research Council of Canada (NSERC). Post-doctoral fellowship, at RPN (Environment Canada), Montréal, Canada (1995-1997).
- International Fellowship of Science and Technology Agency (STA) Japan, (1994-1995) at the National Institute for Earth Sciences and Disaster prevention (NIED), Tsukuba, Japan.
- Junior Research Fellowship award by the Indian Institute of Technology (IIT), Kharagpur, India (1988-1993).

## Research Grants

- NCAR PI for the DOE-SciDAC 2011 Proposal, “A Petascale Non-Hydrostatic Atmospheric Dynamical Core in the HOMME Framework”, 9/1/2011- 8/31/2014, CU/NCAR - \$1,547,436, with H. Tufo (PI / CU) and J. Dennis (Co-PI / NCAR).
- Co-PI for the DOE SciDAC 2009 BER proposal, “Toward a Non-Hydrostatic HOMME.” With H. Tufo (PI), P. Lauritzen (Co-PI) [funded, \$ 700K for 3 years.].
- A Co-PI for the NCAR proposal (collaboration across CGD and CISL) “Seamless Global Decadal Earth System Prediction at Regional Resolution,” proposed by team of NCAR scientists.
- DOE SciDAC, “Improved Transport Processes for CCSM,” \$683, 100, 9/15/04 - 9/14/07, Co-PI; H. Tufo (PI), P. Rasch (Co-PI)
- DOE SciDAC, “Petascale atmospheric general circulation models for CCSM,” 8/14/07- 8/14/10, \$2, 700, 000, Co-PI; H. Tufo (PI), A. St-Cyr (Co-PI) and J. Tribbia (Co-PI)

## Publications

### Refereed Research Article

1. Katta, K. K., **R. D. Nair**, and V. Kumar, 2014: High-Order Finite Volume Transport on the Cubed-Sphere: Comparison between 1D and 2D Reconstruction Schemes, *Monthly Weather Review*, doi: 10.1175/MWR-D-13-00176.1.
2. Gao, W., **R. D. Nair**, J-M. Qiu, 2014: A Conservative Semi-Lagrangian Discontinuous Galerkin Scheme on the Cubed-Sphere, *Monthly Weather Review* Vol.142, 457–475.
3. Erath, C. and **R. D. Nair**, 2014: A conservative multi-tracer transport scheme for spectral-element spherical grid, *Journal of Computational Physics*, Vol. 256, 118–134
4. Bao L., **R. D. Nair** and H. Tufo, 2014: A Mass and Momentum Flux-Form High-Order Discontinuous Galerkin Shallow-Water Model on the Cubed-Sphere, *Journal of Computational Physics*, Vol.271, 224–243.
5. **Nair R. D.** and K. Katta, 2013: The central-upwind finite-volume method for atmospheric numerical modeling. *Contemporary Mathematics (AMS)*, Vol.586, 277-285.
6. Hall, D., and **R. D. Nair**, 2013: Discontinuous Galerkin transport on the spherical Yin-Yang overset mesh, *Monthly Weather Review*, Vol.141, 264-282.
7. Zhang, Y., and **R. D. Nair**, 2012: A non-oscillatory discontinuous Galerkin transport scheme on the cubed-sphere. *Monthly Weather Review*, Vol.140, 3106-3126.
8. Mishra, S. K., M. Taylor, **R. D. Nair**, H. M. Tufo, J. J. Tribbia, 2011: Performance of the HOMME dynamical core in the aqua-planet configuration of NCAR CAM4: Equatorial waves, *Ann. Geophys.*, Vol. 29, 221–227.

9. Norman, M., **R. D. Nair**, and F.H.M. Semazzi, 2011: A low communication and large time step explicit finite-volume solver for non-hydrostatic atmospheric dynamics, *Journal of Comput. Phys.*, Vol. 230, 1567-1584.
10. Mishra, S. K., M. Taylor, **R. D. Nair**, P. H. Lauritzen, H. M. Tufo, J. J. Tribbia, 2011: Performance of the HOMME Dynamical Core in the Aqua-Planet Configuration of NCAR CAM4: Rainfall Simulation *Journal of Climate*: doi: 10.1007/s00382-011-0994-4.
11. **Nair, R. D.**, M. N. Levy and P. H. Lauritzen, 2011: Emerging numerical methods for atmospheric modeling. A Chapter in the Springer book on *Numerical Techniques for Global Atmospheric Models*, LNCSE, Chapter 9, Vol. 80, 251–312. [Published]
12. Lauritzen, P. H., P. A. Ullrich and **R. D. Nair**, 2011: Atmospheric transport schemes: Desirable properties and a semi-Lagrangian view on finite-volume discretizations. A Chapter in the Springer book on *Numerical Techniques for Global Atmospheric Models*, LNCSE, Chapter 8, Vol. 80, 181-250. [Published]
13. Lauritzen, P. H., C. Jablonowski, M. A. Taylor and **R. D. Nair**, 2010: Rotated versions of the Jablonowski steady-state and baroclinic wave test cases: A dynamical core intercomparison, *J. Adv. Model. Earth Syst.*, Vol. 2, Art. #15, 34 pp., doi:10.3894/JAMES.2010.2.15.
14. **Nair, R.D.** and P.H. Lauritzen, 2010: A class of deformational flow test cases for linear transport problems on the sphere. *Journal of Comput. Phys.*, Vol.229, 8868-8887.
15. Lauritzen, P.H., **R.D. Nair** and P.A. Ulrich, 2010: A conservative semi-Lagrangian multi-tracer transport scheme (CSLAM) on the cubed-sphere grid. *Journal of Comput. Phys.* Vol.229, 1401-1424.
16. **Nair, R.D.**, 2009: Diffusion experiments with a global discontinuous Galerkin shallow water model. *Mon. Wea. Rev.*, Vol.137, 3339–3350.
17. Norman, M.R, F.H.M. Semazzi, and **R.D. Nair**, 2009: Conservative cascade interpolation on the sphere: An intercomparison of various non-oscillatory reconstructions. *Quart. J. Roy. Meteor. Soc.*, Vol.135, 795-805.
18. **Nair R. D.**, C.-W. Choi and H. M. Tufo, 2009: Computational aspects of a high-order discontinuous Galerkin atmospheric dynamical core, *Computers & Fluids*, Vol. 38, 309-319.
19. Norman, M.R and **R. D. Nair**, 2008: Non-polynomial based remapping schemes: Application to semi-Lagrangian advection, *Monthly Weather Review*, Vol.136, 5044-5061.
20. **Nair, R. D.**, and C. Jablonowski, 2008: Moving vortices on the sphere: A test case for horizontal advection problems. *Monthly Weather Review*, Vol. 136, No. 2, pp 699-711.
21. Levy M.N., **R. D. Nair** and H.M. Tufo, 2008: A high-order element-based Galerkin method for the barotropic vorticity equation, *Int. J. of Numer. Meth. Fluids*, doi: 10.1002/fld.1874.
22. Lauritzen, P. H., and **R. D. Nair**, 2008: Monotone and conservative Remapping between spherical grids (CaRs): Regular latitude-longitude and cubed-sphere grids. *Monthly Weather Review*, Vol.136, pp 1416-1432.

23. **Nair R.D.** and H. M. Tufo, 2007: Petascale atmospheric general circulation models, *Journal of Physics: Conference Series*, Vol. 78, SciDAC 2007, IOP Publishing, doi: 10.1088/1742-6596/78/1/012078.
24. Taylor M.A., J. Edward, S. Thomas, and **R. Nair**, 2007: A mass and energy conserving spectral element atmospheric dynamical core on the cubed-sphere grid, *Journal of Physics: Conference Series*, Vol. 78, SciDAC 2007, IOP Publishing, doi:10.1088/1742-6596/78/1/012074.
25. Dennis, J.M., **R. D. Nair**, H.M. Tufo, M. Levy, and T. Voran, 2008: Development of a Scalable Global Discontinuous Galerkin Atmospheric Model. *Int. J. of Comput. Sci. Eng.*, in press.
26. Levy, M. N., **R. D. Nair**, and H. M. Tufo, 2007: High-order Galerkin method for scalable global atmospheric models. *Computers and Geosciences*, Vol. 33, Issue 8, pp 1022-1035.
27. Cheruvu V., **R. D. Nair**, and H. M. Tufo, 2007: A spectral finite volume transport scheme on the cubed-sphere. *Applied Numerical Mathematics*, Vol. 57, Issue 9, pp 1021-1032.
28. **Nair, R. D.**, S. J. Thomas and R. D. Loft, 2005: A discontinuous Galerkin global shallow water model. *Monthly Weather Review*, Vol. 133, 876-888.
29. **Nair, R. D.**, S. J. Thomas and R. D. Loft, 2005: A discontinuous Galerkin transport scheme on the cubde-sphere. *Monthly Weather Review*, Vol. 133, 814-828.
30. **Nair, R. D.**, 2004: Extension of a conservative cascade scheme on the sphere to large Courant numbers. *Monthly Weather Review*, Vol. 132, 390-395.
31. **Nair, R. D.**, J. S. Scroggs, and F.H.M. Semazzi, 2003: A Forward-Trajectory global semi-Lagrangian transport scheme. *Journal of Computational Physics*, Vol. 193, 275-294.
32. **Nair, R. D.**, J. S. Scroggs, and F.H.M. Semazzi, 2002: Efficient conservative global transport schemes for climate and atmospheric chemistry models. *Monthly Weather Review*, Vol. **130**, 2059-2073.
33. **Nair, R. D.**, and B. Machenhauer, 2002: The mass-conservative cell-integrated semi-Lagrangian advection scheme on the sphere. *Monthly Weather Review*, Vol. **130**, 647-667.
34. **Nair, R.** , J. Côté, and A. Staniforth, 1999: Cascade interpolation for semi-Lagrangian advection over the sphere. *Quart. J. Royal Meteorological . Soc.*, **125**, 1445-1468.
35. **Nair, R.**, J. Côte and A. Staniforth, 1999: Monotonic Cascade interpolation for semi-Lagrangian advection. *Quart. J. Royal Meteorological Soc.*, Vol. **125**, 197-212.
36. Majumdar, S., **D. R. C. Nair** , R. S. Saraswat and A. Chandrasekar, 1997: A comparative study of an explicit and implicit normal mode initialization for a tropical limited area model. *Proc. Indian Academy of Sciences (Earth & Planetary sciences)*, **106**, No. 3, 1-9.
37. **Nair, D. R. C.**, B. Chakravarty, and P. Niyogi 1993: Implicit nonlinear normal mode initialization: A multigrid approach. *Acta Meteorologica Sinica*, **7**, 19 - 30.

38. **Nair, D. R. C.**, B. Chakravarty, and P. Niyogi 1993: Implicit nonlinear normal mode initialization for a barotropic primitive equation limited area model. *Mausam*, **44**, 1 - 8.

*In Progress (or Submitted)*

39. Gao, W., **R. D. Nair** , and X. Zhong An Efficient WENO Limiter for Discontinuous Galerkin Transport Scheme on the Cubed Sphere, *Int. J. Numer. Meth. Fluids*, [Submitted]
40. Bao, L., R. Kloefkorn, **R. D. Nair**, 2014: Horizontally Explicit and Vertically Implicit (HEVI) Time Discretization Scheme for a Discontinuous Galerkin Non-Hydrostatic Mode *Monthly Weather Review*, [Revised].
41. **Nair R. D.**, 2014: Quadrature-free Implementation of a Discontinuous Galerkin Global Shallow-water Model via Flux Correction Procedure. *Monthly Weather Review*, [Revised].

*Recent Scientific Presentations (select)*

- *A Discontinuous Galerkin Non-Hydrostatic Model with an Operator-Split Semi-Implicit Time Stepping Scheme*, SIAM Annual Meeting, 07-07-2014, Chicago.
- *A Time-Split Discontinuous Galerkin Non-Hydrostatic Model in HOMME Dynamical Core*, ICOSAHOM, 06-24-2014, Salt Lake City, Utah.
- *Discontinuous Galerkin Methods for Atmospheric Numerical Modeling*, Dept. Applied Math, CU Boulder, Feb 14th, 2014 [Invited]
- *Toward a Discontinuous Galerkin Non-Hydrostatic Dynamical Core in HOMME Framework*, KIAPS, Seoul, Korea, Nov 5th, 2013 [Invited]
- *Advanced Numerical Methods for Atmospheric Modeling*, NARL, India, February 18th-23rd 2013. [Invited]
- *A High-Order Unstaggered Finite-Volume Approach for Atmospheric Numerical Modeling*, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK. September 20th, 2012. [Invited].