Hyun-Gyu Kang

BLDG 4500N, 1 Bethel Valley Road, Oak Ridge, Tennessee, 37831-6301, United States

(865)-308-0111 | kangh@ornl.gov

Curriculum Vitae

Recent Professional Experiences

02/2020-Present	**Computational Earth System Scientist**, Computational Earth Sciences Group, Computational Sciences and Engineering Division, Oak Ridge National Laboratory (ORNL)
02/2019-01/2020	**Postdoctoral Research Associate**, Computational Earth Sciences Group, Computational Sciences and Engineering Division, Oak Ridge National Laboratory (ORNL)
03/2017-01/2019	**Postdoctoral Fellow** in Pukyong National University supported by Brain-Korea 21 Plus Project of the Graduate School of Earth Environmental Hazard System

Research Experiences

- Development and implementation of scalable numerical algorithms for atmospheric and oceanic models
- Implementation of implicit solvers for community models
- Parallelization and optimization of numerical models
- High-performance computing using MPI, OpenACC, and OpenMP
- Development of the high-order filtering scheme for the cubed sphere atmospheric model
- Construction of a numerous global atmospheric models using a variety of discretization methods such as spectral element method, Fourier-finite element method, double Fourier series, and spherical harmonics spectral method
- Investigation of the characteristics of the spherical Laplacian operator
- Research on the numerical simulation and dynamical analysis of the tropical cyclone

Education

09/2010-02/2017	**Ph.D.**, Department of Environmental Atmospheric Sciences, Pukyong National University, Republic of Korea
	Dissertation title: 'Development of a scalable spherical-Laplacian high-order filter for the spectral element model on the cubed sphere'
09/2008-08/2010	**M.S.**, Department of Environmental Atmospheric Sciences, Pukyong National University, Republic of Korea
	Dissertation title: 'Angular momentum transport in an idealized tropical cyclone'
03/2005-08/2008	**B.S.**, Department of Environmental Atmospheric Sciences, Pukyong National University, Republic of Korea

Awards

• The outstanding thesis award presented by Korean Meteorological Society, 2017

Memberships

• Member, Society for Industrial and Applied Mathematics (SIAM)

Peer-Reviewed Journal Articles

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, and S. Bishnu, 2021: A scalable semi-implicit barotropic mode solver for the MPAS-Ocean. *J. Adv. Model. Earth Syst.*, **13**, e2020MS002238. https://doi.org/10.1029/2020MS002238

Kang, H.-G., and H.-B. Cheong, 2018: Effect of the high-order filter on the cubed-sphere spectral element dynamical core. *Mon. Wea. Rev.*, **146**, 2047-2064.

Kang, H.-G., H.-B. Cheong, and W.-H. Kim, 2018: On the angular momentum loss of tropical cyclones: An f-plane approximation. *Asia-Pacific J. Atmos. Sci.*, **54**, 43-52.

Kang, H.-G., and H.-B. Cheong, 2017: An efficient implementation of high-order filter for a cubed-sphere spectral element model. *J. Comput. Phys.*, **332**, 66-82.

Cheong, H.-B., and **H.-G. Kang**, 2015: Eigensolutions of the spherical Laplacian for the cubed-sphere and icosahedral-hexagonal grids. *Q. J. R. Meteorol. Soc.*, **141**, 3383-3398.

Cheong, H.-B., H.-J. Kong, **H.-G. Kang**, and J.-D. Lee, 2015: Fourier finite-element method with linear basis functions on a sphere: Application to elliptic and transport equations. *Mon. Wea. Rev.*, **143**, 1275-1294.

Cheong, H.-B., J.-R. Park, and **H.-G. Kang**, 2012: Fourier-series representation and projection of spherical harmonic functions. *J. Geod.*, **86**, 975-990.

Cheong, H.-B., I.-H. Kwon, **H.-G. Kang**, J.-R. Park, H.-J. Han, and J.-J. Kim, 2011: Tropical cyclone track and intensity prediction with a structure adjustable balanced vortex. *Asia-Pacific J. Atmos. Sci.*, **47**, 293-303.

Park, J.-R., H.-B. Cheong, **H.-G. Kang**, 2011: High-order spectral filter for the spherical-surface limited area. *Mon. Wea. Rev.*, **139**, 1256-1278.

Kwon, I.-H., H.-B. Cheong, **H.-G. Kang**, H.-J. Han, and J.-J. Kim, 2010: Structure change of typhoon Nari (2007) in the weakening stage. *Asia-Pacific J. Atmos. Sci.*, **46**, 327-340.

Invited Talks

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2021: A scalable semi-implicit barotropic mode solver for the MPAS-Ocean. SIAM conference on Computational Science and Engineering 2021.

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2019: A semi-implicit barotropic mode solver for Ocean. 2019 E3SM Fall Meeting, NGD Software and Algorithms parallel session.

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2019: A semi-implicit barotropic mode solver for Ocean. 2019 E3SM Fall Meeting, NGD plenary session.

Conference Presentations

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2020 (poster): An efficient implementation of a semi-implicit barotropic mode solver for the MPAS-Ocean. Ocean sciences meeting.

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2019 (oral): A semi-implicit barotropic mode solver for the MPAS-Ocean. American Geophysical Union fall meeting.

Kang, H.-G., K. J. Evans, P. W. Jones, M. R. Petersen, A. G. Salinger, and R. S. Tuminaro, 2019 (poster): A new semi-implicit version of the MPAS-Ocean. 18th International workshop on multi-scale (un)-structured mesh numerical modeling for coastal, shelf, and global ocean dynamics.

Kang, H.-G., H.-B. Cheong, and C.-H. Lee, 2017 (poster): Normal modes of the shallow water system on the cubed sphere. American Geophysical Union fall meeting.

Kang, H.-G., and H.-B. Cheong, 2016 (poster): A scalable high-order spherical Laplacian implicit filter for the cubed-sphere spectral element dynamical core. Spring meeting of meteorological society of Japan.

Jeong. H.-B., H.-B. Cheong, **H.-G. Kang**, and M.-G. Jin, 2016 (poster): Study on the barotropic instability of steady Rossby-Haurwitz wave. Spring meeting of meteorological society of Japan.

Kang, H.-G., and H.-B. Cheong, 2015 (poster): Parallel high-order global implicit filter for the spectral element dynamical core on the cubed sphere. American Geophysical Union fall meeting.

Kang, H.-G., and H.-B. Cheong, 2015 (oral): Parallel scalable, isotropic, scale-selective spatial filter for the cubed- sphere spectral element model. The workshop on partial differential equation on the sphere.

Kang. H.-G., H.-B. Cheong, H.-B. Jeong, and W.-H. Kim, 2015 (poster): Pressure gradient error of spectral element dynamical core associated with topographic forcing: comparison with the spherical harmonics dynamical core. European Geoscience Union.

Cheong, H.-B., **H.-G. Kang**, H.-B. Jeong, and M.-G. Jin, 2015 (poster): Eigensolutions of the spherical Laplacian for the cubed sphere and icosahedral-hexagonal grid. European Geoscience Union.

Kang. H.-G., H.-B. Cheong, and H.-J. Kong, 2013 (poster): Discontinuous Galerkin shallow water model with implicit diffusion. American geophysical union fall meeting.

Kong, H.-J., H.-B. Cheong, and **H.-G. Kang**, 2013 (poster): Fourier finite element method on the spherical surface. American geophysical union fall meeting.

Cheong, H.-B., J.-R. Park, **H.-G. Kang**, and J.-D. Lee, 2012 (poster): Application of Fourier- and finite element- method to elliptic equations on the spherical surface. American Geophysical Union fall meeting.

Cheong, H.-B., J.-R. Park, and **H.-G. Kang**, 2012 (poster): Fourier-series expansion of spherical harmonic functions. European Geoscience Union.

Kang, H.-G., H.-B. Cheong, and J.-R. Park, 2011 (oral): Track and intensity prediction of typhoons in 2010 with SABV method. The fifth Korea-Japan-China joint conference on meteorology.

Kang, H.-G., H.-B. Cheong, and J.-R. Park, 2011 (poster): Angular momentum transport in an

idealized tropical-cyclone. American Geophysical Union fall meeting.

Kang. H.-G., H.-B. Cheong, J.-R. Park, and H.-J. Han, 2010 (poster): Typhoon prediction with the new tropical cyclone initialization scheme. The third international workshop on next-generation NWP models.

Skills

- OS: Linux, Windows, MacOS
- Programming languages: FORTRAN, Python, C++, shell scripts, MATLAB, Mathematica
- High-performance computing libraries: MPI, OpenACC, OpenMP
- Linear algebra libraries and solver packages: BLAS, LAPACK, Trilinos, ForTrilinos
- Visualization tools: Python, NCL, MATLAB, GrADS, SigmaPlot
- Office software: MS Word, MS Excel, MS PowerPoint