

AMAN GUPTA

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RESEARCH INTERESTS

physics-informed machine learning, climate modeling, atmospheric dynamics, atmospheric transport

ACADEMIC EXPERIENCE

Stanford University | Stanford, USA

Postdoctoral Researcher in the Stanford Doerr School of Sustainability (August 2022 -)

Mentor: Aditi Sheshadri

Ludwig-Maximilian University | Munich, Germany

Postdoctoral Researcher in the Department of Physics (Feb 2020 - July 2022)

Collaboration with the Institute for Atmospheric Physics, German Aerospace Center (DLR)

Mentor: Thomas Birner

Courant Institute of Mathematical Sciences, New York University | New York City, USA

Ph.D. in Mathematics and Atmosphere-Ocean Science (Sep 2014 - Jan 2020)

Advisor: Edwin P. Gerber

Indian Institute of Technology Guwahati | Guwahati, India

B. Tech. Mathematics & Computing (Jul 2010 - May 2014)

Advisor: Rafikul Alam

PUBLICATIONS

12. Gupta, Aman, Aditi Sheshadri, Inna Polichtchouk, and Valentine Anantharaj: **“Non-local Machine Learning Gravity Wave Parameterization: Training and Performance using O(1 km) Resolution Global Climate Model Integrations”**, *in prep.*
11. Gupta, Aman, Thomas Birner, Andreas Dörnbrack, Hella Garny, and Roland Eichinger: **“Coupled Planetary Wave - Gravity Wave Interactions in the Southern Hemisphere Stratosphere as Revealed by ERA5”**, *in prep.*
10. Gupta, Aman, Robert Reichert, Andreas Dörnbrack, Hella Garny, Roland Eichinger, Inna Polichtchouk, Bernd Kaifler, and Thomas Birner: **“Estimates of Southern Hemispheric Gravity Wave Momentum Fluxes Across Observations, Reanalyses, and Kilometer-scale Numerical Weather Prediction Models”**, *J. Atmos. Sci.*, *submitted*
9. Mansfield, Laura A., Aman Gupta, Adam C. Burnett, Brian Green, Catherine Wilka, and Aditi Sheshadri: **“Updates on Model Hierarchies for Understanding and Simulating the Climate System: A Focus on Data-informed Methods and Usability”**, *Journal of Advances in Modeling Earth Systems*, *submitted*.
8. Gupta, Aman, Marianna Linz, Jezabel Curbelo, Olivier Pauluis, Edwin P. Gerber, and Douglas E. Kinison: **“Estimating the Meridional Extent of Adiabatic Mixing in the Stratosphere using Age-of-Air”**, *J. Geophys. Res.: Atmospheres* [doi]
7. Thomas, Jim, Aman Gupta (2022): **“Wave-Enhanced Tracer Dispersion”**, *J. Geophys. Res.: Oceans* [doi]
6. Linz, Marianna, R. Alan Plumb, Aman Gupta, and Edwin P. Gerber (2021): **“Stratospheric adiabatic mixing rate derived from the vertical age gradient”**, *J. Geophys. Res.: Atmospheres* [doi]
5. Gupta, Aman, Edwin P. Gerber, R. Alan Plumb, and Peter H. Lauritzen (2021): **“Numerical impacts on tracer transport: Diagnosing the influence of dynamical core formulation and resolution on stratospheric transport”**, *J. Atmos. Sci.* [doi]
4. Gupta, Aman, Thomas Birner, Andreas Dörnbrack, and Inna Polichtchouk (2021): **“Importance of Gravity Wave Forcing for Springtime Southern Polar Vortex Breakdown as Revealed by ERA5”**, *Geophys. Res. Lett.* [doi]

3. Gupta, Aman, Edwin P. Gerber, and Peter H. Lauritzen (2020): “**Numerical impacts on tracer transport: A proposed intercomparison test of Atmospheric General Circulation Models**”, Quart. J. Roy. Meteor. Soc. [doi]
2. Gerber, Edwin P., Kevin DallaSanta, and Aman Gupta (2019): “**Imagining Simpler Worlds to Understand the Complexity of Our Own**”, J. Adv. in Model. Earth Syst., 11 [doi]
1. Yuting Chen, Samis Trevezas, Aman Gupta and Paul-Henry Cournede (2013): “**Some sequential Monte Carlo techniques for data assimilation in a plant growth model**”, Applied Stochastic Models & Data Analysis (ASMDA), Spain. [doi]

TEACHING

Objective Data Analysis in the Atmospheric and Climate Sciences | LMU, Summer 2020

Co-Instructed with Prof. Dr. Thomas Birner. Teaching statistical analysis of climate data in Python to graduate students.

Fundamental Dynamics of the Earth, Atmosphere and Climate | NYU, Spring 2017

Recitation Leader. Weekly tutorials to teach geophysical fluid dynamics and atmosphere dynamics using both theory and rotating lab experiments to undergraduates with diverse backgrounds.

Vector Analysis | NYU, Spring 2017

Recitation Leader. Weekly tutorials to teach multivariable calculus and tensor analysis to undergraduates.

Linear Algebra PhD qualification exam workshop | NYU, Fall 2016

Month long problem solving sessions focused on preparing Courant Institute’s PhD students for the linear algebra qualification examination.

Grader: Graduate Linear Algebra (NYU, Fall 2017), Graduate Scientific Computing (NYU, Spring 2018)

RESEARCH SUPERVISION

Graduate Student: Christian Sackrenz, LMU Munich (2021-2022), “Aspects of Planetary Waves in the Austral Winters Stratosphere”

SERVICE

Journal Referee: Journal of the Atmospheric Sciences (JAS), Journal of Geophysical Research (JGR) Atmospheres, Journal of Advances in Modeling Earth Systems (JAMES), Weather and Climate Dynamics (WCD), Geoscientific Model Development (GMD), Atmospheric Chemistry and Physics (ACP), MDPI Atmosphere, Journal of the Meteorological Society of Japan (JMSJ)

Session Organizer: “Extratropical Large-Scale Atmospheric Circulation Variability” with Paul Kushner, Pedram Hassanzadeh, and Aditi Sheshadri, at the American Geophysical Union Fall Meeting, S.F. 2023

Session Organizer: “Transport and Mixing Across Scales in the Upper Troposphere and Stratosphere” with Clara Orbe at the AMS 21st Conference on Middle Atmosphere (23-27 Jan 2022)

Organizing Member: Middle Atmosphere Committee, American Meteorological Society (Jan 2017 - Dec 2018)

Top Honors: Volunteer math tutoring for New York City middle school kids (2017)

Social Volunteer: Child Rights and You, New Delhi. State level malnutrition and Right to Education (RTE) (Summer 2011)

AWARDS

NCAR CISL Large Allocation: Prepared a grant and procured 11.33 million core-hours on *NCAR Cheyenne* supercomputer to assess transport in CAM Spectral Element dynamical core (Nov 2018)

Henry M. MacCracken Fellowship, NYU (Sep 2014 - May 2019)

NYU Dean’s Travel Grant (Aug 2018)

Courant CSO Travel Grant (Aug 2018)

TECHNICAL SKILLS

Programming Languages: Python (with PyTorch), Fortran90 (with proficiency in MPI and OpenMP), C, C++, Shell scripting, NCL
Operating Systems: GNU/Linux, Supercomputing Architectures, Mac OS, Windows
Software Packages: MATLAB, L^AT_EX, MS-Office, CDO

PARTICIPATION

Summer School on Satellite Observations and Climate Models, NASA JPL-Caltech (Aug 2017)
International HPC Summer School, Czech Republic (Jul 2018)

CONFERENCES

1. Aman Gupta, Robert Reichert, Thomas Birner, Andreas Dörnbrack, Hella Garny, Roland Eichinger, Inna Polichtchouk and Aditi Sheshadri **“Gravity Wave Momentum Flux Estimation Across Observations, Reanalyses and High-Resolution Models”**, at SPARC General Assembly, Boulder Hub, CO 2022
2. Aman Gupta, Robert Reichert, Thomas Birner, Andreas Dörnbrack, Hella Garny, Roland Eichinger and Inna Polichtchouk, **“Gravity Wave Momentum Flux Estimation Across Observations, Reanalyses and High-Resolution Models”**, at SPARC Gravity Wave Symposium, Frankfurt, Germany 2022
3. Aman Gupta, Thomas Birner, Andreas Dörnbrack, Hella Garny and Roland Eichinger, **“Coupled Planetary Wave-Gravity Wave Interactions in the Stratosphere as Revealed by ERA5”**, at AMS 21st Conference on Middle Atmosphere, Houston, Texas 2022
4. Aman Gupta, Thomas Birner, Andreas Dörnbrack and Inna Polichtchouk, **“Importance of gravity wave forcing for springtime southern polar vortex breakdown as revealed by ERA5”**, at European Geophysical Union General Assembly, Vienna 2021
5. Aman Gupta, Edwin P. Gerber and Peter H. Lauritzen, **“Assessing numerical impacts on stratospheric dynamics and transport using the age of air and the leaky pipe theoretical model”**, at European Geophysical Union General Assembly, Vienna 2020
6. Aman Gupta and Edwin P. Gerber, **“The circulation of the upper-troposphere and lower-stratosphere: A stiff test for the comparison of dynamical cores”**, at AMS 22nd Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, Maine 2019
7. Aman Gupta, Edwin P. Gerber and Peter H. Lauritzen, **“The effect of numerics on trace gas transport: A proposed intercomparison test of atmospheric general circulation models”**, NCAR Atmosphere Model, Whole Atmosphere Working Group Meeting, Boulder, CO 2019
8. Aman Gupta, Edwin P. Gerber, **“The impact of model numerics on trace gas transport in the stratosphere: A dynamical core benchmark test using age of air”**, American Geophysical Union Fall Meeting, Washington D.C. 2018
9. Aman Gupta, Edwin P. Gerber, **“The impact of model numerics on trace gas transport in the stratosphere: A dynamical core benchmark test using age of air”**, 6th SPARC General Assembly, Kyoto 2018
10. Aman Gupta **“Reducing tracer transport biases among GCMs for better climate prediction,”** at 11th Graduate Climate Conference, Woods Hole, MA 2017
11. Aman Gupta, Edwin P. Gerber, Olivier Pauluis **“Understanding how model numerics bias tracer transport: Insight from the age of air in idealized GCMs,”** at 19th Conference on Middle Atmosphere, Portland, Oregon 2017
12. Aman Gupta, V Senthilkumar **“Pseudospectral methods : Nanoscale effect of vibration of Carbon Nanotubes with elastic medium using pseudospectral methods and Chebyshev grid interpolation,”** accepted in Computational Mathematics, Computational Geometry & Statistics (CMCGS), Singapore 2013.