DOE CSGF Application - Science and Engineering Track

Name: Gabriel Rios

Applicant Information

First name	Middle name	Last name
Gabriel	Angel	Rios

Pronouns
he/him/his

Previous names

Phonetic spelling of name
gay-bree-ull ree-ohs

Preferred first name:
Gabriel

Email
[redacted]

Citizenship

Country of Birth: United States

U.S. Citizen: Yes

If no,

- *Country of Citizenship:*
- *Lawful Permanent Resident:* ----

  If yes,

  - *LPR Number:*
  - *Port of Entry:*

Name: Gabriel Rios

Current Mailing Address

Street address 1

[redacted]

Street address 2

City

[redacted]

State

[redacted]

Zip code

[redacted]

Home phone

Cell phone

[redacted]

Work phone

Address effective through (mm/dd/yyyy): [redacted]

After this date, all correspondence will be sent to the permanent address listed below unless otherwise requested. Notify the Krell Institute if your address changes after the application has been submitted.

Permanent Address

Street address

[redacted]

City

[redacted]

State

[redacted]

Zip code

[redacted]

Phone

[redacted]

References

List at least three persons familiar with your academic preparation and your technical abilities.
Please have these individuals mail the reference forms directly to Krell Institute.

	Title	*First name*	*Last name*	*Institution*	*Email*	*Status*
1.	**Staff Scientist**	[redacted]	[redacted]	[redacted]	[redacted]	**Submitted**
2.	**Oceanographer**	[redacted]	[redacted]	[redacted]	[redacted]	**Submitted**
3.	**Associate Professor**	[redacted]	[redacted]	[redacted]	[redacted]	**Submitted**
4.	**Professor and Department Chair**	[redacted]	[redacted]	[redacted]	[redacted]	**Notified**

Name: Gabriel Rios

Academic Status

Current Academic Status: **First-year Graduate Student**

Have you completed any academic credit towards your computational science/engineering doctoral degree? **Yes**

If yes, how many terms have you completed? (exclude summer) **1 Semester**

Official transcripts from every listed institution are a required component of the application including your Fall 2022 transcript, if applicable.

Doctoral Institution (Institution where you plan on completing your computational science and engineering doctorate or first choice doctoral university):

Institution	***Start Date***	***Expected End Date***	***Department***	***Academic Discipline***	***GPA***
Princeton University	09/2022	05/2027	Atmospheric and Oceanic Science	Atmospheric Science	[redacted]

Department Chair at Doctoral Institution:

First Name	***Last Name***	***Email***
[redacted]		

Other Doctoral Institution Choices (Answer only if not currently at doctoral institution)

			Department Chair Information	
Institution	***Department***	***Academic Discipline***	***Name***	***Email***

Higher Educational History (All university/colleges attended and degrees obtained with the exception of the doctoral degree listed above):

Institution	***Start Date***	***End Date Expected or Actual***	***Department***	***Academic Discipline***	***Degree***	***GPA***
Vanderbilt University	08/2014	05/2018	Engineering	Mechanical Engineering	Bachelors	[redacted]
City College of New York	08/2020	05/2022	Engineering	Mechanical Engineering	Masters	[redacted]
					None	
					None	
					None	

Name: Gabriel Rios

Graduate Advisor Contact Information

The graduate advisor is the person from the preferred institution **who views and approves the Program of Study.**

First Name
[redacted]

Last Name
[redacted]

Institution
Princeton University

Title (Dr., Ms., Mr., Professor, ...)
[redacted]

Email
[redacted]

Address 1
[redacted]

Address 2
[redacted]

City
[redacted]

State
[redacted]

Zip Code
[redacted]

Telephone
[redacted]

Fax

Name: Gabriel Rios

Program of Study

Listed are the courses in science and engineering, applied mathematics, and computer science that you agreed to take on your proposed Program of Study.

University: Princeton University

Course number	Course Title	Credit hours	Term and Year	Grade	Academic Level
Science & Engineering Applications					
AOS 547	Atmospheric Thermodynamics and Convection	3S	Spring 2023		G
AOS 572	Atmospheric and Oceanic Wave Dynamics	3S	Spring 2023		G
Mathematics and Statistics					
AOS 575	Numerical Prediction of the Atmosphere and Ocean	3S	Fall 2022	[redacted]	G
APC 523	Numerical Algorithms for Scientific Computing	3S	Spring 2023		G
High-Performance Computing					
SC 3260/5260 *from Vanderbilt University*	High Performance Computing	3S	Spring 2018	[redacted]	G
Computer Science and Computer Engineering					
APC 524	Software Engineering for Scientific Computing	3S	Fall 2023		G
ECE 585	Parallel Computation	3S	Fall 2023		G

I have read this program of study and affirm that, in my opinion, it satisfies the fellowship program requirements. This POS has been approved by my advisor, [redacted], and I understand that, if offered a fellowship, my advisor and I are required to sign this page and send it to the Krell Institute.

Student's signature ____________________________ Date _______________

[redacted]

Graduate Advisor's Institute: **Princeton University**

Graduate Advisor signature ____________________________ Date _______________

Krell Institute (Office use only) __________________________________

Krell Institute, Attn: DOE CSGF Coordinator

1609 Golden Aspen Drive, Suite 101, Ames, IA 50010

Phone: 515-956-3696, Fax: 515-956-3699, csgf@krellinst.org

Name: Gabriel Rios

Course Description

AOS 547: Atmospheric Thermodynamics and Convection

Thermodynamics of water-air systems. Overview of atmospheric energy sources and sinks. Planetary boundary layers. Closure theories for atmospheric turbulence. Cumulus convection. Interactions between cumulus convection and large-scale atmospheric flows. Cloud-convection-radiation interactions and their role in the climate system.

AOS 572: Atmospheric and Oceanic Wave Dynamics

Observational evidence of atmospheric and oceanic waves; laboratory simulation. Surface and internal gravity waves; dispersion characteristics; kinetic energy spectrum; critical layer; forced resonance; instabilities. Planetary waves: scale analysis; physical description of planetary wave propagation; reflections; normal modes in a closed basin. Large-scale baroclinic and barotropic instabilities. Eady and Charney models for baroclinic instability, and energy transfer.

AOS 575: Numerical Prediction of the Atmosphere and Ocean

A practical introduction to the numerical approaches that are used to simulate the evolution of the ocean and atmosphere. This course covers the forms of the equations of motion that are most appropriate for numerically studying various atmospheric and oceanic phenomena, and the numerical techniques that are used for their spatial and temporal discretization. The conservation properties of the continuous equations of motion and the numerical approaches for reproducing them are covered, as are the parameterization of unresolved phenomena, and specific considerations for accurate simulation of tracers.

APC 523: Numerical Algorithms for Scientific Computing

A broad approach to numerical algorithms used in scientific computing. The course begins with a review of the basic principles of numerical analysis, including sources of error, stability, and convergence. The theory and implementation of techniques for linear and nonlinear systems of equations and ordinary and partial differential equations are covered in detail. Examples of the application of these methods to problems in engineering and the sciences permeate the course material. Issues related to the implementation of efficient algorithms on modern high-performance computing systems are discussed.

SC 3260/5260: High Performance Computing *from Vanderbilt University*

Introduction to concepts and practice of high performance computing. Learning how to develop scientific programming methods to be executed on distributed systems. Parallel computing, grid computing, GPU computing, data communication, high performance security issues, performance tuning on shared-memory-architectures.

APC 524: Software Engineering for Scientific Computing

The goal of this course is to teach basic tools and principles of writing good code, in the context of scientific computing. Specific topics include an overview of relevant compiled and interpreted languages, build tools and source managers, design patterns, design of interfaces, debugging and testing, profiling and improving performance, portability, and an introduction to parallel computing in both shared memory and distributed memory environments. The focus is on writing code that is easy to maintain and share with others. Students will develop these skills through a series of programming assignments and a group project. A project will be undertaken in groups, and will involve creating a major piece of software related to scientific computing.

ECE 585: Parallel Computation

The class reads seminal papers on different parallel programming models and parallel computer architectures. In addition, we explore different parallel programming models via programming assignments. Finally the course culminates in a project where students create a research-grade experiment and write a full length conference-style paper. One of the goals of this class is to get students introduced to writing a complete conference style computer architecture/CS paper.

Name: Gabriel Rios

Other Planned Courses

Listed are the other courses you plan to take that you believe are particularly pertinent to your proposed or current research in the areas of Mathematics, Science and Engineering, and Computer Science.

Course number	Course Title	Credit hours	Term and Year	Grade	Academic Level
Science & Engineering Applications					
AOS 571	Introduction to Geophysical Fluid Dynamics	3S	Fall 2022	[redacted]	G
CEE 588	Boundary Layer Meteorology	3S	Spring 2023		G
GEO 425	Introduction to Ocean Physics for Climate	3S	Fall 2022	[redacted]	G
Computer Science and Computer Engineering					
AOS 551	Deep Learning in Geophysical Fluid Dynamics	3S	Fall 2023		G

Name: Gabriel Rios

Course Description

AOS 571: Introduction to Geophysical Fluid Dynamics

This course covers the physical principles and mathematical tools fundamental to the theoretical, observational, experimental, and numerical study of the atmosphere and oceans. Topics include: kinematical, dynamical, and thermodynamical equations for rotating and stratified fluids; hydrostatic and geostrophic balance; Boussinesq approximation; energetic balances; transport of scalar fields by advection and diffusion; vorticity and potential vorticity; shallow water theory; quasi-geostrophic theory.

CEE 588: Boundary Layer Meteorology

This course covers the basic dynamics of the atmospheric boundary layer (ABL) and how it interacts with other environmental and geophysical flows. Topics to be covered include: mean, turbulence, and higher order flow equations, turbulence closure models for the ABL, similarity theories, surface exchanges and their impact on the stability of the atmosphere, the different ABL flow regimes, its role in the hydrologic cycle, the fundamentals of scalar (pollutant, water vapor, etc) transport, modeling and measurement approaches for the ABL, and the role and representation of the ABL in large-scale atmospheric flows and models.

GEO 425: Introduction to Ocean Physics for Climate

The study of the oceans as a major influence on the atmosphere and the world environment. The contrasts between the properties of the upper and deep oceans; the effects of stratification; the effect of rotation; the wind-driven gyres; the thermohaline circulation.

AOS 551: Deep Learning in Geophysical Fluid Dynamics

Course provides a survey of the rapidly growing field of physics-informed deep learning, which integrates known physics principles with neural networks to predict the behavior of a physical system. It both introduces the background knowledge required to implement physics-informed deep learning and provides practical in-class coding exercises. Students gain experience applying this emerging method to their own research interests, including topics in geophysical fluid dynamics (atmospheric, oceanic or ice dynamics) or other nonlinear systems where the same technique applies. Students develop individual projects throughout the semester.

Name: Gabriel Rios

Completed Courses

Please list up to six courses you have completed that are particularly pertinent to your proposed or current research in the areas of Mathematics, Science and Engineering, and Computer Science. Please do not list entry level science/engineering or mathematics courses like Calculus I.

Course number	Course Title	Credit hours	Term and Year	Grade	Academic Level
AOS 527	Atmospheric Radiative Transfer	3S	Fall 2022	[redacted]	G
EAS A4170	Satellite Meteorology	3S	Fall 2022	[redacted]	G
EAS B3090	Fundamentals of Atmospheric Science	3S	Fall 2021	[redacted]	G
EAS B9018	Environmental Remote Sensing and Image Analysis	3S	Spring 2022	[redacted]	G
ENGR I1500	Introduction to Numerical Methods	3S	Spring 2021	[redacted]	G
ME I4600	Computational Fluid Mechanics	3S	Spring 2022	[redacted]	G

Name: Gabriel Rios

Course Description

AOS 527: Atmospheric Radiative Transfer

Structure and composition of terrestrial atmospheres. Fundamental aspects of electromagnetic radiation. Absorption and emission by atmospheric gases. Optical extinction of particles. Roles of atmospheric species in Earth's radiative energy balance. Perturbation of climate due to natural and antropogenic causes. Satellite observations of climate system.

EAS A4170: Satellite Meteorology

Satellites have become an increasingly important tool for studying and monitoring the Earth's weather and climate. Topics include orbits of meteorological satellites, instruments they carry, fundamentals of atmospheric radiation and remote sensing, meteorological parameters that can be retrieved from satellites, and applications. Matlab is used to analyze satellite data.

EAS B3090: Fundamentals of Atmospheric Science

An introductory survey to the field of Atmospheric Science, with special attention given to thermodynamics and dynamics. Atmospheric science is a complex field of study that builds on physics, chemistry and math, hence the prerequisites. This course covers rudimentary components of chemistry and cloud microphysics and in depth details of thermodynamics and dynamics. This course is intended to provide an introductions and solid foundation for students interested in atmospheric physics.

EAS B9018: Environmental Remote Sensing and Image Analysis

Remote sensing of the environment is a course devoted to the study of earth system interactions through downloading and manipulating satellite data. The course reviews the historical creation of satellite platforms, current usages of satellite data in the earth sciences, and emphasizes image analytical techniques used to highlight important data sets. Lecture and laboratory work emphasizes the use of Interactive Data Language (IDL) programming to perform image manipulations.

ENGR I1500: Introduction to Numerical Methods

Computation of roots of algebraic and transcendental equations. Solution of simultaneous equations. Determinations of eigenvalues. Interpolation. Approximation of functions by polynomials. Integration and solution of ordinary differential equations.

ME I4600: Computational Fluid Mechanics

Governing equation and models of fluid flow and heat transfer; basic numerical techniques for solution; estimation of accuracy and stability of the numerical approximations; boundary conditions; grid generation; structure and performance of commercial software for applications in analysis and design of thermo-fluid systems.

Name: Gabriel Rios

Research Statements

The research statements afford you the opportunity to articulate your academic plans in relation to the objectives of the DOE CSGF. Reviewed in the context of your complete application, your responses shed important light into your way of thinking as influenced by your experiences and goals.

Field of Interest and the Role of Computational Science

a. *In terms a general audience would understand, describe an important, outstanding scientific or engineering challenge in your field of interest where computational science can play an important role.*
b. *Describe the particular science or engineering problem that you would like to pursue in your research. What would be the impact on the field and/or on science, engineering and/or society in general if this challenge could be successfully addressed?*

[a] Understanding climate change's impact on disasters is critical for future efforts to protect life and property globally. Among the most dangerous are tropical cyclones (TCs), which result in damages of over $15 billion annually [1]. We use global climate models (GCMs) to predict the impacts of climate change on TCs. These models can be run for relevant future scenarios, such as increases in sea surface temperatures and carbon dioxide (CO2) concentrations [2]. Despite the utility of GCMs to project changes in TC activity due to climate change, results among models differ significantly, leading to limited confidence in future projections of TC activity [3]. Additionally, simulating future global phenomena presents a computational challenge, requiring supercomputing resources to handle high memory and storage demands while minimizing runtimes [4]. My research aims to leverage these resources to identify and reduce error to mitigate model uncertainty. Reduced uncertainty can support policymakers in efforts to mitigate effects of climate change and improve communication of projections to the public [5].

[b] Uncertainty in future TC activity is a composite of climatic and phenomenological factors. The causes of this uncertainty are difficult to analyze because of system complexity [6] and high computational expense. To address this problem, I plan to achieve two objectives: (1) determine GCM ability to represent individual meteorological phenomena and (2) quantify phenomena sensitivity to perturbations (e.g., CO2 concentrations, sea surface temperature). To accomplish (1), a suite of GCMs (HighResMIP, [7]) will be used to simulate past climate over historical records (1851 to 2021) to quantify GCM performance in representing individual phenomena needed for TC formation. To accomplish (2), perturbation experiments representing future climates will be run to assess GCM performance in representing these phenomena in past climates. This allows for the quantification of uncertainty among GCMs and deviations from observations, such that GCM perturbation sensitivity can be assessed. This research improves our understanding of GCM physics and parameterizations, which provides confidence in future TC projections.

Citations *(Optional)*

[1]Weinkle, Jessica, et al. "Normalized hurricane damage in the continental United States 1900--2017." Nature Sustainability 1.12 (2018): 808-813. [2] Camargo, Suzana J., and Allison A. Wing. "Tropical cyclones in climate models." Wiley Interdisciplinary Reviews: Climate Change 7.2 (2016): 211-237. [3] Palmer, Tim. "Climate forecasting: Build high-resolution global climate models." Nature 515.7527 (2014): 338-339. [4Walsh, Kevin JE, et al. "Tropical cyclones and climate change." Wiley Interdisciplinary Reviews: Climate Change 7.1 (2016): 65-89. [5] Parker, Wendy S. "Predicting weather and climate: Uncertainty, ensembles and probability." Studies in history and philosophy of science part B: Studies in History and Philosophy of Modern Physics 41.3 (2010). [6] Hsieh, Tsung-Lin, et al. “Large-Scale Control on the Frequency of Tropical Cyclones and Seeds: A Consistent Relationship across a Hierarchy of Global Atmospheric Models.” Climate Dynamics, vol. 55, no. 11--12, Dec. 2020.

Use of Computational Science in your research

a. *What is the most complex calculation you have run on a high-performance machine as part of your research experience? Or if you haven't run a high-performance computing system, tell us about the most complex computational problem you have tackled.*
b. *Imagine if you were given access to resources 100 times more powerful than what you have access to. What would that enable you to do, and what do you perceive the mathematical and computer science challenges to be?*

[a] During my 2022 research experience at LLNL, I simulated regional atmospheric model (HRRR) runs with observational validation on the Quartz cluster. The objective of this experiment was to identify improvements in prediction of boundary layer flows for wind energy forecasting applications. This consisted of a model resolution and sensitivity study to assess performance in representing turbulence over topographical features (hills, valleys) in an operational weather model. The experiment ran on 16 parallel nodes over 4 weeks at 4 model resolutions with 3 modified turbulent kinetic energy budget parameters to identify an optimal resolution and parametric value combination. Simulations were performed to identify where model physics and parameterizations were deficient relative to observations (vertical lidar). Limitations included limited priority-cluster times and the inability to perform studies at feature-level resolutions (order of 100 m) due to insufficient cluster access. However, the experiment demonstrated that including neighbor-cell processes in the energy budget at 1-km resolution improved prediction of turbine-height wind speeds (publication in preparation).

[b] 100x the resources would enable me to pursue implementation of cloud-resolving modeling (CRM) and using deep learning on existing GCMs to reduce projection uncertainty. CRMs, which model clouds and radiative energy transfer directly, reduce uncertainty in modeling of extreme weather [1]. However, implementing CRMs in GCMs for yearlong timescales is infeasible with current computational resources [2]. Additional resources would enable more confident future projections of TCs and help answer open questions regarding TC physics. In parallel, experiments to reduce uncertainty of parameterizations in existing GCMs can be pursued using deep learning. Neural networks can be trained using massive data assimilation for past climates (satellites, surface observations, emissions data) over parameter value ranges to minimize model uncertainty relative to historical TC records, Challenges would include assimilated data cleaning and unification, validation of CRM physics with limited vertical observations, and model initialization on global scales [3].

Citations *(Optional)*

[1] Satoh, Masaki, et al. "Global cloud-resolving models." Current Climate Change Reports 5.3 (2019): 172-184. [2] Rasp, Stephan, Michael S. Pritchard, and Pierre Gentine. "Deep learning to represent subgrid processes in climate models." Proceedings of the National Academy of Sciences 115.39 (2018): 9684-9689. [3] Prein, Andreas F., et al. "A review on regional convection-permitting climate modeling: Demonstrations, prospects, and challenges." Reviews of geophysics 53.2 (2015): 323-361.

Program of Study

Describe how the courses listed in your planned program of study would help prepare you to address the challenges you have described in questions 1 and 2. Discuss your rationale for choosing these courses.

Atmospheric Thermodynamics and Convection (AOS 547): provides a physical basis for energy exchange processes in the atmosphere that are crucial to weather and climate. The course is relevant to the research problem as TCs are driven by moisture exchange and thermodynamic processes, which are often parameterized in GCMs.

Atmospheric and Oceanic Wave Dynamics (AOS 572): provides a diverse physical basis for fluid motion and signal propagation in the atmosphere. The course is relevant to the research problem since rotational and wavelike atmospheric motions are crucial to TC formation and dissipation.

Numerical Prediction of the Atmosphere and Ocean (AOS 575): presents numerical methods catered to geophysical applications, with emphasis on discretization in time for computational efficiency. The course is relevant to my research as I intend to modify and develop custom numerical methods to model idealized atmospheric processes relevant to TC formation.

Numerical Algorithms for Scientific Computing (APC 523): introduces approaches to discretize differential equations and implementations of numerical algorithms on distributed systems. The course is relevant to my research as it allows me to tailor custom numerical methods to nonlinear processes in TCs (e.g., surface processes, size-intensity relationships).

Software Engineering for Scientific Computing (APC 524): introduces tools and methods relevant to performance optimization and parallel implementation on parallel systems. This is relevant to my research as skills gained here can be implemented in execution or modification of code to maximize supercomputing resource usage.

Deep Learning in Geophysical Fluid Dynamics (AOS 551): provides experience in incorporating data assimilation and system physics to address research problems. The course is relevant to the research problem as it provides tools to support data assimilation and parameter modification in validation and sensitivity studies.

Parallel Computation (ECE 585): introduces parallel computation topics and frameworks for parallel computation algorithms. This is relevant to the research as it introduces methods for parallelizing custom code and managing model runs on supercomputing clusters.

Name: Gabriel Rios

Programming Languages and Models

List (four at most) the programming languages and programming models with which you have experience. This section is simply intended to provide context to that experience. A presence or absence of information will be viewed neutrally. Provide a sentence that describes how you use them.

1. Programming Language/Model: **Python**

Used for observational data organization and analysis, model data processing, analysis, and visualization.

2. Programming Language/Model: **FORTRAN**

Used for debugging, modifying, and implementing existing numerical schemes in existing numerical models. Focus of work is on parameterizations of atmospheric boundary layer physics.

3. Programming Language/Model: **Weather Research & Forecasting Model**

Used and modified for analysis of turbulent atmospheric boundary layer processes for wind energy forecasting applications.

4. Programming Language/Model: **MATLAB**

Used for general data processing and observational analysis.

What are the programming languages that you intend to use in your research?

Languages: Python, FORTRAN; Models: HiRAM, AM4, NOAA/GFDL FV3

Name: Gabriel Rios

List of Publications

Papers

4. Rios, G., Ramamurthy, P., Gamarro, H.: Boundary layer structure and dynamics over New York City during extreme heat events. Submitted to Theoretical and Applied Climatology.
3. Rios, G. and Ramamurthy, P., 2022: Turbulence in the mixed layer over an urban area: a New York City case study. Submitted to Boundary Layer Meteorology.
2. Rios, G. and Ramamurthy, P., 2022: A novel model to estimate sensible heat fluxes in urban areas using satellite-derived data. Remote Sensing of Environment, 270. https://doi.org/10.1016/j.rse.2021.112880.
1. Rios, G., Morrison, R.J., Song, Y., Fernando, S.J., Wootten, C., Gelbard, A. and Luo, H., 2020: Computational Fluid Dynamics
Analysis of Surgical Approaches to Bilateral Vocal Fold Immobility. The Laryngoscope, 130: E57-E64. https://doi.org/10.1002/lary.27925.

Talks

Posters

7. Ramamurthy, P., Rahman, MD K., Rios, G.: Observations of coastal-urban boundary layer characteristics. AMS 103rd Annual Meeting, 11 Jan 2023, Denver, CO.
6. Ramamurthy, P., Rios, G.: Observations of urban boundary layer characteristics during extreme heat episodes. AGU Fall
Meeting 2022, 14 Dec 2022, A35M-1642, Chicago, IL.
5. Rios, G. and Ramamurthy, P.: Boundary layer structure and dynamics over New York City during extreme heat events, 2nd Annual NYS Mesonet Symposium, 13-14 Sep 2022, Albany, NY.
4. Rios, G. and Ramamurthy, P.: Estimating Urban Sensible Heat Flux using Satellite-Based Data, 10th Biennial NOAA EPP/MSI Education and Science Forum, 6-8 Apr 2022, Tallahassee, FL.
3. Rios, G., Ramamurthy, P., Arend, M.: Observations of urban boundary layer characteristics during extreme heat episodes, AGU Fall Meeting 2021, 13-17 Dec 2021, B15G-1507, 2021.
2. Rios, G. and Ramamurthy, P.: Estimating Urban Sensible Heat Flux using Satellite-Based Data, EGU General Assembly 2021, 19--30 Apr 2021, EGU21-6079, https://doi.org/10.5194/egusphere-egu21-6079, 2021, online.
1. Rios, G. and Luo, H., 2020: Computational Fluid Dynamics Analysis of Surgical Approaches to Bilateral Vocal Fold Immobility, Vanderbilt Institute for Surgery and Engineering Assembly, 26 Apr 2018, Nashville, TN.

Name: Gabriel Rios

Laboratory and Research Experience/Other Employment

- Princeton University; Aug 2022 to present; Graduate Research Assistant;

- Lawrence Livermore National Laboratory; Jun 2022 to Aug 2022; Graduate Student Summer Intern;
--- Performed evaluation of the High-Resolution Rapid Refresh (HRRR) model in complex topography
--- Conducted analysis of turbulence in fluid flows using high-frequency vertical-profiling lidar data
--- Executed validation simulations using the Weather Research and Forecasting (WRF) model

- National Oceanic and Atmospheric Adminstration; Jun 2021 to Aug 2021; NERTO Graduate Intern;
--- Incorporation of Joint Polar Satellite System albedo data for urban evapotranspiration modeling
--- Validation of Joint Polar Satellite System urban albedo estimates with in-situ observational data

- The City College of New York; Aug 2020 to Aug 2022; Graduate Research Assistant;
--- Developed surface heat flux estimation models for urban areas using GOES-R satellite data
--- Performed analysis of boundary layer structural anomalies in urban areas during heatwave events
--- Assisted with scintillometry campaign setup and planning for Manhattan urban heat flux observations

- Collins Aerospace; Jun 2018 to Aug 2020; Engineer II
--- Design lead for Mitsubishi Regional Jet pneumatic valves product line during qualification effort
--- Supported design & analysis efforts for KF-X Environmental Control pneumatic components
--- Provided design consultation to Material Review Board for supplier and quality control support

- Vanderbilt University; Jun 2017 to Aug 2018; Undergraduate Research Assistant
--- Conducted computational fluid dynamics simulations to assist surgical procedure selection
--- Modeled flow behavior in to observe effects of tracheal stenoses on breathing patterns

Academic Awards and Honors - *Include undergraduate and graduate honors (if applicable).*

- Princeton University President's Fellowship; Apr 2022
- GEM Ph.D. Engineering and Science Fellowship; Apr 2022
- NSF Graduate Research Fellowship, Honorable Mention; Apr 2022
- NOAA-CESSRST Professional Development Award; Apr 2021
- NOAA-CESSRST Graduate Fellowship; Aug 2020

Extracurricular Activities

- American Meteorological Society Committee on Hispanic and Latinx Advancement (CHALA); Oct 2021 to present; Member
--- Member of student committee to further engagement and resource accessibility of the geosciences to underrepresented communities in STEM

- Harlem Gallery of Science & NSBP Mentoring Program; Oct 2021 to present; Mentor, Mentor Leader
--- Hosted weekly mentoring sessions with middle schoolers with focus on STEM discussions
--- Chaperoned group outings to STEM and art-focused events and exhibits

- Vanderbilt University Scientists Volunteering for Science; Mar 2015 to May 2018; Group Lead
--- Integrated STEM lessons into multiple curricula, taught lessons to 100+ middle school students
--- Served as liaison between Vanderbilt and select Metro Nashville schools to create lesson plans

- Society of Hispanic Professional Engineers (SHPE), Vanderbilt University Chapter; May 2016 to May 2018; Academic Chair, President
--- Organized & led professional development events (e.g. resume preparation, interview drills)

--- Recruited chapter sponsors to provide donations & host professional development events

Name: Gabriel Rios

Additional Comments

Website: mr-gabrielrios.github.io Github: https://github.com/mr-gabrielrios

Name: Gabriel Rios

DOE CSGF and Other Fellowships

1. If applicable, what graduate fellowships did you apply for in addition to the DOE CSGF?

- ☐ Department of Defense (DOD; various)
- ☐ Department of Energy (DOE; various)
- ☐ Ford
- ☐ Hertz
- ☐ NASA
- ☑ National Science Foundation (NSF)
- ☐ University-sponsored Names of fellowships:
- ☑ Other Names of fellowships: **GEM Fellowship**

2. How did you find out about the program?

- ☑ DOE CSGF poster/recruitment mailing
- ☐ DEIXIS, the DOE CSGF annual publication
- ☐ Advertisement Source/publication:
- Word of mouth from
  - ☐ DOE CSGF recipient, past or present
  - ☐ Student colleague
  - ☐ University faculty
  - ☐ University administrator
  - ☑ DOE laboratory staff
- ☐ Institutional announcement
- ☐ Conference or meeting Name:
- ☐ Krell Institute email
- ☐ DOE CSGF webinar or talk
- ☐ Website or social media post URL:
- ☐ Other Explain:

Applicant Demographics

Ethnicity:	**Hispanic or Latino**
Race:	**White**
Gender:	**Male**
Disability:	**No**
First-Generation College Student:	**Yes**
Military Service:	**Not Applicable**