Name: Riley Brady

Graduate Record Examination

Verification of these scores is required. **Note:** Official Graduate Record Examination (GRE) Scores must be sent directly by the Educational Testing Service to the Krell Institute/DOE Computational Science Graduate Fellowship program. The Krell Institute's Institution Code is **6343** and the department code is **5199**. MCAT scores will not be accepted in place of GRE scores.

Your name as it appears on your GRE record:	**Riley X Brady**
Date test taken/to be taken:	**11/13/15**

GRE Test Results

			Reported from ETS	
Examination	***Score***	***Percentile(%)***	***Score***	***Percentile(%)***
Verbal	161	87	161	87
Quantitative	159	75	159	75
Analytical or Analytical Writing	5.0	93	5	93

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***	***E-mail***	***Status***
1.	**Dr.**	**Ryan**	**Rykaczewski**	**University of South Carolina**	[redacted]	**Submitted**
2.	**Dr.**	**Michael**	**Alexander**	**NOAA Earth System Research Lab**	[redacted]	**Submitted**
3.	**Dr.**	**Alexander**	**Yankovsky**	**University of South Carolina**	[redacted]	**Submitted**
4.	**Dr.**	**Joel**	**Fodrie**	**UNC Institute of Marine Sciences**	[redacted]	**Submitted**

Name: Riley Brady

Academic Status

Current Academic Status: **Undergraduate Student**

Have you completed any academic credit towards your computational science/engineering doctoral degree? **No**

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

Official transcripts from every listed institution are a required component of the application including your Fall 2015 transcript, if applicable. Please see the instructions for more information on where to send the transcripts.

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***	***Degree***
University of Colorado Boulder	08/2016	05/2020	Atmospheric and Oceanic Sciences	Atmospheric and Oceanic Dynamics		PhD

Department Chair at Doctoral Institution:

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

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

			Department Chair Information	
Institution	***Department***	***Academic Discipline***	***Name***	***Email***
University of California, San Diego	Scripps Institution of Oceanography	Climate Sciences	Brian Palenik	[redacted]
University of California, Santa Cruz	Ocean Sciences	Physical Oceanography	Margaret Delaney	[redacted]

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*
University of South Carolina (SC Honors College)	08/2012	05/2016	Marine Science Program	Marine Science (AoE: Physical Oceanography)	Bachelors	3.91
Otto-Friedrich-Universität Bamberg	03/2014	07/2014	Humanities	German Studies	German Minor	N/A
John Tyler Community College	08/2011	06/2012	English/Natural Sciences	Dual Enrollment High School Student	None	4.00
					None	
					None	

Name: Riley Brady

Graduate Advisor

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

First Name	*Last Name*
Nicole	**Lovenduski**

Institution	*Title (Dr., Ms., Professor, ...)*
University of Colorado Boulder	**Dr.**

E-mail
[redacted]

Address 1
[redacted]

Address 2
[redacted]

City	*State*	*Zip Code*
[redacted]	[redacted]	[redacted]

Telephone	*Fax*
[redacted]	[redacted]

Name: Riley Brady

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: University of Colorado Boulder

Course number	Course Title	Credit hours	Term and Year	Grade	Academic Level
Science/Engineering					
ATOC 5060	Dynamics of the Atmosphere and Ocean	3S	Spring 2017		G
ATOC 5200	Biogeochemical Oceanography	3S	Spring 2017		G
Mathematics and Statistics					
APPM 5540	Introduction to Time Series	3S	Spring 2018		G
APPM 5720	Methods and Analysis of Large Data Sets (Special Topics)	3S	Spring 2018		G
Computer Science					
ATOC 6100	Modeling Weather and Climate	3S	Fall 2017		G
CSCI 5576	High-Performance Scientific Computing	4S	Fall 2017		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, **Nicole Lovenduski**, 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 _____________

Graduate Advisor: **Nicole Lovenduski**
Graduate Advisor's Institute: **University of Colorado Boulder**
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: Riley Brady

Course Description

ATOC 5060: Dynamics of the Atmosphere and Ocean

Provides a physical and mathematical understanding of the dynamics of the atmosphere and ocean, with a focus on its fluid dynamical nature. The course will build on what you learned in ATOC 5050, and covers the basic equations of atmospheric and oceanic dynamics, the wave phenomena present in the atmosphere and ocean, instability theory, and turbulence.

ATOC 5200: Biogeochemical Oceanography

Provides a large-scale synthesis of the processes impacting ocean biogeochemistry. Transforms theoretical understanding into real-world applications using oceanographic data and models. Topics include: chemical composition, biological nutrient utilization and productivity, air-sea gas exchange, carbonate chemistry, ocean acidification, ocean deoxygenation, iron fertilization, biogeochemical climate feedbacks, and much more.

APPM 5540: Introduction to Time Series

Single and multivariable regression, forecasting using regression models, time series models, and modeling with MA, AR, ARMA, and ARIMA models, forecasting with time series models, and spectral analysis.

APPM 5720: Methods and Analysis of Large Data Sets (Special Topics)

Focuses on the power of statistical methods to deal with data that would be difficult to interpret using elementary statistics and limited graphics. Some overall themes include the ability to recognize different types of data and statistical questions and to identify the statistical tools that are appropriate for the situation.

ATOC 6100: Modeling Weather and Climate

Discusses background theory and procedures used for modeling climate on a variety of space and time scales. Includes numerical simulation of weather and climate with models in a hierarchy of complexity, assessments of error growth, prediction of circulations and impact of radiative and other influences. Explores various numerical methods, develops core computing skills, and considers data handling and visualization.

CSCI 5576: High-Performance Scientific Computing

Introduces computing systems, software, and methods used to solve large-scale problems in science and engineering. Students use high-performance workstations and a supercomputer.

Name: Riley Brady

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					
ATOC 5050	Introduction to Atmospheric Dynamics	3S	Fall 2016		G
ATOC 5051	Introduction to Physical Oceanography	3S	Fall 2016		G
ATOC 5235	Introduction to Atmospheric Radiative Transfer and Remote Sensing	3S	Spring 2017		G
ATOC 5300	The Global Carbon Cycle	3S	Fall 2017		G
ATOC 7500	Physical Oceanography and Climate (Special Topics)	3S	Fall 2018		G
Mathematics and Statistics					
APPM 5470	Partial Differential and Integral Equations	3S	Fall 2016		G

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Course Description

ATOC 5050: Introduction to Atmospheric Dynamics

Covers atmospheric motion and its underlying mathematical and physical principles. Explores the dynamics of the atmosphere and the mathematical laws governing atmospheric motion. Topics include atmospheric composition and thermodynamics, conservation laws, geostrophic balance, vorticity dynamics, boundary layers, and baroclinic instability.

ATOC 5051: Introduction to Physical Oceanography

Provides fundamental knowledge of the basic dynamics of the ocean.

ATOC 5235: Introduction to Atmospheric Radiative Transfer and Remote Sensing

Examines fundamentals of radiative transfer and remote sensing with primary emphasis on the Earth's atmosphere; emission, absorption and scattering by molecules and particles; multiple scattering; polarization; radiometry and photometry; principles of inversion theory; extinction- and emission-based passive remote sensing; principles of active remote sensing; lidar and radar; additional applications such as the greenhouse effect and Earth's radiative energy budget.

ATOC 5300: The Global Carbon Cycle

Covers the role of the ocean, terrestrial biosphere, and atmosphere in the global carbon cycle. Specific topics include marine carbonate chemistry, biological production, terrestrial fluxes, anthropogenic emissions, and the evolution of the global carbon cycle in a changing climate.

ATOC 7500: Physical Oceanography and Climate (Special Topics)

A quantitative introduction to the field of physical oceanography, with special emphasis on the ocean's interaction with the atmosphere and role in the global climate system. Topics include the ocean's heat and salt budgets, the equations of motion, wind-driven and thermohaline circulations, equatorial oceanography, ocean-atmosphere coupling, natural climate variability such as El Niño, and the ocean's role in--and response to--anthropogenic climate change. Theory is complemented by exposure to state-of-the-art instrumental data, satellite observations, and numerical models.

APPM 5470: Partial Differential and Integral Equations

Studies properties and solutions of partial differential equations. Covers methods of characteristics, well-posedness, wave, heat and Laplace equations, Green's functions, and related integral equations.

Name: Riley Brady

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
MATH 344	Applied Linear Algebra	3S	Spring 2016	IP	U
MSCI 305	Ocean Data Analysis	3S	Fall 2013	A	U
MSCI 313	The Chemistry of the Sea	4S	Spring 2015	A	U
MSCI 314	Physical Oceanography	4S	Spring 2015	A	U
MSCI 557	Coastal Processes	3S	Fall 2015	A	B
MSCI 599	Data Collection and Analysis Methods in Marine Science	3S	Spring 2015	A	B

Name: Riley Brady

Course Description

MATH 344: Applied Linear Algebra

Matrix algebra, Gauss elimination, iterative methods; overdetermined systems and least squares; eigenvalues, eigenvectors; numerical software. Computer implementation.

MSCI 305: Ocean Data Analysis

Instrumentation, oceanographic time series, spatial and directional data sets, and basic parametric modeling. [Note: The course covered the fundamentals of MatLab, as data were processed and analyzed through the software.]

MSCI 313: The Chemistry of the Sea

Biogeochemical cycling, carbonate chemistry, climate change, hydrothermal vents, stable isotopes, trace metals, radioactive tracers, mass balance, and properties of sea water. Three lecture and three laboratory hours per week.

MSCI 314: Physical Oceanography

Properties of seawater, mass and momentum balances, circulation, mixing, waves and other processes in the marine environment.

MSCI 557: Coastal Processes

Physical and geological processes controlling the formation and evolution of beach, barrier, and nearshore environments, including discussion of coastal management issues.

MSCI 599: Data Collection and Analysis Methods in Marine Science

This course covers applications of data collection strategies, numerical methods, the actual mechanics of oceanographic data analyses, and interpretation of the results (i.e., hypothesis testing). The primary emphasis will be on common techniques and approaches used in the collection and analysis of oceanographic data. Although a textbook will be used for the course, much of the lecture material and examples will be obtained from the scientific literature and available data sets. Students will be required to perform analyses, interpret, and present the results of their analysis using selected oceanographic data sets provided by the instructor. Students will also be encouraged to contribute their own data for analysis by the class.

Name: Riley Brady

Research Statements

This information is vital to the overall evaluation of your application.

Field of Interest and the Role of Computational Science

Describe an important, outstanding scientific or engineering challenge in your field of interest. 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? How could high performance computing and mathematics help address all or part of the challenge you have described?

It is difficult to make multi-decadal predictions of climate change impacts, particularly over regional scales where uncertainty is high. This is because our evolving climate responds to a number of factors: anthropogenic global warming (AGW), internal climate variability (ICV), such as El Nino events, and random external forcings, such as volcanic eruptions. As we are fundamentally unable to predict the last factor, our ability to model and separate the relative impacts of AGW and ICV will be the key to making more accurate multi-decadal forecasts.

Historically, climate model developers initialized their models from a single state and forced them with a range of future emissions scenarios. While this method quantifies uncertainty due to AGW, it can only be used to forecast the combined impacts of AGW and ICV--by using a single set of initial conditions, variability in the natural climate is suppressed. More recently, climate modeling centers, such as the National Center for Atmospheric Research (NCAR), have begun to experiment with round-off level differences in model initialization, allowing small differences to propagate through the chaotic climate system. In turn, they generate an ensemble, or a range of ‘possible realities.' Through this, one can consider uncertainty due to natural variability, estimating the resilience of the AGW ‘signal' to the background ‘noise' of ICV.

Due to the high computational costs associated with producing such an ensemble, the NCAR climate prediction ensemble is simulated at a coarse spatial resolution (1° x 1°). This is fine for forecasting large-scale phenomena--such as global precipitation--but makes forecasting finer-scale phenomena--such as complex regional ecosystems--much more difficult. Fortunately, one can use high performance computing approaches such as dynamical and statistical downscaling to resolve this issue.

The future of climate science relies on high performance computing to make the most skillful forecasts possible with the tools available today. The availability of these forecasts will be invaluable to policy- and decision-makers. Due to the long-term thermal inertia of the oceans, the actions of society today will impact the Earth for decades to come.

Research Using High-Performance Computing and/or Large Data Analysis

Describe the particular science or engineering problem that you would like to pursue in your research. How could you use high performance computing and mathematics to help address this problem? How would you demonstrate the success of your approach?

Eastern Boundary Upwelling Ecosystems (EBUE) occur at the eastern edge of ocean basins, where cross-shore pressure gradients mediate alongshore winds that produce upwelling currents. These currents provide nutrient-rich waters from depth, fueling productive ecosystems that cover 5% of the ocean surface, but contribute to 25% of global fish catch. Thus, the response of EBUE to climate change is of critical concern for food security.

EBUE are controlled from the bottom-up by phytoplankton. As such, it is crucial to investigate biogeochemistry (BGC) in EBUE by exploring changes in water chemistry, nutrients, and so on. However, BGC in EBUE is sensitive to atmospheric and oceanic variability; one must consider internal climate variability to make accurate forecasts of BGC.

Modelers now perturb the initial conditions of their climate models to generate an ensemble of ‘possible realities' from which they may extract the relative impacts of anthropogenic and natural climate change. However, it is computationally-intensive to generate a BGC ensemble with this method. Whereas a physical ocean model uses temperature and salinity to track flow (2 tracers), BGC models use as many as 30 chemical tracers, increasing the computational cost roughly 6-fold. To date, ocean BGC ensembles are only available at a coarse spatial resolution (1°x1°). This is an issue because previous research shows that coarse-resolution models fail to capture small-scale variability in ocean BGC, as compared to observations.

I propose a novel approach to generating multi-decadal predictions of BGC in the California Current System (CCS), the most observationally-dense of EBUE. Using a method called dynamical downscaling, I will force the boundary conditions of a regional high-resolution (0.1°x0.1°) physical and BGC model of the CCS with iterations of the perturbed initial conditions coarse-resolution model. By doing so, I may isolate the influence of large-scale climate variability on future BGC in the CCS. While there are many ways to demonstrate success in this approach, the most marked indicator would be if my dynamically-downscaled high-resolution runs captured more BGC variability than that of the stand-alone coarse-resolution climate model.

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.

Projects addressing the challenge of generating skillful multi-decadal

forecasts of regional ecosystems require three main steps: performing an experiment on an existing climate model, analyzing the resulting output, and placing the analyses into the context of Earth science.

MODEL EXPERIMENTATION
CSCI 5576: High-Performance Scientific Computing. This course will introduce me to the basics of high-performance computing and will provide me with firsthand experience using a high-performance workstation and supercomputer prior to running my first experiments on climate models.

ATOC 6100: Modeling Weather and Climate. This course will provide me with an understanding of the theory behind climate model development, which will be crucial for modifying source code and running my own experiments on models.

OUTPUT ANALYSIS
APPM 5540: Intro to Time Series. Predicting the impacts of climate change over multiple decades requires a thorough understanding of the statistical assumptions associated with time series analysis. This course will provide me with an understanding of discipline-independent fundamentals for analyzing trends in my output and for using forecasting models to predict the future.

APPM 5720: Methods and Analysis of Large Data Sets. Each iteration of the NCAR prediction ensemble contains over 5 billion data points. This course will train me to use the proper statistical methods to sift through these massive datasets, to extract particular regions of interest, and to compute climatological means.

EARTH SCIENCE CONTEXT
ATOC 5060: Dynamics of the Atmosphere and Ocean. Eastern Boundary Upwelling Ecosystems (EBUE) flourish because of the delivery of nutrients by upwelling currents in the ocean. These currents are mediated by a number of atmospheric phenomena, including pressure gradients and wind stress. This course will provide me with a quantitative understanding of these physical drivers of EBUE.

ATOC 5200: Biogeochemical Oceanography. Organisms in EBUE are sensitive to a specific range of pH, alkalinity, nutrient saturation depths, and so on for survival. This course will provide me with an understanding of these biological and chemical drivers of EBUE.

Programming Languages and Models

List (four at most) the programming languages and models with which you have experience.

PROGRAMMING LANGUAGES: MATLAB, Unix, and Java.

PROGRAMMING MODELS: N/A.

List of publications

Please include a list of publications that you have authored or co-authored.

PUBLICATIONS:
(1) (Manuscript in Preparation) BRADY, RX, Rykaczewski, RR, Alexander, MA. "Emergent Anthropogenic Trends in California Current Upwelling in the Presence of Natural Climate Variability." Geophysical Research Letters. (Planned submission: March/April 2016)

PRESENTATIONS:
(1) BRADY, RX, Rykaczewski, RR, Alexander, MA. "Emergence of Anthropogenic Trends in California Current Upwelling in the Presence of Natural Climate Variability." Ocean Sciences Meeting: New Orleans, LA. February 2016. (Poster)

(2) BRADY, RX, Rykaczewski RR, Alexander, MA. "The Influence of Natural Variability on Future California Current Upwelling." AGU Fall Meeting: San Francisco, CA. December 2015. (Talk)

(3) BRADY, RX, Alexander, MA, Rykaczewski, RR. "Quantifying Natural and Anthropogenic Variation in California Current Upwelling." Eastern Pacific Ocean Conference: South Lake Tahoe, CA. September 2015. (Talk)

(4) BRADY, RX, Alexander, MA. "Quantifying Natural and Anthropogenic Variation in Future California Upwelling." NOAA Hollings Science and Education Symposium: Silver Spring, MD. July 2015. (Talk)

(5) BRADY, RX, Rykaczewski, RR. "Consequences of Changing High-Pressure Zones on Future Coastal Upwelling." Ocean Sciences Meeting: Honolulu, HI. February 2014. (Poster)

(6) BRADY, RX. "Mercenaria mercenaria Impacts on Estuarine Shallow Water Primary Production." UNC-IMS REU Final Presentations: Morehead City, NC. July 2013. (Talk)

(7) BRADY, RX. "The Future of Coastal Upwelling in Marine Ecosystems." U. South Carolina Discovery Day Symposium: Columbia, SC. April 2013. (Talk)

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Laboratory and Research Experience/Other Employment

Begin with current or most recent employment. Please include employer, dates employment started and ended, position, and nature of work.

University of South Carolina: Ecosystem Oceanography and Climate Change Lab. September 2012-Present, Undergraduate Research Assistant. (Columbia, SC)
Analyze atmospheric and oceanic output of General Circulation Models (GCMs) to investigate potential changes to critical physical ocean processes (e.g. upwelling in eastern boundary currents) in response to a changing climate.

NOAA Earth System Research Laboratory: Physical Sciences Division. May-July 2015, NOAA Hollings Research Intern. (Boulder, CO)
Used a state-of-the-art perturbed initial conditions climate model ensemble to investigate the relative influence of anthropogenic and natural climate variability on future California Current upwelling.

NMFS Marine Resources Population Dynamics Workshop: Keys Marine Laboratory. March 2015, Selected Workshop Participant. (Layton, FL)
Explored many topics related to fisheries research including stock assessment, fisheries oceanography, and population dynamics.

University of North Carolina at Chapel Hill: Institute of Marine Sciences. May-July 2013, NSF Research Experience for Undergraduates (REU) Intern. (Morehead City, NC)
Constructed a mesocosm experiment to investigate the impact of Mercenaria mercenaria (Hard clam) filtration on shallow-water estuarine primary production.

Academic Awards and Honors

Include undergraduate and graduate honors (if applicable).

ACADEMIC AWARDS AND HONORS:
2012-2016 Member of the South Carolina Honors College: Ranked as the #1 public Honors Program in the country.

2016 Graduation with Leadership Distinction in Research: Honors the broader scope of achievements for students engaged within and beyond the classroom.

2015 Barry M. Goldwater Scholar: The most prestigious undergraduate award given in the sciences. (Up to $7,500)

2013 Ernest F. Hollings Scholar: NOAA undergraduate fellowship including two years of academic stipends and a ten-week summer internship with a NOAA research lab. ($30,000 over two years)

2012 David Odom Memorial Scholar: U. South Carolina Marine Science Program merit scholarship. ($2,000)

2012 McNair Scholar: U. South Carolina's most prestigious out-of-state merit scholarship, offered to less than 1% of the incoming freshman class. ($130,800 over four years)

President's List: Fall 2012, Spring 2013, Spring 2015, Fall 2015.

Dean's List: Fall 2012, Spring 2013, Fall 2013, Spring 2013, Fall 2015.

RESEARCH GRANTS:
2014-2015 Magellan Scholarship (Office of Undergraduate Research): "Variability in Large-Scale Forcing of the Four Major Eastern Boundary Upwelling Systems." ($3,000)

2013-2014 Science Undergraduate Research Fellowship (South Carolina Honors College): "The Influence of Water Vapor on Upwelling." ($2,900)

2012-2013 Science Undergraduate Research Fellowship: "Ocean Ecosystems in 2100." ($2,700)

PRESENTATION AWARDS:
2015 Best Student Talk Award: Eastern Pacific Ocean Conference.

2014 Outstanding Student Presentation Award: Ocean Sciences Meeting. (Poster)

2013 First Place Morning Oral STEM II Session. U. South Carolina Discovery Day Symposium.

SYMPOSIUM TRAVEL GRANTS:
2013 Scholarly Research Travel Support (South Carolina Honors College): $968 for 2014 Ocean Sciences Meeting.

2013 Marine Science Travel Fund (Marine Science Program): $460 for 2014 Ocean Sciences Meeting.

2013 Magellan Voyager (Office of Undergraduate Research): $500 for 2014 Ocean Sciences Meeting.

Extracurricular Activities

Include technical societies and service organizations.

OUTREACH:
Office of Fellowships and Scholar Programs. August 2014-Present, Volunteer Intern.
Present at orientations, workshops, and tabling events about personal experiences in the national fellowship application process; meet with students on an individual basis to clarify their goals and review their fellowship applications prior to submission.

Office of Undergraduate Research. August 2013-Present, Magellan Ambassador.

Present weekly to University 101 freshmen classes about how to get involved in undergraduate research; represent the Office of Undergraduate Research at various tabling and student panel events on campus.

Sustainable Carolina. September 2014-December 2015, Volunteer Intern. Served as the inaugural Director of Education for the Green Greeks program where I trained ten sorority members to be environmental liaisons to their individual chapters; organized and assisted with sustainability outreach events, such as the Green Networking Breakfast and Sustainable Showcase; assisted Dr. Joe Jones in selecting reading materials for an aquaponics course offered Spring 2016.

SOCIETIES:
American Geophysical Union. 2013-Present, Member.
Beta Theta Pi. 2012-Present, Member; New Member Education Committee.

STUDENT GOVERNMENT:
UofSC Safe Walk. November 2012-December 2013, Co-Founder; Assistant Director of Volunteers.
Helped launch program to provide trained volunteers to walk students from the library to their dorms, cars, and parking garages late at night; trained over 80 volunteers on program expectations, safety procedures, and communication with the campus police department.

Freshman Council. August 2012-May 2013, Delegate.

TEACHING:
University 101. August-December 2015, Co-Instructor. 19 students.
Covered a wide range of topics imperative to a successful transition into and throughout college.

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Additional Comments

In addition to CU Boulder's renowned coursework and research in Atmospheric and Oceanic Sciences (ATOC), they promote cross- and intra-institutional collaborations and maintain relationships with the Los Alamos National Lab through the National Center for Atmospheric Research (NCAR). Furthermore, my proposed advisor works closely with researchers at the Max Planck Institute for Meteorology in Hamburg (MPI Hamburg) and at ETH Zürich, opening the door for me to collaborate internationally.

INTRA-INSTITUTIONAL
ATOC at CU Boulder is modestly-sized and houses a tight-knit faculty. As such, I would have the opportunity to work closely with an eclectic dissertation committee that complements the many areas of my research.

My primary advisor, Nikki Lovenduski, would foster my interest in biogeochemistry and regional ecosystems; Kris Karnauskas would provide his expertise in tropical ocean-atmosphere dynamics and natural climate variability; and Ralph Milliff would help me to bring advanced statistical methods--such as Bayesian analysis--to my dissertation work.

CROSS-INSTITUTIONAL
Due to CU Boulder's close proximity to the NOAA Earth System Research Lab and NCAR, I can also include federal researchers on my committee. I envision including scientists such as Michael Alexander from NOAA, an accomplished meteorologist specializing in air-sea interactions, and Justin Small from NCAR, who focuses on the representation of small scale features in ocean models and how they influence the climate system.

RESEARCH AT LANL
Matt Long's research group at NCAR is currently using Los Alamos' new MPAS-O ocean model for high-resolution biogeochemical and ecosystem modeling in the California Current. The MPAS-O is unique, as it employs a hexagonal grid, allowing for cross-shore resolutions as small as 1km.

By working alongside Matt Long's group during my Ph.D., I would be exposed to the intricacies of the MPAS-O model, which would prepare me well for a practicum working on high-resolution ocean modeling at Los Alamos.

RESEARCH ABROAD
I plan to enhance my graduate research experience by spending a summer conducting research with either the Decadal Climate Prediction group at MPI Hamburg or the Environmental Physics group at ETH Zürich. By doing so, I would continue my passion for studying German culture and would broaden my scientific perspective to that of researchers in Europe.