## GENERAL INFORMATION

**Program sponsor:** Princeton Environmental Institute  
**Position number:** B1SAR  
**Project title:** Using Biogeochemical Information to Better Understand Biogeography of Southern Ocean Fisheries  
**Organization/research group:** Program in Atmospheric and Oceanic Sciences  
**Primary location(s) of internship:** Princeton, NJ  
**Additional cities and/or countries to be visited (if applicable):** n/a  

*Note:* If this internship is located in a country with an International SOS risk rating of High or Extreme, final candidates must participate in a travel review process overseen by the Travel Oversight Group (TOG), and obtain safety guidance prior to departure. The University reserves the right to revoke support and funding for travel at any time there has been a significant deterioration in the safety and security conditions surrounding travel arrangements, or in the sector of the country, or countries, where travel is to occur.

## FACULTY SPONSOR(s)/HOST INFORMATION

**Name(s):** Jorge Sarmiento, Professor, Geosciences  
**University Department(s):** Program in Atmospheric and Oceanic Sciences  
**E-mail:** jls@princeton.edu  
**Phone:** 609-258-6585  
**Website:** [https://www.princeton.edu/geosciences/people/sarmiento/](https://www.princeton.edu/geosciences/people/sarmiento/)

## INTERNSHIP/RESEARCH PROJECT INFORMATION

**Internship/project description:**  
Antarctic and Southern Ocean (ASO) marine ecosystem supports a long tradition of commercial fisheries and continues to provide social and economic opportunity to increasing global demand for food resources. Biogeography ASO fisheries are hypothesized to be influenced by a combination of bottom-up processes. Understanding spatiotemporal changes in abundance of commercially important fish stocks is the foundation for the informed management decisions in fisheries. Although an extensive effort has been made to understand the temporal dynamics of biogeochemical variables in the Southern Ocean, biogeochemical control of fishery productivity in the Southern Ocean have not been explicitly quantified or incorporated into the assessment of the ASO fisheries. To this end, this project will develop a machine learning-based species distribution model that can incorporate biogeochemical information to better understand large seasonal, decadal, and long-term variability in ASO fishery dynamics.

**Student's role and responsibilities:**  
- This project aims to develop a machine learning based species distribution model that can incorporate existing biogeochemical data (e.g. Biogeochemical Southern Ocean State Estimate solution).  
- The student will evaluate the relative importance and synergistic ecological impacts of environmental drivers of ASO fisheries.  
- The student will primarily focus on Antarctic krill (Euphausia superba) as a case species.  
- The student is expected to conduct a literature review on Southern Ocean biogeography and biogeochemistry.  
- The student is expected to analyze large amount of data using an efficient computational software, preferably R (prior knowledge would be beneficial but not required).  
- The student will present project results in an oral presentation at the end of summer.
Internship/project learning objectives:
This project will allow the student to gain fundamental knowledge of marine biogeography and fisheries science. The student will also be able to gain in-depth data-mining & statistical programming experiences.

PROGRAM REQUIREMENTS

Academic background and any course pre-requisites:
Useful: Statistics, Ecology, Biology
Taking some introductory R programming courses is recommended, but not required.

Technical skills:
Programming experience is helpful but not essential. Strong willingness to learn R programming language is required.

Additional training(s):
n/a

Equipment:
The student must bring a laptop.

Physical demands:
n/a

Language abilities/competencies (if applicable): n/a

Additional information about the internship/project:
n/a

INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)

Visa(s) required? Yes ☐ No ☐
Research permit/pass required? Yes ☐ No ☐
Immunizations required? Yes ☐ No ☐

INTERNESHIP/PROJECT SUPERVISOR(S)

Name and title of primary supervisor: Kisei Tanaka, postdoctoral research associate
Email: kiseit@princeton.edu
Phone: 609-258-0846

Name and title of additional supervisor, if applicable: n/a

E-mail: Phone:

PROGRAM DATES AND FUNDING INFORMATION

Weekly Stipend: $500
Number of Positions Available: 1
Tentative Start Date (mm/dd/yyyy): 06/01-2019
Number of Weeks: 8
Tentative End Date (mm/dd/yyyy): 07/31/2019
Note: PEI funding is for full-time work, 35 hours per week minimum, and for a period of at least 8 continuous weeks.

Application deadline: January 11, 2019