Madolyn Kelm

✉ mskelm@stanford.edu LinkedIn

OBJECTIVES

- ➢ Ph.D. student in Oceans at Stanford University, specializing in researching the biophysical interactions of kelp aquaculture in Southern California, contributing to optimizing farming productivity through predictive modeling.
- ➢ Pursuing validation of the MacroAlgae Cultivation MODeling System (MACMODS) through the NSF Graduate Research Fellowship to inform sustainable kelp farming practices.
- ➢ Possessing a unique interdisciplinary background for integrating biological and physical dynamics in focused coastal ocean research.
- ➢ Aspiring to contribute to addressing climate change impacts on coastal ecosystems and fostering diversity in STEM as a future professor.

EDUCATION

Stanford University, Stanford, California
Ph.D. Student in Oceans | NSF Graduate Research Fellow — July 2024 - Present

University of California - Irvine, Irvine, California
Masters of Science in Earth Systems Science — September 2022 - June 2024

Willamette University, Salem, Oregon
Bachelor of Arts in Physics, Magna Cum Laude, Phi Beta Kappa — May 2022
Study Abroad | National University of Ireland | Galway — January 2020 - April 2020

SKILLS

- ➢ Fieldwork, Data Collection, and Analysis with Oceanographic Monitoring Instruments: Acoustic Doppler Current Profilers (ADCPs) | Thermistors | Conductivity, Temperature, and Depth Sensors (MicroCTD and MicroCAT CTD) | Submersible Autonomous Nitrate Analyzer (SUNAV) | SOFAR Spotter Buoys
- ➢ Programming: MATLAB| Python | C++ | JupyterHub | Linux OS | Cloud Computing (Jetstream)
- ➢ Lab Skills: Class Four Laser Operation | Goniometer Design and Operation | Scientific Visualization (MACMODS and ULMO model)

SCIENCE RESEARCH AND LAB EXPERIENCE

Graduate Research Student

Stanford University, Stanford, CA July 2024 - Present

University of California Earth System Science Department, Irvine, CA August 2022 - June 2024

- ➢ Partnered and collaborated with kelp farmers at Ocean Rainforest, Inc. and the creators of the MacroAlgae Cultivation MODeling System (MACMODS), a comprehensive model designed to assess the potential for scalable macroalgae cultivation for global carbon sequestration by incorporating farm-scale physical dynamics and growth parameters.
- ➢ Awarded NSF GRFP based on proposed work to validate MACMODS by leveraging well-defined farm-scale physical dynamics and growth parameters collected from field experiments.
- ➢ Collected and analyzed diverse data sets, including nutrient concentrations, stratification, light levels, turbulence strength, and current profiles, to comprehensively assess the physical and biological dynamics within and around the seaweed farms.
- ➢ Utilized 20 years of historical data on ocean stratification and nutrient profiles in the Southern California Bight to comprehensively analyze the El Niño-Southern Oscillation (ENSO) impact on kelp farms. This extensive dataset provided insights into the long-term trends and variations in oceanographic conditions, contributing to a holistic understanding of the region's future resilience and productivity of kelp farms.

Undergraduate Researcher

Willamette University Physics Department, Salem, OR September 2019 - May 2022

- ➢ Developed and optimized an oil/water separator created by laser ablation to find an environmentally friendly solution to ocean oil contamination.
- ➢ Authored a ten-page research proposal outlining our plan for creating an environmentally friendly oil spill clean-up method to preserve ocean biodiversity from detrimental and irreversible oil contamination.
- ➢ Engineered and designed a goniometer, automated by C++, to test the wettability of our oil/water separator in all combinations of water, oil, and air to test the effectiveness of our separators in real-world situations.
- ➢ Wrote and adapted a Python program to extract contact angle data from hydrophobic and hydrophilic laser-ablated surfaces. Collaborated with others on projects such as laser ablation using a class four laser, micro texturing in gases, and switchable wettability.

Undergraduate Researcher

Graduate School of Oceanography University of Rhode Island, Narragansett, RI June 2021 - August 2021

- ➢ Downloaded Visible Infrared Imaging Radiometer Suite (VIIRS) SST dataset to use with ULMO, a probabilistic autoencoder that utilizes a Convolutional Neural Network, to learn the diversity of SST patterns.
- ➢ Collaborated with a fellow researcher and two mentors to deepen our understanding of the ULMO model and how it identifies complex sea surface temperature patterns.

Undergraduate Researcher

Texas A&M Oceanography Department, College Station, TX June 2020 -August 2020

- ➢ Created a JupyterHub within a cloud environment through Jetstream to foster analysis of large data sets used to analyze physical oceanographic properties.
- ➢ Learned the basics of the Linux Operating system, Docker Hub, Jetstream, and XSEDE to support an online collaborative environment to facilitate further research.

AWARDS

NSF Graduate Research Fellowship Program ($159k Research and Academic Stipend) April 2023

- ➢ Awarded prestigious nationwide fellowship based on academic achievement, interdisciplinary research experience, dedication to outreach and teaching, and original research proposal.

Willamette University Swindell's Presidential Scholarship ($10k Research Stipend) May 2021

- ➢ Awarded as one of two university-wide scholars based on academic achievement, outreach, and research project proposal and development.

Willamette University Webber Scholarship ($8k Research Stipend) May 2019

- ➢ Awarded based on academic achievement, leadership, and dedication to mentorship and outreach in underrepresented communities.

PUBLICATIONS

- ➢ Gallmeier, K. M., Prochaska, J. X., Cornillon, P., Menemenlis, D., and **Kelm, M**.: *An evaluation of the LLC4320 global ocean simulation based on the submesoscale structure of modeled sea surface temperature fields, Geosci. Model Dev. Discuss*. [preprint], https://doi.org/10.5194/gmd-2023-39, Accepted, 2023.

PRESENTATIONS

- ➢ Oral Presentations
  - ○ *Modeling Biophysical Interactions of Cultivated Macroalgae in the Southern California Bight*, University of California Irvine Earth System Science Thesis Proposal, June 2023
  - ○ *Fish Scales and Pulsed Lasers to the Rescue: Using Biomimicry of Fish Scales to Design an Environmentally Friendly Mesh to Aid in Oil Spill Clean Up*, Willamette University Student Scholarship Presentation, April 2022.
  - ○ *Exploring Sea Surface Temperature Data Using Machine Learning,* Ocean Sciences Meeting, February 2022
  - ○ *Fish Scales and Pulsed Lasers to the Rescue: Using Biomimicry of Fish Scales to Design an Environmentally Friendly Mesh to Aid in Oil Spill Clean Up*, Willamette University SCRP Symposium, September 2021.
  - ○ *Exploring Sea Surface Temperature Data Using Machine Learning,* University of Rhode Island SURFO Presentation Symposium, August 2022

- *Fish Scales and Pulsed Lasers to the Rescue: Using Biomimicry of Fish Scales to Design an Environmentally Friendly Mesh to Aid in Oil Spill Clean Up*, Willamette University ATEP Senior Thesis Proposal, April 2021.
- *Creation of an Automated Python Program to Characterize Hydrophobic/Oleophilic Surfaces Used in Oil/Water Separation,* Willamette University Student Scholarship Recognition Day, April 2021.
- *Ocean Model Analysis using Jupyter in the Jetstream Cloud,* Pacific NorthWest Virtual Atmospheric, Polar and Ocean Sciences REU Symposium, August 2020

➢ Poster Presentations

- *Predicting the influence of ENSO dynamics on the future of kelp farming in Southern California*, Ocean Sciences Meeting, February 2024
- *The importance of internal tides in Southern California kelp farms*, University of California Environmental Research Symposium, December 2023
- *The importance of internal tides in Southern California kelp farms*, Southern California Biogeochemical Ocean Observations and Modeling Symposium, November 2023
- *The importance of internal tides in Southern California kelp farms*, California Seaweed Festival: Seaweed Speakesy, November 2023
- *Validating MACMODS: Modeling the biological-physical interactions in cultivated macroalgae,* Southern California Biogeochemical Ocean Observations and Modeling Symposium, April 2023
- *Fish Scales and Pulsed Lasers to the Rescue: Using biomimicry of fish scales to design an environmentally friendly mesh to aid in oil spill clean up*, Murdock Trust Foundation Conference for Undergraduate Research, November 2021.

TEACHING EXPERIENCE

Teaching Assistant

University of California Civil and Environment Engineering Department, Irvine, CA April 2023 - June 2023

- ➢ Designed and executed comprehensive lesson plans for weekly discussion sections, aligning content with lecture topics to enhance student understanding.
- ➢ Led engaging and interactive sessions for a cohort of 50 students, fostering a more profound comprehension of course material and contributing to a collaborative learning atmosphere.
- ➢ Conducted regular office hours, offering personalized one-on-one support to students by clarifying course concepts, addressing questions, and providing additional resources.

Colloquium Associate

Willamette University, Salem, OR August 2021 - December 2021

- ➢ Served as a mentor and critical resource by teaching 16 classes to 11 first-year students about different aspects of college life, including academic and personal resources on campus, how to register for class and campus culture to ensure high retention rates, and to aid first-year students in

their transition to college life.

- ➢ Built and fostered a sense of community and belonging among 11 first-year students by connecting one-on-one and in groups and responding to individual needs.
- ➢ Tailored and revamped required lessons to be relevant and engaging for my students.
- ➢ Held weekly office hours for students to be able to advise students and aid students with concerns regarding school, campus life, and personal issues.

National Science Foundation Embedded Tutor

Willamette University Physics and Math Department, Salem, OR September 2019 - December 2020

- ➢ Held 3-4 outside-of-class tutoring hours to facilitate a more focused learning environment to assist with weekly homework and test prep.
- ➢ Attended weekly classes to assist professors and answer questions as needed by students.

LEADERSHIP EXPERIENCE

SoCal BOOM Lead Organizer

University of California, Irvine, CA January 2023 - Present

- ➢ Orchestrated and coordinated all aspects of the Southern California Biogeochemical Ocean Observation and Modeling Symposium by leading the organizational efforts and overseeing a team of professionals and volunteers to ensure the symposium's success.
- ➢ Curated abstracts for speakers and poster presenters, showcasing a diverse range of research by graduate students and postdoctoral researchers. Emphasized the importance of early-career researchers and their contributions to ocean biogeochemical research.
- ➢ Implemented innovative strategies to enhance engagement, fostering a collaborative atmosphere among over 60 participants, including graduate students, postdocs, and faculty members.
- ➢ Adapted the symposium's website and promotional materials to align with the spooky theme, enhancing engagement and creating a memorable experience for attendees.

Physics Club President and Event Coordinator

Willamette University Physics Department, Salem, OR May 2021 - May 2022

- ➢ Planned and organized weekly events by coordinating with external guest speakers and finding activities to enhance knowledge of physics concepts, current research, equity, diversity, and inclusion.
- ➢ Editor, designer, and writer for the bi-weekly newsletter to advertise club events and feature undergraduate research within the department.
- ➢ Composed transparent budgets reflecting the club's needs to encourage engagement and attendance in members.

OUTREACH

SACNAS Mentoría Program

University of California, Irvine, CA September 2023 - Present

- ➢ Provided individualized guidance and mentorship to mentees, offering academic, professional, and personal development support to help them navigate challenges and achieve their goals in STEM.
- ➢ Engaged in mentorship training programs aimed at developing practical mentoring skills tailored for diverse groups. Acquired valuable insights and strategies to support the professional development of individuals from diverse backgrounds in STEM.
- ➢ Demonstrated cultural sensitivity and awareness in mentoring, recognizing the unique experiences and challenges faced by individuals from diverse backgrounds and incorporating these considerations into mentorship strategies.

ESS Graduate and Undergraduate Mentor Program

University of California Earth System Science Department, Irvine, CA September 2023 - Present

- ➢ Guided mentees in navigating the Earth System Science program at UCI, sharing knowledge of its curriculum, requirements, and resources to help students make informed decisions about their academic paths.
- ➢ Offered personalized guidance tailored to each mentee's individual needs and aspirations, addressing specific challenges and fostering a supportive mentor-mentee relationship.
- ➢ Encouraged and motivated mentees to confidently pursue their STEM goals, emphasizing the importance of resilience and perseverance in facing challenges.

Climate, Literacy, Empowerment, and iNquiry (CLEAN) Education

University of California Earth System Science Department, Irvine, CA September 2022 - Present

- ➢ Taught 6th-grade lesson plans regarding ocean science in a local classroom, including lessons on the carbon cycle, biodiversity, and climate change.
- ➢ Coordinated with administrations and other board members to design and implement monthly lessons throughout the school year.

EmpowHER Mentorship and Outreach Program

University of California, Irvine, CA September 2022 - September 2022

- ➢ Conducted an Exploring STEM Majors and Careers Panel for 56 Latina high school students through the Empowering Women through High School Engagement and STEM Research Event.
- ➢ Mentored Latina students interested in STEM, giving guidance on college applications, exploring STEM majors, and how to get involved.

Willamette University Webber Scholar

Willamette University Physics Department, Salem, OR May 2019 - May 2022

- ➢ Mentored and fostered scientific curiosity and understanding in local 5th-grade students and encouraged them to pursue an interest in science, math, and engineering.
- ➢ Designed outreach media and lesson plans appropriate for 5th-grade students about ocean dynamics, pollution, and conservation.