**Future Job Opportunities**

**Current and Future Research**

**Increasing chance of getting into graduate school**

**Ability to integrate programming (apps, data, AI) and Statistics**

**Questions**

1. Your Career and Background
2. How does finding an advisor work
3. Office Space
4. Funding
5. Current number of PhD Students
6. The different fields
7. Role of Technology, Application Development
8. Major Research Questions and Unsolved Problems
9. How can this benefit people
10. Given my background what are some next steps I can take
11. Are there any volunteer opportunities or ways to get involved
12. Can I implement a data analysis/computer science focus in this field
13. What is the current chance of getting an associate professor position
14. What are some positives of this field
15. What are some drawbacks
16. What struggles did you have in your career
17. What is the job market like in the Pacific Northwest
18. How can I increase my chances of getting accepted to grad school
19. How could I be (or people in general) exceptional in this field
20. Who else might be good for me to meet with
21. Volunteering Opportunities
22. Classes
23. Guidance Adviser and potential courses if I can afford them
24. Reaching out to faculty and following up (Funding)
25. Focus on Biology
26. Emphasis on Statistics or Software/Computer Science
27. Sub Disciplines in the College for a Career
28. Career Path
29. How to be good
30. Gaining a Faculty Position
31. Any Recommendations
32. How to get engaged in research
33. How was moving here and not knowing anyone

**Physical Oceanography**

**Research areas include:**

* turbulence and ocean mixing,
* internal waves and nonlinear dynamics
* coastal processes
* climate and large scale dynamics
* physical/biological interactions
* numerical modelling and techniques
* instrumentation development
* ocean observations all over the world (examples include Hawaii, Chile, Spain, Taiwan, NJ, NC, WA and of course Oregon and more)

**Courses**

* OC 515 Oregon Coast Math Camp (P/N) 3
* OC 607 Seminar: CEOAS Student Series 4 (or more)
  + You must register for OC 607 once in each year of your program and give two presentations.
* OEAS 520 The Solid Earth (fall) 4
* OEAS 530 The Fluid Earth (fall) 4
* OEAS 540 The Biogeochemical Earth (winter) 4
* OC 670 Fluid Dynamics 4
* OC 671 Geophysical Fluid Dynamics 4
* OC 672 Theory of Ocean Circulation 4
* OC 673 Descriptive Physical Oceanography 4
* OC 603 Thesis 36 (or more)
* Total 108 (or more)

**Select Research Opportunities for Students**

We have numerous openings for Masters and PhD students. Students interested in all areas of ocean physics, including turbulence, waves, coastal circulation, large-scale circulation, and air-sea interaction and climate, are encouraged to apply.

* El Nino, La Nina and mixing.
  + Ocean Mixing Group faculty and engineers have developed new ways to measure mixing and internal waves on equatorial moorings, neither of which are adequately accounted for in numerical models of ocean circulation, esp. at the equator. These measurements provide us the opportunity to determine their role in important global scale phenomena that originate in the tropics, such as El Nino and La Nina. Important and creative new analyses by exceptional graduate students will play a fundamental role in improving our understanding of equatorial ocean dynamics. (Moum, Nash)
* Oceanic feedbacks to the Madden-Julian Oscillation >DYNAMO.
  + A large, international experiment is planned for fall 2011 (DYNAMO- Dynamics of the Madden-Julian Oscillation) to study how the Madden-Julian Oscillation is formed in the Indian Ocean. Because of the global importance of this phenomenon (for example it is associated with storm activity in the Gulf of Mexico), this first-ever study of the underlying processes will be significant. The Ocean Mixing Group will participate in at-sea studies in the equatorial Indian Ocean. (Moum)
* Oceanic Form Drag.
  + Just as a moving aircraft wing requires thrust to overcome its drag, topographic obstacles exact a force on ocean currents that flow over them. This force takes the name of form drag and is now being measured in the ocean for the first time, by deploying strings of high-resolution pressure sensors across undersea mountain ranges. Exceptional graduate students will help to decipher the physics that contribute to the results. (Moum, Nash)
* Winds, Waves and Headlands.
  + The inner shelf is a poorly explored region, and bridges the expertise of coastal oceanographers and wave dynamicists. It is a region where winds, breaking waves, and periodic stratification all play a role in regulating exchanges of material (plankton, pollutants, etc.), momentum and energy from the coastline to open ocean. Headlands add to the complexity of these regions by focusing wave energy, steering winds and currents, and creating retentive eddies. We seek students to become engaged in a combination of modeling and field experiments to unravel this fascinating region. (Nash, Lerczak, Shearman and Ozkan-Haller)
* Turbulence and internal waves over a Hawaiian reef.
  + Internal tides transport nutrients and larvae in shallow waters, and drive turbulent exchanges as the shoal and waves break. In this project, we investigate how these exchanges occur using new turbulence sensors cabled to shore at the Kilo Nalu nearshore observatory south of Oahu. (Nash)
* Ocean dynamics and climate.
  + On horizontal scales of hundreds to thousands of kilometers, the ocean circulation is a complex, fluctuating mixture of distinct, interacting flow features. These features include: propagating, nonlinear eddy disturbances; vast, slow, coherent gyres; narrow, intense boundary currents; coupled ocean-atmosphere modes. These eddies, gyres, currents, and modes transport heat and matter on global scales, and play essential roles in Earth's climate system. We investigate their intrinsic dynamics and interactions with the climate system using a wide variety of methods, including satellite remote-sensing measurements, and numerical simulation with high-performance computing systems (Chelton, Matano, Miller, Samelson, Strub).
* Coastal ocean modeling and data assimilation.
  + The coastal ocean is a unique environment with special physics and dynamics. It supports highly productive ecosystems and fisheries, and is heavily impacted by human activities. We use high-resolution numerical simulations to study the physics and dynamics of coastal ocean circulation and its interaction with larger-scale ocean circulation, sea-floor topography, and estuarine and terrestrial systems. We develop and use advanced data assimilation methods, similar to those used in numerical weather prediction, to test dynamical hypotheses and to construct and analyze systems for the numerical forecasting of coastal ocean conditions (Allen, Kurapov, Lerczak, Miller, Samelson)

**Physical Oceanography**

Physical oceanography is the study of the physics of the ocean. This encompasses a very broad range of processes that can be characterized by the time and space scales over which they vary. On the rapidly varying end of the scale, there are turbulent eddies with durations of seconds and spatial scales of centimeters. At somewhat longer scales, there are propagating surface and internal gravity waves with periods of seconds to hours and wavelengths of meters to kilometers. Astronomical forces generate tides which propagate on the rotating earth as waves with periods predominantly near 12 and 24 hours and wavelengths of thousands of kilometers. At intermediate scales, there are horizontal eddies, fronts and coastal currents that vary on time scales of days to months and spatial scales of one to hundreds of kilometers. At the slowly varying end of the scale there are wind-forced and thermodynamically driven ocean currents with time scales of days to centuries and spatial scales of tens to thousands of kilometers. Transfers of momentum, heat and salt occur within the ocean and across the air-sea interface on all of these space and time scales.

One of the intriguing aspects of physical oceanography is the overlap and interaction between the various physical processes. For example, processes that occur on very short and intermediate scales determine the water motion, temperature, salinity and other properties on very large scales. Large-scale water properties in the ocean are mixed by turbulent eddies that occur on vertical scales of centimeters and seconds and horizontal scales of kilometers and days. Vertical turbulent mixing can be enhanced by the cascade of energy from internal gravity waves that have vertical and horizontal scales of tens of meters and hours. A primary mechanism for the generation of internal waves is the interaction of ocean tides with bottom topography. It is thus apparent that a comprehensive understanding of the large-scale ocean circulation requires consideration of the full range of physical processes occurring in the ocean.

Physical oceanographic research conducted by OSU faculty includes the development of specialized instrumentation, deployment and retrieval of these instruments at sea and processing of the data collected by the instruments. It also includes analysis and interpretation of the observations within a comprehensive theoretical framework that has been developed over the past century. The vastness of the ocean makes it impractical to measure the ocean directly over the broad range of important space and time scales. In-water observations are therefore supplemented with global satellite-based observations of a large number of oceanographic variables (e.g., the sea surface height, surface currents, sea surface temperature and surface winds). Analytical and numerical models are used to interpret the in-water and satellite observations, yielding an improved understanding of ocean dynamics and thermodynamics. Physical oceanographic observations and models are also used to investigate the interaction between physical oceanography and ocean biology, chemistry and geology, as well as air-sea interaction.

**Specialty**

Air-sea interactions, satellite meteorology and oceanography, atmospheric boundary layer and ocean mixed layer dynamics.

**Current Research**

Currently I am working on characterizing the divergence variability from scatterometer observations. I also am working with colleagues at the Naval Research Laboratory to use numerical weather prediction models to better understand what physical processes shape the observed divergence variability. We are also continuing research into understanding how sea surface temperature variability affects the surface wind field, including the divergence field. Finally, I am also continuing work to understand how clouds and rainfall are affected by variability in the near-surface divergence field.

**Abstract:**

Satellite microwave sensors, both active scatterometers and passive radiometers, have been systematically measuring near-surface ocean winds for nearly 40 years, establishing an important legacy in studying and monitoring weather and climate variability. As an aid to such activities, the various wind datasets are being intercalibrated and merged into consistent climate data records (CDRs). The ocean wind CDRs (OW-CDRs) are evaluated by comparisons with ocean buoys and intercomparisons among the different satellite sensors and among the different data providers. Extending the OW-CDR into the future requires exploiting all available datasets, such as OSCAT-2 scheduled to launch in July 2016. Three planned methods of calibrating the OSCAT-2 σo measurements include 1) direct Ku-band σo intercalibration to QuikSCAT and RapidScat; 2) multisensor wind speed intercalibration; and 3) calibration to stable rainforest targets. Unfortunately, RapidScat failed in August 2016 and cannot be used to directly calibrate OSCAT-2. A particular future continuity concern is the absence of scheduled new or continuation radiometer missions capable of measuring wind speed. Specialized model assimilations provide 30-year long high temporal/spatial resolution wind vector grids that composite the satellite wind information from OW-CDRs of multiple satellites viewing the Earth at different local times.