

# **Moorings metadata from multiple sites in the California Current System starting 2008 (OMEGAS-MaS project, ACIDIC project, OMEGAS-II project)**

**Website:** <https://www.bco-dmo.org/dataset/3647>

**Version:** 28 May 2015

**Version Date:** 2015-05-28

## **Project**

- » [OCEAN ACIDIFICATION - Category 1: COLLABORATIVE RESEARCH: Acclimation and adaptation to ocean acidification of key ecosystem components in the California Current System](#) (OMEGAS-MaS)
- » [The role of calcifying algae as a determinant of rocky intertidal macrophyte community structure at a meta-ecosystem scale](#) (ACIDIC)
- » [OMEGAS II - Linking ecological and organismal responses to the ocean acidification seascape in the California Current System](#) (OMEGAS-II)

## **Programs**

- » [Science, Engineering and Education for Sustainability NSF-Wide Investment \(SEES\): Ocean Acidification \(formerly CRI-OA\)](#) (SEES-OA)
- » [Partnership for Interdisciplinary Studies of Coastal Oceans](#) (PISCO)
- » [Science, Engineering and Education for Sustainability NSF-Wide Investment \(SEES\): Ocean Acidification \(formerly CRI-OA\)](#) (SEES-OA)

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## Dataset Description

Moorings - Metadata

See also: [OMEGAS moorings site page](#)

## Methods & Sampling

Generated by BCO-DMO staff from information on the [OMEGAS moorings site page](#)

## Data Processing Description

Generated by BCO-DMO staff from information on the [OMEGAS moorings site page](#)

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## Data Files

File
<b>Moorings_Metadata.csv</b> (Comma Separated Values (.csv), 3.52 KB) MD5:a98d755d7902cb9d5c2ab94e5e8f65a6 Primary data file for dataset ID 3647

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## Parameters

Parameter	Description	Units
Site	Mooring site	text
Site_Code	Mooring site code	text
Type	Mooring type	text
Latitude	Latitude (South is negative)	dec_degs
Longitude	Longitude (West is negative)	dec_degs
Institutions	Responsible Institutions	text
pH_sensor	pH sensor type	text
pCO2_sensor	pCO2 sensor type	text
Notes	Notes	text

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## Deployments

**PISCO-SH-15-SAMI**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58806">https://www.bco-dmo.org/deployment/58806</a>
<b>Platform</b>	PISCO SH-15 Mooring Array
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-04-11
<b>End Date</b>	2020-01-01
<b>Description</b>	Inner-shelf moorings (15-20 meter depth) See also: OMEGAS moorings site page

#### OMEGAS-FCKX00-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58808">https://www.bco-dmo.org/deployment/58808</a>
<b>Platform</b>	PISCO Fogarty Creek Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-04-17
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

#### OMEGAS-SHLX00-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58807">https://www.bco-dmo.org/deployment/58807</a>
<b>Platform</b>	PISCO Strawberry Hill Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-04-17
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

#### OMEGAS-IBODXX-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58893">https://www.bco-dmo.org/deployment/58893</a>
<b>Platform</b>	Bodega Head State Marine Reserve Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-05-20
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

#### OMEGAS-ILOLXX-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58894">https://www.bco-dmo.org/deployment/58894</a>
<b>Platform</b>	PISCO Lompoc Landing Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-05-05
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

**OMEGAS-ITRPXX-GIFET**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58895">https://www.bco-dmo.org/deployment/58895</a>
<b>Platform</b>	PISCO Terrace Point Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-05-05
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

**OMEGAS-IVDPXX-GIFET**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58896">https://www.bco-dmo.org/deployment/58896</a>
<b>Platform</b>	Van Damme State Park Intertidal Long-Term Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-05-09
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

**OMEGAS-IHOPXX-GIFET**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/472472">https://www.bco-dmo.org/deployment/472472</a>
<b>Platform</b>	PISCO-OMEGAS Hopkins Ecological Research Site
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2012-04-24
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

**OMEGAS-CBLX00-GIFET**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/511592">https://www.bco-dmo.org/deployment/511592</a>
<b>Platform</b>	PISCO Cape Blanco Ecological Time-Series Station
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2012-08-21
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page NOTE: This platform/deployment is shared with the ACIDIC Project as well.

**OMEGAS-ICMDXX-GIFET**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/511596">https://www.bco-dmo.org/deployment/511596</a>
<b>Platform</b>	PISCO Cape Mendocino Ecological Time-Series Station
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2011-05-22
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

#### OMEGAS-KHLX00-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/511600">https://www.bco-dmo.org/deployment/511600</a>
<b>Platform</b>	Kibesillah Hill Ecological Time-Series Station
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2012-04-11
<b>End Date</b>	2020-01-01
<b>Description</b>	Intertidal (surf-zone) station See also: OMEGAS moorings site page

#### OMEGAS-CARX00-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58809">https://www.bco-dmo.org/deployment/58809</a>
<b>Platform</b>	PISCO Cape Arago Ecological Time-Series Station
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2008-04-01
<b>End Date</b>	2020-01-01
<b>Description</b>	surf-zone PAR, chlorophyll fluorescence, and temperature sensors

#### OMEGAS-ISOPXX-GIFET

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/559904">https://www.bco-dmo.org/deployment/559904</a>
<b>Platform</b>	PISCO Soberanes Ecological Time-Series Station
<b>Report</b>	<a href="http://omegas.science.oregonstate.edu/?q=sites">http://omegas.science.oregonstate.edu/?q=sites</a>
<b>Start Date</b>	2013-04-01
<b>End Date</b>	2020-01-01
<b>Description</b>	surf-zone PAR, chlorophyll fluorescence, and temperature sensors

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## Project Information

**OCEAN ACIDIFICATION - Category 1: COLLABORATIVE RESEARCH: Acclimation and adaptation to ocean acidification of key ecosystem components in the California Current System (OMEGAS-MaS)**

**Website:** <http://omegas.science.oregonstate.edu>

**Coverage:** California Current Large Marine Ecosystem, Oregon, California

In 2010-2012/13, the OMEGAS consortium is investigating the impact of ocean acidification (OA) on two ecologically important, calcification-dependent marine invertebrates (sea urchins *Strongylocentrotus purpuratus* and mussels *Mytilus californianus*) in relation to local-to-coastal variation in carbonate chemistry in the California Current Large Marine Ecosystem (CCLME). An interdisciplinary team of investigators with expertise in physical and chemical oceanography, marine ecology, biochemistry, molecular physiology, and molecular genetics carry out integrated, lab and field, multi-site investigations of the ecological, physiological, and evolutionary responses of sea urchins and mussels to spatial and temporal variation in OA.

The research takes place in the context of a mosaic of variable oceanography, including recently documented latitudinal variation in carbonate chemistry along the upwelling-dominated US west coast. Variation in upwelling regimes from Washington to southern California generates spatial and temporal gradients in concentration of CO<sub>2</sub> that shoal to surface waters during upwelling events, extending shoreward into the inner shelf region. Because calcifiers in the upwelling-dominated CCLME probably have historically experienced wide fluctuation in pH, many likely are adapted to a variable carbonate chemistry environment. The new challenge to these organisms is that they may have limited ability to respond to additional increases in CO<sub>2</sub>. It is this challenge, the mechanistic ability of calcifying invertebrates to acclimate or adapt to increasing CO<sub>2</sub> and aragonite saturation states < 1.0, that is addressed in this program.

Our research includes several integrated elements that span our three project areas (Moorings and sensors; Genomics, physiology, and larval rearing; and Field transplants and growth experiments):

(1) Document the oceanographic context in which the study organisms operate in four regions of the CCLME with contrasting upwelling regimes.

(2) Examine physiological, genomic, and genetic mechanisms underlying acclimatization and adaptation to OA conditions with coordinated and integrated studies of adults and larvae of sea urchins and mussels collected from each of two sites within each of the four regions. In common-garden experiments culture sea urchins and mussels, respectively, under different CO<sub>2</sub> and temperature regimes, and use genomics techniques to determine the tolerance of larvae to present and future OA conditions.

(3) Determine evolutionary responses and adaptational potential to OA using genetic surveys of urchins and mussels across the 8 sites and relate detected variability to the oceanographic conditions.

(4) Examine ecological responses to OA with transplants of mussels and urchins in the field and monitor growth rates and shell accretion rates in relation to oceanographic and physical conditions.

The team will investigate the impact of ocean acidification (OA) on two ecologically important, calcification-dependent marine invertebrates (sea urchins *Strongylocentrotus purpuratus* and mussels *Mytilus californianus*) in relation to local-to-coastal variation in carbonate chemistry in the California Current Large Marine Ecosystem (CCLME). An interdisciplinary team of investigators with expertise in physical and chemical oceanography, marine ecology, biochemistry, molecular physiology, and molecular genetics will carry out an integrated, lab and field, multi-site investigation of the ecological, physiological, and evolutionary responses of sea urchins and mussels to spatial and temporal variation in OA. The research will take place in the context of a mosaic of variable oceanography, including recently documented latitudinal variation in carbonate chemistry along the upwelling-dominated US west coast. Variation in upwelling regimes from Washington to southern California generates spatial and temporal gradients in concentration of CO<sub>2</sub> that shoal to surface waters during upwelling events, extending shoreward into the inner shelf region. Because calcifiers in the upwelling-dominated CCLME probably have historically experienced wide fluctuation in pH, many likely are adapted to a variable carbonate chemistry environment. The new challenge to these organisms is that they may have limited ability to respond to additional increases in CO<sub>2</sub>. It is this challenge, the mechanistic ability of calcifying invertebrates to acclimate or adapt to increasing CO<sub>2</sub> and decreasing carbonate mineral saturation state, that is addressed in this project.

The OMEGAS Moorings and Sensors team will document the oceanographic context in which the study organisms operate in four regions of the CCLME with contrasting upwelling regimes. This project also coordinates closely with other OMEGAS projects [(i) Genetics, physiology, larval rearing and (ii) Field transplants] to achieve goals of the project to determine acclimatization and adaptational capacity to present and future OA conditions .

## **PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH**

Gaylord, B., T. M. Hill, E. Sanford, E. A. Lenz, L. A. Jacobs, K. N. Sato, A. D. Russell, and A. Hettinger. "Functional impacts of ocean acidification in an ecologically critical foundation species", *Journal of Experimental Biology*, v.214, 2011, p. 2586.

Howarth, R., F. Chan, D. J. Conley, S. C. Doney, R. Marino, and G. Billen. "Coupled biogeochemical cycles: eutrophication and hypoxia in temperate estuaries and coastal marine ecosystems", *Frontiers in Ecology and the Environment*, v.9, 2011, p. 18.

Yu, P. D., P. G. Matson, T. R. Martz, and G. E. Hofmann. "The ocean acidification seascape and its relationship to the performance of calcifying marine invertebrates: laboratory experiments on the development of urchin larvae framed by environmentally-relevant pCO<sub>2</sub>/pH", *Journal of Experimental Marine Biology and Ecology*, v.400, 2011, p. 288.

## **The role of calcifying algae as a determinant of rocky intertidal macrophyte community structure at a meta-ecosystem scale (ACIDIC)**

**Coverage:** US West Coast; North bounding latitude: 45.00N, South bounding latitude: 38.00N

### **Algal Communities in Distress: Impacts and Consequences (ACIDIC)**

Environmental stress models have recently been modified to incorporate the influence of facilitation to join negative effects such as predation, competition, and abiotic stress as determinants of community structure. Nevertheless, our empirical understanding of the processes that regulate the expression of facilitation effects across systems and the potential for facilitation to amplify or dampen the ecological consequences of climate change remains limited. This project focuses on facilitation dynamics in the broader meta-ecosystem concept, which hypothesizes that variation among communities depends not only on locally-varying species interactions and impacts of abiotic factors such as environmental stress and physical disturbance but also on regionally- and globally-varying ecosystem processes such as dispersal and flows of materials such as nutrients and carbon. The investigators will study the influence of a potentially critical facilitative interaction between coralline algal turfs and canopy-forming macrophytes including kelps and surfgrass in a rocky intertidal meta-ecosystem. The research will be conducted in a climate change context, with a focus on how the macrophyte-coraline interaction is influenced by ocean conditions, including factors driven by variable upwelling (temperature, nutrients, phytoplankton abundance, and light) and increases in ocean acidification, which vary in a mosaic pattern along the coast of the northern California Current (NCC) in Oregon and northern California.

The goal of the project is to test the hypothesis that the coralline turf-macrophyte canopy interaction is a cardinal interaction in the determination of low rocky intertidal community structure, and that disruption of this interaction would dramatically alter the structure and function of this kelp- and surfgrass-dominated assemblage. The project will take advantage of, and enhance, a research platform established across 17 sites spanning ~800 km in the NCC coastal meta-ecosystem with prior NSF funding that will at each site: (1) quantify ocean conditions, including temperature, nutrients, phytoplankton, light (PAR), and carbonate chemistry to document the response of community structure oceanographic variation across a meta ecosystem mosaic; (2) carry out field experiments testing the nature of the interaction between coralline algal turfs (primarily *Corallina vancouveriensis*) and dominant canopy species, the kelp *Saccharina sessile* and the surfgrass *Phyllospadix scouleri*; and (3) carry out laboratory experiments focusing on the mechanism of the interaction, specifically testing the effects of carbonate chemistry, light, temperature, and nutrients. Component (1) will employ both remote sensors deployed in the intertidal (fluorometers, thermal sensors, PAR sensors, and a recently developed pH sensor) and direct sampling (nutrients, phytoplankton, pCO<sub>2</sub>, and pH) to quantify the in situ exposure regime of benthic primary producers to resources, energy, and environmental stress across spatial scales. These metrics will be combined with a newly developed index for quantifying local-scale variation in upwelling intensity to characterize the linkages between climate forcing and ecosystem state. Coupling oceanography with our field and laboratory experiments will provide unique and valuable insights into how the current state of rocky intertidal ecosystems is likely to be altered in the future.

**Intellectual Merit.** The project will contribute one of the first studies to test the community consequences of varying upwelling and CO<sub>2</sub> across an ecosystem scale. How these factors alter the direct and indirect interactions of key species is of fundamental importance in our efforts to learn how field ecosystems will respond to climate change. Such knowledge is crucial to our efforts to manage and conserve marine communities facing human-induced variation in climate.



## **OMEGAS II - Linking ecological and organismal responses to the ocean acidification seascape in the California Current System (OMEGAS-II)**

**Website:** <http://omegas.science.oregonstate.edu>

**Coverage:** California Current Large Marine Ecosystem, Oregon, California

### *Project abstract:*

This project is a renewal of an existing ocean acidification (OA) grant supporting an interdisciplinary research team (called OMEGAS) with expertise in oceanography, ecology, biogeochemistry, molecular physiology, and molecular genetics. Research to date has documented a dynamic oceanographic mosaic in the inner shelf of the California Current System (CCS) that spans 1,200+ km and varies at tidal, diurnal, event, and seasonal temporal scales at local to ocean basin spatial scales. In OMEGAS II, the project seeks to better understand the drivers of this striking time-space variability, and to link the OA seascape to the physiological and ecological performance of a key member of this ecosystem, the mussel *Mytilus californianus*. In addition, the investigators will explore the influence of this oceanographic mosaic on species interactions and community organization. As a dominant habitat-forming species, strong interactor, and major space occupant, *M. californianus* is arguably the core component of the rocky intertidal ecosystem along the upwelling-dominated CCS. Using an interdisciplinary, spatially extensive approach integrating inner shelf oceanography with ecology, physiology, and eco-mechanics, the interdisciplinary team will study the response of juvenile mussels *M. californianus* to OA. The studies span levels of biological organization, thereby allowing assessment of how the cost of forming a shell under field conditions might influence physiological performance and resistance to predation. This investigation will include modeling to link to larger-scale ecosystem and oceanographic dynamics in the CCS and beyond.

Results from OMEGAS I show that the growth, survival, and shell strength of mussel larvae are strongly negatively affected by elevated pCO<sub>2</sub>, and that growth of adult mussels varied among sites within regions and between regions. Emerging data on natural variability in seawater conditions will allow a deeper exploration of the organismal response of *M. californianus*, and the ecological consequences of traits, such as reduced shell thickness and strength. The present project will expand and strengthen the existing oceanographic network to increase our understanding of the coastal OA regime, and provide the environmental context for ecological and physiological research. Specifically, this project will (1) conduct field and laboratory experiments on the influence of OA on the growth, shell accretion, and resistance to predation of juvenile mussels collected from 10 sites spanning 1,400 km of coastline, (2) link the OA-sensor oceanographic "backbone" to an existing database of community structure via ecological modeling to assess the influence of OA on coastal variation in community organization, (3) determine the physiological responses of juvenile mussels following field deployments and culture under common garden conditions to evaluate mechanistic underpinnings to the responses observed in mussels from different sites, (4) explore the physiological and transcriptomic response of mussels in lab mesocosms to field-documented variability in pCO<sub>2</sub>, and (5) using modified ROMS models, evaluate the linkage between basin-scale oceanography and local-scale variation in inner-shelf oceanography to evaluate the relative influences of large-to-local scale factors on OA variability. This research aims to understand how coastal ecosystems will respond to OA, and thus to develop our capacity to predict the future impact of OA on coastal ecosystems.

### **PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH**

Hettinger, A., E. Sanford, T. M. Hill, J. D. Hoffelt, A. D. Russell, and B. Gaylord.. "The influence of food supply on the response of *Olympia* oyster larvae to ocean acidification.," *Biogeosciences*, v.10, 2013, p. 6629.

Hettinger, A., E. Sanford, T.M. Hill, E.A. Lenz, A.D. Russell, and B. Gaylord. "Larval carry-over effects from ocean acidification persist in the natural environment.," *Global Change Biology*, 2013.

Hofmann, G. E., T. G. Evans, M. W. Kelly, J. L. Padilla-Gamiño, C. A. Blanchette, L. Washburn, F. Chan, M. A. McManus, B. A. Menge, B. Gaylord, T. M. Hill, E. Sanford, M. LaVigne, J. M. Rose, L. Kapsenberg, and J. M. Dutton.. "Exploring local adaptation and the ocean acidification seascape ? studies in the California Current Large Marine Ecosystem.," *Biogeosciences Discussions*, v.10, 2013, p. 11825.

LaVigne, M. T.M. Hill, E. Sanford, B. Gaylord, A.D. Russell, E.A. Lenz, J.D. Hoffelt, M.K. Young.. "The elemental composition of purple sea urchin (*Strongylocentrotus purpuratus*) calcite and potential effects of pCO<sub>2</sub> during early life stages.," *Biogeosciences*, v.10, 2013, p. 3465.

Pespeni, M.H., E. Sanford, B. Gaylord, T. M. Hill, J. D. Hoffelt, H. Jaris, M. LaVigne, E. A. Lenz, A. D. Russell, M. K. Young, S. R. Palumbi. "Evolutionary change during experimental ocean acidification.," *Proceedings National Academy of Sciences*, v.110, 2013, p. 6937.

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## **Program Information**

### **Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)**

**Website:** [https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503477](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477)

**Coverage:** global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF ([https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=504707](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707)).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

#### **Solicitations issued under this program:**

[NSF 10-530](#), FY 2010-FY2011

[NSF 12-500](#), FY 2012

[NSF 12-600](#), FY 2013

[NSF 13-586](#), FY 2014

NSF 13-586 was the final solicitation that will be released for this program.

#### **PI Meetings:**

[1st U.S. Ocean Acidification PI Meeting](#) (March 22-24, 2011, Woods Hole, MA)

[2nd U.S. Ocean Acidification PI Meeting](#) (Sept. 18-20, 2013, Washington, DC)

3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA – Tentative)

#### **NSF media releases for the Ocean Acidification Program:**

[Press Release 10-186 NSF Awards Grants to Study Effects of Ocean Acidification](#)

[Discovery Blue Mussels "Hang On" Along Rocky Shores: For How Long?](#)

[Discovery nsf.gov - National Science Foundation \(NSF\) Discoveries - Trouble in Paradise: Ocean Acidification This Way Comes - US National Science Foundation \(NSF\)](#)

[Press Release 12-179 nsf.gov - National Science Foundation \(NSF\) News - Ocean Acidification: Finding New Answers Through National Science Foundation Research Grants - US National Science Foundation \(NSF\)](#)

[Press Release 13-102 World Oceans Month Brings Mixed News for Oysters](#)

[Press Release 13-108 nsf.gov - National Science Foundation \(NSF\) News - Natural Underwater Springs Show How Coral Reefs Respond to Ocean Acidification - US National Science Foundation \(NSF\)](#)

[Press Release 13-148 Ocean acidification: Making new discoveries through National Science Foundation research grants](#)

[Press Release 13-148 - Video nsf.gov - News - Video - NSF Ocean Sciences Division Director David Conover](#)

[answers questions about ocean acidification. - US National Science Foundation \(NSF\)](#)

[Press Release 14-010 nsf.gov - National Science Foundation \(NSF\) News - Palau's coral reefs surprisingly resistant to ocean acidification - US National Science Foundation \(NSF\)](#)

[Press Release 14-116 nsf.gov - National Science Foundation \(NSF\) News - Ocean Acidification: NSF awards \\$11.4 million in new grants to study effects on marine ecosystems - US National Science Foundation \(NSF\)](#)

## **Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)**

**Website:** <http://www.piscoweb.org/>

**Coverage:** West coast of North America from Mexico to Alaska

The Partnership for Interdisciplinary Studies of Coastal Oceans is a long-term ecosystem research and monitoring program established with the goals of:

- understanding dynamics of the coastal ocean ecosystem along the U.S. west coast
- sharing that knowledge so ocean managers and policy makers can make science based decisions regarding coastal and marine stewardship
- producing a new generation of scientists trained in interdisciplinary collaborative approaches

Over the last 10 years, PISCO has successfully built a unique research program that combines complementary disciplines to answer critical environmental questions and inform management and policy. Activities are conducted at the latitudinal scale of the California Current Large Marine Ecosystem along the west coast of North America, but anchored around the dynamics of coastal, hardbottom habitats and the oceanography of the nearshore ocean - among the most productive and diverse components of this ecosystem. The program integrates studies of changes in the ocean environment through ecological monitoring and experiments. Scientists examine the causes and consequences of ecosystem changes over spatial scales that are the most relevant to marine species and management, but largely unstudied elsewhere.

Findings are linked to solutions through a growing portfolio of tools for policy and management decisions. The time from scientific discovery to policy change is greatly reduced by coordinated, efficient links between scientists and key decision makers.

Core elements of PISCO are:

- Interdisciplinary ecosystem science
- Data archiving and sharing
- Outreach to public and decision-making user groups
- Interdisciplinary training
- Coordination of distributed research team

Established in 1999 with funding from The David and Lucile Packard Foundation, PISCO is led by scientists from core campuses Oregon State University (OSU); Stanford University's Hopkins Marine Station; University of California, Santa Cruz (UCSC); and University of California, Santa Barbara (UCSB). Collaborators from other institutions also contribute to leadership and development of PISCO programs. As of 2005, core PISCO activities are funded by collaborative grants from The David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation. Core support, along with additional funding from diverse public and private sources, make this unique partnership possible.

## **Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)**

**Website:** [https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503477](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477)

**Coverage:** global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF ([https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=504707](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707)).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

**Solicitations issued under this program:**

[NSF 10-530](#), FY 2010-FY2011

[NSF 12-500](#), FY 2012

[NSF 12-600](#), FY 2013

[NSF 13-586](#), FY 2014

NSF 13-586 was the final solicitation that will be released for this program.

**PI Meetings:**

[1st U.S. Ocean Acidification PI Meeting](#) (March 22-24, 2011, Woods Hole, MA)

[2nd U.S. Ocean Acidification PI Meeting](#) (Sept. 18-20, 2013, Washington, DC)

3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA - Tentative)

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## Funding

<b>Funding Source</b>	<b>Award</b>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041260</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041222</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041089</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041240</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1061233</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041244</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041229</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041075</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1220372</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1220363</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1220412</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1220338</a>

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