

Autonomous Underwater Vehicle Monterey Bay Time Series - AUV Dorado from AUV Dorado in Monterey Bay from 2003-2009 (C-MORE project, Prochlorococcus project)

Website: <https://www.bco-dmo.org/dataset/3417>

Version: 26 January 2011

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Project

» [Center for Microbial Oceanography: Research and Education](#) (C-MORE)

» [The Ecology of Prochlorococcus: Toward a Model System for Microbial Oceanography](#) (Prochlorococcus)

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Dataset Description

[MBARI AUVs](#)

Methods & Sampling

[MBARI AUVs](#)

Data Processing Description

[MBARI AUVs](#)

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Parameters

Parameters for this dataset have not yet been identified

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Deployments

AUV_Monterey_Bay_Time_Series_Dorado

Website	https://www.bco-dmo.org/deployment/58642
Platform	AUV Dorado
Start Date	2003-01-01
End Date	2099-01-01
Description	MBARI AUVs

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Project Information

Center for Microbial Oceanography: Research and Education (C-MORE)

Website: <http://cmore.soest.hawaii.edu/>

Coverage: North Pacific Subtropical Gyre (large region around 22 45 N, 158 W)

Project summary

The **Center for Microbial Oceanography: Research and Education** (C-MORE) is a recently established (August 2006; NSF award: EF-0424599) NSF-sponsored Science and Technology Center designed to facilitate a more comprehensive understanding of the diverse assemblages of microorganisms in the sea, ranging from the genetic basis of marine microbial biogeochemistry including the metabolic regulation and environmental controls of gene expression, to the processes that underpin the fluxes of carbon, related bioelements and energy in the marine environment. Stated holistically, C-MORE's primary mission is: *Linking Genomes to Biomes*.

We believe that the time is right to address several major, long-standing questions in microbial oceanography. Recent advances in the application of molecular techniques have provided an unprecedented view of the structure, diversity and possible function of sea microbes. By combining these and other novel approaches with more well-established techniques in microbiology, oceanography and ecology, it may be possible to develop a meaningful predictive understanding of the ocean with respect to energy transduction, carbon sequestration, bioelement cycling and the probable response of marine ecosystems to global environmental variability and climate change. The strength of C-MORE resides in the synergy created by bringing together experts who traditionally have not worked together and this, in turn, will facilitate the creation and dissemination of new knowledge on the role of marine microbes in global habitability.

The new Center will design and conduct novel research, broker partnerships, increase diversity of human resources, implement education and outreach programs, and utilize comprehensive information about microbial life in the sea. The Center will bring together teams of scientists, educators and community members who otherwise do not have an opportunity to communicate, collaborate or design creative solutions to long-term ecosystem scale problems. The Center's research will be organized around four interconnected themes:

- (Theme I) microbial biodiversity,
- (Theme II) metabolism and C-N-P-energy flow,
- (Theme III) remote and continuous sensing and links to climate variability, and
- (Theme IV) ecosystem modeling, simulation and prediction.

Each theme will have a leader to help coordinate the research programs and to facilitate interactions among the other related themes. The education programs will focus on pre-college curriculum enhancements, in service teacher training and formal undergraduate/graduate and post-doctoral programs to prepare the next generation of microbial oceanographers. The Center will establish and maintain creative outreach programs to help diffuse the new knowledge gained into society at large including policymakers. The Center's activities will be dispersed among five partner institutions:

- Massachusetts Institute of Technology,
- Woods Hole Oceanographic Institution,

- Monterey Bay Aquarium Research Institute,
- University of California at Santa Cruz and
- Oregon State University

and will be coordinated at the University of Hawaii at Manoa.

Related Files:

[Strategic plan \(PDF file\)](#)

The Ecology of Prochlorococcus: Toward a Model System for Microbial Oceanography (Prochlorococcus)

Coverage: BATS and HOT station ALOHA

The goal was to collect long-term, high-resolution data on the temporal and spatial variability of Prochlorococcus ecotypes in the Pacific and Atlantic Oceans. The abundance of five Prochlorococcus ecotypes was determined by quantitative PCR at 12 depths every month for 5 years at two locations.

The work was done in coordination with NSF-funded Bermuda Atlantic Time Series (BATS) and Hawaii Ocean Time-series (HOT), but not officially affiliated with these programs.

Geolocation:

BATS location (5 nautical mile radius around 31 40'N, 64 10'W)

HOT Station ALOHA (5 nautical mile radius around 22 45'N, 158 00' W)

References:

Temporal dynamics of Prochlorococcus ecotypes in the Atlantic and Pacific oceans. Rex R Malmstrom, Allison Coe, Gregory C Kettler, Adam C Martiny, Jorge Frias-Lopez, Erik R Zinser, Sallie W Chisholm. The ISME Journal 4, 1252-1264 (13 May 2010) doi:10.1038/ismej.2010.60 [Link to paper](#)

Original Project Abstract:

The power of a model system for advancing our understanding of the natural world has been proven repeatedly in diverse sub-disciplines of science. This approach is equally valuable for the study of marine microbial ecology, either through the sustained study of a particular ecosystem, or through the study of a particular organism at all scales of organization from the genome to the ecosystem level. In this project the investigators will do the latter through a diverse set of laboratory and field studies designed to advance the understanding of Prochlorococcus, the numerically dominant phytoplankter in the world oceans. The objective is to understand what regulates the distribution and abundance of this important primary producer. Prochlorococcus has a number of features that make it a useful model organism for understanding the forces that shape marine microbial systems, and for generating hypotheses that will advance the field of Microbial Oceanography. It is the smallest and most abundant photosynthetic cell in the oceans, it can be isolated into culture, and it can be easily enumerated and studied in situ. Furthermore, it has the smallest genome of any known photosynthetic cell -- the minimal phototroph to date. Prochlorococcus is really a collection of "ecotypes", i.e., closely related but physiologically distinct populations that co-exist with different distributions along the light, temperature, nutrient, and predator (including viruses) gradients that shape their habitat. These distributions are determined by the relative fitness of the cells, i.e. the balance of growth rates and death rates along these gradients. The broad challenge is to understand the forces that have shaped this microdiversity over evolutionary time, and that guide the self-organization of these populations under different selective regimes. This is a multi-dimensional project designed to understand the "bottom up" (growth limitation by light, temperature, oxygen, and nutrients) and "top down" (mortality from viruses and grazing) influences on the population growth of different Prochlorococcus ecotypes through both laboratory and field studies. The project will involve high-throughput studies of the growth of ecotypes along gradients of environmental variables in the laboratory, as well as studies of the distribution of ecotypes along spatial and temporal gradients in the field (at the Hawaii and Bermuda Time Series Stations, along a longitudinal Atlantic transect, and in Oxygen Minimum Zones in the Arabian Sea and Peruvian Upwelling) using Q-PCR to assess their relative

abundance. The investigators will also study the life cycle of viruses that infect *Prochlorococcus* and cross infect between ecotypes, and the growth and mortality rates of specific ecotypes in field samples due to grazing pressure. Another set of analyses will measure the full diversity of co-occurring *Prochlorococcus* in selected field samples, and work toward understanding at what level genetic diversity corresponds to ecologically meaningful diversity. Finally, the study will develop statistical methods for the characterization and analysis of *Prochlorococcus* ecotype "fitness spaces" established in the laboratory, and compare them with the distribution of ecotypes along environmental gradients in the field. This will allow a rigorous analysis of the degree to which different selective pressures shape the relative abundance of the different *Prochlorococcus* ecotypes in the oceans, and how they change over time and space.

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Funding

Funding Source	Award
NSF Division of Biological Infrastructure (NSF DBI)	DBI-0424599
David and Lucile Packard Foundation (Packard)	unknown AUV_MontereyBay Packard

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