Processed first profiles of sensor data from AUV Clio taken on R/V Atlantic Explorer (C-CoMP AE2504 expedition) from St. Georges, Bermuda to Woods Hole, MA in March 2025

Website: https://www.bco-dmo.org/dataset/1011381
Version: 1
Version Date: 2026-11-09

Project
» C-CoMP Cruise AE2504 (C-CoMP Cruise AE2504)

Program
» Center for Chemical Currencies of a Microbial Planet (C-CoMP)

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Abstract
This is the data associated with Clio, an Autonomous Underwater Vehicle (AUV) focused on biogeochemical sampling. Deployed on the R/V Atlantic Explorer C-CoMP AE2504 expedition from St. Georges, Bermuda to Woods Hole, Ma that occurred in March 2025. The dataset contains processed profiling sensor data from the initial vehicle descent (i.e., the “first profile”). This profile data contains all sensors binned into 0.5 m depth increments.

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Methods & Sampling

The AE2504 cruise contains Clio dives 051-054. Each dive has a processed first profile, which includes processed data from the first descent to maximum depth for a particular dive.

Oboard sensors include: CTD (SBE 49 FastCAT CTD), fluorometer (Wetlabs Fluorometer FLNTURTD-3151), optode (AANDERAA Oxygen Optode 4831), SUNA nitrate sensor (SUNA V2 - Submersible Ultraviolet Nitrate Analyzer) and transmissometer (SEA-BIRD SCIENTIFIC C-Star Transmissometer) and a Suspended Particulate Rosette Sampler (SUPR)

Data Processing Description

This profile data contains all sensors interpolated onto the same time base, binned into 0.5 m depth increments.

Problem Description

Suna V2 was out of calibration

The Bushbaby SUPR pump was not functional for clio051, clio052, and clio054. On clio053, the pump was functional for 2 out of the 10 attempted samples.

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Related Publications

Jakuba, M., Breier, J., & Dalpe, A. (2026). Clio Operations on AE2504-SE (, Ed.). Woods Hole Oceanographic Institution. https://doi.org/10.1575/1912/73164
Results

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Parameters

Parameters for this dataset have not yet been identified

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	AUV Clio
Generic Instrument Description	Clio is an autonomous underwater vehicle (AUV) created to accomplish the dual goals of global ocean mapping and biochemistry sampling. The ability to sample dissolved and particulate seawater biochemistry across ocean basins while capturing fine-scale biogeochemical processes sets it apart from other AUVs. Clio is designed to efficiently and precisely move vertically through the ocean, drift laterally to observe water masses, and integrate with research vessel operations to map large horizontal scales up to a depth of 6,000 meters. More information is available at https://www2.whoi.edu/site/deepsubmergencelab/clio/

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Deployments

AE2504

Website	https://www.bco-dmo.org/deployment/1002147
Platform	R/V Atlantic Explorer
Report	https://doi.org/10.5281/zenodo.15642894
Start Date	2025-03-09
End Date	2025-03-21
Description	The purpose of cruise AE2504 was to compare diel marine microbial dynamics in an oligotrophic region with a more productive region under spring bloom conditions in the North Atlantic. See more information at R2R: https://www.rvdata.us/search/cruise/AE2504

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Project Information

C-CoMP Cruise AE2504 (C-CoMP Cruise AE2504)

Website: https://ccomp-stc.org/

Coverage: North Atlantic

The purpose of cruise AE2504 was to compare diel marine microbial dynamics in an oligotrophic region with a more productive region under spring bloom conditions in the North Atlantic. Two stations were selected: the Bermuda Atlantic Time-series Study site (BATS) near Bermuda and the southernmost station of the New England Shelf Long-Term Ecological Research site west of Connecticut (NES-LTER station L11). At each station, we conducted diel sampling near the surface (15 meters (m) depth) and placed these samples into context with hydrographic profiles (200 – 1500 m max depth), underway sampling along the cruise track, targeted incubations, and large-volume sampling from the autonomous water sampler Clio. We used Surface Velocity Program (SVP) drifters to follow and sample from the same water mass at 15 m over the diel sampling period at each station. The following datasets were collected: ship data, CTD data, carbonate chemistry conditions, nutrient concentrations, total organic carbon and dissolved organic carbon concentrations, cell abundances, respiration rates, drifter tracks, and Clio sensor data. Water/filter samples were collected from CTD casts, Clio, and incubations for the following 'omics analyses: metagenomics, metatranscriptomics, metabolomics, and proteomics. The routine environmental sensor data collected from the R/V Atlantic Explorer during AE2504 is available from the rolling deck to repository (R2R): 10.7284/911163. The cruise report is available on Zenodo: https://doi.org/10.5281/zenodo.15642894.

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Program Information

Center for Chemical Currencies of a Microbial Planet (C-CoMP)

Website: https://ccomp-stc.org/

Coverage: North Atlantic, BATS, global/other

Functions carried out by microscopic inhabitants of the surface ocean affect every aspect of life on our planet, regardless of distance from the coast. Ocean phytoplankton are responsible for half of the photosynthesis on Earth, the first step in a complex system that annually withdraws 50 billion metric tons of carbon from the atmosphere to sustain their growth. Of this, 25 billion metric tons participate in a rapid cycle in which biologically reactive material is released into seawater and converted back into carbon dioxide by marine bacteria within hours to days. The chemical-microbe network at the heart of this fast cycle remains poorly

constrained; consequently, its primary currencies and controls remain elusive; its sensitivities to changing ocean conditions are unknown; and its responses to future climate scenarios are not predictable. The Center for Chemical Currencies of a Microbial Planet (C-CoMP) integrates research, education and knowledge transfer activities to develop a mechanistic understanding of surface ocean carbon flux within the context of a changing ocean and through increased participation in ocean sciences. C-CoMP supports science teams that merge biology, chemistry, modeling, and informatics to close long-standing knowledge gaps in the identities and dynamics of organic molecules that serve as the currencies of elemental transfer between the ocean and atmosphere. C-CoMP fosters education, outreach, and knowledge transfer activities that engage students of all ages, broaden participation in the next generation of ocean scientists, and extend novel open-science approaches into complementary academic and industrial communities. The Center framework is critical to this mission, uniquely facilitating an open exchange of experimental and computational science, methodological and conceptual challenges, and collaborations that establish integrated science and education partnerships. With expanded participation in ocean science research and ocean literacy across the US society, the next generation of ocean scientists will better reflect the diverse US population.

Climate-carbon feedbacks on the marine carbon reservoir are major uncertainties for future climate projections, and the trajectory and rate of ocean changes depend directly on microbial responses to temperature increases, ocean acidification, and other perturbations driven by climate change. C-CoMP research closes an urgent knowledge gap in the mechanisms driving carbon flow between ocean and atmosphere, with global implications for predictive climate models. The Center supports interdisciplinary science teams following open and reproducible science practices to address: (1) the chemical currencies of surface ocean carbon flux; (2) the structure and regulation of the chemical-microbe network that mediates this flux; and (3) sensitivity of the network and its feedbacks on climate. C-CoMP leverages emerging tools and technologies to tackle critical challenges in these themes, in synergy with existing ocean programs and consistent with NSF’s Big Ideas. C-CoMP education and outreach activities seek to overcome barriers to ocean literacy and diversify participation in ocean research. The Center is developing (1) initiatives to expand ocean literacy in K-12 and the broader public, (2) ocean sciences undergraduate curricula and research opportunities that provide multiple entry points into research experiences, (3) post-baccalaureate programs to transition undergraduates into graduate education and careers in ocean science, and (4) interdisciplinary graduate student and postdoctoral programs that prepare the next generation of ocean scientists. The C-CoMP team includes education faculty who evaluate the impacts of education and outreach activities and export successful STEM initiatives to the education community. C-CoMP is revolutionizing the technologies for studying chemical transformations in microbial systems to build understanding of the outsized impact of microbes on elemental cycles. Open science, cross-disciplinary collaborations, community engagement, and inclusive practices foster strategic advances in critical science problems and STEM initiatives. C-CoMP science, education, and knowledge-transfer themes are efficiently addressed through a sustained network of scientists addressing critical research challenges while broadening the workforce that will tackle multi-disciplinary problems with academic, industrial and policy partners.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

The Program's Data Management Plan (DMP) is available as a PDF document.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2019589

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