Biogeochemical (BGC) Argo and the Global Ocean Biogeochemistry (GO-BGC) Array

BGC Argo is an international program designed to observe key biogeochemical parameters globally using an array of profiling floats, and it is one of the three pillars of the OneArgo array alongside Core and Deep. The US National Science Foundation (NSF) has invested heavily in developing the BGC-Argo array over the past decade, first through SOCCOM in the Southern Ocean, and then globally through GO-BGC. In particular, the GO-BGC project is on target to deploy its 500th BGC-Argo float by the end of 2026, playing a critical role in establishing the global array.

These NSF investments have opened a door for a new era of ocean discovery and innovation through a global, standardized, open data set. However, with the end of US support after 2026, and insufficient international funding to sustain the global effort, the array will start to degrade after the last GO-BGC deployments occur in early 2027, compromising our ability to observe the ocean in a rapidly changing world.

This document is in response to the NSF's Dear Colleague Letter for ocean observing priorities. It sets out the key characteristics we believe ocean observing infrastructure supported by NSF should have, and describes how BGC-Argo exemplifies them. It is offered as a resource for members of the community preparing their own responses.

Key characteristics for ocean observing infrastructure:

Support NSF ocean science objectives and accelerate discovery and innovation. Community supported science priorities are identified in *Forecasting the Ocean: 2025-2035 Decade of Ocean Science* (National Academies, 2025). We highlight key recommendations relevant to BGC-Argo.

- NSF supported infrastructure should enable basic research that improves our ability to forecast ocean processes, with emphasis on heat and carbon fluxes, ecosystem response to a changing Earth system, and extreme events and their associated impacts (Recommendation 2.2). BGC-Argo supports research across all three themes by supplying collocated, in situ measurements for up to eight different parameters, and providing the foundation that global gap-filling and machine-learning products are built on. Such products are rapidly improving our ability to quantify changes in interior oxygen, nutrient, and carbon content, primary production and export, and the drivers of ecosystem response, and it continues to deliver observations through extreme events such as marine heat waves, ENSO, and storms.
- NSF should "explicitly support the increased use of autonomous assets for making sustained observations" (Recommendation 4.4). Autonomous assets also increase the efficiency of oceanographic expeditions by extending a vessel's footprint while at sea. BGC-Argo provides sustained, global observations of key biogeochemical parameters, and can supply environmental context for process studies and extend their results beyond the duration of their campaign through float-derived proxies.

Support Agency priorities. Agency priorities have been outlined in the NSF FY 2026-2030 Strategic Plan and the FY 2027 Administration R&D Priorities (OMB M-25-34).

- Agency priorities emphasize use of artificial intelligence. BGC-Argo data are well suited for AI and machine learning applications due to their timely delivery of science-ready data in a standardized format, uniform quality-control protocols, and quasi-random global coverage.
- Polar research is an explicit priority in FY 2027. BGC-Argo floats have been operating under seasonal sea ice near Antarctica for over a decade, returning wintertime observations from regions that ships effectively cannot reach. Core-Argo floats are operated in the Arctic Ocean; modest investment in engineering development would enable expansion of BGC-Argo to the Arctic.

Operate synergistically with other large Federal and international efforts. Observing infrastructure is most effective when systems work synergistically to amplify one another.

- *OneArgo*: NSF-funded BGC floats are part of the international OneArgo array, and have contributed 34% of new temperature and salinity data of the US Argo array over the past 5 years, supporting operational weather and ocean prediction.
- *GO-SHIP and GLODAP*: repeat hydrography cruises and synthesis efforts of those data are the backbone of the global biogeochemical observing system. BGC-Argo depends on them to adjust several parameters, and to deploy floats with high-quality shipboard measurements for data validation. In return, the float array fills in the spatiotemporal gaps between decadal surveys, resolving changes on societally relevant timescales (e.g. seasonal to interannual) that ships alone cannot.
- *SOCAT*: Surface CO_2 observations from ships and moorings provide critical observational constraints on the global air-sea carbon flux. Observation System Simulation Experiments have demonstrated that uncertainty of the global flux can be significantly improved if unbiased float-derived surface pCO_2 are incorporated into their flux estimates.
- *Remote Sensing (NASA)*: Satellites have revolutionized ocean monitoring by providing high resolution global observations of the surface ocean. BGC-Argo can help validate ocean color retrievals and algorithms, and provide subsurface or under-cloud data that are inaccessible from satellites to provide a more comprehensive view of the ocean.

Provide actionable information to meet societal needs. Fisheries and resource management depend on understanding variations and changes in oxygen content and biological productivity that, along with temperature, drive shifts in habitat use as well as habitat compression; Arctic and Antarctic change is a national security concern; marine heat waves, and extreme events in general, have measurable subsurface structure and ecosystem consequences. All of these are active research areas, and BGC-Argo data play a critical role in developing and validating the tools and models that will eventually support management decisions.

Deliver quality controlled, science ready data in a timely manner. BGC-Argo delivers publicly available, science-ready data in near real time, typically < 12 hours from time of the float surfacing, supporting key operational activities (e.g., weather forecasts). Periodic Delayed-mode QC further improves data quality, enabling the highest quality scientific research. Timely delivery of science ready data accelerates discovery and innovation.

Deliver information through an open and transparent data system and philosophy. Raw data, adjusted data, and the quality-control protocols are all public and documented, with monthly snapshots with citable DOIs.

Support research across a wide range of disciplines and career stages. Over 880 peer-reviewed publications have used BGC-Argo data as of September 2026, spanning physical oceanography, biogeochemistry, ecology, carbon-cycle science, and data science. Open, ready-to-use global data are especially beneficial for graduate students and early-career researchers, who can pursue a wide variety of scientific questions without access to ships.

Efficient use of national science funding. Profiling floats are the only demonstrated means of autonomously observing the ocean interior globally in near real time. The per-profile cost is a fraction of the costs of ship-based sampling, and enables observations when ship operations are not feasible. Sustaining the array requires a predictable annual commitment to replenish floats.

Support US industry and incorporate innovation. The US array is built on a domestic supply chain of float and sensor manufacturers, and sustained demand from NSF programs has been essential to maintaining capability and to drive down sensor cost and improve reliability. Additionally, BGC-Argo has continued to incorporate and drive innovations in sensors and platform technology to expand its scientific user community and applications.