

# Hydrographic measurements from Niskin bottle water samples collected at Hydrostation S site in the Sargasso Sea ongoing from 1955-01-29

**Website:** <https://www.bco-dmo.org/dataset/859990>

**Data Type:** Cruise Results

**Version:** 1

**Version Date:** 2021-09-02

## Project

» [The Panulirus Hydrographic Stations \(Hydrostation S\)](#) (Hydrostation S)

Contributors	Affiliation	Role
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## Coverage

**Spatial Extent:** N:32.983 E:-63.289 S:30.154 W:-66.799

**Temporal Extent:** 1955-01-29 - 2016-12-18

## Dataset Description

Hydrographic measurements from Niskin bottle water samples collected at Hydrostation S located 25 km SE of Bermuda (32°10' N, 64°30' W). Measurements have been collected since 1955 and include salinity, temperature, sigma theta, oxygen, and dissolved oxygen anomaly.

## Data Processing Description

BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added ISO\_datetime column from submitted date and time columns

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## Data Files

**File**

**hydrostation\_s\_niskin.csv**(Comma Separated Values (.csv), 3.74 MB)  
MD5:2ebd704e46d93b618f799d0f10ab08ab

Primary data file for dataset ID 859990

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**Parameters**

Parameter	Description	Units
Cruise_type_text	Text description of cruise type	unitless
Cruise_number	Cruise number	unitless
Cast_number	Cast number; 1-80=CTD casts, 81-99=Hydrocasts (i.e. 83 = Data from Hydrocast number 3)	unitless
Decimal_year	Decimal year	dimensionless
ISO_DateTime_UTC	Date and Time in ISO8601 standard format	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude (west is negative)	decimal degrees
Bottle_sample_ID	Unique bottle ID which identifies cruise type, cruise, cast, and Niskin bottle number	unitless
Depth	Depth	meters (m)
Niskin_number	Niskin bottle number	unitless
Temp	Temperature ITS-90	degrees Celsius
CTD_S	CTD Salinity on PSS-78 scale	dimensionless
Sal1	Salinity-1 measurement on PSS-78 scale	dimensionless
SigTh	Sigma-Theta	kilogram per meter cubed (kg/m <sup>3</sup> )
O2	Oxygen-1	micromole per kilogram (umol/kg)
OxFix	Oxygen Fix Temp	degrees Celsius
Anom1	Oxy Anomaly-1	micromole per kilogram (umol/kg)
Pres	Pressure	decibar (dbar)

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**Instruments**

<b>Dataset-specific Instrument Name</b>	CTD Sea-Bird 911
<b>Generic Instrument Name</b>	CTD Sea-Bird 911
<b>Generic Instrument Description</b>	The Sea-Bird SBE 911 is a type of CTD instrument package. The SBE 911 includes the SBE 9 Underwater Unit and the SBE 11 Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). More information from Sea-Bird Electronics.

<b>Dataset-specific Instrument Name</b>	Niskin bottle
<b>Generic Instrument Name</b>	Niskin bottle
<b>Generic Instrument Description</b>	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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## Deployments

### BATS cruises

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58883">https://www.bco-dmo.org/deployment/58883</a>
<b>Platform</b>	Unknown Platform
<b>Report</b>	<a href="http://bats.bios.edu/bats-data/">http://bats.bios.edu/bats-data/</a>
<b>Start Date</b>	1988-10-20
<b>Description</b>	Bermuda Institute of Ocean Science established the Bermuda Atlantic Time-series Study with the objective of acquiring diverse and detailed time-series data. BATS makes monthly measurements of important hydrographic, biological and chemical parameters throughout the water column at the BATS Study Site, located at 31 40N, 64 10W.

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## Project Information

### The Panulirus Hydrographic Stations (Hydrostation S) (Hydrostation S)

**Website:** <http://www.bios.edu/research/projects/hydrostation-s/>

**Coverage:** Sargasso Sea at 31 50'N 64 10'W

Hydrostation S (also known as Panulirus hydrographic station) is recognized as one of the most important sustained ocean time-series sites in the world. Located about 25 km southeast of Bermuda in the North Atlantic Ocean, this site has oceanographic measurements dating back to 1954, when Henry Stommel and co-workers initiated repeat biweekly hydrographic observations.

The most recent project awards and abstracts are listed below. A detailed **history of funding** with summary of all project awards for Hydrostation S (Panulirus Hydrographic stations) can be found here (PDF format):

[https://datadocs.bco-dmo.org/docs/305/Hydrostation\\_S/data\\_docs/Hydrostation\\_S\\_funding\\_history.pdf](https://datadocs.bco-dmo.org/docs/305/Hydrostation_S/data_docs/Hydrostation_S_funding_history.pdf)

#### **Years 70-74:**

##### ***NSF Award OCE-2122606 Abstract:***

This project continues hydrographic observations at Hydrostation S, extending the time-series of ocean data to almost 70 years. Hydrostation S (formerly known as the Panulirus site), located about 25 km southeast of Bermuda in the North Atlantic Ocean, is one of the longest open-ocean hydrographic stations in the world. This program of repeat biweekly hydrographic observations began in 1954 and now, in its seventh decade, has proved to be the catalyst for numerous studies of ocean physics, biological processes and biogeochemistry. Sustained observations of the ocean, such as those from Hydrostation S, remain critically important to establish rates of change to provide quantitative empirical data for myriad regional and global ocean synthesis and modeling of ocean processes and future ocean change. Hydrostation S program and its data are considered as a service to the community, being openly distributed and subsequently have been an invaluable resource in understanding processes and patterns of variability in the ocean, as well as education, mentorship and outreach activities.

The major objective of the proposal is to continue Hydrostation S into the eighth decade with numerous questions related to warming and cooling, salinification and freshening, deoxygenation and insights on biogeochemical changes over time. This program constitutes frequent water column sampling of temperature, salinity, and dissolved oxygen (and indirectly, sampling of important ocean carbon time-series) of the North Atlantic subtropical gyre at the Hydrostation S site. Such work is complementary to other sustained observations such as the Bermuda Atlantic Time-series Study (BATS) and Ocean Flux Program (OFP). The project entails a similar sampling format that has been followed for the past 68 years. Hydrostation S also supports the longest global ocean CO<sub>2</sub> and acidification time-series (from 1983 to present).

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.

#### **Years 65-69:**

##### ***NSF Award OCE-1633125 Abstract:***

The physical properties of the ocean from the surface layers to the abyssal water masses are changing in concert with natural and anthropogenically influenced physical forcing and sustained observations of the ocean are critically important to establish these rates of change. One of the longest open-ocean hydrographic stations in the world is maintained at the Hydrostation S site (formerly known as the Panulirus site) located about 25 km southeast of Bermuda in the North Atlantic Ocean. This repeat biweekly hydrographic observations was initiated by Henry Stommel and co-workers in 1954. Now, in its seventh decade, it continues to be recognized as one of the most important sustained ocean time-series and provides an invaluable metric for the long-term state of the North Atlantic subtropical gyre in relation to the meridional overturning circulation, western boundary transport, and gyre recirculation. For example, the upper ocean warming trend has strengthened (about 0.8° C since the 1970's) while the deep Labrador Sea has cooled by a few tenths of a degree. The signature of deoxygenation has been observed at Hydrostation S in the upper ocean (about 7 micro-moles/kg/decade decrease in dissolved oxygen) as well as an intensification and expansion of the oxygen minimum zone. These changes suggest that the North Atlantic subtropical gyre is experiencing deoxygenation as in the Pacific Ocean as a result of increased upper ocean stratification and reduced solubility of oxygen in warmer waters. The Hydrostation S program and its data set are managed as a service to the ocean community, being openly distributed and used as a resource in understanding processes and patterns of variability in the ocean, as well as for education, mentorship and outreach activities. The Hydrostation S project will contribute to the research and training of six research specialists and research technicians at BIOS and contribute to the research projects of at least three Ph.D. students through on-going educational partnership with Princeton University and the University of Southampton in the U.K. The one-day Hydrostation S research cruises are an ideal platform for testing new sensors and for providing hand-on training to undergraduate students enrolled in summer programs.

The Hydrostation S project is designed to address the overarching hypothesis that the physical properties of

the upper-ocean to deep-ocean are changing in concert with natural and anthropogenically influenced physical forcing. Sustained observations of the ocean, such as those from Hydrostation S, remain critically important to establish rates of change to provide quantitative empirical data for myriad regional and global ocean synthesis and modeling of ocean processes and future ocean change. The major objective of Hydrostation S into the seventh decade is to continue the frequent water column sampling of temperature, salinity, and dissolved oxygen (and indirectly, sampling of important ocean carbon time-series) of the North Atlantic subtropical gyre. Such work is complementary to other sustained observations such as the Bermuda Atlantic Time-series Study (BATS) and Ocean Flux Program (OFP). As for the past five years, two CTD profiles will be conducted to better capture the deep-water variability while maintaining all the previous discrete depths. The first CTD cast will profile to full ocean depth (3,200-3,500 m) while the second CTD cast will profile from the surface to 500 m to allow for biogeochemical instrumentation not rated for full ocean depth and to support ancillary studies of ocean physics, biological processes and biogeochemistry. A secondary objective will be to build upon the collaborative comparison of physical data collected as part of two autonomous sensor projects. In the latter stages of the project, as ocean glider deployment becomes more sustainable and reliable, collaborative and comparative efforts will be used to test the capability of ocean gliders to provide data of sufficient quality to detect long-term oceanic change in a "virtual" mooring time-series mode. The robust and highly accurate Hydrostation S data will be used to test the capability of emerging technologies over the next five to ten years.

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1633125</a>

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