CTD profile data from the R/V Hugh R. Sharp cruises HRS2213, HRS2215 and HRS2407 in the Northwestern Atlantic Ocean in 2022 and 2024

Website: https://www.bco-dmo.org/dataset/997528
Data Type: Cruise Results
Version: 1
Version Date: 2026-04-27

Project
» Collaborative Research: Impacts of surface ocean surfactant sources and transformations on their chemical composition and air-sea relevant properties (SOAPI)

Contributors	Affiliation	Role
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Abstract
Processed CTD profile measurements collected from four hydrographic regions in the Northwestern Atlantic Ocean using various sensors during the R/V Hugh R. Sharp cruises HRS2213, HRS2215 and HRS2407 in summer and fall of 2022, and summer of 2024. These data were generated as part of the Surfactants at the Ocean-Atmosphere Physical Interface (SOAPI) project to investigate the the composition, structure, and interfacial properties of surfactant organics at the sea surface. Data were collected by Dr. Andrew Wozniak (University of Delaware).

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Coverage

Location: Northwestern Atlantic Ocean
Spatial Extent: **N**:38.7386 **E**:-67.21579 **S**:35.97299 **W**:-74.7529
Temporal Extent: 2022-08-30 - 2024-08-19

Methods & Sampling

CTD profile measurements collected from four hydrographic regions in the Northwestern Atlantic Ocean using various sensors during the R/V Hugh R. Sharp cruises HRS2213, HRS2215 and HRS2407 in summer and fall of 2022, and summer of 2024.

Data Processing Description

Raw CTD data collected with a Sea-Bird SBE 9plus system were converted from hexadecimal (.hex) format to a human-readable format (.cnv) files using Sea-Bird Seasave software (version 7.26.0.7). Standard Sea-Bird processing steps were applied, including sensor alignment, low-pass filtering, conductivity cell thermal mass correction, loop editing to minimize ship heave effects, and calculation of derived variables such as salinity, density, dissolved oxygen, and potential temperature. Data were binned into 1 dbar vertical intervals using downcast data only. The processed .cnv files were subsequently imported into R using the oce package, where timestamps were converted to ISO 8601 UTC format, cruise and station metadata were added, and all casts were combined into a single dataset. The .cnv files have been added as supplemental files.

BCO-DMO Processing Description

* Treating empty strings and "nd" as missing values
* Renamed 11 fields to replace special characters in field names: points and é have been converted to underscores (_)

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Data Files

File
997528_v1_CTD.csv (Comma Separated Values (.csv), 546.03 KB) MD5:e7881a29cd5668570dec8170063b8ce6 Primary data file for dataset ID 997528, version 1

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Supplemental Files

File
SOAPI_CTD_FILES.zip (ZIP Archive (ZIP), 238.94 KB) MD5:a9c7c0a9d32e4c5852060f5330ecd5a7 Processed .cnv files (Sea-Bird Output)

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Parameters

Parameter	Description	Units
source_file	name of the originators file	unitless
cruise	SOAPI1 = Summer 2022 cruise, SOAPI2 = Fall 2022 cruise, SOAPI3 = Summer 2024 cruise	Unitless

cruise_number	Cruise identifier	Unitless
station	The station names are Virginia Coast, Delaware Coast, Continental Slope, and Open Ocean.	Unitless
station_id	Station identifier	Unitless
ISO_DateTime_UTC	System date and time in UTC following ISO8601 format	yyyy-MM-dd'T'HH:mm:ss'Z'
scan	Scan Count	Unitless
timeS	Time, Elapsed	seconds (S)
depSM	Depth in salt water at specified latitude	meters (m)
prDM	Pressure, Digiquartz	decibar (db)
t090C	Temperature ITS-90	degrees Celsius (C)
t190C	Temperature 2 ITS-90	degrees Celsius (C)
c0S_m	Conductivity	Siemens per meter (S/m)
c1S_m	Conductivity, 2	Siemens per meter (S/m)
sal00	Salinity, Practical	Practical Salinity Units (PSU)
sal11	Salinity, Practical, 2	Practical Salinity Units (PSU)
timeQ	Time, NMEA	seconds
timeY	Time, System	seconds
latitude	Latitude	decimal degrees
longitude	Longitude	decimal degrees
svCM	Sound Velocity, Chen-Millero	m/s

flECO_AFL	Fluorescence, WET Labs ECO-AFL/FL	milligrams/meter^3 [mg/m^3]
sbeox0ML_L	Oxygen, SBE 43	milliliters per liter (ml/l)
sbox0Mm_Kg	Oxygen, SBE 43	micromole per kilogram [umol/kg]
sbeox0Mg_L	Oxygen, SBE 43	miligram per liter (mg/l)
sigma_e00	Density, sigma-theta,	kilogram per meter cubed [kg/m^3]
sigma_e11	Density, 2, sigma-theta	kilogram per meter cubed [kg/m^3]
potemp090C	Potential temperature from ITS-90	degrees Celsius
potemp190C	Potential temperature from ITS-190	degrees Celsius
svCM_1	Sound Velocity, Chen-Millero	meter per second (m/s)
sal00_1	Salinity, Practical	Practical Salinity Units (PSU)
sal11_1	Salinity, Practical, 2	Practical Salinity Units (PSU)
flag	data quality flag; 0 indicates good value	Unitless

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Instruments

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

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Deployments

HRS2213

Website	https://www.bco-dmo.org/deployment/990301
Platform	R/V Hugh R. Sharp
Start Date	2022-08-29
End Date	2022-09-03
Description	See more information from R2R: https://www.rvdata.us/search/cruise/HRS2213

HRS2215

Website	https://www.bco-dmo.org/deployment/990303
Platform	R/V Hugh R. Sharp
Start Date	2022-11-09
End Date	2022-11-11
Description	See more information at R2R: https://www.rvdata.us/search/cruise/HRS2215

HRS2407

Website	https://www.bco-dmo.org/deployment/990307
Platform	R/V Hugh R. Sharp
Start Date	2024-08-11
End Date	2024-08-21
Description	See more information at R2R: https://www.rvdata.us/search/cruise/HRS2407

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Project Information

Collaborative Research: Impacts of surface ocean surfactant sources and transformations on their chemical composition and air-sea relevant properties (SOAPI)

Coverage: Western North Atlantic surface waters

NSF abstract:
The surface microlayer (SML), the thin layer of water at the interface between the ocean and the atmosphere, controls the exchange of materials to and from the ocean. As a result, it can profoundly influence biogeochemical cycles and global climate. One type of chemical species that accumulates at this interface are surfactant molecules, which influence the surface tension of and the rate of material exchange at air-water interfaces. Biological and chemical production and degradation processes represent surfactant sources and removal pathways, but the relative importance of those processes for determining surfactant quantities and molecular composition remains unclear. Similarly, the relationship between surfactant molecule composition and surface tension at the air-water interface has not been established. As a result, their effects on material exchange at the interface cannot currently be predicted. This work will use measurements at sea, laboratory experiments, and high-resolution analyses to measure the chemical and physical characteristics of surfactants and their properties at the air-sea interface. An improved understanding of surfactant processes and surface ocean will benefit society by improving our understanding of the exchange of climate-relevant gases and particles. Two early career PIs will advance their established collaboration and gain further experience leading research projects and mentoring students. Students will receive valuable hands-on training in oceanographic field collections, state-of-the-science analytical techniques, data interpretation, and data dissemination. The results and methodologies from this work will be featured in courses at the University of Georgia and the University of Delaware and will be developed into content for K-12 students, enhancing infrastructure for education.

This work includes the unique pairing of state-of-the-science measurements across time and spatial scales to assess the influence of oceanographic processes on surfactant chemical composition and physical air-sea relevant properties. SML and subsurface waters will be collected from estuarine, coastal ocean, and open ocean sites during high and low productivity conditions to establish surfactant molecular characteristics over a range of space, time, and ocean biological activity. The effects of light will be assessed via diurnal sampling efforts and laboratory experiments. Samples will be analyzed for their detailed chemical, biological, and physical characteristics. The surface tension of the SML is expected to be inversely correlated with the abundance of lipid-like compounds (low O content, high H/C ratios, e.g., sulfur-containing lipids) produced during periods of high biological activity. Prolonged exposure to light is hypothesized to result in photo-oxidation of surfactant compounds, higher abundances of oxygenated and lower molecular weight aliphatic compounds, and increased surface tension. Multivariate statistical approaches will be used to reveal a mechanistic understanding of the links between biological and photochemical processes and the resulting surfactant and SML chemical and physical characteristics. This new knowledge will represent a first step toward improved models of the air-sea exchange of climate relevant gases which currently have large uncertainties. It will inform future work on the exchange of volatile and aerosol organics with significant potential impacts for our understanding of the climate system.

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