Particulate organic matter data set from samples collected using ship's surface underway system taken on board of the R/V Oceanus OC1701A, OC1611B, OC1603B, OC1602A, OC1601A in the Oregon Coast (47-43 N, 126-124 W) from 2016 to 2017.

Website: https://www.bco-dmo.org/dataset/817952
Data Type: Cruise Results
Version: 1
Version Date: 2020-07-20

Project
» Coastal Ocean Carbon Cycling during Wintertime Conditions (CCAW)

Contributors	Affiliation	Role
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Abstract
Particulate organic matter data set and added temperature and salinity from samples collected using ship's surface underway system taken on board of the R/V Oceanus OC1701A, OC1611B, OC1603B, OC1602A, OC1601A in the Oregon Coast (47-43 N, 126-124 W) from 2016 to 2017.

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Coverage

Spatial Extent: **N**:45.73821 **E**:-124.0017 **S**:43.49702 **W**:-125.0027
Temporal Extent: 2016-01-23 - 2017-01-16

Dataset Description

These data are part of a manuscript submitted to Continental Shelf Research:

Goñi, M.A., Welch, K.A., Alegria, E., Alleau Y., Watkins-Brandt, K., White, A.E. (submitted) Wintertime Particulate Organic Matter Distributions in Surface Waters of the Northern California Current System. Continental Shelf Research.

The data are shown in figures in the manuscript (Figures 6, 8 and 9).

Methods & Sampling

Full details for collection and analyses of underway POM samples are provided by Holser et al., 2011 and Goñi et al., 2019 and Goñi et al., submitted. Brief summaries are provided below.

Samples for this study were collected aboard RV Oceanus using the surface underway scientific system.

Aboard the vessel we had access to uncontaminated seawater and collected samples at specific times that allowed us to determine location (latitude and longitude) and seawater characteristics (temperature and salinity) from the ships' navigation and sensor panels. We used a semi-automated filtration system (SAFS) described by Goñi et al., (2019) connected to Oceanus surface underway water to collect particulate organic matter samples. Surface underway water was connected to the SAFS through a manual flow-control valve via opaque polyethylene tubing. A fly wheel flow meter was placed in-line and connected to a laptop computer using a data acquisition system to measure and record flows during the filtration stage. A switching valve with 8 ports was placed downstream from the flow meter and controlled by the laptop. Under stand-by conditions, flow was directed to the 'waste' port, which was fitted with unobstructed tubing that drained into one of the ship's sinks and flowed back to sea. The 8-sample ports were fitted with tubing, quick-turn sockets and in-line stainless steel 13-mm Swinney filter holders. The flow from these filters was directed to the same sink as the 'waste' flow. In each holder, we placed one pre-combusted (400 oC for 3 hours) 13-mm glass fiber filter supported by a stainless steel screen and locked into place with a Teflon o-ring that prevents leakage and results in a filtration area of 78.5 mm2. Once filters were fitted in each of the sample ports, the filtration program was started to collect samples at selected intervals.

Once the filtration run was completed, the filter housings were removed from the SAFS, opened, and each individual filter folded into pre-cleaned silver capsules, which were placed into sample trays that were frozen until CN analyses. Each sample was assigned a specific time stamp (start-end of filtration process) that coincided with the ship's clock and allowed us to retrieve location and oceanographic data for each sample, as well as determine an overall filtration volume, which was used to calculate particulate nitrogen and carbon concentrations once their contents were determined. During normal operations, we stacked two filter holders at specific positions in order to collect both particles from a sample using the first filter as well as measure blanks associated with dissolved organic matter sorption as filtered water goes through the second filter.

Carbon and nitrogen analyses were conducted using high temperature combustion/reduction according to Holser et al., 2011 and Goñi et al., 2019. Sample and blank filters were exposed to concentrated hydrochloric acid fumes to remove carbonates and run in two CN analyzers (NC2500 Thermoquest and ECS 4010 Costech) using the manufacturers' recommendations for carbon and nitrogen analyses (e.g., specified temperatures for combustion and reduction furnaces, O2 loops/pressure, and the use of a water trap). In each run of a full auto-sampler, we typically included 6 standards (e.g., cystine, atropine) with different and known amounts of carbon and nitrogen to develop distinct calibration curves for each run. All filters were treated the same and we used the DOM blanks to correct for DOC and DN sorption. Detection limits for OC and N were 0.04 and 0.03 micromoles, respectively. Replicate analyses of selected samples yielded average standard errors for both measurements of ~2% of measured values.

References cited: Holser *et al.,* 2011; Goñi *et al.,* 2019; Goñi *et al.,* submitted.

Data Processing Description

Data were acquired at approximately 1 Hz and then binned to correspond to the time stamps of discrete POM samples collected by the semi-automated filtration system (SAFS, see above). The transmission (Tr) data from the C-Star instrument (r = 0.25 m) was converted into beam attenuation coefficients (c = lnTr/r; m-1), which represent the sum of attenuation due to particles, water and colored dissolved organic matter. Particle beam attenuation data (Cp) were determined after correcting for the latter two by conducting attenuation measurements in low POC waters from offshore regions to adjust measured beam attenuation by an offset (e.g., Gardner et al., 2006). In the winter cruises, we verified these corrections by measuring beam attenuation

signals of particle-free waters that were filtered through a 0.2 mm membrane filter (White et al. 2017; Slade et al. 2010). Navigation data were integrated into the sensor data set using the sample filtration time stamps to provide latitude and longitude information for each surface underway sample.

BCO-DMO processing notes:

- Concatenated all cruises
- added ISO_DateTime_UTC column
- Adjusted column names to comply with database requirements
- Adjusted all Date_Time_PST rows to following notation: mm/dd/yyyy HH:MM

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Data Files

File
pom_concat.csv (Comma Separated Values (.csv), 31.50 KB) MD5:858c1c3a8d0b1eb8363ef002bcccc59a Primary data file for dataset ID 817952

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Related Publications

Goñi, M. A., Corvi, E. R., Welch, K. A., Buktenica, M., Lebon, K., Alleau, Y., & Juranek, L. W. (2019). Particulate organic matter distributions in surface waters of the Pacific Arctic shelf during the late summer and fall season. Marine Chemistry, 211, 75–93. doi:10.1016/j.marchem.2019.03.010
Methods

Holser, R. R., Goni, M. A., & Hales, B. (2011). Design and application of a semi-automated filtration system to study the distribution of particulate organic carbon in the water column of a coastal upwelling system. Marine Chemistry, 123(1-4), 67–77. doi:10.1016/j.marchem.2010.10.001
Methods

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Parameters

Parameter	Description	Units
Cruise	Cruise designation	unitless
Latitude	Latitude measured by ship’s navigation system for sample/data collection, southern hemisphere is negative	decimal degrees
Longitude	Longitude as measured by ship’s navigation system for sample/data collection, western hemisphere is negative	decimal degrees
Date_Time_PST	Date and time of sample and data collection (pacific standard time)	unitless
Temperature	Temperature in degrees Celsius measured at seachest in ship’s underway system at the time of sample collection	degrees Celsius (°C)
Salinity	Salinity measured by TSG lab unit in ship’s underway system at the time of sample collection	unitless
PN	Particulate Nitrogen concentrations measured in filtered samples collected from ship’s undereway system using a semi-automated filtration system. Concentrations have been blank corrected.	micromoles N per liter of water (um/L)
POC	Particulate Organic Carbon concentrations measured in filtered samples collected from ship’s undereway system using a semi-automated filtration system. Concentrations have been blank corrected.	micromoles C per liter of water (um/L)
Beam_attenuation	Corrected beam attenuation values measured at the time of sample collection by Oceanus Wetlabs C-STAR transmissometer installed inline the ship’s underway system. Corrected values for beam attenuation were determined using the approach described in Goñi et al., submitted, Goñi et al., 2019 and Holser et al., 2011.	1/m
ISO_DateTime_UTC	Date and time of sample and data collection in UTC, standard ISO format (yyyy-mm-ddThh:mmZ)	unitless

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Instruments

Dataset-specific Instrument Name	SBE 38
Generic Instrument Name	Sea-Bird SBE 38 Remote Digital Immersion Thermometer
Dataset-specific Description	Surface water temperature was measured inside the ship by a flow-through system sensor (SBE 38).
Generic Instrument Description	Sea-Bird SBE 38 Remote Digital Immersion Thermometer is a seawater temperature sensor in a 10,500 meter (34,400 ft) titanium pressure housing. Real-time temperature data is transmitted in ASCII characters (degrees C or raw counts) via an RS-232 or optional RS-485 serial interface for display or logging by PC or data logger. The SBE 38's measurement range is -5 to +35 C; absolute accuracy is better than 0.001 C (1 mK) and resolution is approximately 0.00025 C (0.25 mK).

Dataset-specific Instrument Name	SBE 45 thermosalinograph
Generic Instrument Name	Sea-Bird SBE 45 MicroTSG Thermosalinograph
Dataset-specific Description	Salinity was measured by a SBE 45 thermosalinograph installed inside the ship in line with the flow-through system.
Generic Instrument Description	A small externally powered, high-accuracy instrument, designed for shipboard determination of sea surface (pumped-water) conductivity and temperature. It is constructed of plastic and titanium to ensure long life with minimum maintenance. It may optionally be interfaced to an external SBE 38 hull temperature sensor. Sea Bird SBE 45 MicroTSG (Thermosalinograph)

Dataset-specific Instrument Name	SBE 48
Generic Instrument Name	Sea-Bird SBE 48 Hull Temperature Sensor
Dataset-specific Description	Surface water temperature was measured outside the ship by a hull-mounted (3 m) sensor (SBE 48).
Generic Instrument Description	The SBE 48 is a high-accuracy temperature recorder with non-volatile memory, designed for shipboard determination of sea surface temperature. Installed with magnets just below the water line, the SBE 48's temperature sensor is in contact with the inside of the ship's hull. For more information, see the SBE48 Manual.

Dataset-specific Instrument Name	WET Labs C-Star transmissometer
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Dataset-specific Description	Particle beam attenuation (Cp) was measured by a 25-cm, 650 nm wavelength WET Labs C-Star transmissometer installed inside the ship in line with the flow-through system.
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly intgrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/c-star-transmissometer/product?id=60762467717

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Deployments

OC1701A

Website	https://www.bco-dmo.org/deployment/773050
Platform	R/V Oceanus
Report	http://datadocs.bco-dmo.org/docs/CCAW/data_docs/cruise_reports/OC1701A_PCAR_103115.pdf
Start Date	2017-01-12
End Date	2017-01-15
Description	Cruise Documents: Cruise Plan (PDF) Post Cruise Assessment Report (PDF) Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1701A

OC1611B

Website	https://www.bco-dmo.org/deployment/773033
Platform	R/V Oceanus
Report	http://datadocs.bco-dmo.org/docs/CCAW/data_docs/cruise_reports/OC1611B_PCAR_103053.pdf
Start Date	2016-12-06
End Date	2016-12-08
Description	Cruise Documents: Cruise Plan (PDF) Post Cruise Assessment Report (PDF) Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1611B

OC1603B

Website	https://www.bco-dmo.org/deployment/772986
Platform	R/V Oceanus
Report	http://datadocs.bco-dmo.org/docs/CCAW/data_docs/cruise_reports/OC1603B_PCAR_102465.pdf
Start Date	2016-03-11
End Date	2016-03-17
Description	Cruise Documents: Cruise Plan (PDF) Post Cruise Assessment Report (PDF) Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1603B

OC1602A

Website	https://www.bco-dmo.org/deployment/772960
Platform	R/V Oceanus
Report	http://datadocs.bco-dmo.org/docs/CCAW/data_docs/cruise_reports/OC1602A_PCAR_102454.pdf
Start Date	2016-02-15
End Date	2016-02-20
Description	Cruise Documents: Cruise Plan (PDF) Post Cruise Assessment Report (PDF) Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1602A

OC1601A

Website	https://www.bco-dmo.org/deployment/772909
Platform	R/V Oceanus
Report	http://datadocs.bco-dmo.org/docs/CCAW/data_docs/cruise_reports/OC1601A_PCAR_102438.pdf
Start Date	2016-01-22
End Date	2016-01-26
Description	Cruise Documents: Cruise Plan (PDF) Post Cruise Assessment Report (PDF) Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/OC1601A

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Project Information

Coastal Ocean Carbon Cycling during Wintertime Conditions (CCAW)

Coverage: Oregon Coast (47-43 N, 126-124 W)

NSF Award Abstract:
As is true for many coastal regions worldwide, the Pacific Northwest margin is characterized by intense seasonal contrasts in conditions controlling carbon flux between the atmosphere, land, and ocean. During the wintertime, rapid and intense flooding of small coastal rivers and the associated inputs of freshwater, nutrients, and organic matter are commonplace in the Pacific Northwest. Impacts of these wintertime

terrestrial-ocean transfers by small, flood-prone rivers on the upwelling regions, such as the Pacific Northwest, have been underestimated at both global and regional scales. In order to gain a complete and predictive understanding of carbon cycling in ocean margins, the biogeochemistry of periods of intense terrestrial-ocean transfers needs to be comprehensively studied. This project will evaluate the dynamics of organic matter cycling along an upwelling-dominated margin during the wintertime period of active terrestrial inputs and biological cycling using a combination of shipboard, glider, moored and remote measurements. New developments in ocean observational technologies through the Ocean Observatories Initiative (OOI)* and existing scientific infrastructure along the Oregon coast will be instrumental in achieving this goal. This work will provide research opportunities for undergraduate and graduate students, and outreach will be conducted through the Centers for Ocean Science Education Excellence Pacific Partnership, local coastal community colleges, and interpretative centers such as Oregon State University Hatfield Center, the Umpqua Discovery Center, and Oregon Coast Aquarium in an effort to educate students and the public about the research.

Globally, most studies of carbon cycling in eastern boundary regimes have focused on the upwelling phase during the summer months, resulting in a much poorer understanding of non-upwelling periods. As is many coastal upwelling systems, wintertime conditions along the Pacific Northwest margin are characterized by southerly, downwelling-favorable winds and moisture-laden storms that result in seasonal flooding by the numerous small to medium-sized rivers in the region. Elevated discharges by these coastal rivers translate into large inputs of land-derived biogeochemical relevant constituents, including freshwater, dissolved inorganic nutrients, and dissolved and particulate organic matter, which collectively rival or exceed those of the Columbia River. To understand the impact of flood-derived terrestrial inputs on the biogeochemistry of the coastal zone along the Pacific Northwest margin, researchers will conduct a detailed investigation of biogeochemical processes in the water column along the Newport Hydrographic Line off the central Oregon coast during fall/winter conditions. The project includes an intensive field effort that takes advantage of ship-based and autonomous platforms to gain comprehensive wintertime coverage. Among the project outcomes, this effort will lead to a revised paradigm of the biogeochemical drivers of carbon cycling in coastal margins.

*The Ocean Observatories Initiative (OOI) is an NSF-funded, networked infrastructure of science-driven sensor systems to measure the physical, chemical, geological and biological variables in the ocean and seafloor. For more information about OOI, please visit the website: www.oceanobservatories.org

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459480

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