Carbon, Nitrogen, biogenic silica, thorium-234, and mass fluxes from upper ocean sediment traps at the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) site in the Northeast Atlantic Ocean during RRS Discovery cruise DY077 in April of 2017

Website: https://www.bco-dmo.org/dataset/765835
Data Type: Cruise Results
Version: 3
Version Date: 2019-06-26

Project
» Collaborative Research: Are all traps created equal? A multi-method assessment of the collection and detection of sinking particles in the ocean (Are Traps Equal)

Contributors	Affiliation	Role
Estapa, Margaret L.	Skidmore College	Principal Investigator
Buesseler, Kenneth O.	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
Lampitt, Richard	University of Southampton	Co-Principal Investigator
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Abstract
Carbon, Nitrogen, biogenic silica, thorium-234, and mass fluxes from upper ocean sediment traps at the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) site in the Northeast Atlantic Ocean during RRS Discovery cruise DY077 in April of 2017.

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Coverage

Spatial Extent: **N**:49.2422 **E**:-16.3234 **S**:48.8198 **W**:-16.7132
Temporal Extent: 2017-04-19 - 2017-04-26

Dataset Description

This dataset contains C, N, bSi, Th-234, and mass fluxes from upper ocean sediment traps at the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) site in the Northeast Atlantic Ocean during RRS Discovery cruise DY077.

Related datasets collected during the same cruise:
In-situ pump: https://www.bco-dmo.org/dataset/765850
Water column Th-234 activities: https://www.bco-dmo.org/dataset/765859

Methods & Sampling

Methodology:

Samples were collected during two deployment cycles (termed deployment 1 and deployment 2) occupied during the RRS Discovery cruise DY077 to the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) Site in April 2017 (Figure 1). In each of the cycles, we conducted particle flux sampling method intercomparisons between two types of neutrally buoyant sediment traps (NBST and PELAGRA), a surface tethered array of sediment traps (STT), and fluxes derived from upper water column deficits of 234Th vs. its parent isotope, 238U. DY077 samples analyzed in US (WHOI and Skidmore College) are archived here; DY077 samples analyzed in the UK (NOC) are archived in the British Oceanographic Data Centre.

Neutrally Buoyant Sediment Trap (NBST)
NBSTs consist of four cylindrical sediment trap tubes (collection area 0.0113 m2) and a 0.25-m pathlength transmissometer (C-Rover 2000, WETLabs, Inc.) arranged around a central SOLO profiling float. The traps are programmed to sink to a predetermined depth, drift while collecting sedimenting particles, close the trap lids, and then rise to the surface at a programmed time for recovery. Recovery aids consist of GPS/Iridium and a flashing strobe light. The transmissometer operates as an optical sediment trap and measures attenuance flux as a function of time, which is a proxy for sinking particulate carbon flux. For the deployments conducted on DY077, trap tubes were set up as follows: Three tubes were prepared with a layer of 500 mL of 70 ppt brine poisoned with 0.1% formaldehyde and borate buffered to pH 8.5. This brine layer was overlain with 1-μm filtered seawater from 350 m. In the fourth trap tube, a jar containing approximately 50 mL of polyacrylamide gel replaced the brine layer and allowed preservation of collected particles for microscopic imaging after recovery. During deployment 1, the NBST sampled at a depth of 200 m; during deployment 2, it sampled at a depth of 350 m.

PELAGRA neutral sediment traps
The Particle Export LAGRAngian (PELAGRA) trap was designed at the National Oceanography Centre, Southampton, UK (Lampitt et al. 2008) and consists of an arrangement of four conical traps (collection area 0.5 m2) around an APEX float (Teledyne-Webb Research, Inc.), with mechanically opening and closing collection cups. For this cruise, samples were collected from three PELAGRA traps: P4, P7, and P9. P4 and P7 each carried two conventional sediment funnels, two non-funnelled collectors for gel sampling and a camera/flash system for capturing time-lapse images of sinking particles. For these traps, the two cups situated beneath the conventional funnels were filled with the same brine solution used in the bottom of the NBST traps. Under the non-funnel collectors, jars containing polyacrylamide gel (described above) and commercially available cryogel were attached. P9 carried four conventional sediment funnels, each with a brine cup installed.

Surface Tethered Trap (STT) arrays
Alongside the neutral traps was deployed a drifting mooring carrying cylindrical sediment trap tubes set up identically to those on the NBSTs as well as tubes of a different design provided by collaborator C. Lamborg (and henceforth termed modified PIT tubes). Modified PIT tubes are identical to standard PIT tubes (collection area 0.00385 m2) but with detachable bottoms. During deployment 1 two arrays were deployed, one at 200 m and one at 350 m. Both arrays contained two NBST-style brine-filled tubes, one NBST-style gel tube, and two modified PIT tubes which collected samples into 125-mL bottles filled with the same poisoned brine used in the other tubes. A programmable burnwire controller was set up to close the NBST-style tube lids at the same time as on the NBST traps. The burnwire controller at 200 m operated as planned but the controller at 350 m did not, due to a hardware failure. During the second deployment, a single trap array at 350 m was deployed using the fully-functioning burnwire controller. Two NBST-style tubes were set up to close at the same time as the NBSTs, two more were set up to remain open, and a third pair of modified PIT tubes (without lids) were included. During both deployments a Nortek current meter was deployed looking downwards approximately 2 m below the bottom of the 350-m trap array

Upon platform retrieval, trap brine samples were processed as follows.
NBST samples and NBST-style tubes on STT: After a period of 1-3 hours to allow particles to finish settling in trap tubes, overlying filtered seawater was removed via peristaltic pump. The bottom brine layer was screened through 350-μm nylon mesh to aid in swimmer removal. The replicate brine tubes were drained through a single screen and combined. The screen was picked under 12x magnification to remove obvious swimmers while leaving behind passively sinking particles. Material remaining on the screen was rinsed back into the main sample while swimmers were filtered onto a QMA filter for later carbon and thorium-234 analysis. Combined trap samples were split eight ways using a custom rotary splitter. Splits were filtered onto QMA filters for C/N,

PIC, and 234Th analysis or polycarbonate filters for biogenic Si and mass analysis on shore. Splits were also kept aside to return to collaborators labs at NOC.

Modified PIT tubes on STT: Overlying seawater was siphoned off as above, then the 125-ml sample collection bottles were removed and combined into an extra NBST tube used as a dispenser. The sample was processed from this point identically to the NBST tubes.
PELAGRA trap samples: Brine cups were removed and either kept by the NOC lab for parallel processing (generally cup 1 on P4 and P7 and cups 3 and 4 on P9) or treated as described for modified PIT tubes above, minus the siphoning step.

QMA filters were dried at 45C, mounted, and immediately counted for low-level β emission onboard the ship. At WHOI, a subset of samples was re-counted within one month on shore. Final background counts to measure non-234Th related β emissions were conducted several months later. At this point, QMA filters were unmounted, re-dried, and gravimetrically subdivided into four sections. One half of the filter was analyzed for total carbon and nitrogen after high-temperature combustion on a Thermo Electron FlashEA 1112 C/N analyzer. Coulometric analysis for PIC after sample acidification was performed on a quarter of the filter (Johnson et al, 1985; Honjo et al, 2000). The remainder of the filter was archived. At Skidmore College, polycarbonate filters for mass and bSi determination were dried and weighed repeatedly on a microbalance until stable weights with a precision better than 0.01 mg were achieved. Filter tare weights were subtracted and net mass accumulation was calculated. Then the filters were digested to release bSi using a weak alkaline digest (0.2 N NaOH for 2 hours at 95C) and analyzed following standard spectrophotometric methods (Strickland and Parsons, 1972).

A replicate set of each type of trap collector was prepared as described above, held in the shipboard laboratory during each deployment, and then analyzed in parallel to provide a process blank determination. The blanks from the two deployments were averaged to determine the mean process blank for the cruise (Table 1).

Data Processing Description

For each analyte, the mean content of the process blank was subtracted from the corresponding sample value (Table 1), and blank-corrected values were normalized by the total number of splits, the trap collection area, and the deployment length to yield flux. The fluxes of each replicate sample at a given depth were averaged to yield the mean flux. Particulate organic carbon (POC) flux was computed as the difference between the mean TC flux and the mean PIC flux.

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* Added column "ISO_DateTime_start" from separate date|time columns
* changed format of date columns to ISO 8601 dates.
* In data version 3, trailing zeros were preserved for the appropriate level of precision.

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Data Files

File
sediment_trap_fluxes.csv(Comma Separated Values (.csv), 7.11 KB) MD5:5d4c89e6e9f7f86beac88800ea9a4f88
Primary data file for dataset ID 765835

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Supplemental Files

File
Figure 1. Locations of platforms   filename: Fig1.png   (Portable Network Graphics (.png), 945.63 KB)   MD5:dc3d6d1d9c796de9027e51149381b31b   Figure 1. Locations of platforms during deployment 1 (19-21 Apr) and deployment 2 (24-27 Apr).
Table 1: Mean process blank values   filename: Table1.csv   (Comma Separated Values (.csv), 506 bytes)   MD5:2392b68d6e779b0c430f46ffe062660a   Mean process blank values for a single split. 234Th blanks were not subtracted, but are reported in units of flux for reference.

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Related Publications

Buesseler, K. O., Pike, S., Maiti, K., Lamborg, C. H., Siegel, D. A., & Trull, T. W. (2009). Thorium-234 as a tracer of spatial, temporal and vertical variability in particle flux in the North Pacific. Deep Sea Research Part I: Oceanographic Research Papers, 56(7), 1143–1167. doi:10.1016/j.dsr.2009.04.001
Methods

Honjo, S., Francois, R., Manganini, S., Dymond, J., & Collier, R. (2000). Particle fluxes to the interior of the Southern Ocean in the Western Pacific sector along 170°W. Deep Sea Research Part II: Topical Studies in Oceanography, 47(15-16), 3521–3548. doi:10.1016/s0967-0645(00)00077-1 https://doi.org/10.1016/S0967-0645(00)00077-1
Methods

Johnson, K. M., King, A. E., & Sieburth, J. M. (1985). Coulometric TCO2 analyses for marine studies; an introduction. Marine Chemistry, 16(1), 61–82. doi:10.1016/0304-4203(85)90028-3
Methods

Lampitt, R. S., Boorman, B., Brown, L., Lucas, M., Salter, I., Sanders, R., … Turnewitsch, R. (2008). Particle export from the euphotic zone: Estimates using a novel drifting sediment trap, 234Th and new production. Deep Sea Research Part I: Oceanographic Research Papers, 55(11), 1484–1502. doi:10.1016/j.dsr.2008.07.002
Methods

Pertuz, S., Puig, D., Garcia, M. A., & Fusiello, A. (2013). Generation of All-in-Focus Images by Noise-Robust Selective Fusion of Limited Depth-of-Field Images. IEEE Transactions on Image Processing, 22(3), 1242–1251. doi:10.1109/tip.2012.2231087 https://doi.org/10.1109/TIP.2012.2231087
Methods

Strickland, J. D. H. and Parsons, T. R. (1972). A Practical Hand Book of Seawater Analysis. Fisheries Research Board of Canada Bulletin 157, 2nd Edition, 310 p.
Methods

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Parameters

Parameter	Description	Units
deployment	deployment cycle during cruise DY077	unitless
station	station occupied during cruise DY077	unitless
platform	type of sediment trap deployed	unitless
collector	type of particle collector deployed on sediment trap platform	unitless
collection_area	area of collector opening	meters squared (m^2)
replicates	number of collectors installed on platform at given depth	unitless
depth	target depth of sediment trap collectors	meters (m)
lat_deploy	latitude of platform deployment	decimal degrees (DD)

lon_deploy	longitude of platform deployment	decimal degrees (DD)
lat_recover	latitude of platform recovery	decimal degrees (DD)
lon_recover	longitude of platform recovery	decimal degrees (DD)
date_start	date sampling began (GMT) in ISO 8601 format yyyy-mm-dd	unitless
time_start	time sampling began (GMT) in ISO 8601 format hh:mm:ss	unitless
ISO_DateTime_start	Date time sampling began (GMT) in format yyyy-mm-ddTHH:MMZ	unitless
date_end	date of collector lid closure or platform recovery (GMT) in ISO 8601 format yyyy-mm-dd	unitless
time_end	time of collector lid closure or platform recovery (GMT) in ISO 8601 format hh:mm:ss	unitless
date_recover	date of platform recovery (GMT) in ISO 8601 format yyyy-mm-dd	unitless
time_recover	time of platform recovery (GMT) in ISO 8601 format hh:mm:ss	unitless
deploy_length	length of sampling period	number of days
N_f_mean	mean total nitrogen flux of splits A, B, C, D	millimoles per meter squared per day (mmol/m^2/d)
N_f_err_mean	total nitrogen flux uncertainty, propagated from the maximum of either the per-filter analytical error or the standard deviation among replicate filter splits	millimoles per meter squared per day (mmol/m^2/d)
N_f_A	total nitrogen flux of split A	millimoles per meter squared per day (mmol/m^2/d)
N_f_err_A	total nitrogen flux uncertainty of split A, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
N_f_B	total nitrogen flux of split B	millimoles per meter squared per day (mmol/m^2/d)
N_f_err_B	total nitrogen flux uncertainty of split B, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
N_f_C	total nitrogen flux of split C	millimoles per meter squared per day (mmol/m^2/d)
N_f_err_C	total nitrogen flux uncertainty of split C, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
N_f_D	total nitrogen flux of split D	millimoles per meter squared per day (mmol/m^2/d)
N_f_err_D	total nitrogen flux uncertainty of split D, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
TC_f_mean	mean total carbon flux of splits A, B, C, D	millimoles per meter squared per day (mmol/m^2/d)
TC_f_err_mean	total carbon flux uncertainty, propagated from the maximum of either the per-filter analytical error or the standard deviation among replicate filter splits	millimoles per meter squared per day (mmol/m^2/d)

TC_f_A	total carbon flux of split A	millimoles per meter squared per day (mmol/m^2/d)
TC_f_err_A	total carbon flux uncertainty of split A, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
TC_f_B	total carbon flux of split B	millimoles per meter squared per day (mmol/m^2/d)
TC_f_err_B	total carbon flux uncertainty of split B, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
TC_f_C	total carbon flux of split C	millimoles per meter squared per day (mmol/m^2/d)
TC_f_err_C	total carbon flux uncertainty of split C, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
TC_f_D	total carbon flux of split D	millimoles per meter squared per day (mmol/m^2/d)
TC_f_err_D	total carbon flux uncertainty of split D, propagated from the per-filter analytical error	millimoles per meter squared per day (mmol/m^2/d)
PIC_f_mean	mean particulate inorganic carbon flux of splits A, B, C, D	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_err_mean	particulate inorganic carbon flux uncertainty, propagated from the maximum of either the per-filter analytical error or the standard deviation among replicate filter splits	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_A	particulate inorganic carbon flux of split A	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_err_A	particulate inorganic carbon flux uncertainty of split A, propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_B	particulate inorganic carbon flux of split B	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_err_B	particulate inorganic carbon flux uncertainty of split B, propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_C	particulate inorganic carbon flux of split C	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_err_C	particulate inorganic carbon flux uncertainty of split C, propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
PIC_f_D	particulate inorganic carbon flux of split D	micromoles per meter squared per day (mmol/m^2/d)

PIC_f_err_D	particulate inorganic carbon flux uncertainty of split D, propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
POC_f_mean	mean particulate organic carbon flux,computed as the difference between mean TC flux and mean PIC flux	millimoles per meter squared per day (mmol/m^2/d)
POC_f_err_mean	particulate organic carbon flux uncertainty, POC_f_err_mean = (TC_f_err_mean^2 + PIC_f_err_mean^2)1/2	millimoles per meter squared per day (mmol/m^2/d)
POC_f_A	particulate organic carbon flux of split A, computed as the difference between TC flux and PIC flux of split A	millimoles per meter squared per day (mmol/m^2/d)
POC_f_err_A	particulate organic carbon flux uncertainty of split A,POC_f_err_A = (TC_f_err_A^2 + PIC_f_err_A^2)1/2	millimoles per meter squared per day (mmol/m^2/d)
POC_f_B	particulate organic carbon flux of split B, computed as the difference between TC flux and PIC flux of split B	millimoles per meter squared per day (mmol/m^2/d)
POC_f_err_B	particulate organic carbon flux uncertainty of split B,POC_f_err_B = (TC_f_err_B^2 + PIC_f_err_B^2)1/2	millimoles per meter squared per day (mmol/m^2/d)
POC_f_C	particulate organic carbon flux of split C, computed as the difference between TC flux and PIC flux of split C	millimoles per meter squared per day (mmol/m^2/d)
POC_f_err_C	particulate organic carbon flux uncertainty of split C,POC_f_err_C = (TC_f_err_C^2 + PIC_f_err_C^2)1/2	millimoles per meter squared per day (mmol/m^2/d)
POC_f_D	particulate organic carbon flux of split D, computed as the difference between TC flux and PIC flux of split D	millimoles per meter squared per day (mmol/m^2/d)
POC_f_err_D	particulate organic carbon flux uncertainty of split D,POC_f_err_D = (TC_f_err_D^2 + PIC_f_err_D^2)1/2	millimoles per meter squared per day (mmol/m^2/d)
bSi_f_mean	mean biogenic silica flux of splits E, F, G, H	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_err_mean	biogenic silica flux uncertainty,propagated from the maximum of either the per-filter analytical error or the standard deviation among replicate filter splits	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_E	biogenic silica flux of split E	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_err_E	biogenic silica flux uncertainty of split E,propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_F	biogenic silica flux of split F	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_err_F	biogenic silica flux uncertainty of split F,propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)

bSi_f_G	biogenic silica flux of split G	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_err_G	biogenic silica flux uncertainty of split G,propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_H	biogenic silica flux of split H	micromoles per meter squared per day (mmol/m^2/d)
bSi_f_err_H	biogenic silica flux uncertainty of split H,propagated from the per-filter analytical error	micromoles per meter squared per day (mmol/m^2/d)
Mass_f_mean	mean mass flux of splits E, F, G, H	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_err_mean	mass flux uncertainty,propagated from the maximum of either the per-filter analytical error or the standard deviation among replicate filter splits	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_E	mass flux of split E	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_err_E	mass flux uncertainty of split E,propagated from the per-filter analytical error	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_F	mass flux of split F	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_err_F	mass flux uncertainty of split F,propagated from the per-filter analytical error	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_G	mass flux of split G	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_err_G	mass flux uncertainty of split G,propagated from the per-filter analytical error	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_H	mass flux of split H	milligrams per meter squared per day (mmol/m^2/d)
Mass_f_err_H	mass flux uncertainty of split H,propagated from the per-filter analytical error	milligrams per meter squared per day (mmol/m^2/d)
Th234_f_mean	mean thorium-234 flux of splits A, B, C, D	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_err_mean	thorium-234 uncertainty,propagated from the standard deviation among replicate filter splits	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_A	thorium-234 flux of split A	disintegration per minute per meter squared per day (dpm/m^2/d)

Th234_f_err_A	thorium-234 uncertainty of split A, propagated from counting statistics	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_B	thorium-234 flux of split B	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_err_B	thorium-234 uncertainty of split B, propagated from counting statistics	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_C	thorium-234 flux of split C	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_err_C	thorium-234 uncertainty of split C, propagated from counting statistics	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_D	thorium-234 flux of split D	disintegration per minute per meter squared per day (dpm/m^2/d)
Th234_f_err_D	thorium-234 uncertainty of split D, propagated from counting statistics	disintegration per minute per meter squared per day (dpm/m^2/d)

Instruments

Dataset-specific Instrument Name	Coulometer
Generic Instrument Name	CO2 Coulometer
Generic Instrument Description	A CO2 coulometer semi-automatically controls the sample handling and extraction of CO2 from seawater samples. Samples are acidified and the CO2 gas is bubbled into a titration cell where CO2 is converted to hydroxyethylcarbonic acid which is then automatically titrated with a coulometrically-generated base to a colorimetric endpoint.

Dataset-specific Instrument Name	Thermo Electron FlashEA 1112 C/N analyzer
Generic Instrument Name	Elemental Analyzer
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	NBST, neutrally buoyant sediment trap, WHOI
Generic Instrument Name	Neutrally Buoyant Sediment Trap
Generic Instrument Description	In general, sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. The Neutrally Buoyant Sediment Trap (NBST) was designed by researchers at Woods Hole Oceanographic Institution. The central cylinder of the NBST controls buoyancy and houses a satellite transmitter. The other tubes collect sediment as the trap drifts in currents at a predetermined depth. The samples are collected when the tubes snap shut before the trap returns to the surface. (more: http://www.whoi.edu/instruments/viewInstrument.do?id=10286)

Dataset-specific Instrument Name	Riso Beta Counter
Generic Instrument Name	Riso Laboratory Anti-coincidence Beta Counters
Generic Instrument Description	Low-level beta detectors manufactured by Riso (now Nutech) in Denmark. These instruments accept samples that can be mounted on a 25mm filter holder. These detectors have very low backgrounds, 0.17 counts per minute, and can have counting efficiencies as high as 55%.

Dataset-specific Instrument Name	Particle Export LAGRAngian sediment traps (PELAGRA)
Generic Instrument Name	Sediment Trap
Dataset-specific Description	PELAGRA, Particle Export LAGRAngian sediment traps, NOC: The PELAGRA trap was designed at the National Oceanography Centre, Southampton, UK (Lampitt et al. 2008) and consists of an arrangement of four conical traps (collection area 0.5 m2) around an APEX float (Teledyne-Webb Research, Inc.) with mechanically opening and closing collection cups.
Generic Instrument Description	Sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. In general a sediment trap has a jar at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. This designation is used when the specific type of sediment trap was not specified by the contributing investigator.

Dataset-specific Instrument Name	surface tethered trap (STT)
Generic Instrument Name	Sediment Trap
Dataset-specific Description	STT, surface tethered trap, WHOI
Generic Instrument Description	Sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. In general a sediment trap has a jar at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. This designation is used when the specific type of sediment trap was not specified by the contributing investigator.

Dataset-specific Instrument Name	Spectrophotometer
Generic Instrument Name	Spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

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Deployments

DY077

Website	https://www.bco-dmo.org/deployment/765832
Platform	RRS Discovery
Start Date	2017-04-14
End Date	2017-05-01

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Project Information

Collaborative Research: Are all traps created equal? A multi-method assessment of the collection and detection of sinking particles in the ocean (Are Traps Equal)

Coverage: Porcupine Abyssal Plain Sustained Observatory (PAP-SO) site in the Northeast Atlantic Ocean (49°N, 16.5°W)

NSF Award Abstract:

There is considerable need to understand the biological and ecological processes that through net primary production fix dissolved carbon dioxide ($CO2$) into organic matter in the upper ocean, and the processes that

subsequently transport this organic carbon in to the ocean's interior. Most of the particulate organic carbon flux to the deep ocean is thought to be mediated by sinking particles. Ultimately it is the deep organic carbon transport and its sequestration that define the impact of ocean biota on atmospheric CO2 levels and hence climate. Currently, various methods are available to measure the amount of particles in the ocean that sink over a specified period of time commonly referred to as particle flux. Unfortunately, all of these methods are used independently of each other with very little intercomparison, leaving some uncertainty as to which approach provides the most accurate estimates. This study seeks to be the first concerted effort to standardize particle flux measurements. Seeking to keep the cost modest, the researchers are taking advantage of a collaboration with scientists in the United Kingdom to participate in an already scheduled research cruise. The proposed research will have much greater impact that merely standardization of particle flux measurements because it will provide the science and modeling community the ability to quantify the transfer of carbon throughout the surface ocean. Also, this project provides a variety of mentoring and training opportunities for students. A PhD student at Woods Hole Oceanographic Institute will get their first sea-going experience and will learn all of the processing steps for the study of an isotope of thorium (234Th). Skidmore College will have an undergraduate participant in the research and the results from the cruise will also be an excellent additional component for undergraduate oceanography classes.

Researchers from Woods Hole Oceanographic Institution and Skidmore College, in collaboration with a scientist from the National Oceanography Centre, Southampton will inter-compare direct, tracer, and optical-sensor methods used to determine sinking particle fluxes in the surface ocean. To do this, they will firstly conduct a comparison of two types of neutrally buoyant traps and one surface-tethered, drifting array. Secondly, measured trap fluxes will be compared to predicted 234Th fluxes from a 3D time-series of data. Lastly, optical sediment trap measurements will be compared to particle size distributions in the water column and gel traps, as well as size-fractionated particles on filters from large volume pumps. With this research, global ocean models, particularly carbon, will have greater accuracy and stronger conclusions will be able to be drawn from them.

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