Fluxes of lipid biomarkers from the Oceanic Flux Program sediment trap time-series in the North Sargasso Sea from September to December 2016

Website: https://www.bco-dmo.org/dataset/775902
Data Type: Other Field Results
Version: 1
Version Date: 2019-09-04

Project
» Time Series Particle Flux Measurements in the Sargasso Sea (OFP Sargasso Sea)

Program
» Oceanic Flux Program (OFP)

Contributors	Affiliation	Role
Conte, Maureen H.	Bermuda Institute of Ocean Sciences (BIOS)	Principal Investigator
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Abstract
Fluxes of lipid biomarkers in the 1500 m and 3200 m Oceanic Flux Program sediment traps in the northern Sargasso Sea, before, during and after of Hurricane Nicole 2016 (Sep-Dec 2016)

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Coverage

Spatial Extent: **Lat**:31.8333 **Lon**:-64.1666
Temporal Extent: 2016-09-25 - 2016-12-10

Dataset Description

Fluxes of lipid biomarkers in the 1500 m and 3200 m Oceanic Flux Program sediment traps in the northern Sargasso Sea, before, during and after of Hurricane Nicole 2016 (Sep-Dec 2016)

Methods & Sampling

Sinking particles were collected at 1500 m and 3200 m depths by Parflux sediment traps (McLane Labs, Falmouth, MA) on the Oceanic Flux Program (OFP) mooring. Trap cups were filled with 40 ppt deep seawater

(concentrated by freezing) poisoned with ultra-trace metal purity HgCl2 (200 mg L-1). OFP methods are detailed in Conte et al. (2001, 2018). Sinking particles analyzed in this study were collected between 25 October 2016 and 10 December 2016 with a biweekly sample resolution.

Lipids were preserved and analyzed using a modification of methods in Conte et al. (2003) (Pedrosa-Pàmies et al., 2018). Briefly, an internal standard mixture (n-C21:0 fatty alcohol, n-C23:0 fatty acid, 5α-cholestane and n-C36:0 alkane) was added to the samples prior to lipid extraction. Lipids were ultrasonically extracted in 2:1 CHCl3-MeOH, transesterified with methanolic HCl and trimethylsilylated using BSTFA with 1% TMCS. The transesterified, trimethylsilyl derivatives were analyzed on an Agilent 7890A GC coupled to a 5975C MS. Compounds were identified by mass spectra and quantified from their FID response relative to the internal standard.

Data Processing Description

Lipid compounds were identified by their mass spectra and were quantified from their FID response relative to the internal standard. The software used were MSD ChemStation (version E.0202.1431) and Chrom Perfect (version 5.5.2).

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- re-formatted date from d-Mon-yy to yyyy-mm-dd

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Data Files

File
lipid_flux.csv (Comma Separated Values (.csv), 2.65 KB) MD5:88c11d1b9be8288f20b1bea37f829261 Primary data file for dataset ID 775902

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Related Publications

Pedrosa-Pàmies, R., Conte, M. H., Weber, J. C., & Johnson, R. (2018). Carbon cycling in the Sargasso Sea water column: Insights from lipid biomarkers in suspended particles. Progress in Oceanography, 168, 248–278. doi:10.1016/j.pocean.2018.08.005 https://doi.org/10.1016/J.POCEAN.2018.08.005
Methods

Pedrosa-Pamies, R., Conte, M. H., Weber, J. C., & Johnson, R. (2019). Hurricanes enhance labile carbon export to the deep ocean. Geophysical Research Letters. doi:10.1029/2019gl083719
https://doi.org/10.1029/2019GL083719
Results

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Parameters

Parameter	Description	Units
depth_m	depth of observation	meters (m)

start_date	start date in yyyy-mm-dd format	unitless
end_date	end date in yyyy-mm-dd format	unitless
days_sampling	number of days sampling	days
poc_perc	Particulate Organic Carbon percentage of total mass flux	unitless
poc_flux	Particulate Organic Carbon flux	milligrams per meter squared per day (mg/m2/d)
total_lipid_perc	Total extractable lipids percentage of total POC	unitless
total_lipid_flux	Total extractable lipids flux	micrograms per meter squared per day (ug/m2/d)
tfa_flux	Total fatty acids flux	micrograms per meter squared per day (ug/m2/d)
sfa_flux	C12-C28 saturated even fatty acids flux	micrograms per meter squared per day (ug/m2/d)
mufa_flux	C14:1-C22:1 monosaturated even fatty acids flux	micrograms per meter squared per day (ug/m2/d)
flux_18_1w9_fa	18:1ω9 fatty acid flux	micrograms per meter squared per day (ug/m2/d)
flux_18_1w7_fa	18:1ω7 fatty acid flux	micrograms per meter squared per day (ug/m2/d)
pufas_flux	C16-C20 polyunsaturated fatty acids flux	micrograms per meter squared per day (ug/m2/d)

flux_18_3w6_pufa	18:3ω6 polyunsaturated fatty acid flux	micrograms per meter squared per day (ug/m2/d)
flux_20_5w3_pufa	20:5ω3 polyunsaturated fatty acid flux	micrograms per meter squared per day (ug/m2/d)
flux_22_6w3_pufa	22:6ω3 polyunsaturated fatty acid flux	micrograms per meter squared per day (ug/m2/d)
odd_br_fa_flux	C13-C19 odd and saturated iso- anteiso-branched fatty acid flux	micrograms per meter squared per day (ug/m2/d)
tfal_flux	Total Fatty alcohols flux	micrograms per meter squared per day (ug/m2/d)
mufal_flux	C16-22 Monounsaturated fatty alcohols	micrograms per meter squared per day (ug/m2/d)
odd_br_fal_flux	C11-21 Odd and iso- anteiso-branched fatty alcohols flux	micrograms per meter squared per day (ug/m2/d)
tbeta_omega_1_hydroxyacids	+ω-1 hydroxyacids flux	micrograms per meter squared per day (ug/m2/d)
tsterols_stanols	Total sterols+stanols flux	micrograms per meter squared per day (ug/m2/d)
phytosterols	Phytosterols= (24-Nor-cholesta-5; 22-dien-3β-ol (C26Δ5;22); 27-nor-24-methylcholesta-5;22-dien-3β-ol (Cnor27Δ5;22); Cholesta-5;22-dien-3β -ol (C27Δ5;22); 24-Methylcholesta-5;22-dien-3β-ol (C28Δ5;22); 24-Methylcholesta-5;24(28)-dien-3β-ol (C28Δ5;24(28)); 24-Methylcholest-5-en-3β-ol (C28Δ5); 24-Ethylcholesta-5;22-dien-3β-ol (C29Δ5;22); 24-Ethylcholest-5-en-3β-ol (C29Δ5); 24-Propylcholesta-5;24(28)-dien-3β-ol (C30Δ5;24(28)); 4α;23;24-Trimethyl-5a-cholest-22-en-3β-ol (4αC30Δ22)) flux	micrograms per meter squared per day (ug/m2/d)

nor27delta5_22e	Cholesta-5;22-dien-3β -ol (Occelasterol) flux	micrograms per meter squared per day (ug/m2/d)
flux_27delta5_22e	Cholesta-5;22-dien-3β -ol (Dehidrocholesterol) flux	micrograms per meter squared per day (ug/m2/d)
flux_28delta5_22e	24-Methylcholesta-5;22-dien-3β-ol (Brassicasterol) flux	micrograms per meter squared per day (ug/m2/d)
flux_29delta5_22e	24-Ethylcholesta-5;22-dien-3β-ol (Estigmasterol) flux	micrograms per meter squared per day (ug/m2/d)
flux_27delta5	Cholest-5-en-3β-ol (cholesterol) flux	micrograms per meter squared per day (ug/m2/d)
flux_28delta5	4-Methylcholest-5-en-3β-ol flux	micrograms per meter squared per day (ug/m2/d)
flux_29delta5	24-Ethylcholest-5-en-3β-ol flux	micrograms per meter squared per day (ug/m2/d)
tstanols	Stanols= (24-Nor-5α-cholest-22-en-3β-ol (C26Δ22); 5α-Cholesta-22-en-3β-ol (C27Δ22); 24-Methyl-5α-cholest-22-en-3β-ol (C28Δ22); 24-Ehtyl-colesta-22-en-3β-ol (C29Δ22); 5α-Cholestan-3β-ol (C27Δ0); 24-Methyl-colestan-3β-ol (C28Δ0); 24-Ethyl-5α-cholestan-3β-ol (C29Δ0); 4α;23S;24R-trimethyl-5α(H)-cholestan-3β-ol (4αC30Δ0).	micrograms per meter squared per day (ug/m2/d)
flux_27delta0	5α-Cholestan-3β-ol) flux	micrograms per meter squared per day (ug/m2/d)
flux_28delta0	24-Methyl-colestan-3β-ol flux	micrograms per meter squared per day (ug/m2/d)

flux_29delta0	24-Ethyl-5α-cholestan-3β-ol flux	micrograms per meter squared per day (ug/m2/d)
flux_27delta22	5α-Cholesta-22-en-3β-ol flux	micrograms per meter squared per day (ug/m2/d)
sk	Saturated 4-methyl steroidal ketones flux	micrograms per meter squared per day (ug/m2/d)
c30diol	C30 alkan-1;15-diol flux	micrograms per meter squared per day (ug/m2/d)
hop	Hopanoids flux	micrograms per meter squared per day (ug/m2/d)
flux_1_o_alkyl	1-O-alkylglycerols flux	micrograms per meter squared per day (ug/m2/d)
alkenones	C37-C39 methyl ketones flux	micrograms per meter squared per day (ug/m2/d)

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Instruments

Dataset-specific Instrument Name	Gas chromatograph-mass spectrometer
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Gas chromatograph-mass spectrometer (GC-MS): Agilent 7890A GC coupled to a 5975C MS equipped with triple-axis MS and FID detectors.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

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Project Information

Time Series Particle Flux Measurements in the Sargasso Sea (OFP Sargasso Sea)

Website: http://www.mbl.edu/ecosystems/conte/ofp/

Coverage: Sargasso Sea

NSF Award Abstract:
This award continues, for another three years, the Ocean Flux Program (OFP) that has been in continuous operation near Bermuda since 1978. The OFP time-series of particle fluxes in the deep Sargasso Sea has produced a unique record of the "biological pump," a term used to describe the sinking of biological material from the surface to the deep ocean. The OFP provided the first direct evidence for seasonal changes in the deep ocean and tight links between deep ocean and upper ocean processes. The OFP provides clear evidence for the intensity of biological activity throughout the ocean's interior and the roles of key processes in biogeochemical and elemental cycling. The time-series is becoming long enough to study flux variability in terms of ocean basin-scale forcing, such as the North Atlantic Oscillation. The OFP sample archives are an unparalleled resource for study of temporal trends and the biogeochemical consequences of changing ocean chemistry. Education provided by the OFP broadens the experiences and science directions of many students (high school to PhD levels) and early investigators at critical career junctures.

The OFP time-series is the longest of its kind and unique in its focus on the deep ocean. As the record lengthens, investigators are better able to put into perspective the observed flux patterns in terms of the interplay between climate and ocean functioning. Colocation of complementary time-series -- Hydrostation S, the Bermuda Atlantic Time-Series (BATS), the Bermuda Testbed Mooring (BTM, 1994-2007), the Tudor Hill atmospheric tower and other sampling conducted near the Bermuda Time-Series Site -- and continuing advances in instrumentation on the OFP mooring present unparalleled opportunities to study coupling among ocean physics, biology and chemistry and material fluxes, and flux linkages with atmospheric and climatic forcing. As ever more sophisticated analytical tools are used to probe the recovered flux materials, new data continue to reveal novel information about ocean processes.

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Program Information

Oceanic Flux Program (OFP)

Website: http://www.mbl.edu/ecosystems/conte/ofp/

Coverage: Sargasso Sea

(Adapted from the NSF Project Summary)

Since 1978, the Oceanic Flux Program (OFP), originally founded and managed by at the Woods Hole Oceanographic Institution and now managed by the Bermuda Institute of Ocean Science (BIOS), has continuously measured particle fluxes in the deep Sargasso Sea. The 35+ year OFP time-series is, by far, the longest of its kind and unique in its focus on the deep ocean. OFP has produced a unique, albeit "edited", record of temporal variability in the "biological pump", a term loosely applied here to material transfer from the surface to the deep ocean. The OFP provided the first direct evidence for seasonality in the deep ocean and the tight coupling between deep fluxes and upper ocean processes. It has provided clear evidence of the intensity of biological reprocessing of flux and scavenging of suspended material in mesopelagic waters. The record has documented interannual and longer variations in deep fluxes and shorter term fluctuations driven by the interactions between mesoscale physical variability, meteorological forcing and ecosystem responses.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1536644

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