Sediment trap carbon and nitrogen flux data from sediment traps deployed in the Mediterranean Sea, 2003-2005 (MedFlux project)

Website: https://www.bco-dmo.org/dataset/3563
Version: 18 October 2011
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Project
» MedFlux collaborative research project (MedFlux)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Data Files

File
SedTrapCN.csv (Comma Separated Values (.csv), 23.13 KB) MD5:88ac02ad174cfa8615ed62e7959ecbef Primary data file for dataset ID 3563

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Parameters

Parameter	Description	Units
date_coll_init	date sample collection began	YYYYMMDD
date_coll_fin	date sample collection ended	YYYYMMDD
lat	latitude	decimal degrees

lon	longitude	decimal degrees
depth_trap	depth of trap	meters
trap_type	trap type: TS = time series trap; SV = settling velocity trap	dimensionless
trap_deploy	trap deployment number	dimensionless
tube_num	tube number	dimensionless
N_tot	total nitrogen content of trapped particulate matter	%
C_tot	total carbon content of trapped particle matter	%
C_org	organic carbon content of trapped particle matter	%
C_inorg	inorganic carbon content of trapped particle matter	%
C_org_to_N	ratio of carbon to nitrogen	ratio atomic
flux_N	particulate mass flux; nitogen	milligrams/meter^2/day
flux_C_tot	total particulate mass flux; total carbon	milligrams/meter^2/day
flux_C_org	particulate mass flux; organic carbon	milligrams/meter^2/day
flux_C_inorg	particulate mass flux; inorganic carbon	milligrams/meter^2/day
IMFD_SV_N	time integrated mass flux density of nitrogen from settling velocity trap (SV)	milligrams/meter^2/SV width
IMFD_SV_C_tot	time integrated mass flux density of total carbon from settling velocity trap (SV)	milligrams/meter^2/SV width
IMFD_SV_C_org	time integrated mass flux density of organic carbon from settling velocity trap (SV)	milligrams/meter^2/SV width
IMFD_SV_C_inorg	time integrated mass flux density from settling velocity trap (SV); inorganic carbon	milligrams/meter^2/SV width

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Instruments

Dataset-specific Instrument Name	Sediment Trap - IRS
Generic Instrument Name	Sediment Trap - IRS
Dataset-specific Description	The Indented Rotary Sphere (IRS) traps were fitted with time-series (TS) carousels.
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. The Indented Rotating Sphere (IRS) Sediment Trap is described in Peterson et al. (Field evaluation of a valved sediment trap. 1993. Limnology and Oceanography, 38, pp. 1741-1761 and Novel techniques for collection of sinking particles in the ocean and determining their settling rates. 2005. Limnology and Oceanography Methods 3, pp. 520-532). The IRS trap consists of four cylindrical modules; a particle interceptor, an IRS valve; a skewed funnel, and an eleven sample carousel (designated IRSC trap). The key to the trap design is the patented IRS valve located between the particle interceptor and particle accumulator portions of the trap. The valve and carousel are regulated by a TattleTale IVA (manufactured by Onset Computer Corp.) microprocessor and custom software. The IRS sediment trap was specifically designed to exclude zooplankton (Trull et al. 2008. Deep-Sea Research II v.55 pp. 1684-1695).

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Deployments

MedFlux_SedTrap_2003_P1

Website	https://www.bco-dmo.org/deployment/58159
Platform	MedFlux_Mooring
Start Date	2003-03-04
End Date	2003-05-09
Description	MedFlux sampling was carried out near the French JGOFS DYFAMED (DYnamique des Flux Atmospheriques en MEDiterranee) site (43 25 N, 7 52 E) in the Ligurian Sea (northwestern Mediterranean), 52 km off Nice in 2300 meters water depth. The P1 designation refers to Period 1, the first deployment of the MedFLux sediment trap mooring at this location. The P1 mooring was deployed during a Tethys II cruise in early March 2003, and recovered on 9 May 2003 during a Seward Johnson II cruise. The P1 mooring was located at 43.3 North, 7.7 East and had sediment traps at 238 and 711 meters.

MedFlux_SedTrap_2003_P2

Website	https://www.bco-dmo.org/deployment/58157
Platform	MedFlux_Mooring
Start Date	2003-05-14
End Date	2003-06-20
Description	MedFlux sampling was carried out near the French JGOFS DYFAMED (DYnamique des Flux Atmospheriques en MEDiterranee) site (43 25 N, 7 52 E) in the Ligurian Sea (northwestern Mediterranean), 52 km off Nice in 2300 meters water depth. The P2 designation refers to Period 2, the second deployment of the MedFlux sediment trap mooring at this location. The P2 mooring was deployed on 14 May 2003 during a Seward Johnson II cruise, and recovered on 30 June 2003 during a Tethys II cruise. The P2 mooring was located at 43.3 North, 7.7 East and had sediment traps at 117 and 1918 meters.

MedFlux_SedTrap_2005

Website	https://www.bco-dmo.org/deployment/58160
Platform	MedFlux_Mooring
Start Date	2005-03-04
End Date	2005-05-01
Description	MedFlux sampling was carried out near the French JGOFS DYFAMED (DYnamique des Flux Atmospheriques en MEDiterranee) site (43 25 N, 7 52 E) in the Ligurian Sea (northwestern Mediterranean), 52 km off Nice in 2300 meters water depth. The 2005 mooring was the third deployment of the MedFlux sediment trap mooring at this location. According to the data documentation, the 2005 mooring was deployed on 4 March 2005 during a Tethys II cruise (the cruise plan indicates the mooring was deployed on 28 February), and recovered on 1 May 2005 during a subsequent Tethys II cruise. The mooring was located at 43.3 North, 7.7 East and had sediment traps at 313, 524, 924, 1918 meters.

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Project Information

MedFlux collaborative research project (MedFlux)

Website: http://www.msrc.sunysb.edu/MedFlux/

Coverage: Mediterranean Sea

The MedFlux collaborative research project will test two hypotheses of the influence of "ballast" on the flux of particulate matter through the water column. It either 1) acts as a physical shielding of the organic matter protecting it as it falls through the water column, or 2) is the ratio of mineral ballast to organic carbon that controls the sinking velocity and consequently the organic carbon flux to the deep sea. The project has two major objectives:

1. To assess the extent to which settling velocity separation techniques accurately and reliably measure in-situ settling velocities and to devise mechanical improvements and/or statistical correction procedures to overcome any deficiencies.
2. To develop perspectives and protocols that take advantage of the different sampling characteristics of in-situ pumps, sediment traps, and optical instruments, combined with radiochemical analysis, to assess the dependence of settling velocity and remineralization on particle size and the organic and inorganic composition of particles.

Project description from the NSF award page:

Collaborative Research: Mineral Ballast and Organic Matter Compositions as Determinants of Particle Settling Velocities and Fluxes in the Sea (MedFlux)

Sinking particulate matter is the major vehicle for exporting carbon from the sea surface to the ocean interior. During its transit towards the sea floor, most (>90%) particulate organic carbon (POC) is returned to inorganic form and redistributed in the water column. This redistribution determines the depth profile of dissolved CO_2, which in turn determines the concentration of CO2 in the surface mixed layer, and hence the rate at which the ocean can absorb CO_2 from the atmosphere. It also determines the depth profile of nutrient regeneration, which determines the time scale of return of mineral nutrients to the photic zone. The ability to predict quantitatively and mechanistically the depth profile of remineralization is therefore critical to predicting the response of the global carbon cycle to environmental change.

Minerals typically constitute more than half the mass of particles sinking out of the ocean surface, and this fraction increases dramatically with depth. Marine plankton contribute biominerals, e.g., opal by diatoms and radiolarians, and $CaCO_3$ by coccolithophorids and foraminifera. Detrital minerals (largely quartz and aluminosilicates) introduced from land by rivers and wind also can become associated with marine plankton (or their remains) through sorption and aggregation processes. Minerals are important for making less dense organic matter (OM) sink, and may also protect OM from degradation, allowing it to penetrate deeper into the ocean.

Prior to the inception of MedFlux, investigators demonstrated that ratios of particulate organic carbon to mineral ballast converge to a nearly constant value (~3-7 wt% POC) at depths >1800 m (Armstrong et al. 2002), and Klaas & Archer (2002) demonstrated that the variability in the data can largely be explained by the chemical composition of the ballast (opal vs. carbonate vs. dust). The focus of MedFlux is to develop a better mechanistic understanding of this “ballast hypothesis”. In particular, given the many processes that could cause large deviations from this ratio, a fundamental goal is to understand why POC:mass ratios seem to be well-delimited, and to use this understanding to create, as fully as possible, a new mathematical description of remineralization to replace those currently in use. This last goal is of utmost significance if, for example, lowered pH causes carbonate minerals to dissolve preferentially, affecting both ballasting and the average remineralization depth of POC in the ocean.

MedFlux is a collaborative research project that includes investigators from the U.S. and Europe.
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Publications:

Goutx, M., Wakeham, S.G., Lee, C., Duflos, M., Guigue, C., Liu, Z., Moriceau, B., Sempéré, R., Tedetti, M., and Xue, J.. "Composition and degradation of marine particles with different settling velocities in the northwest Mediterranean Sea," *Limnology and Oceanography*, v.52, 2007, p. 1645.

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McCarthy, M.D., Benner, R., Lee, C., and Fogel, M.L.. "Amino acid nitrogen isotopic fractionation patterns as indicators of heterotrophy in plankton, particulate, and dissolved organic matter," *Geochim. Cosmochim. Acta*, v.71, 2007, p. 4727.

Rodriguez y Baena, A.M., Fowler, S.W., and Warnau, M. "Could krill schools significantly bias 234Th-based carbon flux models?," *Limnology and Oceanography*, v.53, 2008, p. 1186.

Rodriguez y Baena, A.M., S.W. Fowler and J.C. Miquel. "Particulate organic carbon: natural radionuclide ratios in zooplankton and their freshly produced fecal pellets from the NW Mediterranean (MedFlux 2005)," *Limnology and Oceanography*, v.52, 2007, p. 966.

Stewart, G., Cochran, J.K., Xue, J., Lee, C., Wakeham, S.G., Armstrong, R.A., Masqué, P., and J.C. Miquel. "Exploring the connection between 210Po and organic matter in the northwestern Mediterranean," *Deep-Sea Research I*, v.54, 2007, p. 415.

Stewart, G., J. K. Cochran, J.C. Miquel, P. Masqué, J. Szlosek, A.M. Rodriguez yBaena, S.W. Fowler, B. Gasser and D.J. Hirschberg. "Comparing POC export from 234Th/238U and 210Po/210Pb disequilibria with estimates from sediment traps in the northwest Mediterranean," *Deep-Sea Research I*, v.54, 2007, p. 154.

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Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
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