CTD cast profile data from R/V Endeavor cruise EN402 from the Mediterranean Sea (MedFlux project)

Website: https://www.bco-dmo.org/dataset/3387
Version: 03 February 2006
Version Date: 2006-02-03

Project
» MedFlux collaborative research project (MedFlux)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Dataset Description

CTD profile data including pressure, temperature, salinity, dissolved oxygen, potential temperature, density and fluorometric chlorophyll a

Data Processing Description

MedFlux cruise: EN402 March 2005
CTD profile data processing notes

31 January 2006: Prepared for OCB data system by Terry McKee (PO Dept, WHOI) and Cyndy Chandler, OCB DMO (WHOI).

DMO Notes Summary:

Original data contributed: 19 September 2005 on CD-ROM by Cindy Lee
Processed: January 2006 by TMcKee (PO Dept., WHOI) and OCB DMO

Data were recovered from Seabird raw data files and are reported as 0.5 dbar pressure sorted profiles. No comparison has been done with any in-situ data. Use with caution.

Details of CTD data processing steps:

Seabird processed CTD downtrace data files (*.cnv) were contributed on the CD-ROM that was generated during the cruise and the OCB DMO extracted the data from those files. Data had been processed during the cruise using the standard set of Seabird utilities, to generate final 0.5-decibar pressure sorted downtrace files

for all CTD casts. The only additional processing done by the OCB DMO, was to reformat the at-sea-processed .cnv files (.5db bin-averaged) found in the "list" directory. The *.cnv files had been output in binary format, so we used the SBEDataProcessing program, "Translate", to convert the data to ASCII format. Also, MATLAB Physical Properties of Seawater routines were used to calculate and add several derived oceanographic parameters.

EN402 CTD shipboard data processing notes:

Modified from 402CTDprocessing.doc file contributed on post-cruise data CD-ROM.

CTD001 a Benthos Altimeter was installed.

CTD002-011 a WET Labs ECO Fluorometer was installed and Altimeter removed.

Datcnv

X Process scans to end of file. Scans to skip over **0. Binary** output, **up& down**, **Both** bottle & data to list. **Scans marked with bottle confirm bit**. Scan range offset **0**. Scan range duration **2**. Do not merge separate header file.

Scan Count, Time Elapsed (s), Pressure Digiquartz (db), Depth seawater (m), Temp 1, Temp 2, Temp Diff, Cond 1, Cond 2, Cond Diff, V0, V1, V3, Beam Attenuation Seatech, Beam Transmission Seatech, Fluorescence Seatech, Fluorescence WETLab ECOFL, V4, Oxygen V SBE43 1, V6, Oxygen V SBE43 2, Pump Status, Latitude, Longitude, Bottles Fired.

Filter for SBE9, old manual.txt suggests Low pass filter B = 0.15s for pressure

Low pass filter A = 0.03s for conductivity

New SBEDataProcessing_5.32a.pdf suggests only .15 for pressure

Used: B=0.15 for Press, Depth. A=0.03 for Cond 1 & 2 & Diff

AlignCTD for

Cond 0.073s (secondary only)

Temp 0

DO 4 (2 at 25C, 5 at 0C) V4, Oxy V pri, V6, OxyV sec

CellTM for 9+ w/TC duct & pump running at 3000rpm. **Correct both pri & sec conductivity** values

alpha = 0.03

1/beta = 7

LoopEdit (not done for EN402)

Fixed minimum velocity of **0.25m/s**. **X** Exclude scans marked bad.

Derive

Depth (sw m), Salinity 1 & 2 (PSU), Density 1 & 2 (sigma-t, Kg/m^3), Descent Rate (m/s), Oxygen 1 & 2 (ml/l)

BinAvg

Pressure, **0.5**, **X** Incl #scans/bin, **X** exclude scans marked bad, skip over **0**, Process **Downcast** only, **X** Incl

surface bin **0**, **0**, **0**

ASCII_Out

Output header & data files, 60 lines/pg, label top of file, semicolon, Julian days, all variables.

BottleSum

Show Min/Max for Avgd variables, all and salinity, density, oxygen (ml/l) derived

Processing Summary Files:

Final CTD station 11 header record showing history of processing steps:
EN402_ctd011_hdr.txt

CTD Configuration report stations 1 - 11:
CTDConReport402.txt

The OCB DMO derived some parameters using MATLAB Physical Properties of Seawater Toolbox:

Depth [sw_dpth.m]

depth=sw_dpth(data.prs,43); % latitude fixed at 43 ° N

Density [sw_dens.m]

sigma-t=sw_dens(data.ctdsal1,data.ctdtmp1,data.ctdprs,0)-1000;

Potential Density [sw_pden.m]

sigma_0=sw_pden(data.ctdsal1,data.ctdtmp1,data.ctdprs,0)-1000;

Potential Temperature [sw_ptmp.m]

potemp=sw_ptmp(data.ctdsal1,data.ctdtmp1,data.ctdprs,0);

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Data Files

File
ctd.csv (Comma Separated Values (.csv), 2.19 MB) MD5:7cbd8adc211c116c9d912d06157dc50b Primary data file for dataset ID 3387

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Parameters

Parameter	Description	Units
event	unique sampling event number	YYYYMMDDhhmm

date	start date of event (GMT)	YYYYMMDD
time	start time of event (GMT)	hhmm
lon	longitude; negative denotes West	decimal degrees
lat	latitude; negative denotes South	decimal degrees
Pmax	pressure; maximum recorded	decibars
sta	station number	integer
press	pressure; from CTD	decibars
depth	depth; calculated from CTD pressure	meters
temp	temperature; from CTD; ITS-90; from primary T0 sensor	degrees Celsius
sal	salinity; from CTD; PSS-78 (PSU);from primary T0 & C0 sensors	dimensionless
potemp	potential temperature; ITS-90; from primary T0& C0 sensors	degrees Celsius
sigma_t	sigma T (density); from primary T0 & C0 sensors	kilograms/meter^3
sigma_0	sigma theta (potential density); from primary T0 & C0 sensors	kilograms/meter^3
O2_ml_L	oxygen; dissolved from SBE CTD	milliliters/liter
trans	light transmission	percent
fluor_chla	fluorescence; Seatech sensor rescaled; units are numerically equivalent to chlorophyll-a concentrations	unknown ?? micrograms/liter ??
fluor_ECO	fluorescence; WET Labs ECO sensor	milligrams/meter^3
cond	conductivity from CTD; from primary C0 sensor	Siemens/meter

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Instruments

Dataset-specific Instrument Name	CTD Sea-Bird 9
Generic Instrument Name	CTD Sea-Bird 9
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Sea Tech Fluorometer
Generic Instrument Name	Sea Tech Fluorometer
Generic Instrument Description	The Sea Tech chlorophyll-a fluorometer has internally selectable settings to adjust for different ranges of chlorophyll concentration, and is designed to measure chlorophyll-a fluorescence in situ. The instrument is stable with time and temperature and uses specially selected optical filters enabling accurate measurements of chlorophyll a. It can be deployed in moored or profiling mode. This instrument designation is used when specific make and model are not known. The Sea Tech Fluorometer was manufactured by Sea Tech, Inc. (Corvalis, OR, USA).

Dataset-specific Instrument Name	Sea Tech Transmissometer
Generic Instrument Name	Sea Tech Transmissometer
Generic Instrument Description	The Sea Tech Transmissometer can be deployed in either moored or profiling mode to estimate the concentration of suspended or particulate matter in seawater. The transmissometer measures the beam attenuation coefficient in the red spectral band (660 nm) of the laser lightsource over the instrument's path-length (e.g. 20 or 25 cm). This instrument designation is used when specific make and model are not known. The Sea Tech Transmissometer was manufactured by Sea Tech, Inc. (Corvalis, OR, USA).

Dataset-specific Instrument Name	SBE 43 Dissolved Oxygen Sensor
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Description	The Environmental Characterization Optics (ECO) series of single channel fluorometers delivers both high resolution and wide ranges across the entire line of parameters using 14 bit digital processing. The ECO series excels in biological monitoring and dye trace studies. The potted optics block results in long term stability of the instrument and the optional anti-biofouling technology delivers truly long term field measurements. more information from Wet Labs

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Deployments

EN402

Website	https://www.bco-dmo.org/deployment/58155
Platform	R/V Endeavor
Report	http://ocb.whoi.edu/MedFlux/CRUISES/cruisePlan_EN402_March2005.pdf
Start Date	2005-05-08
End Date	2005-05-14
Description	MedFlux cruise May 2005

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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.
Robert Armstrong, Stony Brook University, Stony Brook, NY
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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
NSF Division of Ocean Sciences (NSF OCE)	OCE-0622754

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