Laser Optical Plankton Counter from R/V Oceanus cruise OC468-02 in the Gulf of Mexico in 2010 (GoMX - Hypoxia and Oil Effects project)

Website: https://www.bco-dmo.org/dataset/3540
Data Type: Cruise Results
Version: 16 September 2011
Version Date: 2011-09-16

Project
» Spatially-explicit, High-resolution Mapping and Modeling to Quantify Hypoxia and Oil Effects on the Living Resources of the Northern Gulf of Mexico (GoMX - Hypoxia and Oil Effects)

Program
» Gulf of Mexico - Deepwater Horizon Oil Spill (GoMX - DHOS)

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Dataset Description

Data consist of particle counts and sizes measured using a Brooke Ocean Technology Laser Optical Plankton Counter (LOPC) and were collected from vertical casts of up to 200 m in depth.

Parameter names, definitions and units:
The following information is from the LOPC Software Operation Manual (see related files and references). The LOPC data files are written as binary files and converted to ASCII during a minimal processing step. Each file contains a set of header information:

Header 1: PC DATE-TIME: contains Date and Time as recorded from the logging computer.

Header 2: USER SUPPLIED HEADER: contains any information provided by the user about the data

Header 3: LOPC SOFTWARE CONFIG: contains information about how the LOPC hardware was configured.

Header 4: LOPC FIRMWARE CONFIG: contains information about how the LOPC software was configured.

Following the header information, the data stream begins as single lines of information, the file format description is as follows:

L1-L4: these four lines contain the 128 bins (32 bins per line) of single element plankton counted during this half-second sample.
L1 0 0 0 0 0 0 6 8 8 7 4 2 3 2 2 7 3 4 5 6 5 3 3 2 1 2 5 7 8 0 0 4
L2 3 2 0 3 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
L3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
L4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

L5: system status/engineering data
L5 0 100 31 7 116 0 2550 0 0 2247
Description of the L5 line from the sample above (from left to right)
0 = Snapshot number
100 = Threshold
31 = Sample Number
7 = Flow Counts
116 = Delta Time
0 = Buffer Overrun
2550 = Laser Monitor (LMon in A/D counts)
0 = Electronic Counts
0 = Count Period
2247 = Laser Voltage (LVolt in A/D counts)

C: indicates a line of instrument data from any attached serial instruments. The rate at which this is transmitted by the LOPC, the data it contains, and the data string format is determined by the instrument in use. Typically, this represents a stream of CTD data.
C +20.06602 2.35579 -0.056 0.2600 3.8046

This example shows the output from a CTD.
M: indicates a portion of Multi-Element Plankton (MEP) data, where the form is 'M Element-Number Scan-Number Scan-Length Peak-Laser Monitor. The MEP data is sent whenever the opportunity is available. Both the binned data (**L1-L5** lines) and the Instrument data (**C** lines) take precedence over MEP data.
M 26 20845 1 32869
M 25 20826 30 291
M 24 20831 21 186
M 4 23768 7 33251
M 3 23760 23 1403
M 2 23761 22 1092

Description of file fields:
Snapshot Indicator: This value indicates whether a snapshot is in progress. A 1 indicates a snapshot is in progress, 0 indicates no snapshot is in progress [Found on L5 lines – position 1]

Threshold: The threshold is used to set a lower limit on signal level detection, which ensures that the LOPC is operating above the "noise level" of internal active components. This improves the accuracy and reliability of detection data. [Found on L5 lines – position 2]

Sample Number: A counter indicating number of samples taken by the LOPC at 2 Hz [Found on L5 lines – position 3]

Flow Counts: The Flow Counts indicate the number of counts within a pre-determined size range within current 0.5-second sample (can be used in combination with Delta Time for flow calculations) [Found on L5 lines – position 4]

Delta Time: Delta Time is the accumulated time for all counts detected in the Flow Counts window to pass through the beam (can be used in combination with Flow Counts for flow calculations) [Found on L5 lines –

position 5]

Buffer Overrun: Used to indicate an internal buffer overrun. ”1” if a buffer overrun occurs, “0” otherwise [Found on L5 lines – position 6]

Laser Monitor (LMon): Laser Monitor is the mean laser intensity detected by all 35 elements of the photo-diode array during this 0.5-second sample [Found on L5 lines – position 7]

Laser Voltage (LVolt): Laser Voltage is the input voltage to the laser. This value is a monitor of a laser control circuit that will increase or decrease the laser input voltage as required to maintain a preset level (LMon) [Found on L5 lines – position 10]

Element-Number: Indicates the element within the 35-element photo-diode array to which this line of MEP data pertains [Found on M lines – position 1]

Scan-Number: The Scan-Number is read from a 16-bit internal counter (0-65535) that is incremented every 35 µs to provide a measure of time. The Scan-Number indicates the “time” at which the MEP entered the beam for this element [Found on M lines – position 2]

Scan-Length: Scan-Length indicates the number of scans, or the “length of time,” a portion of a MEP was detected on the element of question [Found on M lines – position 3]

Peak Laser Level: The maximum level of laser light detected on this element during passage of a MEP [Found on M lines – position 4]

Related files and references:
Laser Optical Plankton Counter Operation and Maintenance Manual. 2010. Brooke Ocean Technology **(www.brooke-ocean.com).**

Herman AW. LOPC post-processing page: **http://www.alexherman.com/lopc_post.php.** Contains software designed to enable first-time users of the LOPC to process data.

Herman AW, M Harvey. 2006. Application of normalized biomass size spectra to laser optical plankton counter net intercomparisons of zooplankton distributions. Journal of Geophysical Research-Oceans. 111(C5): C05S05.

Herman AW, B Beanlands, EF Phillips. 2004. The next generation of Optical Plankton Counter: the Laser-OPC. Journal of Plankton Research. 26(10): 1135-1145.

Methods & Sampling

Data were collected using a Brooke-Ocean Technology Laser Optical Plankton Counter model LOPC-660. Instrument was deployed in individual, vertical casts < 200m in depth. The LOPC was calibrated prior to deployment; however, the data have not been examined in depth for quality control or assurance.

Data have not been analyzed beyond the initial collection.

Samples were taken in two locations:
near the Macondo-1 well site: 28.736669 N, 88.387161 W
offshore location bounded by 27.377-28.866667 N and 90.57366667-88.06766667 W

Data Processing Description

The data have been processed only by converting the original binary data into an ASCII format.
Otherwise the data have not been processed.

PI Note:
These date are processed enough so that people can follow the instructions to further analysis listed in the metadata.

Any further processing would be specific to any users direction questions.

BCO-DMO Processing Notes
Generated from original text file "LOPC_Locations.txt" contributed by David Kimmel

BCO-DMO Edits
- Date reformatted to YYYYMMDD
- Time reformatted to HHMM
- Longitude values signed negative for West Longitude
- "nd" (no data) value inserted in blank cells
- Parameter names modified to conform to BCO-DMO convention

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Data Files

File
LOPC.csv (Comma Separated Values (.csv), 2.42 KB) MD5:39e170a52736f04823a2a6835f096d0f Primary data file for dataset ID 3540

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Parameters

Parameter	Description	Units
Station	LOPC Station Id	text
Date	Date (GMT)	YYYYMMDD
Time	Time (GMT)	HHMM
Latitude	Station latitude (South is negative)	Decimal degrees
Longitude	Station longitude (West is negative)	Decimal degrees
Depth	LOPC Cast Depth	meters
DataFile	Link to LOPC data file	text

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Instruments

Dataset-specific Instrument Name	Laser Optical Plankton Counter
Generic Instrument Name	Laser Optical Plankton Counter
Dataset-specific Description	Brooke Ocean Technology Laser Optical Plankton Counter (LOPC) Laser Optical Plankton Counter Operation and Maintenance Manual. 2010. Brooke Ocean Technology (www.brooke-ocean.com). Herman AW. LOPC post-processing page: http://www.alexherman.com/lopc_post.php. Contains software designed to enable first-time users of the LOPC to process data.
Generic Instrument Description	Laser Optical Plankton Counter (LOPC)

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Deployments

OC468-02

Website	https://www.bco-dmo.org/deployment/58119
Platform	R/V Oceanus
Start Date	2010-08-21
End Date	2010-09-16

Description	To support additional work related to the Deepwater Horizon well leak oil spill, the Oceanus operations will be coordinated with those aboard R/V Cape Hatteras. Chief Scientist pre-cruise update May 17 ,2010 ********** Over the last few days, we've rethought our fall cruise as it's become evident that much of the oil from the Deepwater Horizon leak isn't reaching the surface and that the 5000 bbl/day official release rate estimate could be low by an order of magnitude or more. The bottom line is that an awful lot of oil is getting into the water column and we really don't know much about where it's going or what it's impact is/will be on ecosystems in the Gulf. We discussed this situation with Dave Garrison on Friday and he was very supportive of us changing the focus of our cruise and using it to survey and assess the spread and impact of the oil. Dave asked us to try to assemble a team that could attack the problem of the physical spread of the oil and its impact through the food web. We're working on this but wanted to let you know of this change in plan and to start a discussion of what the revised cruise plan would look like. Our current thinking is that we would make use of the two ships in complementary ways: * The Oceanus will focus on the vertical distribution of oil and its impact on phytoplankton and zooplankton. We envision running a series of stations along a roughly E-W transect along the slope and one or more transects running out into deep water. We would be using a CTD-rosette system to sample the water column and both meter nets and the mocness to sample zooplankton. We'll also want to use a LADCP system to measure flows in deep plumes of oil. We're talking to Andreas Thurnherr at LDEO, who has experience in these measurements and expect that he'll have someone on board to carry them out. We would carry out deck incubations to assess productivity, nutrient dynamics, and toxicity of hydrocarbons in the water column. Finally, we would like to take box and gravity cores at selected stations. * The Cape Hatteras will focus on mapping the spatial extent of oil in the upper water column through a broad survey of the northern Gulf. This would involve mostly towed instrumentation and in-line analyses complemented by CTD profiles and net tows at selected stations. A limited amount of experimental work would be done on this Planned science activities include CTD casts, mocness tows, meter net tows, surface pumping for collecting large volumes of water, deck incubations, floating sediment traps, moored sediment trap (1), multicoring (if no multicore then box and gravity core), camera deployment, radioisotopes, possible small boat ops for personnel transfer between R/V Cape Hatteras and sample collecting. Additional information: WHOI cruise planning synopsis Figure of Station Locations Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Spatially-explicit, High-resolution Mapping and Modeling to Quantify Hypoxia and Oil Effects on the Living Resources of the Northern Gulf of Mexico (GoMX - Hypoxia and Oil Effects)

Coverage: Northern Gulf of Mexico

RAPID Collaborative Proposal: Spatially-explicit, High-resolution Mapping and Modeling to Quantify Hypoxia and Oil Effects on the Living Resources of the Northern Gulf of Mexico

From the NSF proposal abstract

On April 22, 2010, the drill platform Deepwater Horizon sank in nearly 1,200 m of water in the northern Gulf of Mexico. Since this date various estimates of oil and added chemical dispersants have been released from the site with dispersion both at the surface and at depth. The transport of this oil and dispersants has been influenced by wind-driven currents over the shelf and by the Loop Current and its derivatives offshore. To date the exact amount and paths of movement of the Horizon spill remain speculative. Since 2003, with NOAA-CSCOR funding, this group of investigators has conducted 5 summer cruises in the northern Gulf of Mexico that used high-resolution sampling to define the spatially explicit relationships between physical structure to pelagic zooplankton and fish distributions. Thus this group has one of the most comprehensive, synoptic data sets on temperature, salinity, oxygen, phytoplankton, zooplankton and fish in the northern Gulf of Mexico for conditions prior to the oil leak.

The current RAPID award will allow this group to repeat their high-resolution mapping of hydrography, oxygen,

plankton and fish in the northern Gulf of Mexico. The domain of interest will include the previous survey region in the hypoxic zone west of the Mississippi Delta but also the area east of the Mississippi where more oil transport from the spill has been suggested. The cruise will take place in the late summer period because the investigators have 5 years of ?baseline? data during this season to compare the results. The measures of species diversity and abundance, biomass size spectrum, fish diets, fish growth rate potential and ecosystem models will all be extremely useful to assess the possible effects of the oil spill on the living resources of the northern Gulf of Mexico. In addition to the rapid mapping cruise on the inner to mid-shelf, this group also will send scientists on the ORV Oceanus to conduct high resolution vertical zooplankton measurements (LOPC and TAPS) and MOCNESS zooplankton tows at deeper stations and broader mapping surveys to extend our spatial coverage of the affected area. They will coordinate our zooplankton and fish measurements with other investigators assessing the biogeochemical and biological impacts of the BP oil spill. Data from previous NOAA will be deposited in the BCODMO data management facility as well as current measurements and model products.

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Program Information

Gulf of Mexico - Deepwater Horizon Oil Spill (GoMX - DHOS)

Coverage: Northern Gulf of Mexico

Grants for Rapid Response Research (RAPID)
The RAPID funding mechanism is used for proposals having a severe urgency with regard to availability of, or access to data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events.

GOM - Broader Impacts
The need to understand the impact of this largest oil spill to date on ecosystems and biochemical cycling is self evident. The consequences of the disaster and accompanying clean up measures (e.g. the distribution of dispersants) need to be evaluated to guide further mediating measures and to develop and improve responses to similar disasters in the future. Would it be advantageous if such oil aggregates sink, or should it rather remain suspended? Possibly measures can be developed to enhance sinking or suspension (e.g. addition of ballast minerals) once we understand their current formation and fate. Understanding the particle dynamics following the input of large amounts of oil and dispersants into the water is a prerequisite to develop response strategies for now and in the future.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1043249

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