Underway temperature, salinity, density, fluorometry, PAR, oxygen, etc. from R/V Falkor cruise FK003 in the North Atlantic high latitudes in July 2012

Website: https://www.bco-dmo.org/dataset/3927
Version:
Version Date: 2013-04-26

Project
» RAPID: High-resolution sampling of plankton taxa, marine snow, and environmental variables across the north Atlantic subpolar gyre (Transatlantic VPR Survey)

Contributors	Affiliation	Role
Davis, Cabell S.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Groman, Robert C.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

Underway temperature, salinity, density, fluorometry, PAR, oxygen, roll, pitch, altitude, distance, date, position, depth, water depth and turbidity measurements collected during the VPR survey by Scientific Computer System (SCS) software developed at NOAA for the NOAA fleet and the instrumentation on the VPR instrument. SCS data are generally only collected while the ship is underway. A variety of sensors can be connected to the system. Please see the list of instruments for specific information.

Methods & Sampling

The SCS data files logging the raw data are set to break once a day at GMT midnight to make acquisition, plotting, processing and transfer easier.

The following information is quoted from SOI's "Guide to SCS Data Sensors and Formats SCS v 4.6.0", by MT Colleen Peters, 2013. There is additional information available in this document that may be relevant to users of these data.

The CNAV (a dynamic Digital Global Navigation Satellite System (DGNSS) precise point positioning systemby C & C Technologies) is the primary scientific navigation positioning system, with capabilities of a decimeter or better. The CNAV provides the Seapath320 with RTCM messages to give improved accuracy. The Seapath 320 position and attitude data are utilized by the multibeam sonars. The CNAV display is located in the rack room. The antenna is located on the starboard side of upper main mast.

Kongsberg Seatex Seapath 320: The Seapath Motion Reference Unit (MRU) is located in a cubby on the starboard side of the passageway between the mess and the forward stairs on the 2nd deck (just before the watertight door). The antennas are on the port and starboard side of the main mast. The deck unit and Human Interface are in 322 rack 1. Seapath provides position and attitude data to all of the sonar systems. It is also connected to the CTD computer for use with the XBT and CTD. The position and attitude data are also distributed to other systems via an overland splitter.

Raytheon Anschuetz STD 22 Gyrocompass: The gyrocompass feed goes both to the bridge and to NMEA splitters. The data is then broadcast via a network patch panel. The gyro data is also fed into the multibeam systems.

Vaisala WXT520: The weather data comes from a sensor mounted on the upper level of the main mast. The Vaisala WXT520 collects wind direction and speed as well as air temperature, relative humidity and pressure. The sensor is directly connected to the bridge Helideck Monitoring System (HMS). The data are then output from the HMS 100 to the network and brought into SCS.

Lambrecht QUATRO IND-H': The second sensor, the Lambrecht QUATRO IND-H' measures wind speed and direction, as well as pressure, air temperature and relative humidity. The met data is only connected to the bridge display on the navigation station. The wind data are then output to the bridge's Raytheon navigation system and sent through the network in the **BridgeData** string. This sensor is for navigation only, and does not get calibrated.

Biospherical Surface Photosynthetically Active Radiation (PAR) Sensor : A PAR sensor with a spherical receiver that is equally sensitive to photons from all direction measures Quantum Scalar Irradiance (QSI). An alternative term for this quantity is "Photosynthetic Photon Flux Fluence Rate" (PPFFR). QSI or PPFFR are defined as the integral photon flux of photons in the 400–700 nm wavelength interval at a point in space from all directions around the point.

***Scientific Seawater System*:** This system was designed to run a continuous flow of seawater through several instruments to measure the properties of the surface water. The intake for this system in is the bow, and the equipment (pump, plumbing and external temperature probe) are all located forward of the bow-thruster room.

Generally, all sensors are turned on as soon as the ship is in clear water when leaving port and run for the duration of the cruise. Running the system in an environment prone to chemicals from ships and land facilities can damage the sensitive sensors. Sometimes, when the ship is in rough weather, the seawater system may catch an air bubble, which can disrupt the data, or require the system to be shut down temporarily. These occasions can be easy to identify by plotting the two temperature measurements—if the TSG temperature is high (like 5°C difference) then there is likely no flow in the system, which allows the TSG temperature to increase to room temperature, while the remote probe will stay at ocean temperature. This will vary with the local ocean temperatures.

SBE 38 Remote Temperature Probe: The 'external' or remote probe, SBE 38 measures temperature as close to the system's intake as possible. When we send 'sea surface temperature' data, we primarily use this sensor. This temperature is used to calculate sound velocity with the TSG.

SBE 45 Micro Thermosalinograph *(TSG):* The TSG measures temperature and conductivity. With these two measurements, it calculates salinity. With the salinity from the TSG, and the temperature from the remote probe, it calculates sound velocity. Using the remote probe makes sound velocity calculations more accurate because the temperature at the TSG can be affected slightly as it travels through the ship to the wet lab.

Valeport MiniSVS Sound Velocity Probe: The Sound Velocity Probe (SVP) is accessed in the forward deck store, by the aft bulkhead behind the workbench. It sits in a pipe welded to the ship's structure. Strapped into a weighted jacket, it is lowered with a cable (not the data cable) and the probe face sticks out past the hull to measure sound velocity close to the transducers. The probe can then be pulled out of the tube for inspection and cleaning, even while the ship is underway. This sensor is calibrated annually.
Seabird 9/11 plus Conductivity Temperature and Depth (CTD): CTDs are standard oceanographic systems on most ocean-going research vessels. This system provides a profile of the water column, measuring the chemical and physical properties of the water.

The CTD data is logged using the Seabird Seasave software, and also logged in SCS as a backup. It is helpful to view the CTD depth on a real time plot with winch wire out. It is also useful for comparing sea-surface temperature between the SBE 38and SBE 9plus. The CTD is a 6800m rated sensor with dual temperature and conductivity sensors. It can accommodate up to 8 auxiliary sensors. We currently have 2 SBE 43 dissolved oxygen, a WetLabs ECO FLNTU fluorometer/turbidity sensor and a C-Star Transmissometer. Due to the nature of CTD casts, the auxiliary instruments can change frequently within a cruise or between cruises, so the data are not accommodated in SCS. It would require frequent reprogramming, which would interrupt the bulk of the data being logged on SCS. The primary sensors are therefore the only ones logged by SCS. These include pressure, depth, conductivity, temperature, salinity and sound velocity.

The CTD frame and SBE 32 carousel can accommodate up to 24 12L OTE Niskin water sampling bottles.

Kongsberg Maritime Skipper DL850 Dual Axis Doppler Speed Log: Provides forward/aft (+/-) and port/starboard (+/-) ship speed measurements, both over ground and through water. The speed range is from 0-40 knots on both axis. The echo sounder has a max range of 100m.

Scientific Echo sounders
All of the following echo sounders are from Kongsberg Maritime. In normal mapping operations, the data from each of the sounders are recorded on the local acquisition machines in the Kongsberg file formats for more in-depth processing. They are recorded on SCS for use with displays, quality assurance and data transfers to the SOI website Falkor Status page. If you want to process any of these data for acoustic surveys, you will need the files in the native formats.

EM302 Deep water multibeam sonar: The EM302 is used for seafloor bathymetry, seafloor backscatter and water column backscatter. This sonar's optimal depth is 1000-6000m, but it can log data from 10-8000m.

EM710 Shallow water multibeam sonar: The EM710 is used for seafloor bathymetry, seafloor backscatter and water column backscatter. This sonar has higher resolution in more shallow depths, and its operating range is up to 2000m, but it tends to stop collecting useful data by 1500m.

EK60 Split-beam fisheries sonar: The EK60 sonar is generally used for studying the plankton or fish in the water column. There are the following frequencies: 12kHz, 38kHz, 70kHz, 120kHz, 200kHz and 710kHz.

EA600 Single-beam hydrographic sonar: The EA600 is not frequently used for logging data. It's primary function is to find the bottom quickly before an ROV dive or CTD cast or to compare to another sonar. There are the following frequencies: 12kHz, 38kHz, 120kHz and 200kHz. The 12kHz EA600 is one of two transducers that will collect data to the bottom of the Marianas Trench, roughly 11,000m in depth.

Data Processing Description

Data were received as a Matlab file. The file was processed using the JGOFS/GLOBEC Matlab method to enable it to be served.

[table of contents | back to top]

Data Files

File
sensor_FK003.csv (Comma Separated Values (.csv), 173.32 MB) MD5:4b3fbda9ce268490f546ac9dc8007cae Primary data file for dataset ID 3927

[table of contents | back to top]

Parameters

Parameter	Description	Units
year	Year the data were collected	
cruiseid	Cruise identification	
yearday_0	Decimal year day in GMT starting with January 1 as day 0. Called time in the original Matlab file.	
lat	Decimal latitude with north being positive. Called latitude in the orginal Matlab file.	decimal degrees
lon	Longitude decimal degrees with east being positive. Called longitude in the original Matlab file.	decimal degrees
depth	Depth of VPR in meters from the VPR SBE49 CTD. These values are shown as negative in the original Matlab file.	meters
temp	Temperature of seawater in degrees Celcius from the VPR SBE49 CTD. Called temperature in the original Matlab file.	degrees Celcius
sal	Salinity from VPR SBE49 CTD	unitless
density	Seawater density as Sigma-t, computed from temperature, salinity, and pressure	
fluor	Fluorescence output in millivolts from a/d fluor channel. Called fluorescence in the original Matlab file.	millivolts
turbidity	Turbidity in millivolts from a/d obs channel	millivolts
par	PAR as 1000*10^(0.004883*millivolts). Called PAR in the original Matlab file.	1000*10^(0.004883*millivolts)
depth_w	Bottom depth from the ship fathometer (EK60 on Falkor). Originally called Bottom Depth in the Matlab file.	meters
oxygen	Oxygen from a/d SBE43 O2 sensor.	millivolts
roll	Roll angle, (degrees, positive: roll to right?)	degrees
pitch	Pitch angle, (degrees, positive up)	degrees
altitude	Altitude from altimeter in millivolts from a/d	millivolts
distance	Cumulative distance traveled by the ship during the tow, in kilimeters	kilometers
month	Month the data were collected	
day	Day of the month the data were collected.	
ISO_DateTime_UTC	Date and time the data were collected in ISO8600 standard format	

[table of contents | back to top]

Deployments

FK003

Website	https://www.bco-dmo.org/deployment/59026
Platform	R/V Falkor
Start Date	2012-07-02
End Date	2012-07-28
Description	The deployment crossed the North Atlantic at high latitude to conduct a high-resolution sampling transect of mesozooplankton, marine "snow" (biogenic aggregates), and environmental variables from the northwestern UK shelf to southern Greenland via a route south of Iceland, thence south across the Labrador Sea and the Grand Banks to the slope water south of Nova Scotia, Canada, to Woods Hole, MA. It was the transatlantic maiden voyage of the Schmidt Ocean Institute's (SOI) new research vessel, R/V Falkor.

[table of contents | back to top]

Project Information

RAPID: High-resolution sampling of plankton taxa, marine snow, and environmental variables across the north Atlantic subpolar gyre (Transatlantic VPR Survey)

This project used the opportunity of a ship crossing the North Atlantic at high latitude to conduct a high-resolution sampling transect of mesozooplankton, marine "snow" (biogenic aggregates), and environmental variables from the northwestern UK shelf to southern Greenland via a route south of Iceland, thence south across the Labrador Sea and the Grand Banks to the slope water south of Nova Scotia, Canada. Sampling was done with the fast-tow Video Plankton Recorder II (VPRII). The VPR enables non-destructive sampling of fragile plankton in situ, and through rapid towyo deployments (continuous raising and lowering while under way), it provides high vertical (top 150 m) and horizontal (1km towyo spacing) resolution of robust as well as fragile plankton and aggregates and numerous environmental variables. The VPRII had been deployed in several locations around the world, but, until this cruise, there was no comparable data set for the far North Atlantic, an area of intense ecological interest. This opportunity arose from the transatlantic maiden voyage of the Schmidt Ocean Institute's (SOI) new research vessel, R/V *Falkor*, from the UK to the Woods Hole Oceanographic Institution from July 2-28, 2012. SOI funded ship costs for the transit, making the underway VPR survey a cost-effective way to sample. This project collected a major data set that can be quickly processed (acoustic, hydrographic, automated image analysis) and will be available to the community soon. Two Ph.D. students participated in the cruise, adding to their training in oceanography and high latitude marine science.

This project was funded by the National Science Foundation. In addition, the VPRII upgrade was supported by the Marine Science and Technology Foundation (WHOI #17073) and the Schmidt Ocean Institute provided the ship itself, the R/V Falkor.

[table of contents | back to top]