Mixed layer depths from R/V Thomas G. Thompson TT043, TT045, TT049, TT050, TT053, TT054 cruises in the Arabian Sea in 1995 (U.S. JGOFS Arabian Sea project)

Website: https://www.bco-dmo.org/dataset/2530
Version: June 6, 2002
Version Date: 2002-06-06

Project
» U.S. JGOFS Arabian Sea (Arabian Sea)

Program
» U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Contributors	Affiliation	Role
Gardner, Wilford D.	Texas A&M University (TAMU)	Principal Investigator
Morrison, John M.	North Carolina State University - Marine, Earth and Atmospheric Sciences (NCSU MEAS)	Co-Principal Investigator
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

PI: Wilford Gardner (Texas A&M University),
Jan Gundersen (Texas A&M University)
John Morrison (North Carolina University)
dataset: Mixed layer depths
dates: January 08, 1995 to December 26, 1995
location: N: 22.5 S: 10 W: 57.3 E: 68.75
project/cruise: Arabian Sea - All Process Cruises
ship: Thomas Thompson

Wilford Gardner - based on temperature changes
John Morrison - based on density changes
Arabian Sea Mixed Layer Depths - all process cruises

PI Notes
PI Notes on density vs. temperature calculation

Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units.

The second TEMPERATURE value was used because there occasionally appeared to

be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program.

Please note variable initial (starting) depths.

Calculations were made by Jan Gundersen. (TAMU).

Wilford D. Gardner
Dept. of Oceanography
Texas A&M University
College Station, TX 77843-3146

From Wilf Gardner, Texas A & M University, August 8, 1997

to Arabian Sea investigators and all interested others

Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors.

None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

Methods & Sampling

See Platform deployments for cruise specific documentation

[table of contents | back to top]

Data Files

File
mixed_layer.csv (Comma Separated Values (.csv), 48.85 KB) MD5:e40cdd6446d8c6984abdba716ba6f662 Primary data file for dataset ID 2530

[table of contents | back to top]

Parameters

Parameter	Description	Units
event	event number, from event log	
sta_std	Arabian Sea standard station identifier	
sta	station number	
cast	CTD cast number	
MLD_0d1_t	depth of mixed layer based on a .1 deg. C change in temperature	meters
MLD_0d5_t	depth of mixed layer based on a .5 deg. C change in temperature	meters
depth_start_temp	starting depth used in computation based on temperature	meters
MLD_0d03_dp	depth of mixed layer based on a .03kg/m^3 change in density	decibars
MLD_0d05_dp	depth of mixed layer based on a .05kg/m^3 change in density	decibars
MLD_0d125_dp	depth of mixed layer based on a .125kg/m^3 change in density	decibars
LD_0d25_dp	depth of mixed layer based on a .25kg/m^3 change in density	decibars
depth_start_dens	starting depth used in computation based on density	decibars
MLD_0d25_dp	depth of mixed layer based on a .25kg/m^3 change in density	decibars

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Conductivity, Temperature, Depth
Generic Instrument Name	CTD - profiler
Dataset-specific Description	CTD measurements taken, CTD unit unidentified
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

[table of contents | back to top]

Deployments

TT043

Website	https://www.bco-dmo.org/deployment/57704
Platform	R/V Thomas G. Thompson
Report	http://osprey.bcodmo.org/datasetDeployment.cfm?ddid=2580&did=353&flag=view
Start Date	1995-01-08
End Date	1995-02-05
Description	Purpose: Process Cruise #1 (Late NE Monsoon) **Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gunderson (Texas A&M University) and John Morrison (North Carolina State University) dataset: Mixed layer depths dates: January 08, 1995 to February 01, 1995 location: N: 22.483 S: 9.9826 W: 57.2999 E: 68.75 project/cruise: Arabian Sea Process Cruise 1, TTN-043 (Late NE Monsoon) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

TT045

Website	https://www.bco-dmo.org/deployment/57706
Platform	R/V Thomas G. Thompson
Start Date	1995-03-14
End Date	1995-04-10
Description	**Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gunderson (Texas A&M University) and John Morrison (North Carolina State University) dataset: Mixed layer depths dates: January 08, 1995 to February 01, 1995 location: N: 22.483 S: 9.9826 W: 57.2999 E: 68.75 project/cruise: Arabian Sea Process Cruise 2, TTN-045 (Spring InterMonsoon) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

TT049

Website	https://www.bco-dmo.org/deployment/57710
Platform	R/V Thomas G. Thompson
Start Date	1995-07-17
End Date	1995-08-15
Description	**Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gundersen-temperature-based (Texas A&M University) and John Morrison-density-based (North Carolina State University) dataset: Mixed layer depths dates: July 18, 1995 to August 13, 1995 location: N: 22.5268 S: 9.911 W: 57.2997 E: 68.7507 project/cruise: Arabian Sea Process Cruise 4, TTN-049 (Middle SW Monsoon) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

TT050

Website	https://www.bco-dmo.org/deployment/57711
Platform	R/V Thomas G. Thompson
Start Date	1995-08-18
End Date	1995-09-15
Description	**Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gundersen-temperature-based (Texas A&M University) and John Morrison-density-based (North Carolina State University) dataset: Mixed layer depths dates: August 18, 1995 to September 13, 1995 location: N: 22.4998 S: 9.9125 W: 57.3004 E: 68.7527 project/cruise: Arabian Sea Process Cruise 5, TTN-050 (Late SW Monsoon) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

TT053

Website	https://www.bco-dmo.org/deployment/57714
Platform	R/V Thomas G. Thompson
Start Date	1995-10-29
End Date	1995-11-26
Description	**Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gundersen-temperature-based (Texas A&M University) and John Morrison-density-based (North Carolina State University) dataset: Mixed layer depths dates: October 29, 1995 to November 25, 1995 location: N: 24.3329 S: 10.0823 W: 56.4858 E: 67.1784 project/cruise: Arabian Sea Process Cruise 6, TTN-053 (bio-optics) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

TT054

Website	https://www.bco-dmo.org/deployment/57715
Platform	R/V Thomas G. Thompson
Start Date	1995-11-30
End Date	1995-12-28
Description	**Methods & Sampling** PI: Wilford Gardner (Texas A&M University), Jan Gundersen-temperature-based (Texas A&M University) and John Morrison-density-based (North Carolina State University) dataset: Mixed layer depths dates: November 30, 1995 to December 26, 1995 location: N: 22.5171 S: 9.9673 W: 57.2992 E: 68.7849 project/cruise: Arabian Sea Process Cruise 7, TTN-054 (Early NE Monsoon) ship: Thomas Thompson Mixed layer depths are based on a temperature increase of 0.1 and 0.5 degrees C from the second temperature value listed in the CTD files, which corresponds roughly to a density increase of 0.03 and 0.125 density units. The second TEMPERATURE value was used because there occasionally appeared to be questionable numbers as the first value. The temperature change of 0.1 degree C was recommended by Dr. Craig Lee (WHOI) after looking at the data and the 0.5 degree C value is the Levitus standard used in his NOAA global atlases. These are also the values used in the US JGOFS EqPac program. Please note variable initial (starting) depths. Calculations were made by Jan Gundersen. (TAMU). Wilford D. Gardner Dept. of Oceanography Texas A&M University College Station, TX 77843-3146 From Wilf Gardner, Texas A & M University, August 8, 1997 to Arabian Sea investigators and all interested others Since the New Hampshire meeting [July, 1997], we have compared the MLD based on the temperature criteria of 0.1 and 0.5 degrees C compared with the density differences of 0.03 and 0.125 density units. About 75% of the time the values are identical. There are other occasions, however, where there are significant differences, especially for the 0.1 degrees C/0.03 comparison. When there is a difference, the temperature calculations generally give deeper MLDs than density calculations. Differences most often occur when there is a salinity increase below the surface. Temperature criteria are often used for MLDs on moored data as salinity sensors are sometimes subject to greater drift than temperature sensors. None of the above criteria identify the "mixed-layer depth" perfectly in all cases, but examination of depth plots where there are differences suggest that the density criteria more reliably identify the depth of most recent mixing. For consistency, we recommend that the MLDs based on density be used when you are trying to calculate mass budgets. In some situations, such as sometimes during the TN045 intermonsoon period, there is no true mixed layer - just a depth at which the MLD criteria are finally exceeded. We suggest that you look at an expanded plot of the density profile if your calculations are critical.

[table of contents | back to top]

Project Information

U.S. JGOFS Arabian Sea (Arabian Sea)

Website: http://usjgofs.whoi.edu/research/arabian.html

Coverage: Arabian Sea

The U.S. Arabian Sea Expedition which began in September 1994 and ended in January 1996, had three major components: a U.S. JGOFS Process Study, supported by the National Science Foundation (NSF); Forced Upper Ocean Dynamics, an Office of Naval Research (ONR) initiative; and shipboard and aircraft measurements supported by the National Aeronautics and Space Administration (NASA). The Expedition consisted of 17 cruises aboard the R/V Thomas Thompson, year-long moored deployments of five instrumented surface buoys and five sediment-trap arrays, aircraft overflights and satellite observations. Of the seventeen ship cruises, six were allocated to repeat process survey cruises, four to SeaSoar mapping cruises, six to mooring and benthic work, and a single calibration cruise which was essentially conducted in transit to the Arabian Sea.

[table of contents | back to top]

Program Information

U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Website: http://usjgofs.whoi.edu/

Coverage: Global

The United States Joint Global Ocean Flux Study was a national component of international JGOFS and an integral part of global climate change research.

The U.S. launched the Joint Global Ocean Flux Study (JGOFS) in the late 1980s to study the ocean carbon cycle. An ambitious goal was set to understand the controls on the concentrations and fluxes of carbon and associated nutrients in the ocean. A new field of ocean biogeochemistry emerged with an emphasis on quality measurements of carbon system parameters and interdisciplinary field studies of the biological, chemical and physical process which control the ocean carbon cycle. As we studied ocean biogeochemistry, we learned that our simple views of carbon uptake and transport were severely limited, and a new "wave" of ocean science was born. U.S. JGOFS has been supported primarily by the U.S. National Science Foundation in collaboration with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Department of Energy and the Office of Naval Research. U.S. JGOFS, ended in 2005 with the conclusion of the Synthesis and Modeling Project (SMP).

[table of contents | back to top]

Funding

Funding Source	Award
Office of Naval Research (ONR)	unknown Arabian Sea ONR
National Science Foundation (NSF)	unknown Arabian Sea NSF

[table of contents | back to top]