

## For Using Data

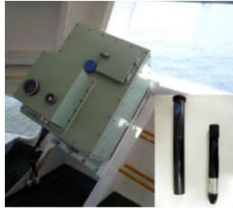
Data Policy	JAMSTEC
Principal Investigator	Data Management Office
Use Constraints	See Terms and Conditions about constrain of use.
Data Citation	See Terms and Conditions about data citation.

## Quality

DMO-Processed

## Instrument

Expendable conductivity temperaturedepth measurements (XCTD) (since MR11-04)



## Overview

Using XCTD (eXpendable Conductivity Temperature Depth profiler) system, the vertical distribution of water temperature and salinity are observed during free fall of its probe part in the seawater. Observed temperature and conductivity are transmitted to the data processor on board by the digital signal. The digital signal is converted to the temperature, conductivity and depth by data processor as binary data. Binary data is transmitted from data processor to PC. The PC calculates salinity from temperature, conductivity and depth, and those properties are recorded in PC as the ASCII files.

## Measurement System

## 1) Launcher

Hand launcher

Manufacturer : Sippican, Inc.  
 Operation area : Rear upper deck

Automatic launcher

Manufacturer : Tsurumi Seiki Co., LTD.  
 Location : Port side of rear upper deck (4m from the sea level).  
 The control panel is installed in the investigation room.

## 2) Converter

Manufacturer : Tsurumi Seiki Co., LTD.  
 Type : See 'Use probes'  
 Sampling rate : 40 msec  
 Location : Investigation room

## 3) XCTD probe specifications

Probe Type	TSK XCTD-1, TSK XCTD-1N	TSK XCTD-2, TSK XCTD-2N	TSK XCTD-3, TSK XCTD-3N	TSK XCTD-4, TSK XCTD-4N
Temperature range	-2 to 35 [deg-C]			
Temperature accuracy	+/- 0.02 [deg-C]			
Temperature resolution	0.01 [deg-C]			
Conductivity range	0 to 60 [mS/cm]			
Conductivity accuracy	+/- 0.03 [mS/cm]			
Conductivity resolution	0.015 [mS/cm]			
Measurement depth	1000 [m]	1850 [m]	1000 [m]	1850 [m]
Depth accuracy	5 or +/- 2% of depth [m]; whichever is larger			
Maximum elapsed time	300 [sec]	600 [sec]	200 [sec]	502 [sec]
Rated ship speed	12 [knot]	3.5 [knot]	20 [knot]	6 [knot]

Since XCTD carries no pressure sensor, we need to estimate depth from the elapsed time. The fall-rate equation is as follows.

$$Z = at + 10E^{-3} * bt^2$$

Where Z(m) is the depth and t(sec) is the elapsed time.

In addition, coefficients of the fall-rate equation are different by probe types.

Probe Type	TSK XCTD-1, TSK XCTD-1N	TSK XCTD-2, TSK XCTD-2N	TSK XCTD-3, TSK XCTD-3N	TSK XCTD-4, TSK XCTD-4N
Coefficient-a	3.42543	3.43898	5.07598	3.68081
Coefficient-b	-0.47	-0.31	-0.72	-0.47

#### Use probes

The list of a XCTD type used in each cast is as follows.

Cast name	Probe Serial No.	Probe Type	Launcher	Converter
202310091347	23014230	XCTD-4N	Auto	MK-150N
202310221023	23014231	XCTD-4N	Auto	MK-150N
202310250437	23014233	XCTD-4N	Auto	MK-150N
202310271548	23014234	XCTD-4N	Auto	MK-150N
202310300813	23014235	XCTD-4N	Auto	MK-150N

#### Data processing

1) For sensor's stability, values of less than 1 m for temperature are replaced by missing values, respectively, based on manufacturer's recommendation.

2) Quality control

QCed data were added flag according to the NODC (National Oceanographic Data Center) quality control procedure.

- i. The gradient check of adjacent depth data
- ii. The density inversion check
- iii. The broad range check set up at given ocean space and depth

Please see the paper for quality control procedure in detail.

Quality control and processing of historical oceanographic temperature, salinity, and oxygen data.

P. Boyer and Levitus, 1994. NOAA technical report NESDIS ; 81

\* <https://repository.library.noaa.gov/view/noaa/13443>

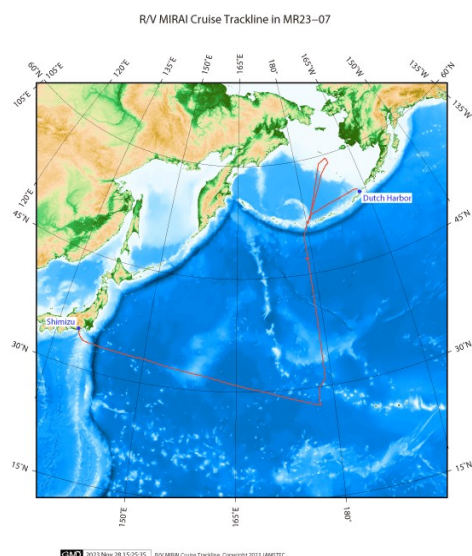
In addition, an abnormal value is identified by a visual check, and the data after visual QC is released.

#### Note

If you would like the raw data set, please contact DMO at "dmo@jamstec.go.jp".

## Related Information

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### MR23-07

Ship Name: MIRAI  
Period: 2023/10/06 - 2023/11/08  
Chief Scientist: Katsuro Katsumata (JAMSTEC)  
Proposal: Quantitative observation experiment in the North Pacific subarctic gyre — GO-SHIP Observation P14

Organic alkalinity

Float Deployments with GO-BGC

Biology Observation with GO-SHIP

Distribution of Iodine and Iodites in the North Pacific Ocean

Biogeography of Plankton in the North Pacific Ocean

Vertical mixing and transport of heat and material in the North Pacific Ocean and Bering Sea

Float Deployments to Capture Environmental Changes in the North Pacific Ocean

Polycyclic Aromatic Hydrocarbons, Radium, Cesium

Multifaceted Observation of Cloud and Rain System in the North Pacific

Speciation of Iodine, Ammonia, Nitrite in the North Pacific Ocean

Deployment of EM-APEX floats as part of US Partnership Project

Experiment on DFMC SBASS from QZSS

## Format Description for XCTD DMO

### Format Description for the DMO-Processed Data

Each data file contains one line header (meta data) followed by data lines for each cast.

The number of data lines are recorded in the header.

#### Header section

No.	Column	Content	Format	Remarks
1	1	Header ID	a1	fixed as '#'
2	3 - 6	Data ID	a4	XCTD
3	8 - 22	Cruise ID	a15	
4	33 - 40	Date	i8	YYYYMMDD (UTC)
5	42 - 45	Time	i4	hhmm (UTC)
6	47 - 55	Latitude	i2,a1,f5.2,a1	dd-mm.mmN(S)
7	57 - 66	Longitude	i3,a1,f5.2,a1	ddd-mm.mmE(W)
8	68 - 71	Number of data lines	i4	
9	72 - 73	Terminator	a2	[CR][LF]

#### Data section

No.	Column	Content	Format	Unit	Remarks
1	1 - 11	Depth	f11.1	m	
2	12 - 22	Temperature	f11.2	deg-C	ITS-90
3	23 - 33	Salinity	f11.3	PSU	PSS-78
4	45 - 55	Quality control flag	i11		45 - 51 : space 52 : flag of depth 53 : flag of temperature 54: flag of salinity 55 : space
5	56 - 57	Terminator	a2		[CR][LF]

Each contents of the data section is stored in 11 bytes.

Missing value is presented by '-5', and error value is presented by '-9'.

### Definition of Quality Control Flags

#### 1) Depth Flags

- 0 - accepted value
- 1 - error in recorded depth ( same or less than previous depth )
- 2 - density inversion

#### 2) Observed Level Flags

- N - missing value
- 0 - accepted value
- 1 - range outlier ( outside of broad range check )
- 2 - failed inversion check
- 3 - failed gradient check
- 4 - zero anomaly
- 5 - failed combined gradient and inversion checks
- 6 - failed range and inversion checks
- 7 - failed range and gradient checks
- 8 - failed range and zero anomaly checks
- 9 - failed range and combined gradient and inversion checks
- A - failed visual check