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Mirai "Cruise Report"
MR17-07C Leg 1

FYH29 (FY2017) SIP Project for Development of New-Generation Research Protocol for Submarine Resources: survey for baseline condition of hydrothermal vent area and in situ examination of observation tools.

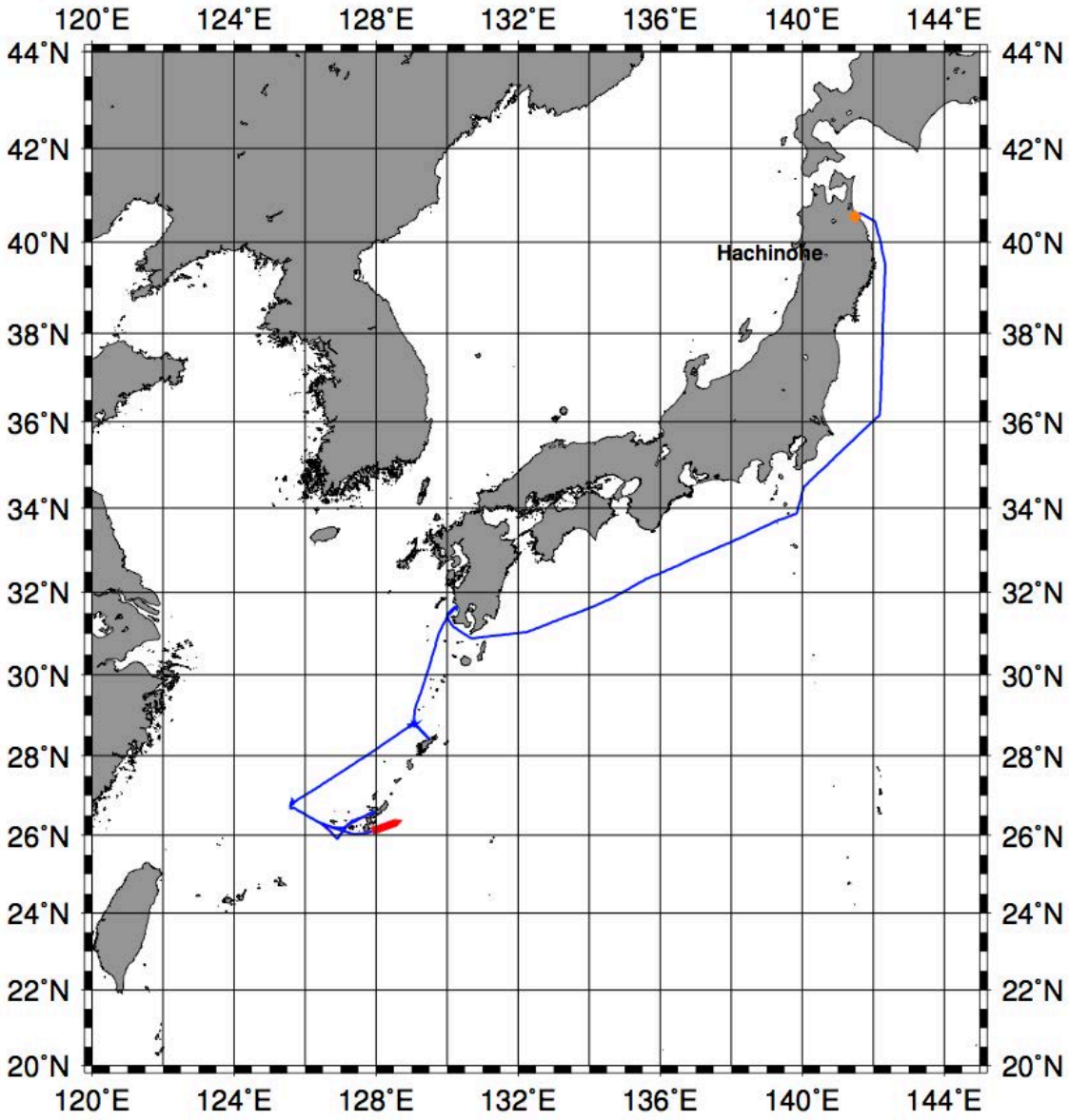
Okinawa Trough
Oct.18, 2017 - Oct. 30, 2017

Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

1. Cruise Information

- Cruise ID MR17-07C Leg1
- Name of vessel Mirai
- Title of cruise FYH29 (FY2017) SIP Project for Development of New-Generation Research Protocol for Submarine Resources: survey for baseline condition of hydrothermal vent area and in situ examination of observation tools.

- Chief Scientist [Affiliation] KAWAGUCCI Shinsuke [JAMSTEC]
- Cruise period Oct 18 2017 - Oct 30 2017
- Ports of departure / call / arrival Hachinohe - Nakagusuku (boat)
- Research area Okinawa Trough
- Research map



2. Research Proposal and Science Party

- Research proposal Title: SIP Project for Development of New-Generation Research Protocol for Submarine Resources: survey for baseline condition of hydrothermal vent area and in situ examination of observation tools.
- Representative of the Proposal [Affiliation]
  KIKAWA Eiichi [JAMSTEC]

- Representative of the Science Party [Affiliation]
  YAMAMOTO Hiroyuki [JAMSTEC]
- Science Party Onboard [Affiliation, assignment etc.]

KAWAGUCCI Shinsuke	[JAMSTEC, SIP-PT]
TADA Yuya	[JAMSTEC, SIP-PT]
MAEDA Yosaku	[JAMSTEC, MARITEC]
LINDSAY Dhugal	[JAMSTEC, SIP-PT]
INOMATA Kentaro	[JAMSTEC, SIP-PT]
KONDO Shunsuke	[JAMSTEC, SIP-PT]
CHEN Chong	[JAMSTEC, D-SUGAR]
NITTA Suehiro	[JAMSTEC, Koho]
SANO Michinori	[Astro-Design]
SANGEKAR Mehul	[U Tokyo, IIS]
MITARAI Satoshi	[OIST]
MATSUMOTO Keisuke	[MWJ]
SATO Hiroyasu	[MWJ]
HASEGAWA Mika	[Japan Marine Surveys Association]
NISHIBAYASHI Kenichiro	[Japan Marine Surveys Association]
UEMICHI Narumi	[Japan Marine Surveys Association]
NISHIBE Yuta	[Japan Marine Surveys Association]
OYAMA Ryo	[NME]
SETA Wataru	[NME]
SAGISHIMA Katsunori	[MWJ]
YOKOGAWA Shinichiro	[MWJ]
ORUI Masahiro	[MWJ]
ITO Rei	[MWJ]
TAKEDA Keisuke	[MWJ]
KOBAYASHI Rio	[MWJ]
MIYAJIMA Yuki	[MWJ]
KANII Takehiro	[MWJ]

3. Research/Development Activities

● Vertical Multiple-opening Plankton Sampler and in-situ filtration pump system

TADA Yuya, LINDSAY Dhugal, INOMATA Kentaro, KONDO Shunsuke, CHEN Chon, HASEGAWA Mika, NISHIBAYASHI Kenichir, UEMICHI Narumi, NISHIBE Yuta, ITO Rei

The biodiversity and spatial distribution of planktonic larvae were investigated from seafloor to surface waters in the Okinawa region by using the Vertical Multiple-opening Plankton Sampler (VMPS6000D, Tsurumi Seiki). After rough observation under microscopes, the collected organisms were fixed on board in 99% ethanol for imaging, taxonomic and molecular analyses.

● DeepTow6KC Video and Storage Details

LINDSAY Dhugal, MAEDA Yosaku, SANGEKAR Mehul Naresh, SANO Michinori, CHEN Chong, INOMATA Kentaro ORUI Masahiro, TAKEDA Keisuke, MIYAJIMA Yuki, KANII Takehiro

The primary cameras already deployed on the new DeepTow Camera system were a forward-downward-facing colour HD camera (OPTICA-H11W-OP7K, Kowa [FCB-H11, Sony]; 1/3 CMOS, [68˚ diagonal field angle]), a downward-facing pan-tilt-capable ethernet camera (VB-R13, Canon; [1/3 CMOS, 62.6˚ horizontal and 36.9˚ vertical field angle]), a rear-facing ethernet camera and for the dive on 26 October 2017 a forward-facing ethernet camera (OE14-377, Kongsberg [480TVL, 768x492 pixels, 36˚ horizontal and 27.5˚ vertical field angle]). The two main pressure housings from the PICASSO uROV were deployed on a skid attached to the bottom of the DeepTow frame along with their associated cameras (one 8K video camera [Astro Design], one downward facing and two forward-facing NTSC cameras (WAT-240 Vivid (G-2.5), Watec), and for the first two dives a forward-facing HDTV camera. The NTSC cameras have effective pixels 768 × 494, 450 lines, minimum luminance of 1.6 lx at F2.0, a signal to noise ratio of >50 dB. The measured camera angle in air is 80˚ (H)x59.3˚ (V) and the image sensor system consists of one 1/4"CCD. The CTD (XR-420CTDm, RBR Ltd.) and CTD-DO (XR-420CTDm, RBR Ltd.) units in addition to the Chlorophyll-Turbidity sensor (ECO FLNTU Puck, WET Labs, Inc.) were also deployed and logged data to PICASSO's logging computer in real time.

A microphone (Ultravoice XM8500, Behringer) was set up on a stand in the control container with phantom power supplied via the XLR connector from a Portable Active Signal Splitter (Kickbox 4x4, Drawmer Electronics Ltd.), which split and provided audio via XLR to the nine video recording decks at +30db gain.

Linear TimeCode (LTC) was supplied to all video recording equipment via LTC In by a timecode generator (HD-488E/GPS/NTP, ESE) that extracted time from the GPS satellite feed via a GPS antenna (GPA-019, Furuno) and converted it to Japan Standard Time (JST). Timecode was supplied via a female-male XLR cable from the SMPTE output of the TC generator to a Portable Active Signal Splitter (Kickbox 4x4, Drawmer Electronics Ltd.). Only four XLR outputs were available from the Splitter after the audio was supplied, so BNC JJJ T-connectors were used in combination with XLR-BNC cables and BNC-BNC cables to supply LTC to the three AJA miniKiPro and one AJA KiProQuad decks that recorded the feeds from the PICASSO system cameras. For the DeepTow cameras and 8K camera recording units, a female XLR to BNC cable was connected to a BNC JJJ T-connector that provided the timecode signal at +18db gain to the LTC-in BNC connectors on an AJA KiPro and to a KiPro Ultra deck via 50cm-long BNC-BNC cables. The original AJA Ki Pro is provided with an LTC Out port (BNC connector) so this LTC feed was input into the two AJA Ki Pro Quads that were recording DeepTow camera HD feeds using a BNC JJJ T-connector and BNC-BNC cables. LTC was also output from the LTC-out BNC connector on the first Ultra deck to a second AJA KiPro Ultra Deck, also via a 50cm-long BNC-BNC cable. (nb. the KiPro Quad has no LTCout BNC connector).

KiPro : DeepTow HD video feed with data overlay
KiProQuad : DeepTow HD video feed without data overlay
KiProQuad : DeepTow pan-tiltable downward-facing ethernet camera

KiProQuad : PICASSO HD camera (forward-facing ethernet camera for dives on 26 Oct.)
KiPro ULTRA: 8K-->4K30fps (whole feed downconverted)
KiPro ULTRA: 8K-->4K60fps (1/4 extract at original resolution and frame rate)
KiPro Mini: NTSC Starboard
KiPro Mini: NTSC Port
KiPro Mini: NTSC Downwards-facing

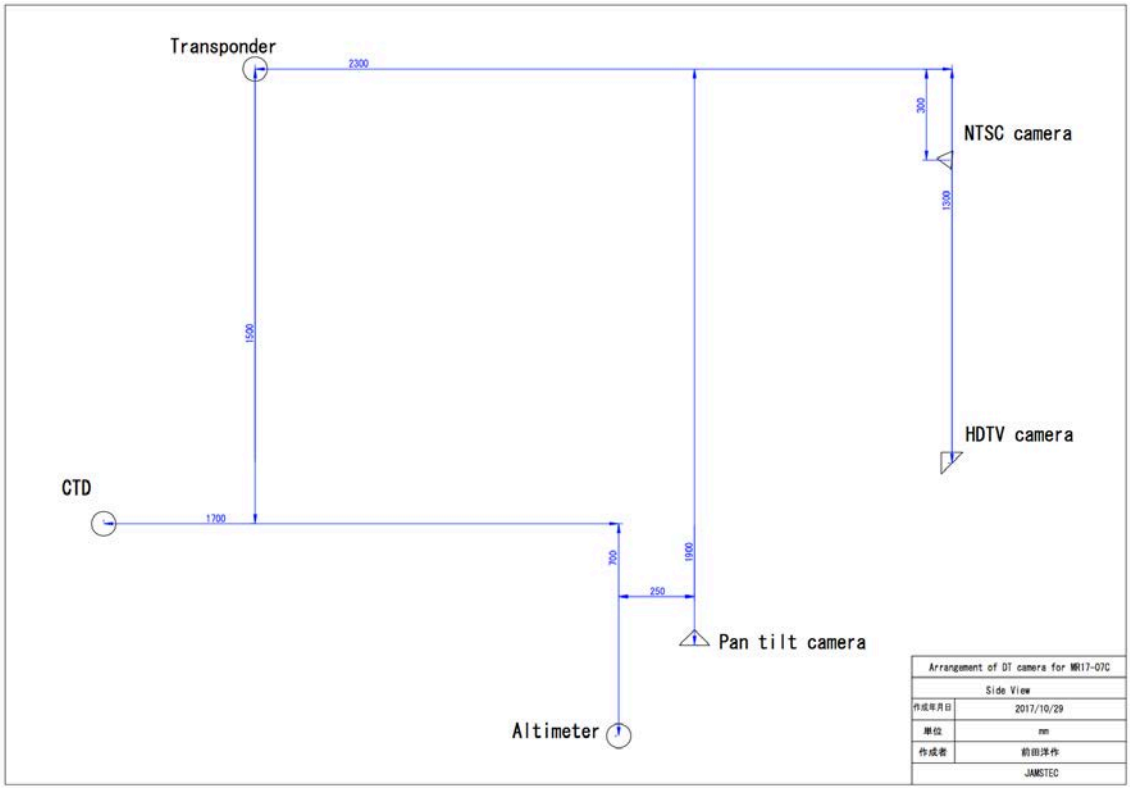
An HD/SD Distribution Amp (HD5DA, AJA) was used to split the HD-SDI output from the DeepTow system's optical-to-HDSDI converter (Kowa) and provide one stream to the DeepTow system's text overlayer and one stream without overlay to one of our KiPro Quad units. The AJA KiPro recorded the DeepTow HD video feed with data overlay from the HD-SDI output from their recording unit (BNC connector). The DeepTow system's pan-tiltable downward-facing ethernet camera feed was displayed in a web browser on their desktop computer's external monitor output, which was extracted with a Roland VC-1-SC scan converter (via HDMI) and output as HD-SDI to be recorded on a KiPro Quad unit. The HD-SDI feed from PICASSO's HD camera was recorded on a KiPro Quad unit until the HD camera housing flooded through the IE55 connector during on the 25th October. On 26 October the forward-facing ethernet camera stream was displayed in a web browser on a MacBook and the external monitor captured through a miniDisplayPort to DVI dongle, a male-male DVI cable and a DVI/HDMI to SDI ROI Mini-Converter (AJA), which output HD-SDI to the KiPro Quad. The AJA Ki Pro Quad includes an embedded monitor but the the AJA Ki Pro video output needed to be converted (OutConvert: HD 1080) for visualization on an external camera view finder monitor (HDF-700V, ProTech MasterTron, Nippon Video System Co., Ltd.) via a BNC-BNC cable.

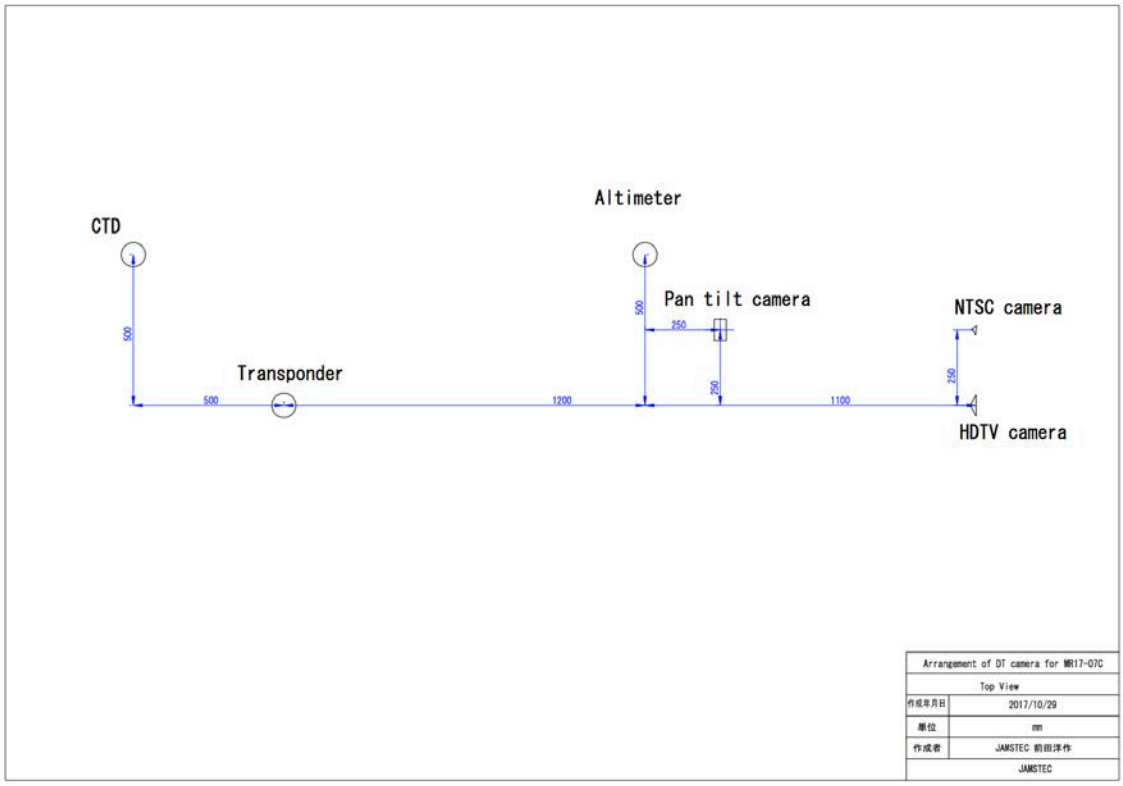
Two of the NTSC feeds from PICASSO's NTSC cameras were input via their single pin video connectors into two analogue 1-input:4-output composite video distribution amplifiers (Shinybow, SB-3701) and outputs were directly to the NTSC monitors (single pin), to a four-channel video encoder (AXIS Q7404, AXIS Communications) in PICASSO's topside unit (via female single pin to BNC connectors with short BNC-BNC cables) and to Roland VC-1-SC scan converters that converted the single pin NTSC analogue input to digital SDI output from a BNC connector. This feed was then recorded by the KiPro Mini decks. The final NTSC stream was split into 2 streams by one of the PICASSO system's original video splitters (VSP-2M, YKmusen) with one stream going to the monitor and the other into another VSP-2M splitter before the two outputs were channelled to the video encoder and to a Roland VC-1-SC scan converter through to a KiPro Mini unit.

One KiPro Ultra deck recorded the 8K camera (AstroDesign) feed, downconverted to 4K60fps through an SHV Cross Converter (SC-8209A, AstroDesign) and then output to a 4K Interface Box (SD-7067, AstroDesign) that reduced the frame rate to 30fps to enable recording to an external SSD (Samsung 2TB EVO-Pro) in an Oyen Digital MiniPro housing via an AJA PAK-ADAPT-eSATA adapter. The other KiPro Ultra deck recorded a 4K area cutout of the original 8K feed at 60fps from the SHV Cross Converter onto AJA PAK1000 or PAK 512 SSDs. Settings for video recordings were all standardized between streams (Encode Type: ProRes 422HQ, Dropped Frames: Continue, Record Type: Normal, In Convert: None, Audio Input: XLR, Analogue Audio: +24dBu, TC In: LTC, TC Type: DF, Loss of Video: CONT Rec).

AJA's PAK512 and PAK1000 SSDs require a proprietary reader (AJA's PAK dock via Thunderbolt 2) to ingest, while the AJA Ki Pro HDD cassettes require a Firewire 800 connection. The AJA KiPro Quad and ULTRA both have dual media ports, with recording automatically switching between media once full. The AJA KiPro Mini recorded onto CompactFlash cards (256GB, SanDisk Extreme PRO, 160 MB/s, UDMA 7) which were formatted by the KiPro Mini in a proprietary format that made them unreadable by either Mac or Windows computers so files could not be copied directly onto external hard disks as with the other media. Instead it was necessary to download files via ethernet using the KiPro Mini's file server function by accessing the server screen by typing the KiPro Mini's IP address into a web browser window. It was then necessary to change the media state to LAN (rather than Play/Record) and then selecting the video files, selecting the download location in your web browser Preferences menu (in our case a 4TB external drive in a SATA naked disk dock with USB 3.0.

All computer clocks from both the science party and the operations team were synced using the ship's Time Server (gts1.mirai.jamstec.go.jp).





Media cassettes were carried from the DeepTow6KC control van post-dive to the main lab for ingestion via a MacBook Pro onto an 8TB external hard disk. Files were all renamed to include the date and video source type with the format of DT6KCYYYYMMDD-VideoSource, where the VideoSource was

"forward", "down" or "combined" and camera type.

The DeepTow6KC operations team recorded the SD-NTSC camera video streams, with navigation and CTD data overlayed/superimposed.

Offline mini-cameras (2x Hero4+, GoPro) were deployed on the DeepTow6KC platform in custom-made (RecSea/SeaTool) housings. Recording settings were 4K30fps, ISO6400 and EV+2.0. One camera looked directly down and through the strobe light of the Visual Plankton Recorder while the other was mounted to face forward in the direction of travel of the DeepTow system. The ship's navigation data readout was filmed by both cameras before they were deployed in their housings to synchronize times post-dive and a wristwatch was also imaged before each deployment to aid in synchronization. Correct timecode will need to be embedded using qtChange2.26 after the .mpg files are combined in Quicktime Player Pro 7.6.6 and saved as a single .mov file.

The eHolocam computer's internal clock was set manually using a remote desktop connection and the host PC's (ToughBook CF-31, Panasonic) clock, synced to the ship's time server. The DPI computer clock was also synced in the same way.

Physical orientations and distance measurements for imaging tools and related sensors recorded by Yosaku Maeda.

● NEMO float

MITARAI Satoshi, MATSUMOTO Keisuke, SATO Hiroyasu

The NEMO Float is a profiling sensor platform that is typically configured for autonomous cyclic Conductivity/Temperature/Depth (CTD) measurements down to 2000 meters. Four NEMO floats were thrown into the sea at OSIT-a region to investigate variation of behaviors of the floats.

● CTD/ water sampling

MITARAI Satoshi, MATSUMOTO Keisuke, SATO Hiroyasu
SAGISHIMA Katsunori, ITO Rei, KOBAYASHI Rio

CTD/Carousel Water Sampling System, which is 36-position Carousel water sampler (CWS) with Sea-Bird Electronics, Inc. CTD (SBE9plus), was used during this cruise. 12-litter Niskin Bottles and Sample Bottles were used for sampling seawater. The sensors attached on the CTD were temperature (Primary and Secondary), conductivity (Primary and Secondary), pressure, dissolved oxygen (RINKO Ⅲ: Primary SBE43: Secondary), transmission, fluorescence, turbidity, colored dissolved organic matter sensor and altimeter. The Practical Salinity was calculated by measured values of pressure, conductivity and temperature. The CTD/CWS was deployed from starboard on working deck. The CTD raw data were acquired on real time using the Seasave-Win32 (ver.7.23.2) provided by Sea-Bird Electronics, Inc. and stored on the hard disk of the personal computer. Seawater was sampled during the up cast by sending fire commands from the personal computer. We stop at each layer for 30 or 60 seconds to stabilize then fire.

Table 1 MR17-07C Leg1 Cast table

Stnnbr	Castno	Date(UTC)	Time(UTC)		BottomPosition		Depth	Wire	HT Above	Max	Max	CTD	Remark
		(mmddyy)	Start	End	Latitude	Longitude	(m)	Out (m)	Bottom (m)	Depth	Pressure	Filename	
C01	1	102517	23:08	23:52	26-45.69N	125-35.63E	750.0	742.2	9.8	739.0	745.2	C01M001	OIST-a

4. Notice on Using

This cruise report is a preliminary documentation as of the end of cruise.
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice. Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.
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