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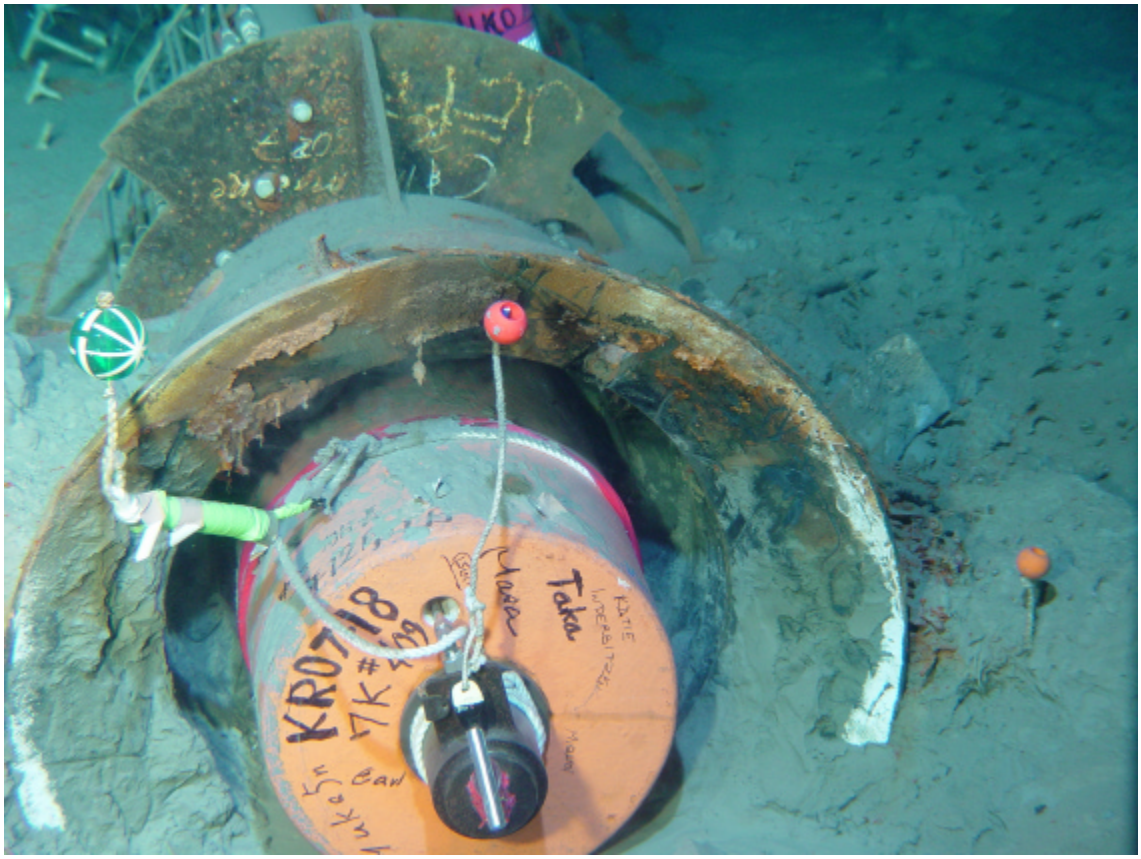
Preliminary Report on

KR07-18 Cruise in the Nankai Trough off Muroto



Dec. 16-26, 2007

Yokosuka - Yokosuka

Masataka Kinoshita (IFREE-JAMSTEC)

KR07-18 Shipboard Science Party

Acknowledgments

The science party would acknowledge that the KR07-18 cruise involved very difficult operations which were only made possible by the professional skill of the following persons: Captain Mr. Hitoshi Tanaka, Chief Officer Mr. Satoshi Susami and KAIREI marine crew for overall support, including ship navigation, KAIKO launching/recovery operation, and ship's life. Chief ROV Operator Kazuyoshi Hirata and KAIKO Operation Team for KAIKO operation, including hovering during data retrieval at 1173B, and mud removal and bridge plug insertion at 808I. JAMSTEC Marine Operation Department for cruise logistics. Ms. Misumi Aoki with Nippon Marine Enterprize, Co. Ltd. for technical support. We also thank Mr. Noriyasu Yamauchi for his many advice about equipment preparation.

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Abstract

During the KR07-18 cruise by JAMSTEC R/V KAIREI and ROV KAIKO 7000II, two ACORK sites were revisited in the Nankai Trough off Muroto. Four dives were carried out out of five planned dives, and all planned operations related to ACORKS could be completed successfully. Both of ACORKS, one at ODP Hole 808I (frontal thrust) and the other at ODP Hole 1173B (trough floor), were found in function and data were downloaded successfully. We obtained more than 6 years of continuous formation pressure records in the toe of accretionary prism and below the trough floor.

However, we had a long-standing operation that has not been completed due to many unfortunate reasons: Installation of the bridge plug into the mouth of ACORK head. This hass been a very important operation, because it can isolate the lowermost section at 808I, approximately containing the decollement section. For this operation we spend a latter half of KAIKO dive406 in order to remove mud using a small rake, spend a full KAIKO dive 408 in order to remove mud and clean up using a hydraulic suction pump, and a three hours of KAIKO dive 409 to carry and insert the bridge plug. Although the dta is not yet retrieved after installing the bridge plug, w believe we successfully set the plug in place.

1. Introduction

Two Advanced CORKs (ACORKs) were installed in the frontal thrust and on the trough floor of the Nankai Trough off Muroto during the ODP Leg196 in 2001 (Mikada et al., 2002; Fig. 1-1). Since then, data was retrieved basically once per year by ROV KAIKO or HOV Shinkai 6500 (both from JAMSTEC). We found that the downhole pressure data have been continuously recorded since the installation of ACORK in 2001 at Hole 808I (frontal thrust site) and at Hole 1173B (trough floor).

Davis et al. (2006) reported a transient pressure increase in July-2003, and interpreted that it was caused by a series of very-low-frequency events in the accretionary prism (Ito and Obara, 200#; Fig. 1-2).

However, because of incomplete installation of ACORK at 808I, its top 40m part could not be inserted in the borehole and was forced to lay down on the seafloor. As such, the bridge plug which should isolate the lowermost section in the decollement could not be installed during the drilling operation, so that channel 1 pressure data remain identical with those on the seafloor. Earl Davis built another bridge plug to be inserted horizontally into the ACORK head on the seafloor, and it was attempted to insert during the KR03-05 KAIKO cruise in 2003. However, we have had bad luck of losing (old) KAIKO vehicle and could install the bridge plug during that cruise. Two more cruises in 2004 and 2006 were spent to complete this operation but we could not do it (Table 1)

The KR07-18 cruise was carried out in order to retrieve data from two ACORKs in the Nankai Trough off Muroto (Fig. 1-1). Also, we tried to set a plug into the mouth of ACORK head at ODP Hole 808I in order to seal off the lowermost pressure port in the decollement. This document reports preliminary results of the cruise KR07-18.

Table 1.1 List of research cruises related to Nankai ACORK

Cruise	Period	Chief Sci.	Platform	Mission & achievements
ODP Leg196	2001	Mikada/Becker	JOIDES Resolution	ACORK Installation
KR02-10	2002	Mikada	Kairei/KAIKO	Data download
KR03-05	2003	Mikada	Kairei/KAIKO	Data download & Deploy BP
YK04-05	2004	Kinoshita	Shinkai 6500	Data download / BP set not completed / recover BP
KR06-10	2006	Kinoshita	KAIKO 7000II	Data download / BP not launched
KR07-18	2007/12/ 16-26	Kinoshita	KAIKO 7000II	Data download / Remove mud / set BP

Note: ‘BP’ stands for the bridge plug.

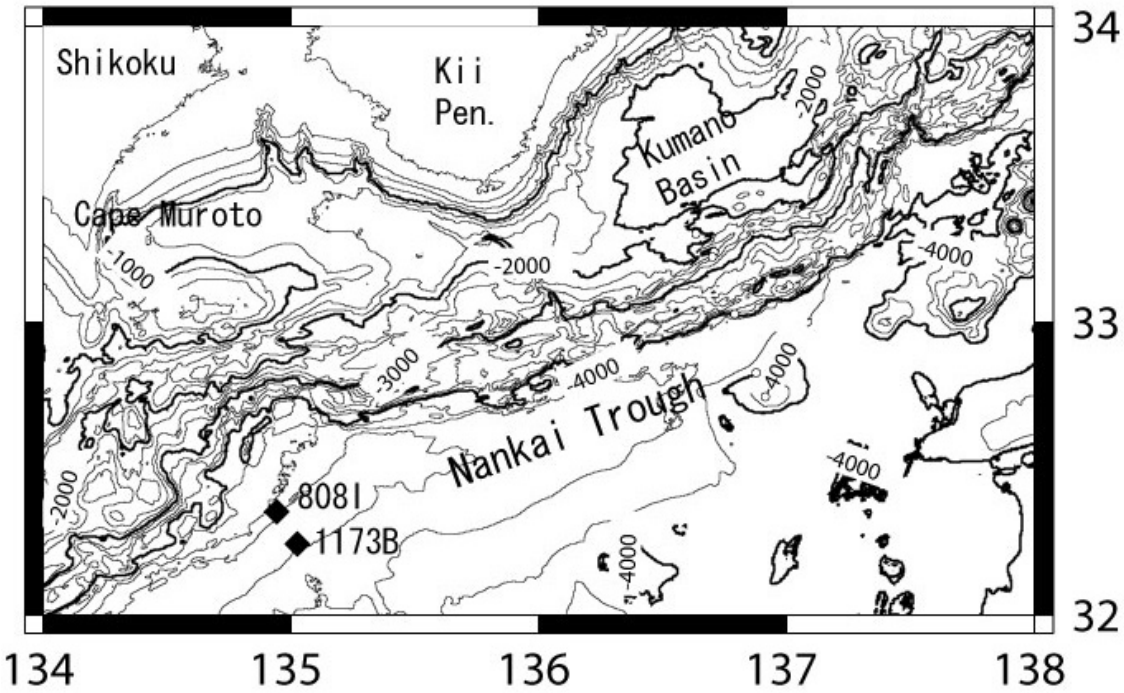


Fig. 1.1 Index map showing the dive locations (808I and 1173B) during the KR7-18 cruise.

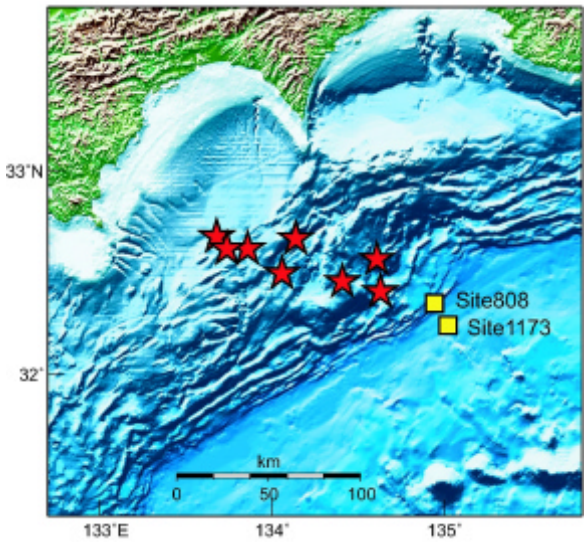


Fig. 1.2 Location of ACORK sites 808 and 1173. Stars indicates spicenter of very low frequency events in 2003 (Ito and Obara, 200#).

KR07-18 List of Dives

Dive Information							Sample and Data			
Dive No.	Date	Site Name		Landing	Taking off	Payload	Sample	CTD data	Acoustic Navigation Data	OAS Capture
7K#406	18-Dec-07	ODP Hole 808I	Time (UTC+9h) Depth (m)	12:10 4,676(m)	15:09 4,676(m)	Under water connector MBARI corer Kumade	7K#406-C-1	07121801.AVG 07121801.CFG 07121801.DAT 07121801.HDR 07121801.SUM Readme_ctd.txt	dive406.csv Readme_ANS.csv KAIKO_Navigation.pdf	
7K#407	19-Dec-07	ODP Hole 1173B	Time (UTC+9h) Depth (m)	12:10 4,794(m)	13:43 4,794(m)	Under water connector		07121901.AVG 07121901.CFG 07121901.DAT 07121901.HDR 07121901.SUM	dive407.csv	
7K#408	20-Dec-07	ODP Hole	Time (UTC+9h)	11:22	15:01	Dorocy		07122001.AVG	dive408.csv	071220_Dive408.bmp

		808I	Depth (m)	4,676(m)	4,676(m)	Kumade		07122001.CFG 07122001.DAT 07122001.HDR 07122001.SUM		2_071220_Dive408.bmp
7K#409	21-Dec-07	ODP Hole 808I	Time (UTC+9h) Depth (m)	11:12 4,676(m)	13:12 4,677(m)	Bridge Plug		07122201.AVG 07122201.CFG 07122201.DAT 07122201.HDR 07122201.SUM	dive409.csv	

Cruise Log of Kairei/Kaiko 7000-II in R07-18

Date & Time (Local=GMT+9h)		Note	Remarks	Weather at noon
Sun.	16-Dec-07			
	8:00	Boarding		bc/NNE/4/4/1/7
	9:00	Departure from Yokosuka		
	10:00-10:30	Briefing about ship's life and safety		
	18:00-18:30	Briefing about ROV KAIKO system		
	10:30-11:00	Science meeting		
	16:40	KONPIRA ceremony		
Mon	17-Dec-07			c/WNW/3/2/1/7
	7:00	XBT measurement		
		Standing-by; Captain negosiated with fishing boats		
Tue.	18-Dec-07			bc/NW/5/4/2/7
	10:00	KAIKO on the surface	7K#406 dive	
	12:10	Landing (Depth=4,676m)	808I	
	15:09	Taking off (Depth=4,676m)		
	16:46	Surface		
	16:55	On deck		
Wed	19-Dec-07			o/North/2/2/2/7
	8:53	KAIKO on the surface	7K#407 dive	
	12:10	Landing (Depth=4,794m)	1173B	
	13:43	Taking off (Depth=4,794m)		
	15:19	Surface		
	15:28	On deck		
Thu	20-Dec-07			bc/NNW/4/2/2/7
	9:17	KAIKO on the surface	7K#408 dive	
	11:22	Landing (Depth=4,794m)	808I	
	15:01	Taking off (Depth=4,794m)		
	16:35	Surface		
	16:44	On deck		
Fri	21-Dec-07			bc/NNW/2/2/1/7
	9:02	KAIKO on the surface	7K#408 dive	
	11:12	Landing (Depth=4,794m)	808I	
	13:12	Taking off (Depth=4,794m)	with Bridge Plug	
	14:45	Surface		
	14:54	On deck		transit to Tanabe Bay
Sat	22-Dec-07			r/East/6/2/1/5
	8:00	Cast anchor		
Sun	23-Dec-07			c/NNW/2/2/1/7
	8:20	2 scientists got off the ship@Tanabe		
	14:00-15:20	On boad seminse		
	16:00	Weigh ancho		
Mon	24-Dec-07			bc/North/7/5/4/7
	7:00	Arrived at the dive area		
	9:00	Dive was canceled because of bad wheather		
Tue	25-Dec-07			
		Transit to JAMSTEC		
Wed	26-Dec-07			
	8:30	Arrive at JAMSTEC		

Wearther/Wind direction/Wind speed index/wave(m)/swell(m)/visibility (nautical mile)

Wearther	Wind speed index
b = blue sky	0 = 0 - 0.2 m/sec.
bc = fine but cloudy	1 = 0.3 - 1.5
o = over cast	2 = 1.6 - 3.3
c = cloudy	3 = 3.4 - 5.4
r = rain	4 = 5.5 - 7.9
f = fog	5 = 8.0 - 10.7
m = mist	6 = 10.8 - 13.8
	7 = 13.9 - 17.1
	8 = 17.2 - 20.7
	9 = 20.8 - 24.4
	10 = 24.5 - 28.4
	11 = 28.5 - 32.6
	12 = 32.7 -

KR07-18　List of Science Party

Scientists

Dr. Masataka Kinoshita
IFREE/JAMSTEC

Dr. Takafumi Kasaya
IFREE/JAMSTEC

Dr. Earl E. Davis
Pacific Geoscience Center, Geological Survey of Canada, Pacific Division

Dr. Robert D. Meldrum
Pacific Geoscience Center, Geological Survey of Canada, Pacific Division

Katie Inderbitzen
University of Maiami

Yuka Masaki
IFREE/JAMSTEC

Marine Technician

Misumi Aoki
Nippon Marine Enterprises, Ltd.

KR07-18　List of Ship Crew and ROV Team

R/V KAIREI Crew

Captain	Hitoshi Tanaka
Chief Officer	Satoshi Susami
2nd Officer	Naoto Kimura
3rd Officer	Yuki Furukawa
Chief Engineer	Hiroyuki Shibata
1st Engineer	Masahiro Kajiwara
2nd Engineer	Kazunori Noguchi
3rd Engineer	Wataru Kurose
Trainee	Yutaka Okano
Chief Electronics Operator	Katsutoshi Kitamura
2nd Electronics Operator	Yoichi Inoue
Boat Swain	Shoichi Abe
Able Seaman	Yuki Yoshino
Able Seaman	Kiyoshi Kaneda
Able Seaman	Tadahiko Toguchi
Able Seaman	Nao Ishizuka
Able Seaman	Yoshiaki Matsuo
Able Seaman	Hitsuo Oda
No.1 Oiler	Kazuaki Nakai
Oiler	Tsuneo Harimoto
Oiler	Yuki Nakahara
Oiler	Keita Funawatari
Oiler	Shota Watanabe
Chief Steward	Tomihisa Morita
Steward	Hideo Fukumura
Steward	Koji Kirita
Steward	Norihito Izumi
Steward	Akira Kanaya

ROV KAIKO Operation Team

Chief ROV Operator	Kazuyoahi Hirata
ROV Operator	Atsumori Miura
	Kiyoshi Takishita
	Homare Wakamatsu
	Hideki Sezoko
	Keigo Suzuki
	Seiji Shigetake
	Yudai Tayama

2. Explanatory Notes

2-1. R.V KAIREI

全　　長	:104.9m
幅	:16.0m
喫　　水	:4.5m
総トン数	:4,628 トン
速　　力	:16.7 ノット
航続距離	:約 9,600 海里 約 17,800km）
主推進機関	:ディーゼル機関 2 基×2,206kW×600rpm
推進システム	:可変ピッチプロペラ 2 軸 バウスラスタ
乗 組 員	:60 名 (乗組員 29 名 研究者等 31 名)
建 造 年	:1997 年
建造造船所	:川崎重工業(株)坂出工場
運航会社	:日本海洋事業(株)

2-2. ROV KAIKO 7000II

「かいこう7000Ⅱ」の主要項目

方　　式	:	有索中継機方式、遠隔操作自航(ランチャー方式)	
最大潜航深度	:	7000m	
		ランチャー	**ビークル**
長　　さ	:	5.2m	2.8m
幅	:	2.6m	2.5m
高　　さ	:	3.2m	2.0m
空 中 重 量	:	5.8 トン	2.9 トン
水 中 重 量	:	3.8 トン	0 トン

ランチャーの搭載装置
二次ケーブルハンドリング装置
ランチャー／ビークル結合装置
音響探査装置
　サイドスキャンソナー
　サブボトムプロファイラー
　前方障害物探査ソナー
結合監視 TV カメラ
音響測位装置
調査観測装置
　CTD（塩分・水温・深度計）

ビークルの搭載装置
推進装置（スラスター）
　前後方向 4 基、左右方向 2 基、上下方向 4 基（各 1PS）
航海装置
　白黒 TV カメラ（後方）、前方障害物探査ソナー、
　方位計、高度計、深度計、フラッシャー、
　音響トランスポンダ（2 基）、GPS／アルゴス装置
調査観測装置
　広角カラーTV カメラ 2 基、3CCD カラーTV カメラ、
　デジタルスチルカメラ、
　マニピュレータ（1 本、6 自由度、把持力 40kgf）、
　バスケット（最大 10kgf）、照明灯（7 基、合計 2,050W）
　CTD（塩分・水温・深度計）

無人探査機「かいこう」／「かいこう 7000」／「かいこう 7000Ⅱ」（仮称）ビークル性能比較表

要目・機器名等	「かいこう」	「かいこう7000」	「かいこう7000Ⅱ」（仮称）
全　長	約3.1m	約2.8m	**約3.0m**
巾	約2.0m	約1.8m	**約2.0m**
高　さ	約2.3m	約2.0m	**約2.1m**
空中重量	約5.7t	約2.9t	**約3.5t**
最大使用深度	約11,000m	約7,000m	約7,000m
電　源	支援母船「かいれい」からﾗﾝﾁｬｰ経由で給電	同左	同左
ﾃｻﾞｰｹｰﾌﾞﾙ	二次ｹｰﾌﾞﾙ	同左	同左
推　進　機	油圧ﾓｰﾀ 水平ｽﾗｽﾀ　4台×6.6馬力 上下ｽﾗｽﾀ　3台×7.0馬力	電動ﾓｰﾀ 水平ｽﾗｽﾀ　4台×1馬力 左右ｽﾗｽﾀ　2台×1馬力 上下ｽﾗｽﾀ　4台×1馬力	電動ﾓｰﾀ 水平ｽﾗｽﾀ　4台×1馬力 上下ｽﾗｽﾀ　6台×1馬力 **「かいこう7000」より推力を増した改良型ｽﾗｽﾀを使用。**
観測装置等			
①広角ｶﾗｰTVｶﾒﾗ	3台（ﾊﾟﾉﾗﾏ視可能）	2台	2台
②3-CCDｶﾗｰTV ｶﾒﾗ	1台	1台	1台
③ｽﾁﾙｶﾒﾗ	1台（撮影枚数800枚）	1台（ﾃﾞｨｼﾞﾀﾙ,5ﾒｶﾞﾋﾟｸｾﾙ）	1台（ﾃﾞｨｼﾞﾀﾙ,5ﾒｶﾞﾋﾟｸｾﾙ）
④ﾏﾆﾋﾟｭﾚｰﾀ	左右各一本、7自由度、ﾏｽﾀｰｽﾚｰﾌﾞ制御 把持力：25kg	一本、6自由度、ﾚｰﾄ制御 **把持力：40kg**	左右各一本 （左）6自由度、ﾚｰﾄ制御、把持力：40kg 「かいこう7000」ﾏﾆﾋﾟｭﾚｰﾀを左用に改造。 **（右）7自由度、ﾏｽﾀｰｽﾚｰﾌﾞ制御、把持力：40kg**
⑤ｻﾝﾌﾟﾙﾊﾞｽｹｯﾄ	大型ﾊﾞｽｹｯﾄ取り付け可能	大型ﾊﾞｽｹｯﾄ取り付け可能	大型ﾊﾞｽｹｯﾄ取り付け可能
⑥ﾍﾟｲﾛｰﾄﾞ	最大約50kg	最大30kg	**最大約50kg**
⑦CTD装置	なし	1台（SBE-49）	1台（SBE-49）
⑧照明灯	ﾊﾛｹﾞﾝ　500W5台 ﾒﾀﾙﾊﾗｲﾄﾞ　400W2台	ﾊﾛｹﾞﾝ500W2台、250W1台 ﾒﾀﾙﾊﾗｲﾄﾞ400W2台	ﾊﾛｹﾞﾝ500W2台、250W1台 ﾒﾀﾙﾊﾗｲﾄﾞ400W2台
航海装置			
①白黒TVｶﾒﾗ	1台	1台	1台
②高度計	1台	1台	1台
③深度計	1台	1台	1台
④ﾌﾗｯｼｬ	なし	1台	1台
⑤方位計	1台（光ﾌｧｲﾊﾞｰｼﾞｬｲﾛ）	1台（光ﾌｧｲﾊﾞｰｼﾞｬｲﾛ）	1台（光ﾌｧｲﾊﾞｰｼﾞｬｲﾛ）
⑥前方障害物探査ｿｰﾅｰ	1台	1台	1台
⑦音響ﾄﾗﾝｽﾎﾟﾝﾀﾞ	1台（ﾚｽﾎﾟﾝﾀﾞ）	ﾚｽﾎﾟﾝﾀﾞ/ﾄﾗﾝｽﾎﾟﾝﾀﾞ　1台 ﾄﾗﾝｽﾎﾟﾝﾀﾞ　1台	ﾚｽﾎﾟﾝﾀﾞ/ﾄﾗﾝｽﾎﾟﾝﾀﾞ　1台 ﾄﾗﾝｽﾎﾟﾝﾀﾞ　1台
⑨ｱﾙｺﾞｽ装置	なし	2台（1台はGPSｱﾝﾃﾅ付き）	2台（GPSｱﾝﾃﾅ付き）
⑩ﾗｼﾞｵﾋﾞｰｺﾝ	1台	なし	なし

※太字は、機能向上項目。

2-3. Heat flow probe

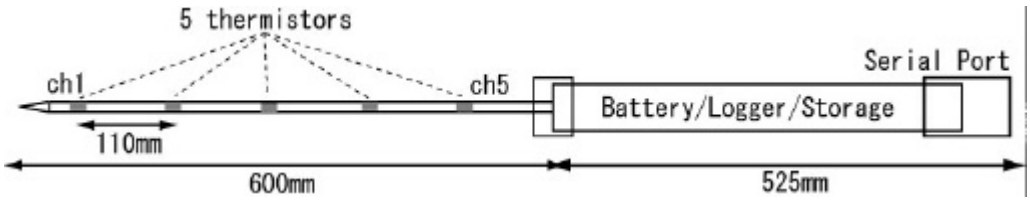
Stand-Alone Heat Flow meter (SAHF) is designed to measure heat flow by manned submersibles or ROVs. Five thermistors situated within the probe at 11 cm intervals. Since SAHF takes measurements as “OFF LINE” system, heat flow can be measured while observer is conducting something else at that position or elsewhere. SAHF can also be used for long-term monitoring of sub-bottom temperature. We prepared three SAHFs, designated as SAHF1, 2 and 6. SAHF #2 and #6 are equipped with LED, which flashes during operation.

While Hyper-Dolphin (HD) is descending or ascending, SAHF is set in a case inside a sample basket prepared by KAIKO operational team. After KAIKO lands on the seafloor, SAHF is grabbed by KAIKO's left manipulator and takes the reference temperature for 2-5 minutes (if SAHF locates enough at same position, temperature measurement for reference can be canceled). SAHF is then put vertically into sediment and measure temperature gradient for at 10-20 minutes. Thermal conductivity is necessary to obtain a heat flow value, which is not available on current SAHF.

Fig2. 1 and 2 shows the photograph and graphical description of SAHF. The following is description of SAHF.

Description:

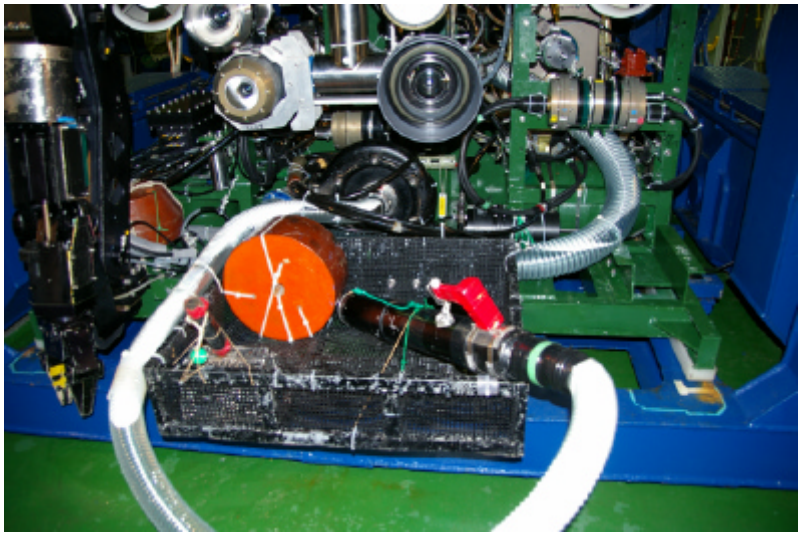
Material	Alloy of titanium
Weight	3.1 kg in air, 1.5 kg in seawater
Length of pressure case	525 mm
Diameter of pressure case	85 mm
Length of probe	600 mm
Diameter of probe	13.8 mm (filled by silicon oil inside)
Number of thermistors	5
Intervals of thermistors	110 mm
Accuracy	0.01 °C
Resolution	0.001 °C
External Interface	RS232C (9600bps, 8 bit, Non-parity, 2 stop-bit)



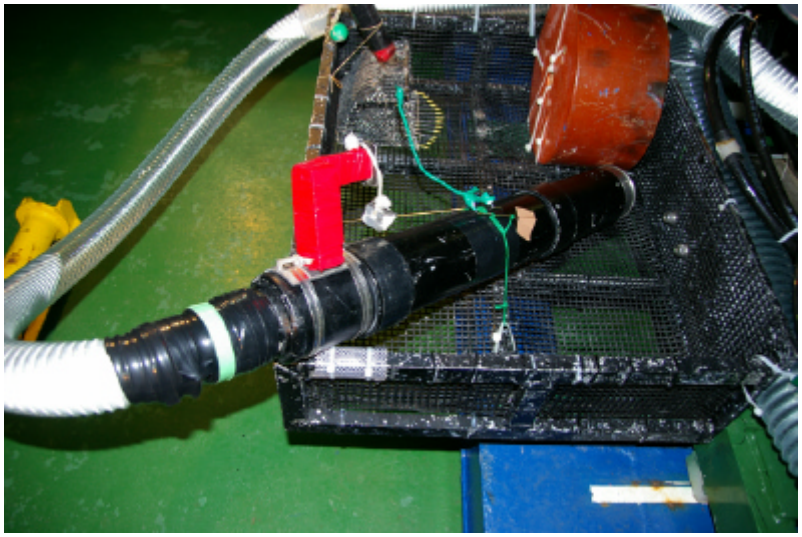
2-4. Hydraulic suction pump “Dorothy” (Kasaya)

To remove muddily sediment inside and outside of the ACORK 808i, the oil hydraulic suction pump “Dorothy” were equipped on the front of ROV KAIKO. Because this suction pump is heavy weight for KAIKO, left manipulator was unloaded and some floats were equipped. The specification of “Dorothy” is as follows;

Max depth	6000m
Max hydraulic pressure	14MPa
Max oil feed rate	14.7 lit/min
Max suction rate	1000 lit/min
Weight (in air)	50kg
Weight (in water)	43kg
Suction hose	65mm
Outlet hose	90mm



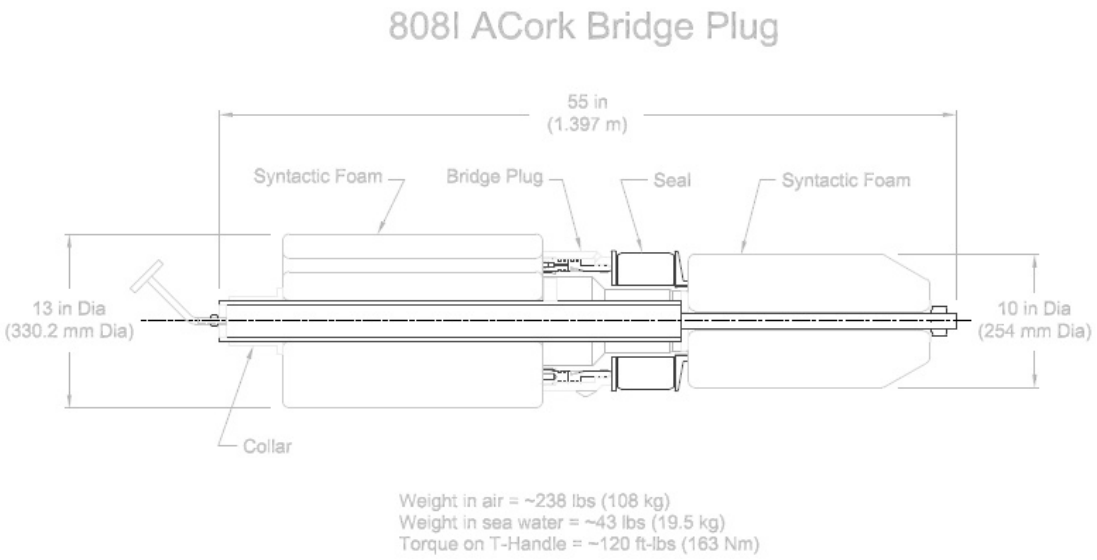
Suction pump “Dorothy” mounted on the ROV KAIKO.

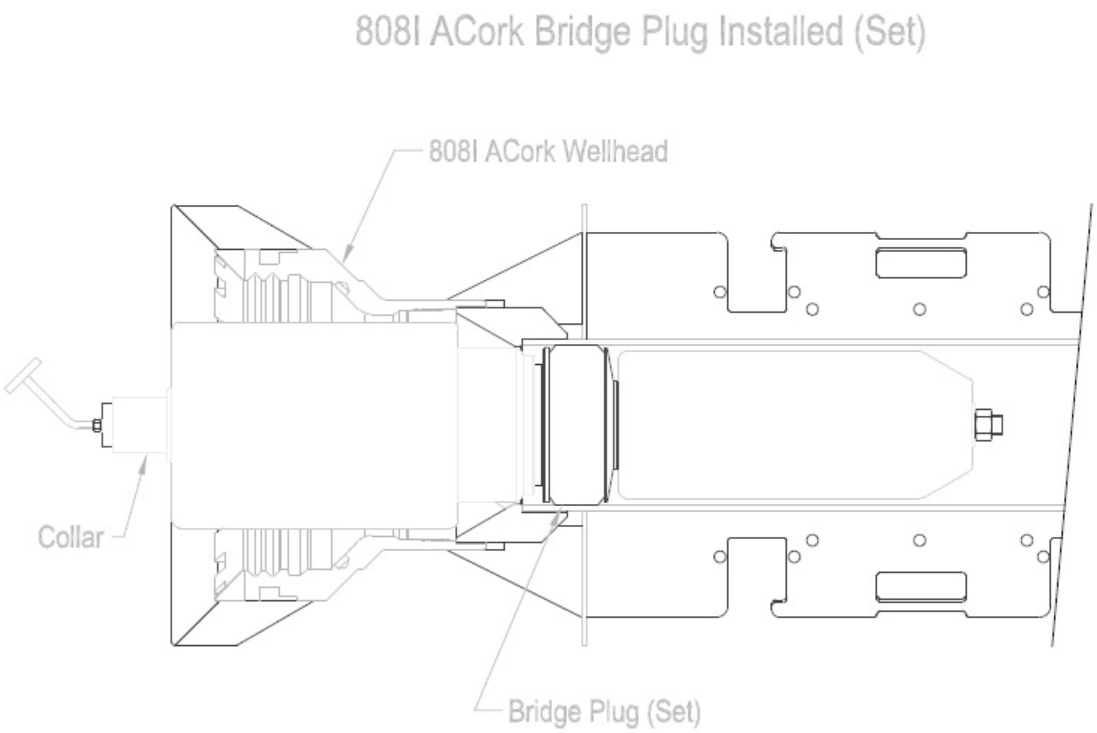


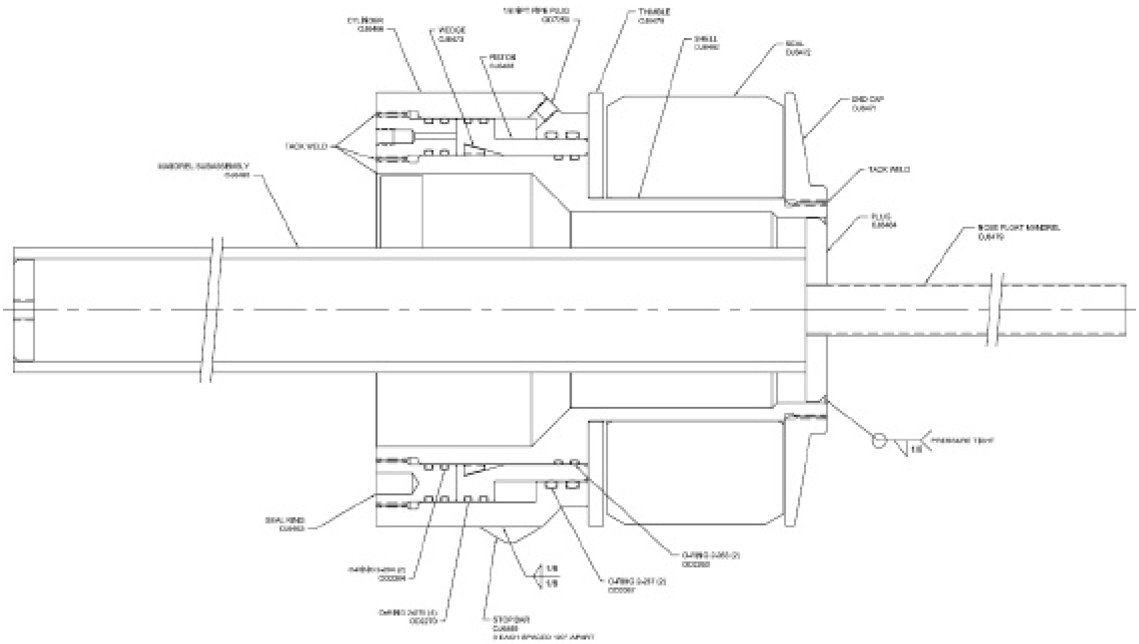
Actuating port of Dorothy.

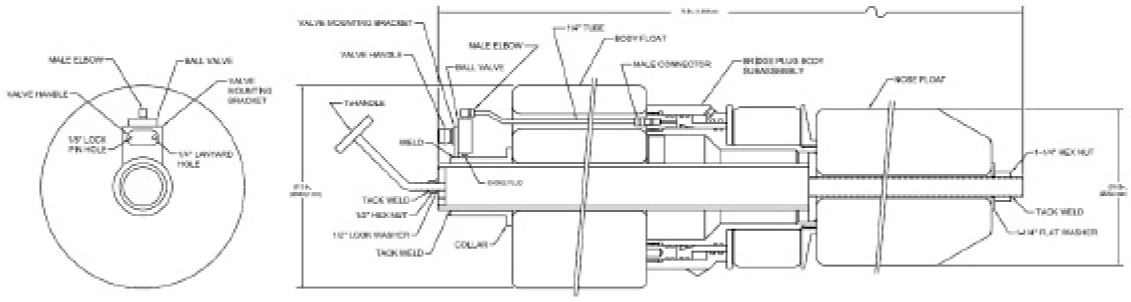
Outlet hole in the back of ROV KAIKO.

2-5. Bridge plug






THIMBLE
SHELL
SEAL
END CAP
TACK WELD
TACK WELD
PLUG
MANDREL SUBASSEMBLY
PISTON
WEDGE
CYLINDER
SEAL RING
STOP BAR
PRESSURE TIGHT
1/8
1/8
1/8


MALE ELBOW
BALL VALVE
VALVE MOUNTING BRACKET
VALVE HANDLE
1/8" LOCK PIN HOLE
1/4" LANYARD HOLE
VALVE MOUNTING BRACKET
VALVE HANDLE
MALE ELBOW
BALL VALVE
1/4" TUBE
BODY FLOAT
MALE CONNECTOR
BRIDGE PLUG BODY SUBASSEMBLY
NOSE FLOAT
T-HANDLE
WELD
TACK WELD
1/2" HEX NUT
1/2" LOCK WASHER
TACK WELD
COLLAR
1-1/4" HEX NUT
TACK WELD
1-1/4" FLAT WASHER

3. Dive Report

3-1. Dive 406

Date: Dec. 18, 2007

Site Description: Nankai Trough ACORK at Site 808

Objectives: ACORK data download / remove sediment around ACORK top

Payloads: ROV connector, MBARI sampler

Dive Results: The first dive during this cruise was originally planned on Dec. 17 at 808I ACORK. However, Several fishery boats were in operation (tune longline mooring) around the site, and we could not launch KAIKO. After telecommunication with them, Captain decided to postpone the dive by one day, when we found we are able to dive in the morning.

The 808I ACORK was located by the sonar, and KAIKO landed by the ACORK head at 12:10. Data downloading was completed successfully in 50 minutes. After that, a core samples was taken using MBARI samples from inside the ACORK head, then a small rake was tried to remove muddy sediments from around the tip of ACORK head in order to make room for the bridge plug. Although the sediment was very fine-grained and sticky, significant amount could be removed, which made us more convincing to install the bridge plug. At 15:09 the operation was terminated, and KAIKO left the bottom.

Dive #406 Log

time	event
1000	KAIKO on the sea surface
1122	#1 cable out=3660; Depth=3661
1139	#1 cable out=4535; Depth=4538
1141	Stop KAIKO at 4537, prepare for vehivle launch
1146	Vehicle detached from Launcher
1149	Seabeam depth 4680; KAIKO deoth 4672
1155	STOP
1157	Head for north
1201	Trace the ACORK pipe to the right
1203	ACORK head detected
1209	プラグ視認
1210	KAIKO bottom contact
1212	uncover receptacle
1215	ROV connector inserted; start downloading

1234 コシオリエビ
1252 コシオリエビ
1309 End download
1316 End communication
1319 Unplug ROV connector, clean up
1326 Put ROV con. Into basket
1327 cover receptacle
1328 Leave bottom to see the mouth of ACORK
1344 Biological community at the mouth of ACORK
1350 コシオリエビ視認
1401 Core sampling from ACORK mouth with MBARI corer
1403 Finish sampling
1405 excavation scoop deployed, excavation of ACORK center begins
1409 cleaning scoop
1419 excavation continues
1431 excavation moves deeper into ACORK barrel center
1449 excavation of area in front of ACORK begins (making a trough)
1502 excavation stopped, sccop replaced in basket
1508 vehicle arm scraping rusty flocculent material from outside of ACORK
1509 vehicle leaves bottom

平成１９年
かいこう７０００Ⅱ 調査潜航
Total Dive No.(dive count from 1st. Apr.) ４０６ＤＩＶＥ（３０）
南海トラフ ８０８Ｉ

２００７年１２月１７日

Geosystem １．測地系　ＷＧＳ－８４（世界測地系）

Navigation ２．測位　Ｄ－ＧＰＳ　（ＬＥＩＣＡ　ＭＸ９４００Ｎ）

３．ＸＢＴ　計測　Ｓ／Ｖ＝　．　ｍ／Ｓ　（Ｄ＝　ｍ）

Start point ４．着水点　（特異点１）
３２°－２１．２１５’Ｎ　Ｄ＝４６７５ｍ
１３４°－５６．７００’Ｅ

Operators ５．潜航配置
Commander: 指　揮：三浦
Vehicle pilot:
ﾗﾝﾁｬｰ PILOT：重竹 Launcher pilot:
ﾋﾞｰｸﾙ PILOT　：若松
ﾋﾞｰｸﾙ CoPILOT：瀬底 Vehicle co-pilot:

Subjects ６．潜航目的　ACORK 圧力モニタリング及び熱流量高密度測定による室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Dive Plan ７．作業内容
データ回収（約２時間）
現状確認
MBARI採泥
熊手による泥除去作業

Schedule ８．日程

Check ROV	０６：３０	操縦盤立ち上げ
Arrive at dive site	０７：００	海域着
XBT measurement		事前調査（ＸＢＴ）
		作動確認
Docking	０８：３０	結合作業
Surface	０９：１０	着水
Landing	１０：５０	着底
Taking off	１４：３０	離底
Surface	１６：００	水切り（浮上）
On deck	１６：２０	揚収完了

９．備考

KAIKO 7000II　　Dive Record

かいこう７０００Ⅱ　潜航記録

Cruise No.

平成 19 年　　KR07-18 行動　　記載者 瀬底 秀樹

Date 潜航年月日　2007 年 12/18

Planned landing position
着底予定位置

緯度	32°21.21′N
経度	134°56.70′E
測地系	WGS-84

潜航回数　1 回

Total Dive No. 通算潜航回数　406 回

Site name 潜航海域　Off Muroto 室戸沖　Nankai Trough, Hole 8081 南海トラフ 8081

Purpose of dive 潜航目的　調査潜航　ACORK圧力モニタリングによる室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Chief Scientist 調査主任　木下 正高

Institute 所属　海洋研究開発機構

ランチャー PILOT　重竹 誠二

PILOT　若松 誉

COPILOT　瀬底 秀樹

Time Record (Local=UTC+9h)

	作業経過時刻	
lifting	吊揚	09:53
surface	着水	10:00
release	離脱	11:45
landing	着底	12:10
taking off	離底	15:09
docking	結合	15:22
surface	水切	16:46
on desk	揚収完了	16:55

Information for operator

累計時間	
潜航時間	6:46
前回潜航	2475:22
通算潜航	2482: 8

ケーブル使用時間		ケーブル番号別使用時間	
1次使用時間	7: 2	1次番号	2
1次前回時間	2576:24	1次番号別前回時間	1663:9
1次通算時間	2583:26	1次番号別通算時間	1670:11
2次使用時間	3:37	2次番号	7
2次前回時間	1122:26	2次番号別前回時間	0
2次通算時間	1126: 3	2次番号別通算時間	3:37

Weather 海象・気象

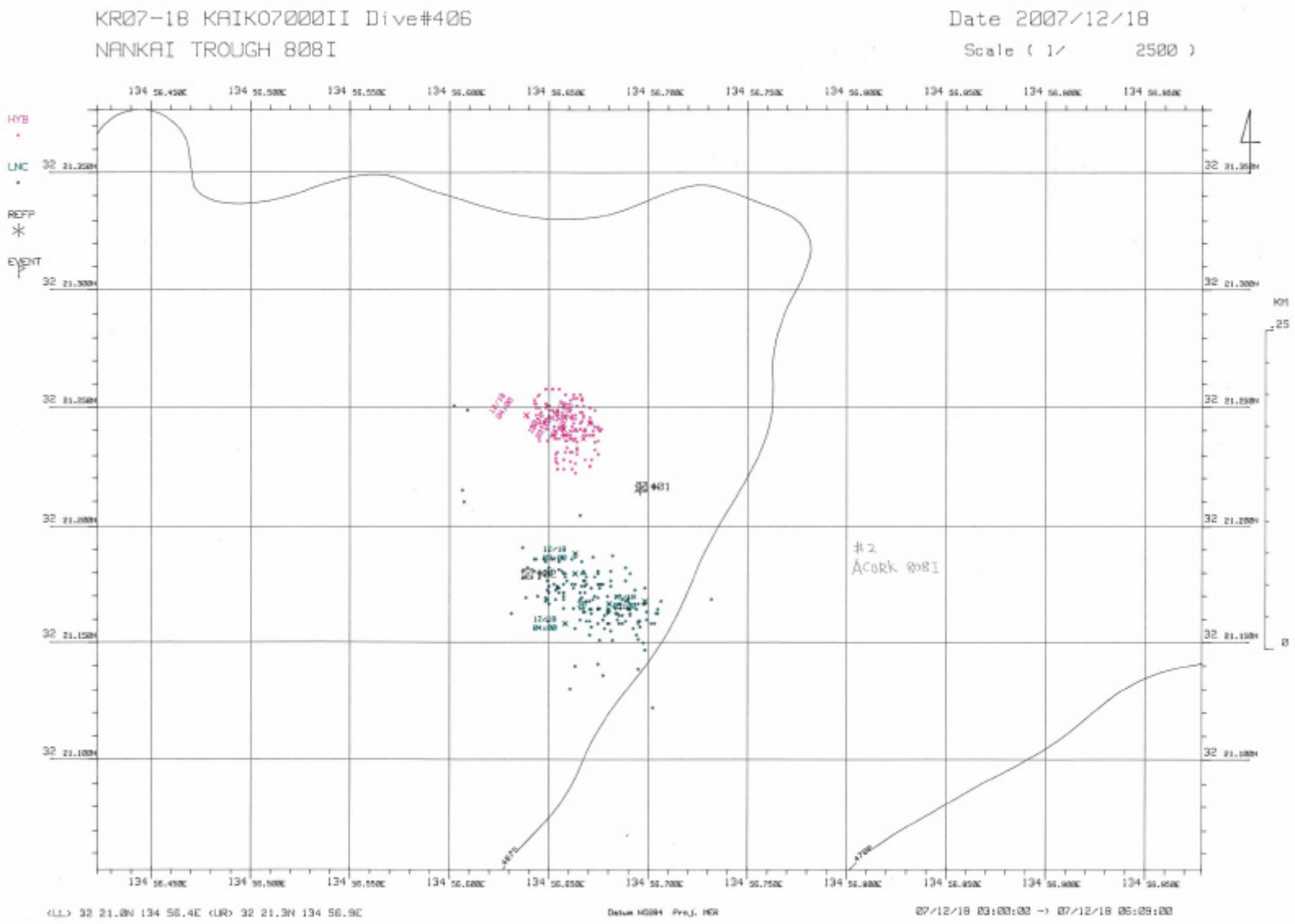
天候	wind direction 風向	wind force 風力	wave 波浪	swell うねり	visibility 視程
bc	NW	5	4	2	7

fine but cloudy

Max. depth 最大潜航深度　4678 m

landing		taking off	
depth 着底深度	4676 m	depth 離底深度	4676 m
bottom 着底底質	泥 mud	bottom 離底底質	泥 mud

記事　リエントリーコーンから孔口にかけて簡易HDTVによる詳細な状況観察の後、観測データ回収、孔口内部堆積物のMBARI採泥および熊手による堆積物除去作業を行った。



Dive Track Chart 406

3-2. Dive 407

Date: Dec. 19, 2007

Site Description: Nankai Trough ACORK at Site 1173

Objectives: ACORK(1173B) data download

Payloads: ROV connector, MBARI sampler

Dive Results: The longline fishery operation has continued around the research area continuously yesterday. However ship crews kept taking the communication with them by telephone and radio. Then, we were able to carry out the 2nd dive during this cruise at the 1173B ACORK according to plan.

We took a lot of time to search the 1173B ACORK, and spent about 35 min to find out it. After arriving at ACORK site, we also spent about one hour to mate the ROV connector because of strong sea bottom current. Data downloading was completed successfully in 50 minutes. After that, KAIKO left the 1173B at 13:43.

time	vehicle altitude	vehicle depth	event
1038			Stop KAIKO at 4662, prepare for vehivle launch
1040	100	4672	Vehicle detached from Launcher at 100m above seafloor
1048	5	4792	Vusual detection of seafloor at 5m
1055	2	4797	Head 110, approach from west
1058	1	4798	ACORK detected 150deg, 20m
1100	3	4786	Empty re-entry cone observed
1109	2	4794	Head 250
1117	3	4791	ACPRK is located 300m west of re-entry cone
1125	5	4790	Arrive at ACORK 1173
1131	5	4789	ROV connector unplugged from dummy connector
1152	4	4791	KAIKO on bottom for retry approaching
1203	5	4790	右マニュピュレーターで持っていた通信カバーを左手でもちなおすように試みる
1208	0	4793	Strong western current
1228	4	4790	connector retrieved from basket
1236	3	4790	connector mated with ACORK
1239	3	4790	data download begins
1328	3	4790	data download finished
1332	4	4790	ACORK data logger reset

1336	3	4790	connector disconnected from ACORK, replaced in basket
1337	7	4788	vehicle manipulator lets go of ACORK
1343	4	4790	Vehicle leaves bottom

平成１９年
かいこう７０００Ⅱ 調査潜航
Total Dive No.(dive count from 1st. Apr:) ４０７ＤＩＶＥ（３１）
室戸沖　南海トラフ　１１７３Ｂ

２００７年１２月１９日

Geosystem １．測地系　ＷＧＳ－８４（世界測地系）

Navigation ２．測位　Ｄ－ＧＰＳ　（ＬＥＩＣＡ　ＭＸ９４００Ｎ）

３．ＸＢＴ　計測　Ｓ／Ｖ＝　．　ｍ／Ｓ　（Ｄ＝　ｍ）

Start point ４．着水点　（特異点１）
３２°－１４．６８３’Ｎ　Ｄ＝４７９１ｍ
１３５°－０１．４８４’Ｅ

Operators ５．潜航配置
Commander: 指　揮：三浦
Vehicle pilot: ﾋﾞｰｸﾙ PILOT：若松
Launcher pilot: ﾗﾝﾁｬｰ PILOT：重竹
Vehicle co-pilot: ﾋﾞｰｸﾙ CoPILOT：瀬底

Subjects ６．潜航目的　ACORK 圧力モニタリング及び熱流量高密度測定による室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Dive Plan ７．作業内容　データ回収（約２時間）
現状確認

Schedule ８．日程

Check ROV	０６：３０	操縦盤立ち上げ 作動確認
Docking	０８：３０	結合作業
Surface	０９：１０	着水
Landing	１０：５０	着底
Taking off	１５：００	離底
Surface	１６：３０	水切り（浮上）
On deck	１６：５０	揚収完了

９．備考

KAIKO 7000II　　Dive Record

かいこう７０００Ⅱ　潜航記録

Cruise No.

平成 19 年　KR07-18 行動

記載者 瀬底 秀樹

Date 潜航年月日 2007 年 12/19

Planned landing position 着底予定位置

潜航回数 2 回

緯度 32°14.68′N

Total Dive No. 通算潜航回数 407 回

経度 135°01.48′E

測地系 WGS-84

Site name 潜航海域 Off Muroto 室戸沖　Nankai Trough, Hole 1173B 南海トラフ 1173B

Purpuse of dive 潜航目的 調査潜航　ACORK圧力モニタリングによる室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Chief Scientist 調査主任 木下 正高

ﾗﾝﾁｬｰ PILOT 重竹 誠二

Institute 所属 海洋研究開発機構

PILOT 若松 誉

COPILOT 瀬底 秀樹

Time Record (Local=UTC+9h)

	作業経過時刻	
lifting	吊揚	08:47
surface	着水	08:53
release	離脱	10:40
landing	着底	12:10
taking off	離底	13:43
docking	結合	13:54
surface	水切	15:19
on desk	揚収完了	15:28

Informations for operator

累計時間	
潜航時間	6:26
前回潜航	2482:8
通算潜航	2488:34

ケーブル使用時間		ｹｰﾌﾞﾙ番号別使用時間	
1次使用時間	6:41	1次番号	2
1次前回時間	2583:26	1次番号別前回時間	1670:11
1次通算時間	2590: 7	1次番号別通算時間	1676:52
2次使用時間	3:14	2次番号	7
2次前回時間	1126:3	2次番号別前回時間	3:37
2次通算時間	1129:17	2次番号別通算時間	6:51

Weather

海象・気象

天候	wind direction 風向	wind force 風力	wave 波浪	swell うねり	visibility 視程
0 over cast	N	2	2	2	7

Max. depth 最大潜航深度 4801 m

landing

depth 着底深度 4794 m

bottom 着底底質 泥 mud

taking off

depth 離底深度 4794 m

bottom 離底底質 泥 mud

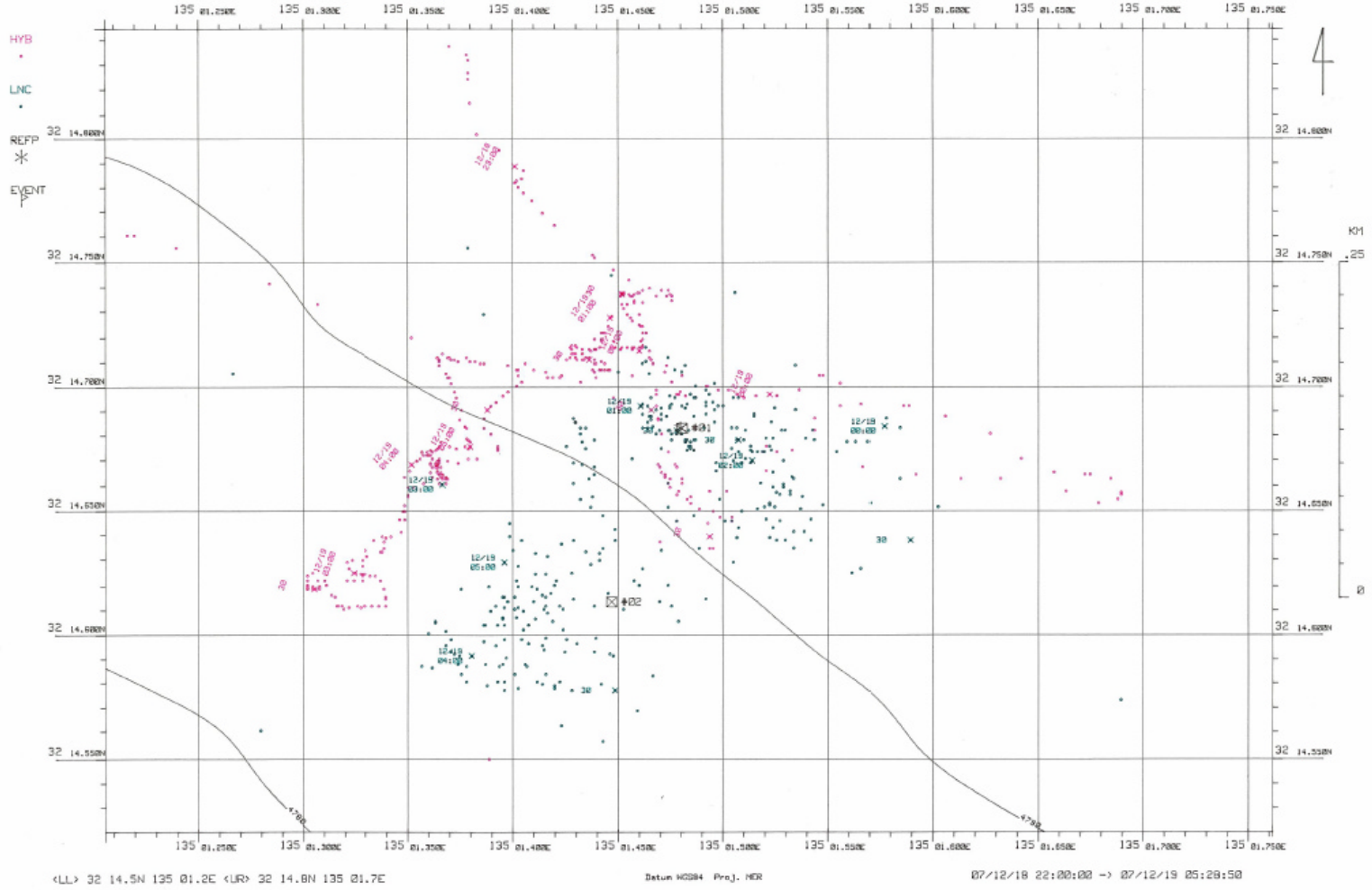
記事　強い流れに対処するため左右両ﾏﾆﾋﾟｭﾚｰﾀでﾋﾞｰｸﾙ位置をﾗｲｻﾞｰﾊﾞｲﾌﾟに固定し観測ﾃﾞｰﾀの回収を行った。また、簡易HDTVによる現状観察を実施した。

KR07-18 KAIKO7000II Dive#407

NANKAI TROUGH 1173B

Date 2007/12/19

Scale (1/ 2500)



<LL> 32 14.5N 135 01.2E <UR> 32 14.8N 135 01.7E

Datum WGS84 Proj. MER

07/12/18 22:00:00 -> 07/12/19 05:28:50

3-3. Dive 408

Date: Dec. 20, 2007

Site Description: Nankai Trough ACORK at Site 808

Objectives: Removal of sediment in and around ACORK head

Payloads: Hydraulic suction pump “Doro-sui”

Dive Results: KAIKO landed by the ACORK at 808I at 11:22, on the northeastern side. A hydraulic suction pump, called “Doro-sui” was used to remove muddy sediment from the ACORK head and its inside. The pump worked very well, and almost all mud inside ACORK could be removed, as well as significant amount of sediments in front of ACORK head. The operation was terminated at 15:01.

The result encouraged us for installing the bridge plug, and we decided to use the old packer-type bridge plug by shortening its length. The original weight in water was 14.5kg, and even after shortening the nose float (plus steel rod in the axis) the weight was estimated as ~22-23 kg, light enough to hold by the KAIKO manipulator.

time	event
1056	Stop KAIKO, prepare for vehivle launch
1100	Vehicle detached from Launcher
1110	Visual detection of seafloor
1117	ACORK detected
1120	KAIKO on the bottom
1144	CORK head, no visibility due to mud cloud
1208	Hydraulic suction pump stand-by
1227	sediment suction begins in ACORK center
1309	suction continues in outer lip of ACORK
1313	suction continues in ACORK center
1320	suction stopped, vehicle moving to a closer position
1321	suction begins again in ACORK center
1349	suction moves to clear in front of ACORK
1414	suction continues making a trough in front of ACORK
1422	vehicle moves to continue making trough in front of ACORK
1458	suction tool replaced in basket
1501	vehicle leaves bottom

平成１９年
かいこう７０００Ⅱ 調査潜航
Total Dive No.(dive count from 1st. Apr.) ４０８ＤＩＶＥ（３２）
室戸沖　南海トラフ　８０８Ｉ

２００７年１２月２０日

Geosystem　１．測地系　　ＷＧＳ－８４（世界測地系）

Navigation　２．測位　　Ｄ－ＧＰＳ　　（ＬＥＩＣＡ　ＭＸ９４００Ｎ）

３．ＸＢＴ　　Ｓ／Ｖ＝１５３６．０ｍ／Ｓ　（Ｄ＝４７００ｍ）

Start point　４．着水点　　（特異点１）
３２°－２１．１７８７’Ｎ　Ｄ＝４６７６ｍ
１３４°－５６．６４２６’Ｅ

Operators　５．潜航配置　　Commander: 指　揮：三浦　　Vehicle pilot: ﾋﾞｰｸﾙ PILOT：若松
Launcher pilot: ﾗﾝﾁｬｰ PILOT：重竹　　Vehicle co-pilot: ﾋﾞｰｸﾙ CoPILOT：瀬底

Subjects　６．潜航目的　　ACORK 圧力モニタリング及び熱流量高密度測定による室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Dive Plan　７．作業内容　　現状確認
ドロシーによる泥除去作業

Schedule　８．日程

Check ROV	０６：３０	操縦盤立ち上げ 作動確認
Docking	０８：３０	結合作業
Surface	０９：１０	着水
Landing	１０：５０	着底
Taking off	１５：００	離底
Surface	１６：３０	水切り（浮上）
On deck	１６：５０	揚収完了

９．備考

KAIKO 7000II　　Dive Record

かいこう７０００Ⅱ　潜航記録

Cruise No.

平成 19 年　　KR07-18 行動

記載者 瀬底　秀樹

Date　潜航年月日　2007 年 12/20

Planned landing position
着底予定位置

緯　度　32° 21.17′ N

経　度　134° 56.64′ E

測地系　WGS-84

潜航回数　3 回

Total Dive No.　通算潜航回数　408 回

Site name　潜航海域　Off Muroto 室戸沖　Nankai Trough, Hole 808I 南海トラフ　808I

Purpose of dive　潜航目的　調査潜航　ACORK圧力モニタリングによる室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Chief Scientist 調査主任　木下　正高

Institute 所属　海洋研究開発機構

ﾗﾝﾁｬｰ PILOT　重竹　誠二

PILOT　若松　誉

COPILOT　瀬底　秀樹

Time Record (Local=UTC+9h)

作業経過時刻		
lifting	吊揚	09:11
surface	着水	09:17
release	離脱	11:00
landing	着底	11:22
taking off	離底	15:01
docking	結合	15:11
surface	水切	16:35
on desk	揚収完了	16:44

Informations for operator

累計時間	
潜航時間	7:18
前回潜航	2488:34
通算潜航	2495:52

ケーブル使用時間	
1次使用時間	7:33
1次前回時間	2590:07
1次通算時間	2597:40
2次使用時間	4:11
2次前回時間	1129:17
2次通算時間	1133:28

ｹｰﾌﾞﾙ番号別使用時間	
1次番号	2
1次番号別前回時間	1676:52
1次番号別通算時間	1684:25
2次番号	7
2次番号別前回時間	6:51
2次番号別通算時間	11: 2

Weather 海象・気象

天候	wind direction 風向	wind force 風力	wave 波浪	swell うねり	visibility 視程
bc	NNW	4	2	2	7

fine but cloudy

Max. depth 最大潜航深度　4676 m

landing

depth 着底深度　4676 m

bottom 着底底質　泥 mud

taking off

depth 離底深度　4676 m

bottom 離底底質　泥 mud

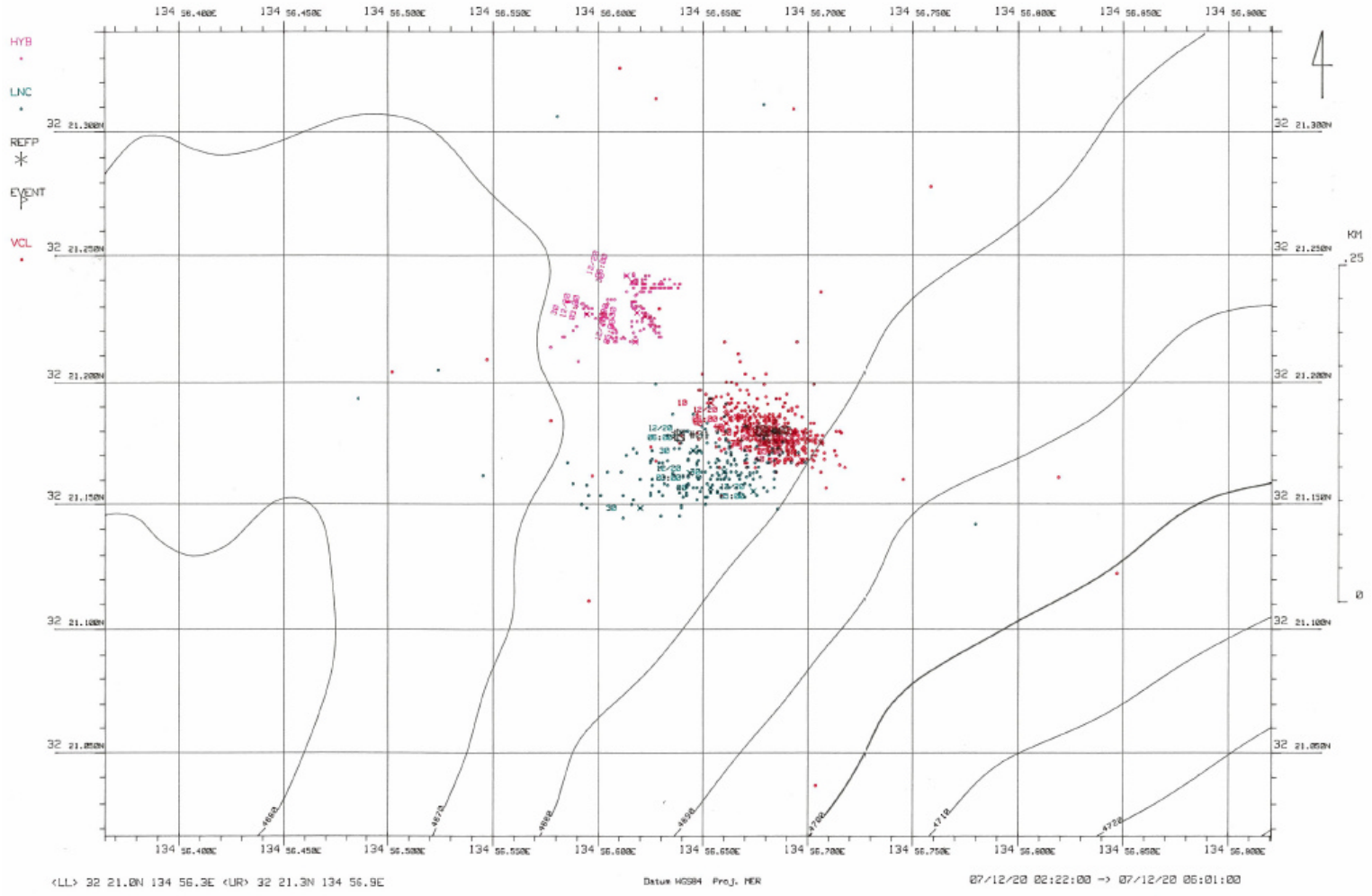
記事　808I観測孔頂上部にﾌﾞﾘｯｼﾞﾌﾟﾗｸﾞを挿入する事前準備作業として、ﾄﾞﾛｼｰを用い頂上部付近及び内部に堆積した泥の除去を実施した。

KR07-18 KAIKO7000II Dive#408

NANKAI TROUGH 808IB

Date 2007/12/20

Scale (1/ 2500)



<LL> 32 21.0N 134 56.3E <UR> 32 21.3N 134 56.9E

Datum WGS84 Proj. MER

07/12/20 02:22:00 -> 07/12/20 05:01:00

3-4.Dive 409

Date: Dec. 21, 2007

Site Description: Nankai Trough ACORK at Site 808

Objectives: Install bridge plug in ACORK head

Payload: Bridge plug

Dive Results: Following the very successful sediment removal from both in front of the ACORK and inside the ACORK head during dive 408, it was decided to make an attempt to install the bridge plug during this dive. Furthermore, the removal of approximately 12 inches of syntactic foam from the nose of the bridge plug lowered its weight in water to 20 kg, which was well within KAIKO's manipulator lifting capacity.

The 808I ACORK was located by sonar, and KAIKO landed by the ACORK head at 11:12. The manipulator was used to remove the safety ties securing the bridge plug in the basket and the plug was lifted free. The plug was set on the seafloor in front of the ACORK head near the trench created during dive 408. The manipulator then rotated the plug until it pointed toward the ACORK. The plug was pushed toward the ACORK until the nose end of the plug was at the outer flange of the ACORK head. The manipulator lifted the plug top slightly and began to slide the plug into the ACORK head, using a side-to-side motion. The vehicle was forced to wait for sediment to clear during this process, as the bottom currents did not seem to be as strong as they had been on previous dives. At 12:02 the plug would not slide any further into the ACORK head, and after some discussion it was decided that it was inserted fully. The packer inflation release was pulled and the plug visibly became centered in the ACORK head over the next few minutes. Test pushes by the vehicle's manipulator indicated that the bridge plug was well seated and that the packer had fully inflated. To get a vertical view of the plug in the ACORK head, the vehicle lifted off the bottom and flew over the ACORK. The top of the plug appeared to be flush with the outer flange of the ACORK head, and the bridge plug installation was declared a success.

Before leaving the bottom, the vehicle drove over to the re-entry cone at 808I and took video of the bent pipe as it enters the cone. KAIKO left the bottom at 13:12.

Dive #409 Log

Time	Event
1041	Stop KAIKO, prepare for vehicle launch
1046	Vehicle detached from Launcher
1055	Detect seafloor
1109	ACORK detected
1112	KAIKO on the bottom
1116	Prepare to pull out plug
1119	Pullout safety pin
1125	Move BP out of the basket on the seafloor
1132	Push BP with manipulater so that the tip heads for the ACORK mouth
1142	Almost
1144	BP is being inserted
1145	KAIKO is relocated toward ACORK
1147	Retry insert
1150	KAIKO is relocated toward ACORK
1202	Manipulator pushes plug again, won't go in any farther
1204	Vehicle moving to get a vertical view of the plug in the casing
1222	KAIKO is relocated toward ACORK for the final BP push (last 5 cm?)
1232	Pullout safety pin for the valve
1233	Turn the valve; mud smoke came out
1257	BP insertion successful; KAIKO observe ACORK pipe toward the reentry cone
1309	Observe reentry cone
1312	KAIKO left bottom

平成１９年
かいこう７０００Ⅱ 調査潜航
Total Dive No.(dive count from 1st. Apr.) ４０９ＤＩＶＥ（３３）
室戸沖　南海トラフ　８０８Ｉ

２００７年１２月２１日

Geosystem １．測地系　　ＷＧＳ－８４（世界測地系）

Navigation ２．測位　　Ｄ－ＧＰＳ　　（ＬＥＩＣＡ　ＭＸ９４００Ｎ）

３．ＸＢＴ　　Ｓ／Ｖ＝１５３６．０ｍ／Ｓ　（Ｄ＝４７００ｍ）

Start point ４．着水点　　（特異点１）
３２°－２１．１７８７’Ｎ　Ｄ＝４６７６ｍ
１３４°－５６．６４２６’Ｅ

Operators ５．潜航配置　　Commander: 指　揮：三浦　　Vehicle pilot: ﾋﾞｰｸﾙ PILOT：若松
Launcher pilot: ﾗﾝﾁｬｰ PILOT：重竹　　Vehicle co-pilot: ﾋﾞｰｸﾙ CoPILOT：瀬底

Subjects ６．潜航目的　　ACORK 圧力モニタリング及び熱流量高密度測定による室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Dive Plan ７．作業内容　　ブリッジプラグ挿入作業

Schedule ８．日程

Check ROV	０６：３０	操縦盤立ち上げ 作動確認
Docking	０８：３０	結合作業
Surface	０９：１０	着水
Landing	１０：５０	着底
Taking off	１５：００	離底
Surface	１６：３０	水切り（浮上）
On deck	１６：５０	揚収完了

９．備考
ブリッジプラグはビークルに搭載し搬送する。

KAIKO 7000II　　Dive Record

かいこう７０００Ⅱ　潜航記録

Cruise No.

平成 19 年　KR07-18 行動

記載者 瀬底 秀樹

Planned landing position
着底予定位置

緯度 32° 21.17′N
経度 134° 56.54′E
測地系 WGS-84

Date 潜航年月日 2007 年 12/21

潜航回数 4 回

Total Dive No. 通算潜航回数 409 回

Site name 潜航海域 Off Muroto 室戸沖　Nankai Trough, Hole 8081 南海トラフ 8081

Purpose of dive 潜航目的 調査潜航　ACORK圧力モニタリングによる室戸沖南海付加体前縁部の水理力学的構造・変動の解明

Chief Scientist 調査主任 木下 正高

Institute 所属 海洋研究開発機構

ﾗﾝﾁｬｰ PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

Time Record (Local=UTC+9h)

	作業経過時刻	
lifting	吊揚	08:56
surface	着水	09:02
release	離脱	10:45
landing	着底	11:12
taking off	離底	13:12
docking	結合	13:23
surface	水切	14:45
on desk	揚収完了	14:54

Informations for operator

累計時間	
潜航時間	5:43
前回潜航	2495:52
通算潜航	2501:35

ケーブル使用時間	
1次使用時間	5:58
1次前回時間	2597:40
1次通算時間	2603:38
2次使用時間	2:38
2次前回時間	1133:28
2次通算時間	1136: 6

ｹｰﾌﾞﾙ番号別使用時間	
1次番号	2
1次番号別前回時間	1684:25
1次番号別通算時間	1690:23
2次番号	7
2次番号別前回時間	11:2
2次番号別通算時間	13:40

Weather 海象・気象

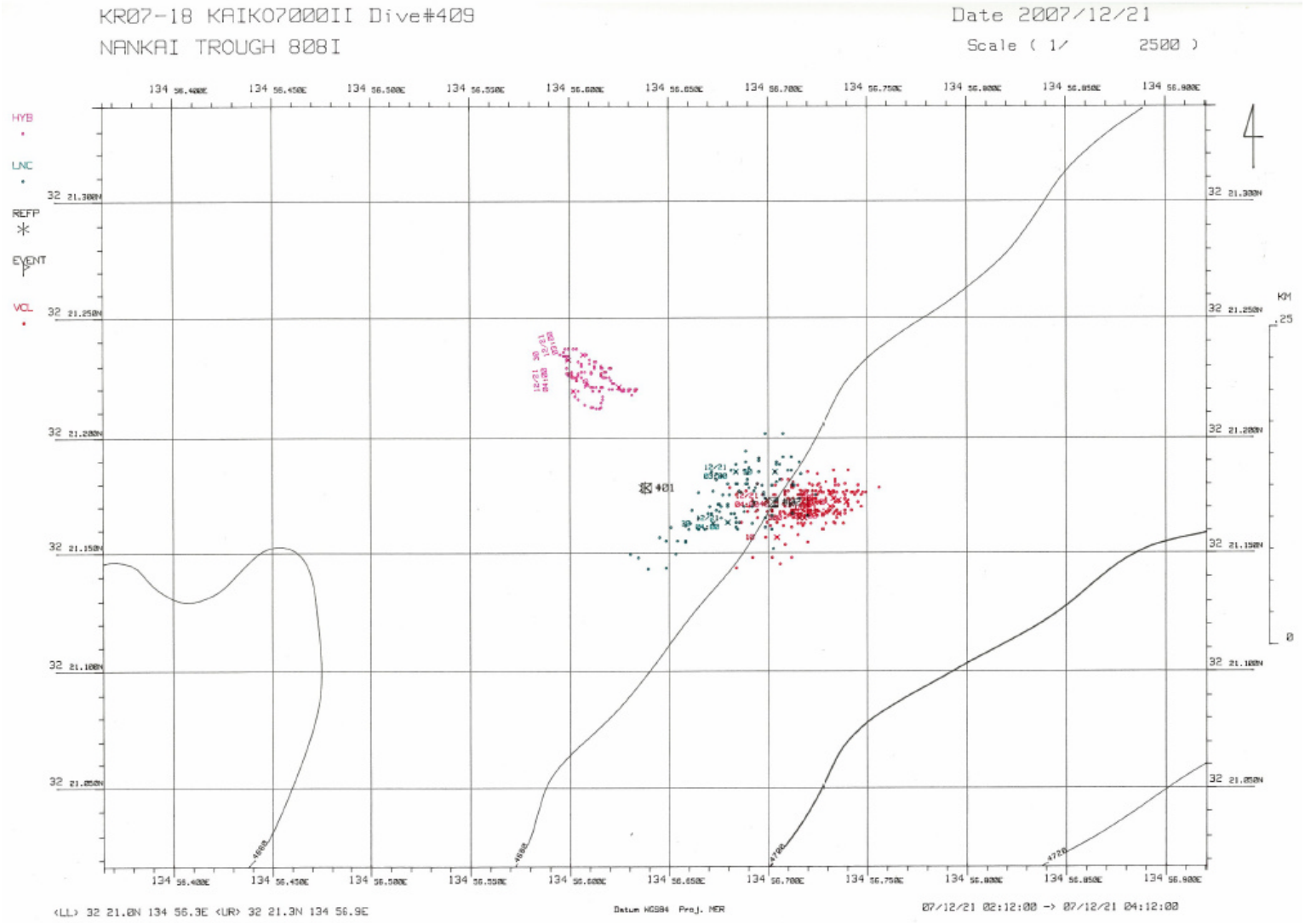
天候	wind direction 風向	wind force 風力	wave 波浪	swell うねり	visibility 視程
c (cloudy)	NNW	2	2	1	7

Max. depth 最大潜航深度 4677 m

landing
depth 着底深度 4676 m
bottom 着底底質 泥 mud

taking off
depth 離底深度 4677 m
bottom 離底底質 泥 mud

記事　8081観測孔頂上部にﾌﾞﾘｯｼﾞﾌﾟﾗｸﾞを挿入し孔口のｼｰﾙを行い、ｼｰﾙ状況を観察した後、頂上部からﾘｴﾝﾄﾘｰｺｰﾝまで簡易HDTVによる詳細な観察を行った。


KR07-18 KAIKO7000II Dive#409
NANKAI TROUGH 808I
Date 2007/12/21
Scale (1/ 2500)
HYB
LNC
REFP
EVENT
VCL
KM
.25
0
401
4
<LL> 32 21.0N 134 56.3E <UR> 32 21.3N 134 56.9E
Datum WGS84 Proj. MER
07/12/21 02:12:00 -> 07/12/21 04:12:00

4. ACORK Operations and Preliminary Results

4.1. ACORK configurations

Two Advanced CORKs (ACORKs) were installed near the toe of the Nankai accretionary prism in 2001 during Ocean Drilling Program Leg 196 to provide long-term in-situ formation pressure records in the Nankai Trough (Mikada et al., 2002). Objectives of these long-term installations include assessing the average state of the formation, detecting deformation-induced transients, and constraining elastic and hydrologic properties of the subsurface from tidal loading signals at this seismically active subduction zone.

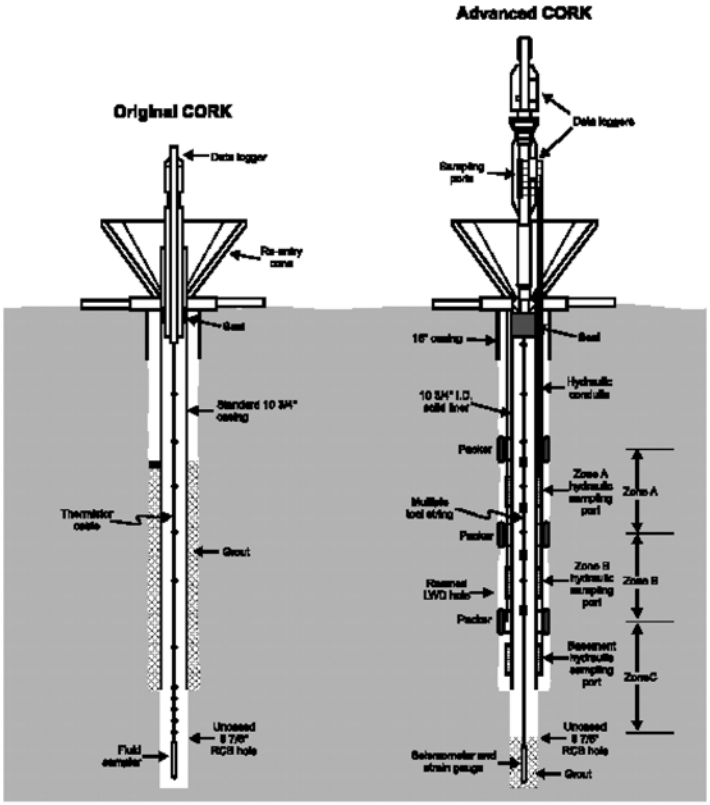


Figure 1: Schematic diagram of CORK and Advanced CORK borehole observatories.

Hydrologic isolation of monitoring intervals is provided by a combination of internal casing seals, grout, inflatable packers, and formation collapse.

The ACORKs were an important advance over the simple CORK hydrogeological

observatories successfully installed in many other ODP locations since 1991 (Figure 1). The original CORKs have a single seal at the seafloor and therefore integrate hydrogeologic signals over the entire drilled interval below the depth of casing, whereas the ACORK has multiple seals and monitoring intervals in a single borehole to allow pressure measurements at isolated stratigraphic intervals. Prior CORK results, the ACORK concept, and specifics regarding sensors and data are described in more detail in Becker and Davis (2000; 2005), Davis and Becker (2000; 2007), and Mikada et al., 2002.

ACORK at Hole 1173B

The ACORK at ODP Site 1173B has four packers and five screened monitoring intervals. It was successfully installed to 728 meters below seafloor (mbsf). A bridge plug was installed to isolate the deepest screen from pressure at the seafloor via the open casing. During deployment, the bridge plug set prematurely at approximately 466 mbsf. The rig floor did not sense the bridge plug setting, and the drill pipe broke off at the ACORK head. A video inspection at the end of Leg 196 confirmed that the drill pipe broke off precisely at the ACORK head and that the ACORK head suffered no damage. Pressure data show that the bridge plug seated properly, and this is supported by the lack of visible mineral or bacterial growth at the top of the ACORK that would be present if formation fluid was leaking up the inside of casing. Unfortunately, the broken drill pipe prevented installation of a thermistor cable built for Leg 196 by JAMSTEC.

Principle observation zones at Site 1173 include uppermost oceanic basement below 731 mbsf (screen 1), the Lower Shikoku Basin formation below the stratigraphic projection of the decollement (screens 2, 3), the stratigraphic projection of the decollement within the upper section of the Lower Shikoku Basin formation (screen 4), and an interval just below the top of the Lower Shikoku Basin formation (screen 5), above which lie higher porosity, coarser-grained, and higher permeability sediments of the Upper Shikoku Basin formation (Figure 2).

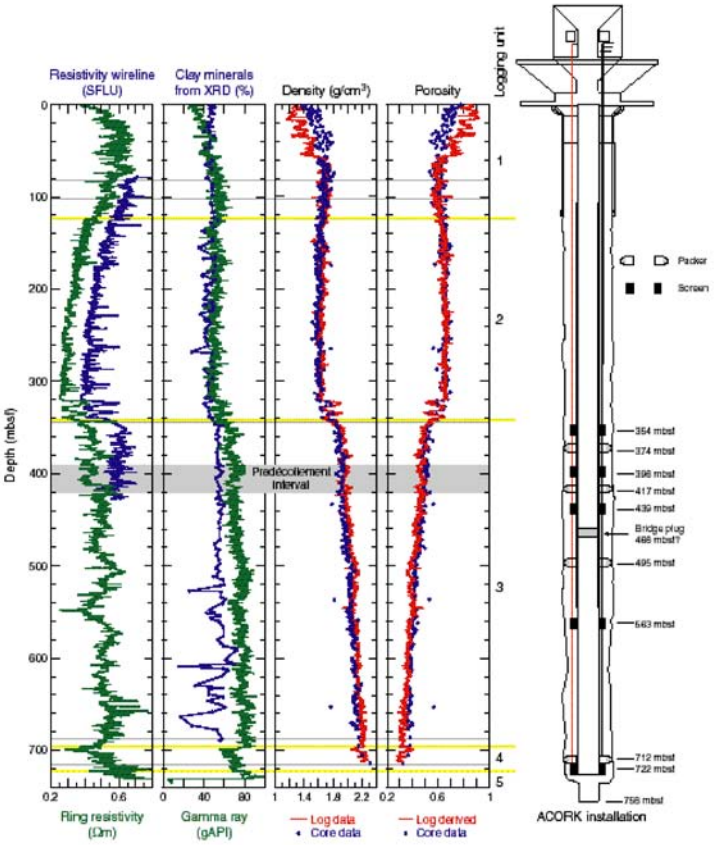


Figure 2. Logs from Hole 1173B and configuration of the ACORK installed during Leg 196.

ACORK at Hole 808I

The ACORK at Site 808 has two packers and six screens and was intended to penetrate the decollement. Due to poor drilling conditions and failure of the underreamer, actual penetration concluded ~36 meters short of the goal of 964 mbsf. This resulted in the ACORK head being situated 42 meters above the seafloor. When the drill string was disengaged, the casing string could not support its own weight, and the casing and ACORK head fell to the seafloor. Careful video inspection showed the casing to be bent but not broken, and the hydraulic umbilical was undamaged. Fortuitously, the ACORK head tipped in the best possible direction, with the ACORK resting horizontally with the data logger bay and sample ports facing upward.

Principal observation zones at Site 808 include the Lower Shikoku Basin formation at several depths above the decollement (screens 1-4), the overlying Upper Shikoku Basin formation (screen 5), and the Outer Marginal Trench-Wedge facies near the frontal thrust (screen 6; Figure 3). The deepest screen 1 is situated immediately below a packer and immediately above the bottom of the ACORK casing; the degree to which it is in communication with the decollement depends on the degree to which the unsupported hole in the section drilled through the fault and into the footwall section has remained open.

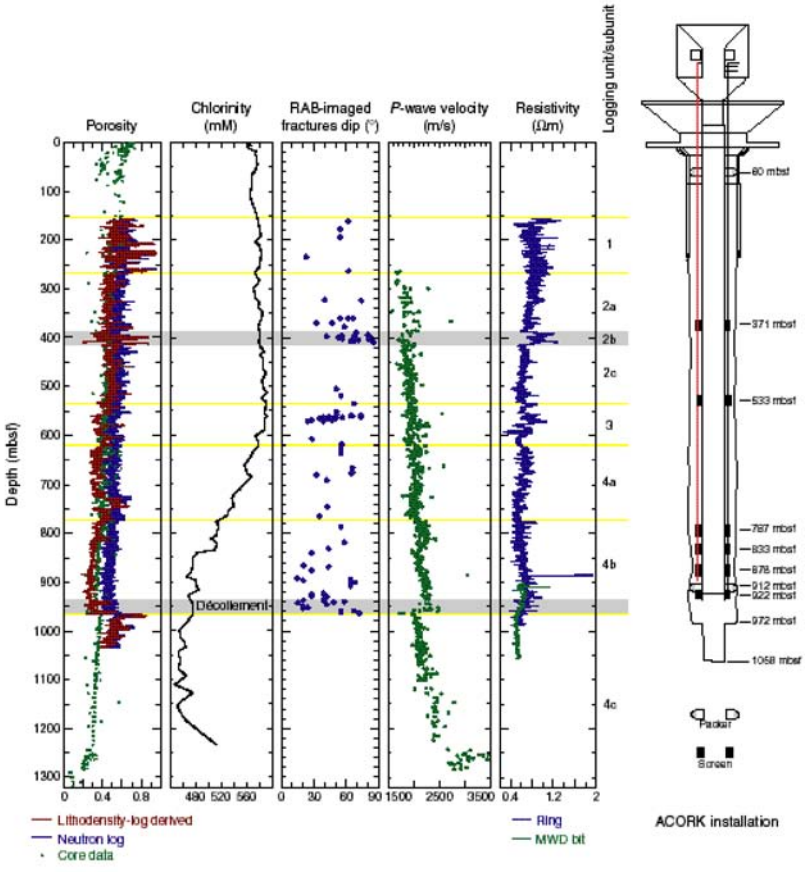


Figure 3. Logs from Hole 808I and configuration of ACORK installed during Leg 196.

4.2. Summary of results

Kairei Cruise 07-18 is the fifth visit to the ACORK borehole observatories at Sites 808 and 1173. Data gathered during this cruise have been merged with those collected previously (using Kaiko 12k in 2002 and 2003, Shinkai 6500 in 2004, Kaiko 7k in 2006) and are shown in Figures 4 and 5. Both sites suffered from fluid sampling valves having been bumped open during Leg 196 deployment operations in the first year of recording. Only screen 2 at Hole 1173B was unperturbed and recovered smoothly from the initial hydrostatic state at the time of drilling. Valves were closed at the time of the first Kaiko 12k visit in 2002; only then did proper formation recording begin at all levels (with caveats at 808 screen 1).

Hole 1173B

While not fully free of complications, the pressure records at Hole 1173B, screens 1, 2, 4, and 5, show smooth long-term trends punctuated twice by transients contemporary with a very-low-frequency (VLF) earthquake swarm off Cape Muroto in July, 2003, and a sequence of large earthquakes (up to Mw = 7.5) off Kii Peninsula in September, 2004 (Fig. 4). The transients are believed to be the consequence of local co-seismic and post-seismic strain, and the rising trends the consequence of slowly accumulating strain of the Philippine Sea plate between great thrust earthquakes. By the final recording interval recovered this cruise, pressures at screens 4 and 5, closest to the top of the Lower Shikoku formation, were relatively stable, while at screens 1 and 2 in the most isolated, undrained part of the drilled section, pressures continued to rise steadily. It is noteworthy that no transient is resolved at the time of a VLF earthquake swarm off Cape Muroto in September, 2006. This swarm was larger than the one in 2003, suggesting there is little correlation between seismic energy release and strain moment.

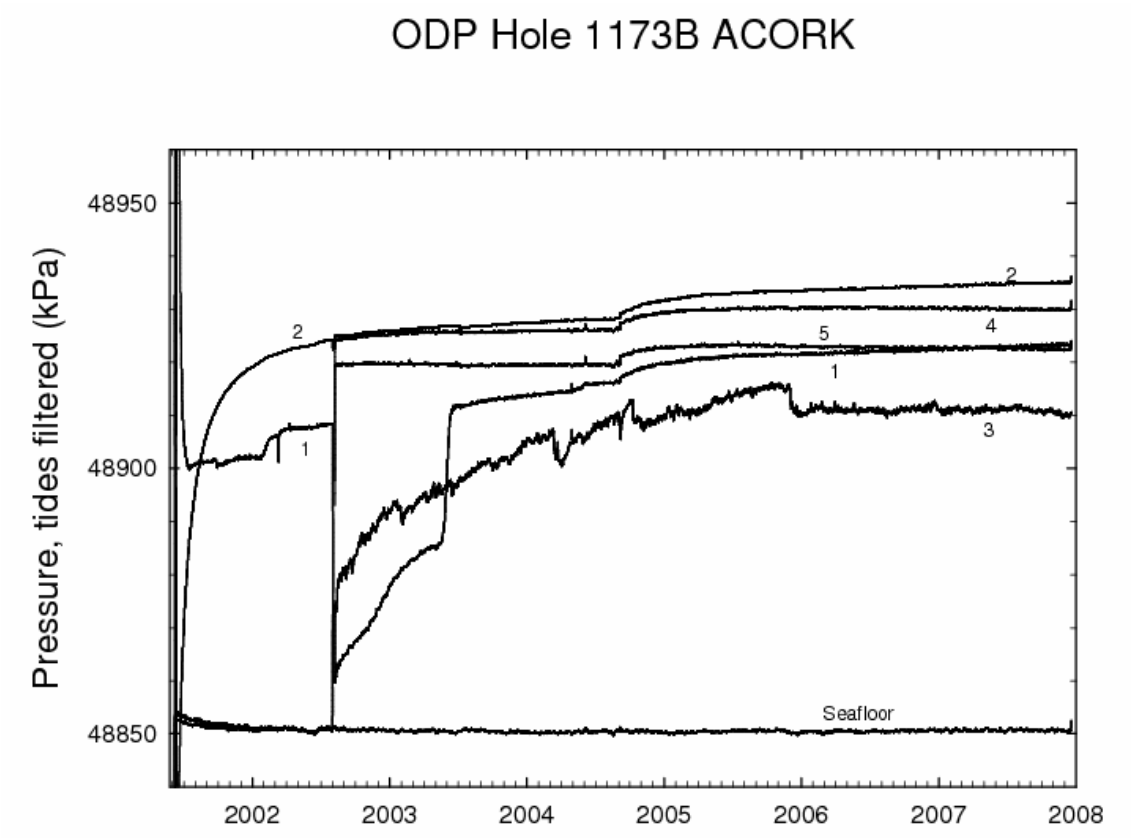


Figure 4. Full recording history of pressures from Hole 1173B, including the data from August 2006 to the present, recovered during Kairei cruise KR-07-18. The records have had tidal components, typically 5-10 kPa in amplitude, filtered.

Hole 808I

The long-term record from Hole 808I (Fig. 5) is complex and more difficult to interpret than that from Hole 1173B, although one first-order aspect are straight-forward to understand, namely that of the average pressure state of the section. All screens within (or immediately below in the case of screen 4) the Upper Shikoku Basin formation show pressures that are very close to hydrostatic. This suggests that this coarser-grained (and presumably higher-permeability) lithology drains as rapidly as strain-related pressures are generated. In contrast, elevated pressures, similar to those at Hole 1173B, are present at screens 2 and 3 in the Lower Shikoku Basin formation, where low permeability allows higher pressures to be maintained. There is no explanation for the noisy character of the records from screens 2 and 3, nor for the decline in pressure beginning in early 2006. Intermediate pressures are seen at screen 1, although because of the leakage through the internal diameter of the unplugged casing, pressures there are completely untrustworthy. As in the case of screen 3, the cause of the decline at screen 1, in this case to a near-hydrostatic state, is unknown. We anticipate that the bridge plug installed during this cruise will allow the true formation state at

the decollement to be observed.

Almost buried amidst the noise at all screens are transients in July 2003 and September 2004 that are contemporary with those observed at Hole 1173B. Simple steps are seen at screen 1, whereas impulsive transients are observed at all other screens. In the case of the 2003 event, the impulsive transients were interpreted as being directly related to strain (Davis, et al., 2006); these are now believed to be the consequence of thermal expansion of fluid caused by augmented leakage internally up the casing from the level of the decollement. We also anticipate that the bridge-plug seal installed during this cruise will prevent thermal perturbations to strain events in the future.

As in the case of Hole 1173B, there is a noteworthy absence of a signal from the large VLF swarm that occurred off Cape Muroto, immediately landward of Hole 808I, in September 2006. While seismically more energetic than the event in 2003, no strain was detected.

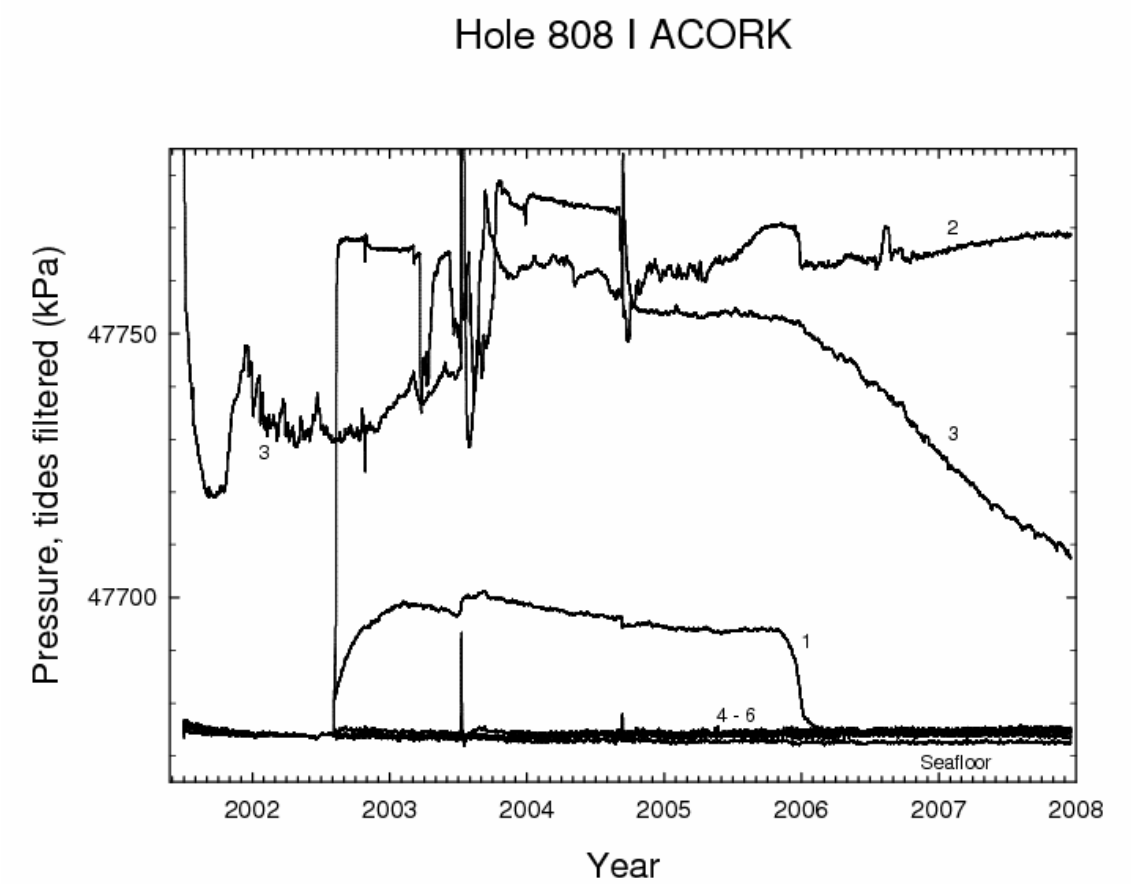


Figure 5. Full recording history of pressures from Hole 808I, including the data from August 2006 to the present, recovered during Kairei cruise KR-07-18. The records have had tidal components, typically 5-10 kPa in amplitude, filtered.

Earthquakes

While the 10 minute sampling rate that us used in these long-term autonomous observatories is hardly adequate to capture seismic signals, a total of six earthquakes was detected, five at both sites. The largest amplitude event is shown in Figure 6. The amplitude of the response to the seismic ground motion (Raleigh waves) varies from screen to screen systematically with tidal loading response. In this plot of raw data, the relative amplitudes of tidal signals can also be seen, as well as noise that is characteristic of the records from screens 3 and 5 at Hole 1173B and to lesser degree from all screens Hole 808I. This noise, which has been noted previously, is coherent among levels at each of the sites; the source is unknown.

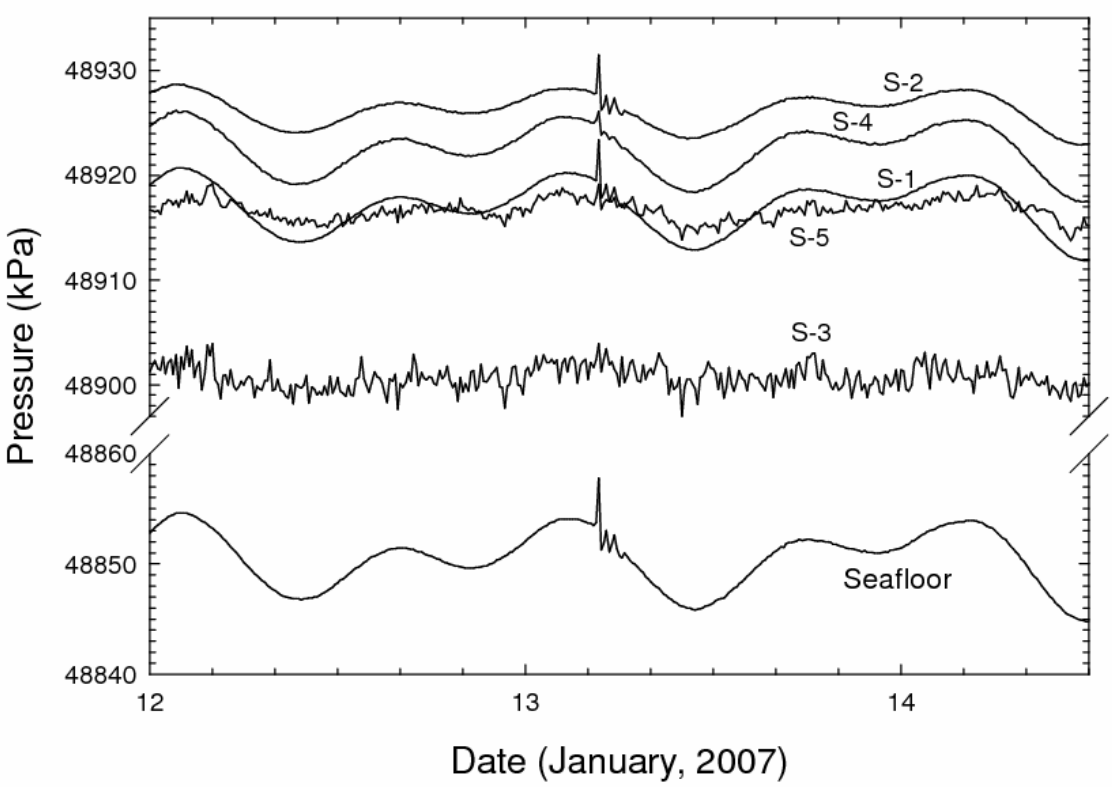


Fig. 6

References:

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Davis, E.E., and Becker, K., Using ODP boreholes for studying sub-seafloor hydrogeology: results from the first decade of CORK observations, Geoscience Canada, 28, 171-178, 2001.

Davis, E.E., and Becker, K., On the fidelity of CORK pressure records, Scientific Drilling, xx, xxx-xxx, 2007.

Davis, E.E., Becker, K., Wang, K., Obara, K., Ito, Y., and Kinoshita, M. A discrete episode of seismic and aseismic deformation of the Nankai trough subduction zone accretionary prism and incoming Philippine Sea plate. Earth Plan. Sci. Lett. 242, 73-84 (2006).

Mikada, H., Becker, K., Moore, J.C., Klaus, A. et al., 2002, Deformation and fluid flow processes: Logging while drilling and Advanced CORK in the Nankai Trough accretionary prism, Proc. ODP, Init. Repts, 196, 2002.

Mikada, H., Kinoshita, M., Becker, K., Davis, E., Meldrum, R., et al., Hydrological and geothermal studies around Nankai Trough (KR02-10 Nankai Trough Cruise Report), *JAMSTEC Journal of Deep Sea Research*, *22*, 125-171, 2003.

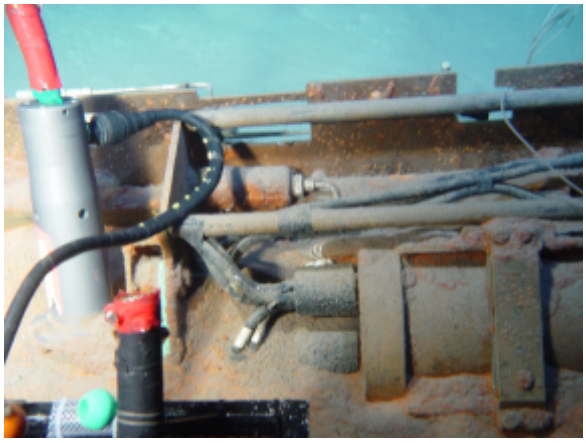
5. Technical Results

5-1. Time variation of 808I ACORK head part

As noted in Chapter 1 of this report, the ACORK at 808I was accidentally placed on the seafloor in 2001. Since then the sediment has been deposited around the ACORK, and also into its head. During the KR06-10 and KR07-18 cruises we inspected carefully the mouth of ACORK part.

Fig. 5-1 compares the head part (side view). The depositional level seems to have increased since 2001, but seems to remain constant in the recent two years. Fig. 5-2 compares the inlet of ACORK head at 808I.

Aug. 6, 2002 May 29, 2003



Dec., 2007

May, 2003 Aug. 2006

Fig. 5-1. Comparison of 808I ACORK head (side view).

KR06-10 (Aug-06)

KR07-18 (Dec. 18, 2007)

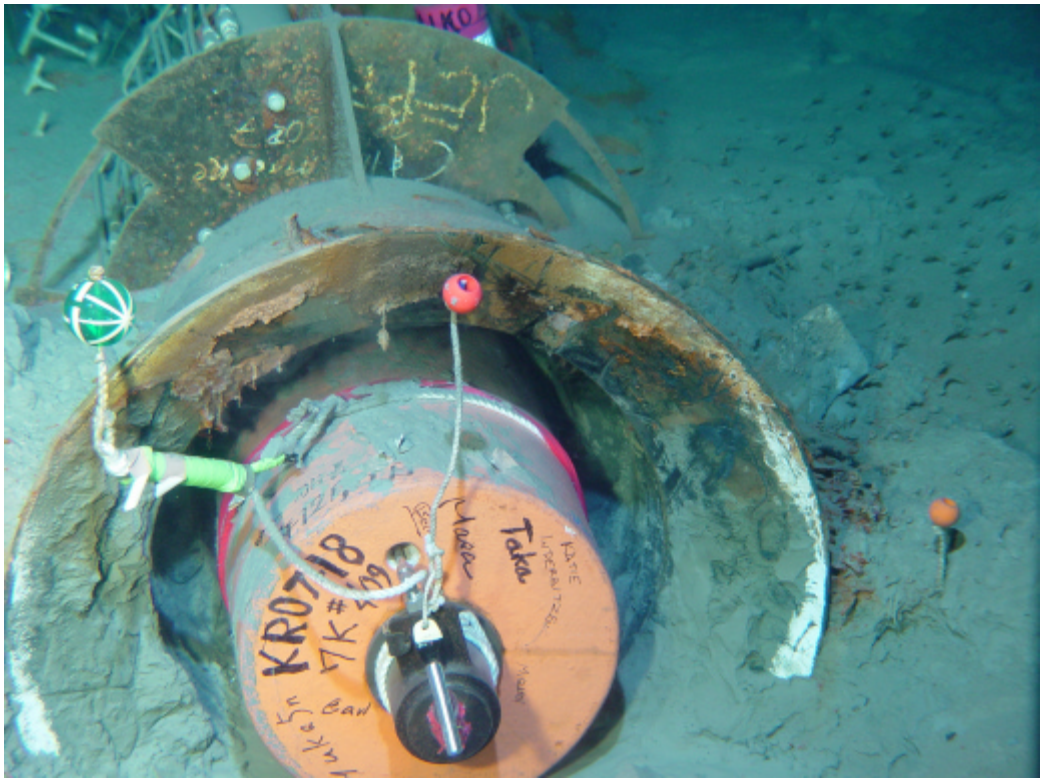


Fig. 5-2. Comparison of the inlet of ACORK at 808I.

5-2. Overview of ACORK at Hole 808I

The overall view of ACORK at 808I is shown below (Figs. 5-3 to 5-5).

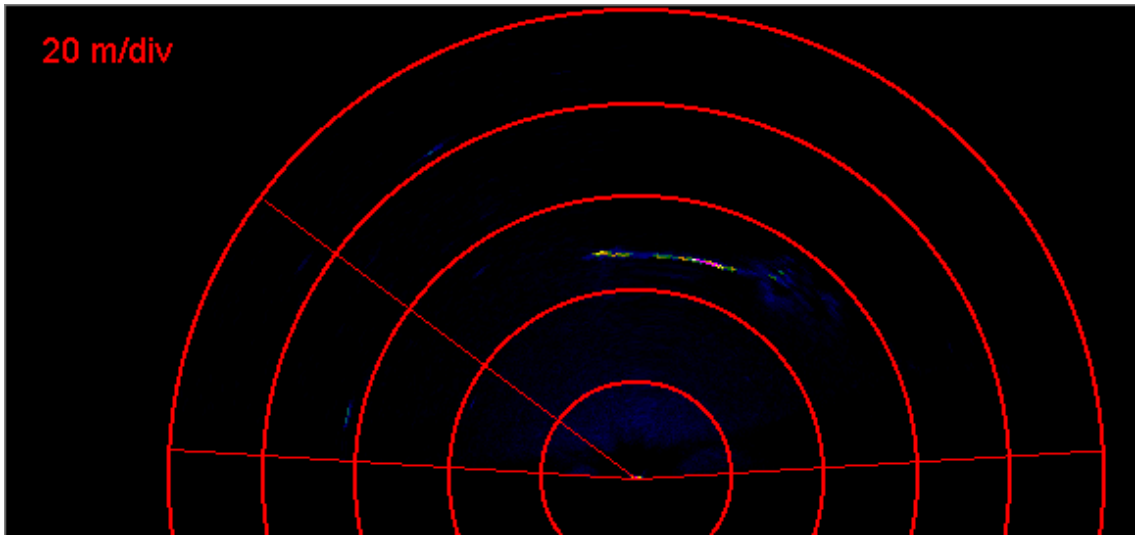


Fig 5-3 Sonar image of ACORK at 808I. The ACORK head is on the left side.

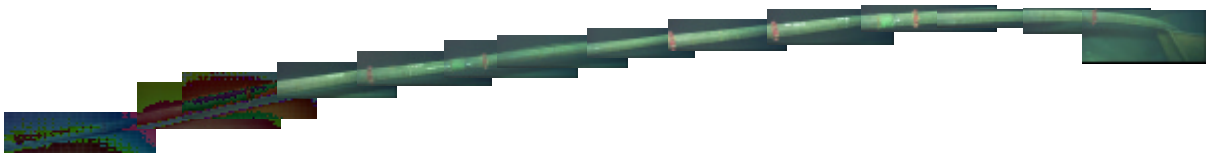
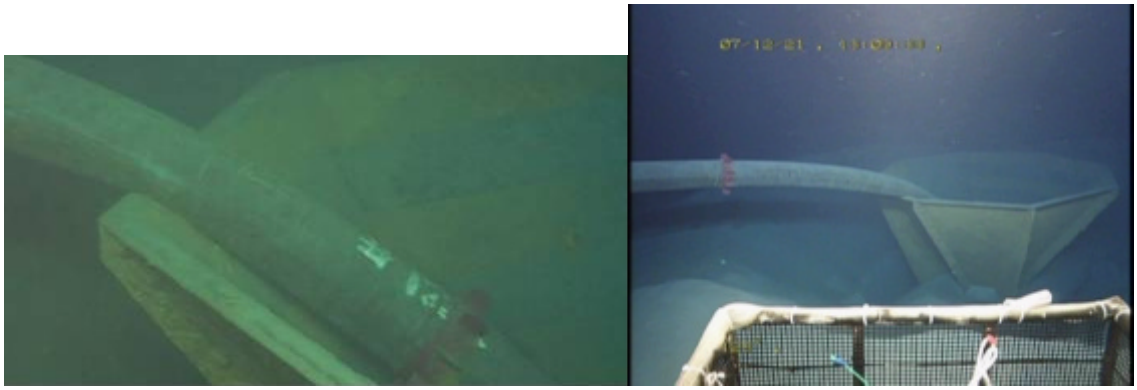
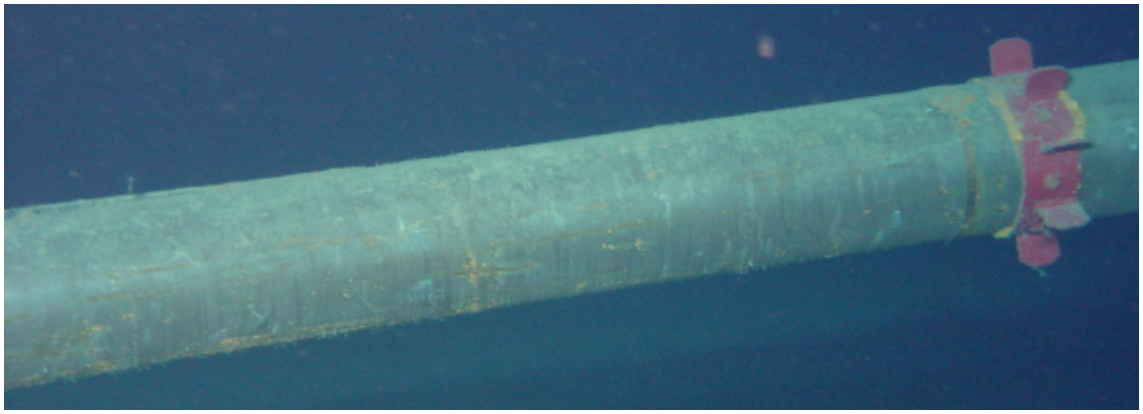
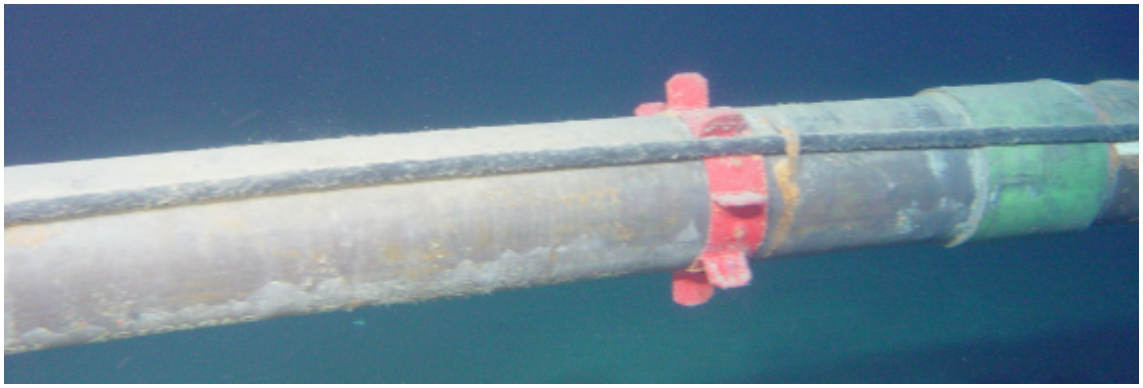
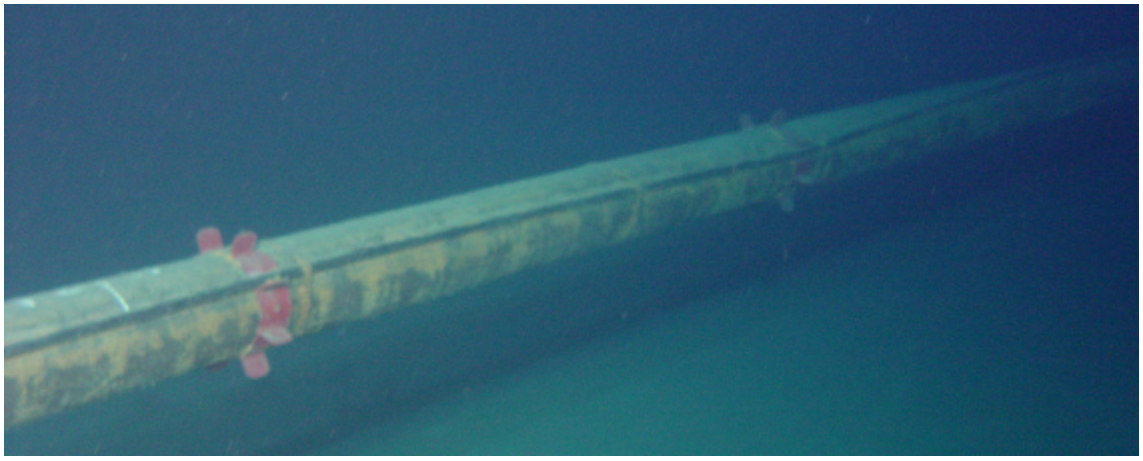


Fig. 5-4 Mosaic of ACORK casing at 808I.









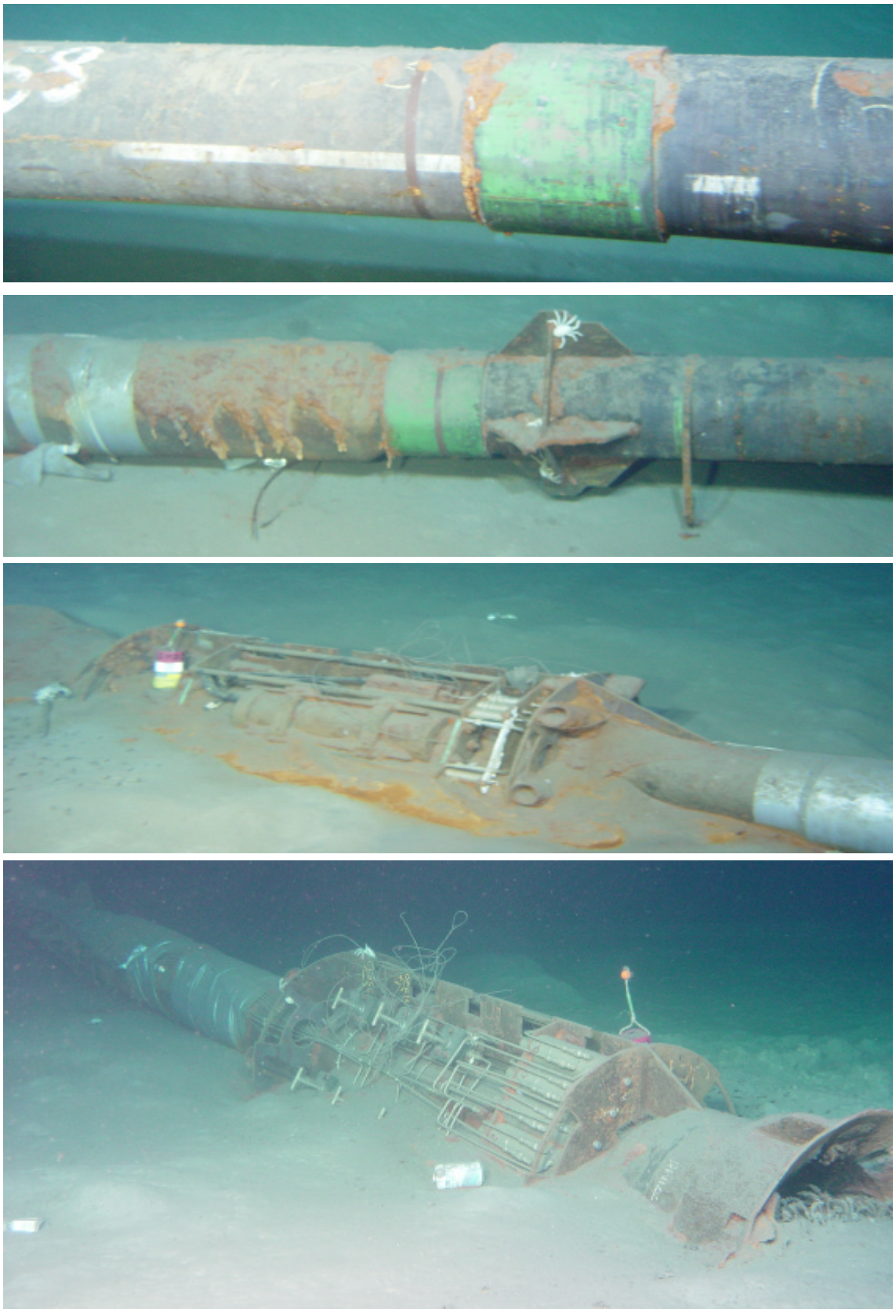


Fig. 5-5 Close-ups for ACORK at 808I.

Appendix

A1. List of video

A2. Information of ACORK equipment (Melrdum)

A3. ACORK manual

A4. Technical Issues

A5. Flubber Plug Design

A1. List of Video

				Recorded Time		Distribution		
Date	Dive No.	Camera	No. of tapes or disks	Start	End	JAMSTEC	GSC	Remarks
18-Dec-07	#406	TV1/HDTV	1/3	11:55	13:14	MiniDV		Hole 808I
			2/3	13:14	14:35	MiniDV		
			3/3	14:35	15:10	MiniDV		
		TV2	1/2	11:55	13:55	HDD/SP		
			2/2	13:55	15:10	HDD/SP		
		TV3	1/2	11:55	13:55	HDD/SP		
			2/2	13:55	15:10	HDD/SP		
		combined	1/2	11:55	13:55	DVD/SP	DVD/SP	
			2/2	13:55	15:10	DVD/SP	DVD/SP	
19-Dec-07	#407	TV1/HDTV	1/3	10:48	12:11	MiniDV		Hole 1173B
			2/3	12:11	13:33	MiniDV		
			3/3	13:33	13:55	MiniDV		
		TV2	1/2	10:48	12:45	HDD/SP		
			2/2	12:45	13:47	HDD/SP		
		TV3	1/2	10:48	12:45	HDD/SP		
			2/2	12:45	13:47	HDD/SP		
		combined	1/3	10:48	11:48	DVD/XP	DVD/XP	
			2/3	11:48	12:45	DVD/XP	DVD/XP	
			3/3	12:45	13:45	DVD/XP	DVD/XP	
20-Dec-07	#408	TV1/HDTV	1/3	11:08	12:28	MiniDV		Hole 808I Dorocy
			2/3	12:28	13:51	MiniDV		
			3/3	13:51	15:02	MiniDV		
		TV2	1/2	11:08	13:08	HDD/SP		
			2/2	13:08	15:02	HDD/SP		
		TV3	1/2	11:08	13:08	HDD/SP		
			2/2	13:08	15:02	HDD/SP		
		combined	1/2	11:08	13:08	DVD/SP	DVD/SP	
			2/2	13:08	15:02	DVD/SP	DVD/SP	
21-Dec-07	#409	TV1/HDTV	1/2	10:54	12:12	MiniDV		Hole 808I

			2/2	12:12	13:13	MiniDV		Bridge Plug
		TV2	1/2	10:54	12:53	HDD/SP		
			2/2	12:53	13:13	HDD/SP		
		TV3	1/2	10:54	12:53	HDD/SP		
			2/2	12:53	13:13	HDD/SP		
		combined	1/2	10:54	12:53	DVD/SP	DVD/SP	
			2/2	12:53	13:13	DVD/SP	DVD/SP	
	Dijest		1/1			DVD/SP	DVD/SP	

*DVD/SP: 2 hours for 1 disk

*DVD/XP: 1 hour for 1 disk

A2. Information for Masa Kinoshita re A-Cork equipment
R.D.Meldrum, December 22, 2007, Kairei

Remaining in Japan

The following items being left for JAMSTEC form a complete A-Cork download kit, including cables and connectors, documentation and software, and test electronics. Each item is briefly described in the following paragraphs.

1. Seacon CM2000 ROV receptacle (corroded male pins)
This is one of two underwater mateable connectors that can be used to communicate with the A-Cork. Three pins on this connector were damaged during the dive to 808I. A discussion of that problem and photos of the damage are provided in the KR07-18 cruise report. This connector was taken apart to assess the extent of the damage to the pins and should not be used for downloads until properly repaired. JAMSTEC should return it to Seacon Advanced Products for repair and re-assembly. A return authorization code should first be obtained from Seacon. Contact information will be provided by Meldrum.

2. Seacon CM2000 ROV receptacle (new)
This connector is identical to #1 and can be used for A-Cork downloads until a new connector and/or a repaired damaged connector are obtained.

3. Kaiko pigtail
This cable connects Kaiko's communication port DF3 to the CM2000 ROV receptacle. It is presently mated to #1 using a Seacon AWM-8X-FS connector. We did not bring dummies to Japan for the AWM connectors, so the cables should remain connected to protect the contacts. Note that it is possible to mate Impulse connectors to a Seacon AWM-8X but they are a very tight fit and probably shouldn't be completely mated or used for dummies at full pressure. Also note that the pin numbering scheme differs between Seacon and Impluse.

4. A-Cork manual on 8½ x 11 paper.
This manual is a complete reference document for the A-Cork logger. It contains a detailed description of the logger and its operation and is the definitive reference for logger commands and download procedures. An electronic copy will be sent from

Canada. As time permits, an unfinished technical section (removed from the paper copy) will be completed and an electronic copy of that sent as well.

5. Card cage with A-Cork electronics and Y-adapter.

This is a genuine A-Cork card cage, complete with CPU card, 9 volt battery clip, and serial Y-adapter, to be used for practicing A-Cork communication and download procedures in the office. It can also be used to provide test signals for checking Kaiko communications. We are not leaving test cables to connect to the Kaiko pigtail (which checks Kaiko communications through to the control room serial port, or to the CM2000 (which checks the entire system).

The A-Cork card cage is to be stored in the anti-static bag supplied. It should be removed from the bag for use, but some care should be taken to avoid touching circuit traces. The mother board obviously should not contact a metal surface when powered. Persons should touch a large metal object or ground point before handling the card cage, or connecting the DB9 connector to the CPU card.

A-Corks have two serial ports, “A” and “B”, both of which are present on the DB9 connector on the CPU card. The supplied Y-adapter splits the two ports into separate DB9 connectors from the single DB9 on the CPU card. Since Kaiko has only one serial port, the download cables are wired to use port “A”, although Port “B” remains enabled at both 1173B and 808I. If the A-Cork should not respond on Port “A”, the Kaiko pigtail could be re-wired to pass port “B” instead of port “A”. If Kaiko had two serial ports available, the pigtail could be re-wired to allow access to both “A” and “B”. There would then be two DB9 connectors in the control room, one for port “A”, the other for port “B”. Note that port “B” can be disabled on command from either Port “A” or “B”. If “A” has failed, extreme care should be taken not to accidentally disable port “B”.

The A-Cork is capable of operating on external power. External power should be supplied in the case of failure to communicate, as battery failure may be the cause. The voltage level applied to pin 4 of DF3 should be no more than 9 volts relative to ground pin 3. Pin 4 of DF3 is not presently connected in the Kaiko pigtail because Kaiko can not presently supply less than 24 volts, and the A-Cork batteries are very unlikely to fail before 2011.

An electronic copy of A-Cork communication wiring will be supplied from Canada.

6. Download-related software.

The following software is part of the “download kit” and has been placed in the shared folder. It includes…

a. PCPLUS.EXE

This is a old commercial DOS-based terminal emulator program which will be found in directory ¥PCPLUS which includes many additional files required for PCPLUS to operate. PCPLUS is what we have been using to download 808I and 1173B. A sub-directory named ¥OPS contains files required to optimize PCPLUS for use with A-CORKs. Detailed but simple instructions on how to configure PCPLUS for A-Corks will be sent from Canada. Instructions on how to use PCPLUS with A-Corks are found in the A-Cork manual, a paper copy of which has been provided.

PCPLUS is an old DOS program, and may not run in modern high performance PCs. We have been using a Toshiba 460CDT with a DOS partition for downloads. Perhaps the sole advantage of PCPLUS is that it has been configured to provide “on-line” access to command descriptions for the A-Cork, although it has several very useful features for working with serial instruments.

An alternative to PCPLUS would be any modern serial terminal software, such as HyperTerm, supplied with Windows. It may require configuration adjustments to properly format communications with the A-Corks (such as when line feeds are to appear). A-Cork downloads use the XMODEM-CRC file transfer protocol, which is available in HyperTerm. Whichever terminal program is used should be configured so that it keeps any download bytes already received if problems occur and the download should stop.

Kaiko's RS-232 serial communication is currently limited to 9600 Baud. The A-Cork operates efficiently at 38,400 Baud, so when Kaiko's rate is raised to 64 k bits per second max, the Baud rate used for downloads should be 38.4 kBaud.

b. ACDAT.EXE

This program converts the binary file downloaded from the A-Cork to formatted ASCII suitable for direct entry into a spread sheet, or other processing program. Its operation is described in the A-Cork manual. File ACDAT.CFG (supplied) has to be present in the same directory as the executable in order to provide formatting information needed by the program.

c. APIK.EXE

This program provides a quick graphical view of A-Cork data and can be used following a download to inspect the data quality. Ancillary files required for full APIK capability are supplied, must be in the same directory as APIK.EXE, and include

Aref1.hlp:	detailed help for APIK
Aref2.hlp:	keystroke reminders for APIK
Cfiles.exe:	displays configuration file settings
Factory.cfg:	factory (generic) scale factors for plotting
Showdoc.exe:	scrolling text display for help files
User.cfg:	user scale factors for plotting

7. Flubber plug

This plug is being left at JAMSTEC as a replacement for the bridge plug installed at 808I in the event it fails to seal completely.

8. Nose cone for Flubber plug is in the shipping box with the plug.

9. Syntactic foam
This is the piece cut off the nose of the installed bridge plug, also in the flubber plug box.

10. O-rings and zinc paint
These are also in the flubber plug box. IMPORTANT: the o-rings provide a critical seal beween the flubber element and the plug body. The body should be lubricated with a suitable o-ring grease, and installed only once to minimize the possibility of damage. Note also that the top end of the flubber element has been ground out to clear the weld fillet on the plug body. The element must be installed in the correct direction. Also note: the nose cone is perhaps over-robust, and could be made lighter (e.g., of sytactic foam). It is important, however, that the flange holding the flubber element on is strong, as this must act against the full piston force from internal (formation) pressure.

To be shipped to **Earl Davis (250) 363-6453**

Geological Survey of Canada

9860 West Saanich Road

Sidney, B.C. V8L 4B2

CANADA

The following items are now packed in the yellow plastic box on Kairei, and are requested to be shipped to Victoria Airport by (Air Canada?) air freight. (FEDEX speed and cost is not necessary.) They include

1. Female 4-pin Seacon CM2000 connector

This connector will be replaced by an 8 pin equivalent sent from Canada until a proper dummy can be obtained by JAMSTEC. Since pins not connected to Kaiko circuitry were corroded (e.g. pin 5), it is thought that all pins, not just the 3 being used, must be protected during Kaiko dives. Kaiko's communication system is being upgraded next year. If two serial ports become available, then A-Cork port "B" should be wired as a backup and all 8 pins must be protected.

2. Miscellaneous cruise related materials, paper notebooks.

3. Meldrum personal effects removed from suitcase to facilitate carry-on.

A3. ACORK Manual

This is very thick and is not included in the paper copy. It is in the digital form of the cruise report.

A4. Technical Issues

Kaiko 7000 Communication Issues

Serial Baud rate

The error-free download of 16 months of data from 808i (2,631,808 bytes) took ~48 minutes at 9600 Baud. As the A-Cork is capable of downloading at 38,400 Baud, it could have taken ~12 minutes if Kaiko could do 38,400 Baud. We understand that an upgrade is planned, and strongly urge the Kaiko team to carry this out.

Corrosion of Seacon CM2000 connector pins

When providing serial communication with an instrument on the seafloor, it is normal for ROV communication lines to be disconnected or otherwise disabled when the ROV connector is exposed to seawater. This protects the male contacts from corrosion damage caused by voltage on the pins in the presence of salt water. It is known that RS-232 logic levels supplied by the ROV are sufficient to cause corrosion.

Since it was previously known (KR06-10) that the Kaiko 7000 DF3 connection cannot be disabled, the Seacon CM2000 ROV receptacle was to be plugged onto a mating connector for descent and ascent. This protects the male pins by greatly reducing the exposure time to seawater. This procedure worked well on the dive to 1173B.

During the 808I dive, the ROV receptacle was unmated before the ROV was ready to connect to the instrument. During the attempt to re-stow it, the mating connector broke free of the basket, leaving the ROV receptacle exposed to seawater for the remainder of the dive.

At the surface, visual inspection of the connector pins revealed pins 1, 4, 6, and 7 to be normal, bright, and with a well defined shape to the tip. The finish on pin 2 was dull and the tip appeared rounded. Pin 3 had a white corrosion deposit with a spot of green on it. Pin 5 had a deposit on its side, below the tip. Pin 8 had a white deposit at the tip. An accompanying photo shows all the pins as described.

The pins were cleaned using a metal polish, and the connector was taken apart to provide a better view. Pin 2 was restored to normal appearance by the polish but pins 3, 5, and 8 are sufficiently corroded to require replacement. A separate photo of each shows the extent of the corrosion.

Pin 1 is the Kaiko RS-232 receive pin, pin 2 is the transmit pin, pins 3 and 8 are grounds, and pins 4, 5, 6, and 7 are not connected to Kaiko. Thus, the pattern of corrosion makes sense, with the exception of pins 5, 3, and 8. That pins 3 and 8

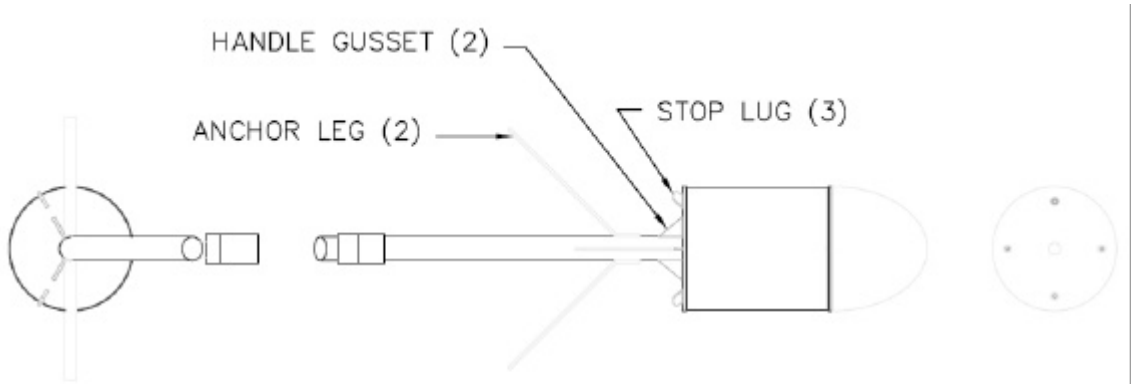
were corroded suggests that a ground fault from Kaiko used our ground pin as a return. The Kaiko team should check their records for any ground currents detected during the dive.

Seacon CM2000 connectors use a pressure balanced oil filled bladder on the female pins, which the male pins penetrate when making contact. Normally, the male pins remain isolated until this contact is made. Damage to the male pins could lead to seawater penetration into the female contacts in the seafloor connector, with disastrous consequences.

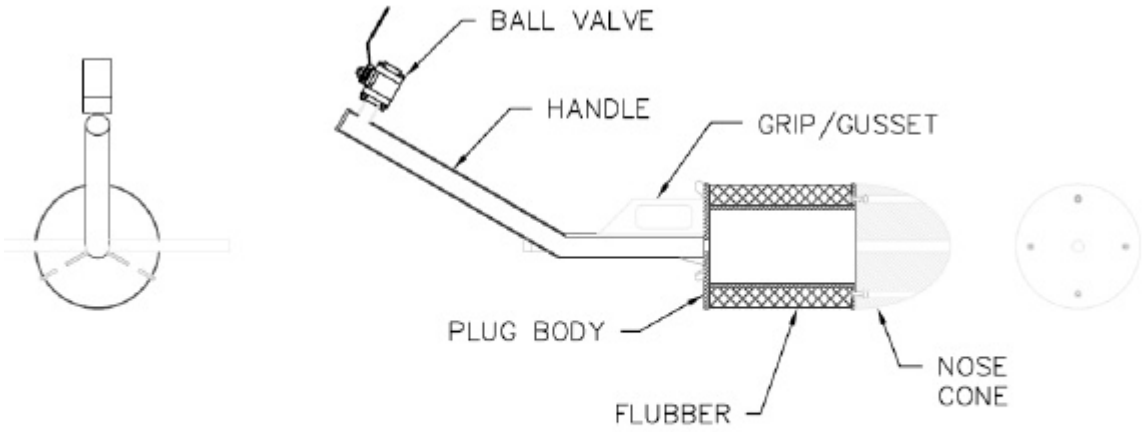
In 2006, on KR06-10, our first operation with Kaiko 7000, this same connector suffered severe corrosion damage to the pins because they were unprotected for both the 808I and 1173B dives, and had to be repaired. It is imperative that the connector be returned to Seacon Inc. for repair again before it is used for the next mission. It would be very good if Kaiko could add switching to completely disable the communications connection; if this cannot be done, then a proper and securely mounted dummy for protecting the ROV connector pins should be acquired.

A5. Flubber Plug

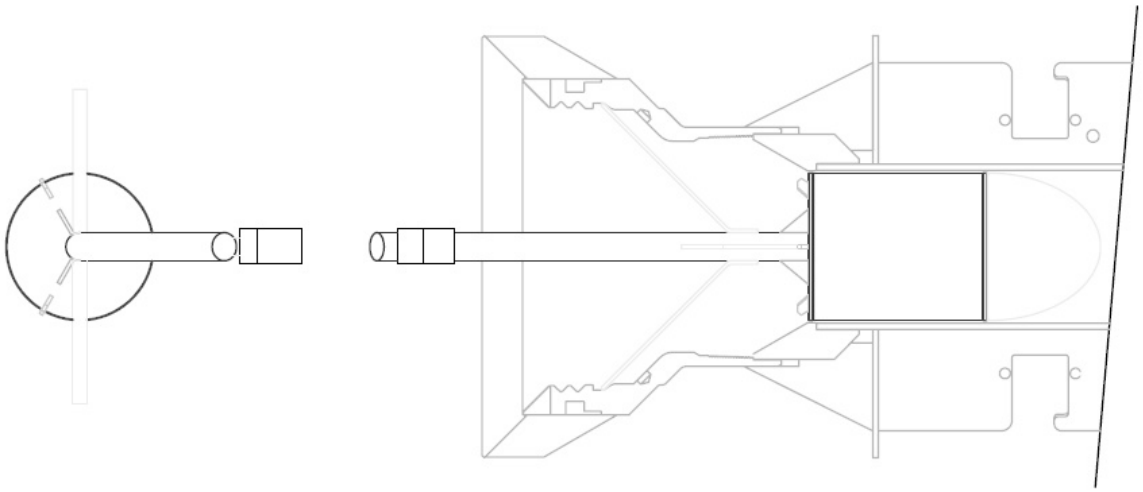
Flubber plug was prepared for this cruise to substitute the old bridge plug. However, the old one was modified and used finally, so the flubber plug was not used. Here we leave a memo for a potential use in the later time.



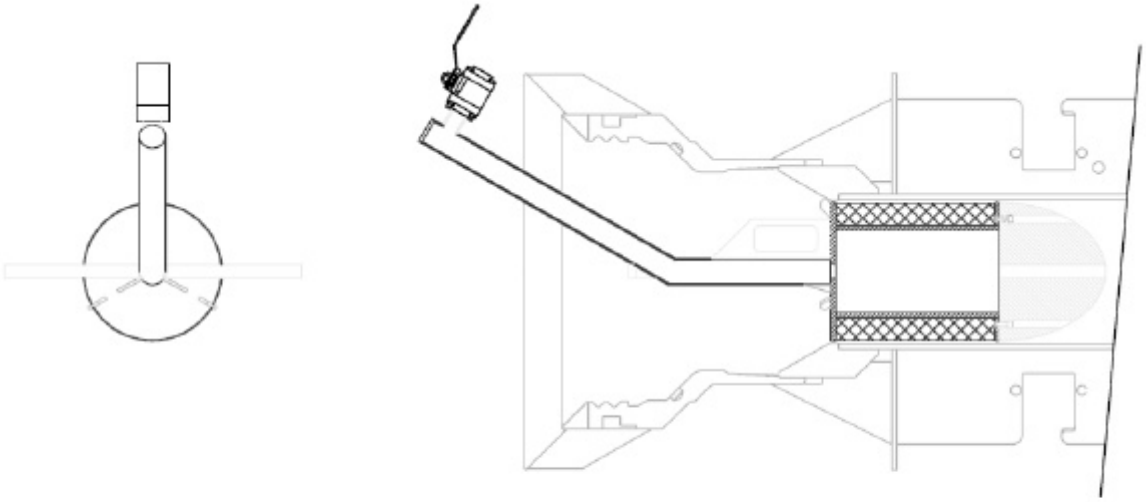
FLUBBER BP-3 (TOP VIEW)



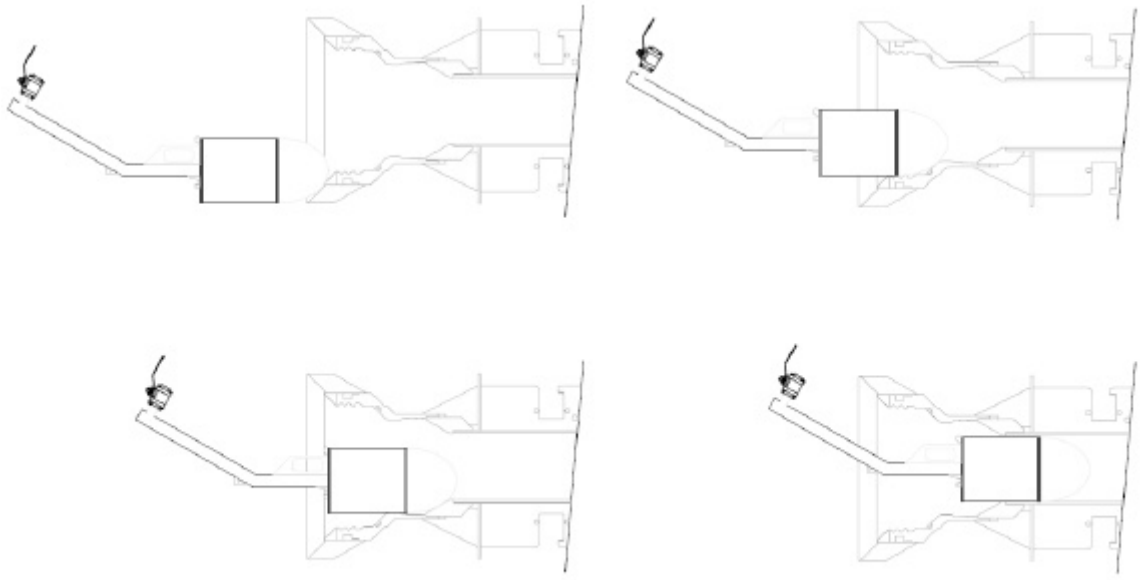
FLUBBER BP-3 (SIDE VIEW)



FLUBBER BP-3
INSTALLED - TOP VIEW



FLUBBER BP-3
INSTALLED - SIDE VIEW



FLUBBER BP-3 INSTALLED IN ACORK BY SLIDING

2007.3.19

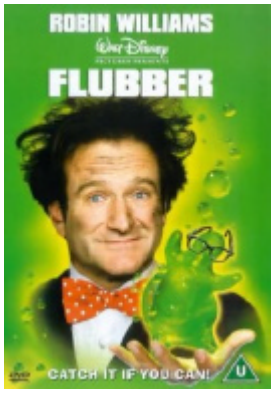
Flubber 素材を利用したパッカーによる小型プラグについて

IFREE　木下正高・笠谷貴史

１．目的

ACORK 孔口にはめ込むブリッジプラグが大きいため、これまで設置ができなかった。この事情をふまえ、Earl Davis らがこのたび別紙のような「Flubber Bridge Plug」を製作したいと言ってきた。KAIKO チームでの検討をお願いしたい。

2.　Flubber とは



http://www.omsi.edu/visit/chemistry/flubber.cfm

“Flubber is a polymer made by a chemical reaction. …. This produces the thick, sticky polymer called Flubber.”

＊ Tom Pettigrew が TAM 製の flubber を使って BP を製作

＊ Flubber は高分子で勝手に膨張するので、現在の BP のように静水圧差を利用する必要なし

＊ 膨らむのに 3-4 ヶ月かかる。その間に孔内圧力が高くなると flubber がうまく膨張しない可能性があるので、バルブをつけて最初はあけておき、数ヶ月後に再度訪問してバルブを閉じる。

＊ 空中 35kg、水中 30kg　の見込み

＊

Dec. 4, 2007 from E. Davis

1. The final weight was a little more than predicted; the total is 80 kg in air, 60 kg in water. The water weight can be reduced some by filling the interior of the frame's tubing (roughly 17 cm diameter x 43 cm long) with some scraps of syntactic foam.
2. Be careful with the end of the frame; the fit of the nose cone (not mounted) is pretty tight, and any damage will require filing/grinding.
3. The packer element itself is not mounted; the fit has been checked, but it is back in its bag as shipped from TAM. It should be kept dry. Grease and internal O-rings are in a separate bag in the crate.
4. The Kaiko team may wish to consider a test insertion without the swellable element. We can simply bend the latching arms out of the way if they want to do this, then bend them back to the correct spread for the real deployment.