CRUISE REPORT

MF-96-11,
June 2 - June 10, 1996

NOAA Ship MILLER FREEMAN

Commanding Officer
John Cleary, CDR, NOAA

National Oceanic and Atmospheric Administration
Pacific Marine Environmental Laboratory
Ocean Environment Research Division
Pacific Tsunami Observation Project

Chief Scientist
Lieutenant (jg) Jonathan G. Wendland, NOAA

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NOAA/OAR/PMEL/OERD - TSUNAMI PROJECT

INTRODUCTION

The **Pac**ific **T**sunami **O**bservation **P**rogram (PacTOP) is an ongoing PMEL research project aimed at a better understanding of tsunami generation, propagation, and coastal inundation. Starting in the summer of 1986 deep ocean Bottom Pressure Recorders (BPRs) have been deployed and recovered on an annual basis. The deployment scheme consists of a triangular directional array located 500 km (270 nm) south southeast of the Shumagin Islands ranging in approximately 1600 - 4700 meters of water.

One Acoustic Doppler Current Profiler (ADCP) transect was completed in an area between the first and second recovery/deployment site. This work is in support of the **F**isheries **O**ceanography **C**oordinated **I**nvestigations (FOCI) project . FOCI is a joint effort by scientists at PMEL (Pacific Marine Environmental Laboratory) and the NWAFC (Northwest Alaskan Fisheries Center) to understand physical and biological processes which cause variability in recruitment to commercially valuable fish and shellfish stocks in Alaskan waters.

OBJECTIVES

The objective of MF-96-11 was to complete the following operations in support of the PacTOP and FOCI programs:

PacTOP - 1. Recover four BPRs;
2. Deploy four BPRs;
3. Obtain a 500 meter CTD cast at each station.

FOCI - 1. Complete one ADCP transect.

CHRONOLOGY OF OPERATIONS

See Appendix I.

DESCRIPTION OF OPERATIONS

Mooring equipment and recovery/deployment instrumentation for the PacTOP project was loaded aboard the MILLER FREEMAN in Kodiak, AK on 1 June 1996, prior to the start of MF-96-11.

MILLER FREEMAN was underway by 1300L on June 2 enroute to BPR Station AK63/AK70. The weather out of Kodiak was predicted to be mild with a dense fog coming through the working area within 24 hrs. MILLER FREEMAN arrived at Station AK63/AK70 at 1359L on the 3rd of June and began recovery operations. Using an EG&G Ocean Products deck unit

(model 8011, S/N 600909), the BPR's acoustic release was interrogated with no results. The release command was sent to the subsurface unit "in the blind" with no reply. The ship's radio was set to Channel 70 to receive the radio beacons transmission affixed to the recovery buoy's mast. The mooring was sighted on the surface 47 minutes later. AK63 along with the remainder of the recovered moorings surfaced within 1/2 NM of the deployment site. However, Novatech RF transmitter S/N B1004 was not working upon recovery, the strobe was observed to be flashing (all strobes and radio beacons were tested and operational prior to deployment). Recovery operations were performed without incident by hauling AK63 on deck with the overhead boom from the portside of the ship. After bringing AK63 on deck, deployment operations commenced with Station AK70. CTD Cast 63 was taken to 500 meters. Once AK70 was believed to be on the bottom, a disable command was sent. Total time on station was approximately five hours.

Upon completion of AK70 deployment operations, MILLER FREEMAN transited north to the beginning of the Acoustic Doppler Current Profile (ADCP) site. The ADCP transit took approximately 6 hours 20 minutes to complete while maintaining a constant heading of 155 degrees and an average speed of 11.3 Knots.

MILLER FREEMAN set course to BPR Station AK64/AK71 following the ADCP transect to recover the second subsurface BPR mooring. The ship arrived on site at 0611 on the 4th of June. CTD Cast 64 was taken to 500 meters before the recovery of AK64 in hopes that the restricted visibility of less than 100M (due to dense fog) would improve. The acoustic release was interrogated using the Ocean Products Deck Unit. Following failed attempts in confirming its existence the release command was sent. During the moorings ascent a confirmed release reply was observed and decreasing ranges were seen from a depth of approximately1600M. AK64 was at the surface 89 minutes after the original release command was sent. TheRF transmitter was heard on Channel 70; however, the strobe (S/N 46307) on the mast of the recovery buoy was not functioning. The encompassing thick fog had not dispersed and the mooring was located via ships radar within 1/2 NM of the deployment site. The Mooring recovery went smoothly as before. AK71 was deployed and disabled approximately 50 minutes after release and prior to its settling on the ocean floor. This decision was made for two different reasons. One- communication with the gauges have been better within 2800M of the surface. Two- The fog was dense and I wanted as much daylight and visibility at the next recovery sight as possible. Total time on AK64/71 was approximately 5 hours.

The weather started to improve 60NM into the transit as MILLER FREEMAN approached AK65/AK72. After the full 100NM transit visibility was good and seas were calm at 1 to 2 meters. Weather conditions were ideal for recovery. Operations began at BPR Station AK65/72 at approximately 1850 on the 4th of June. The BPR mooring was queried with disable commands without an observed response. The deck and transponder were individually swapped out with an existing onboard FOCI unit. NO positive results were gained. The first attempted release command was sent at 1911 without an adequate reply. After enabling the unit, ranges were taken even though a confirmation of existence was not observed. Ranges started at 5,369M. After the release command was sent the following ranges were recorded with their corresponding times: 2436M @2007, 2119M @2028, 1026M @2044Z, 869M @2052, 479M @2058Z. After checking Bridge radios for Channel 70 The ship to maneuvered back to the original deployment site. Upon arrival on site again @2137Z a slant range of 734M was observed. Numerous release and disable commands were further attempted in hopes of establishing communication of confirming release and existence. As before no positive results were seen. I believed it was possible for a number

of floats to have imploded which may have caused the signal flag, strobe, and RF transmitter from being seen or heard by forcing the flotation system on its side. Therefore, I requested the ship to keep a good lookout and to slowly maneuver 1/2NM east of the site, 1/2NM north of that point, and 1/2NM north of the original deployment site. At all sites slant and horizontal ranges were taken accompanied by release and disable commands. At the third position 1/2NM north of the original deployment site the ship turned 360 degrees stopping every 45 degrees to lower the transducer just into the water. Slant and horizontal ranges were taken using the ships hull as a shadow in hopes of getting "unreal" ranges for 180 degrees of the turn. The resultswere inconclusive and darkness had well surrounded the ship hours before this point in time of 0110. I decided for the deck department to start rigging the spare flotation system while I communicated with AK72 to check its parameters, reset the pressure threshold to the minimum(32768), and turn on the release. Deployment of AK 72 occurred at approximately 0130 with still no sight of AK65. AK72 was observed upon descent until around 2900M. After this point the ranges were unrealistic. Disable commands was sent prior to conducting a 500M CTD cast. Operation concluded without the recovery of AK65 0330L. Time on site was approximately 8.5 hours.

Equipment lost at sea: BPR AK65 S/N 17, Paros transducer S/N 51183, MTR S/N 3164, Novatech Strobe S/N B1007, Novatech RF transmitter S/N 65879, EG&G acoustic release S/N 600597, 7 Benthos glass spheres and holder.

MILLER FREEMAN arrived at the fourth and last station AK66/73 at approximately 1515 on the 5th of June. AK66 was interrogated, yet with no response. The release code was sent and AK66 surfaced "in the blind" approximately 114 minutes later. The strobe and radio beacon were operational. Deployment operations of AK73 occurred without incident. The unit was able to be tracked up until a slant range of 2300M where further reply's could not be ovserved. A disable command was given a number of times, with negative response. A 500-meter CTD was conducted after the descent of the BPR. Total time on station was approximately 3.5 hours.

DEVIATIONS FROM PROJECT INSTRUCTIONS

There were two deviations from the cruise instructions.

1) The cruise schedule was moved up a day from June 3rd to June 2nd.

2) Hazardous materials were not loaded on board MILLER FREEMAN prior to departing Kodiak, AK. Scheduling of shipment was delayed and was not available for loading.

(2)- Fifty five gallon drums containing denatured and natured alcohol.
(2)- Twenty liter containers containing 37% undiluted Formaldehyde.

Responsible party for the Hazardous material is Bernie Goiney at the Alaskan Marine Fisheries Science Center (206)/526-4214.

PROBLEMS ENCOUNTERED

1) Continual problems were observed in receiving responses from the EG&G acoustic releases in Alaskan "deeper water". An observed depth around 2800M seems to be the unresponsive depth in the water coulumb. Post cruise investigations with prior billet personnel have pointed to the same problems, although never pursued.

2) Whether or not AK65 released or if the mooring is still resting on the ocean floor is remains unclear. By observation of decreasing ranges over time it appeared that BPR AK65 was released but never fully reached the surface. This summation is not conclusive because release and disable commands should have been observed at the surface, but were not. Possible floatation implosion could have caused (although unlikely) the mooring to be residing on its side just under the surface. This would explain why a signal flag and strobe were not observed and why an RF transmission was not heard. Mooring release of AK65 is inconclusive because communication with the release should have been possible if the unit was residing near the surface.

3) Coorosion was observed on the inner ring of the newly designed 7 pack flotation holder.

4) The glue used to hold together the MTR bucket ring is failing.

RECOMMENDATIONS

1) It may be possible that there is not enough power in the EG&G 8202 or 8242 releases to reply appropriately in deeper Alaskan waters. This may be caused by underhull shipnoise of the MILLER FREEMAN and/or an unknown oceanographic anonamaly. It is my recommendation that further investigation is necessary to understand the acoustical problems that have been observed over the years. Of course the possibility of operator error always exists. However, I have tried and questioned everything I know with the deck units in attmepting to get good responses. I believe the problem is stemming from another source because prior billet personell have encountered the same problems. Prior billet personell have deployed the same releases using the same deck units in the equitorial pacific on ships other than the FREEMAN and have not had any problems with communications. Further investigation regarding this matter is necessary.

2) There are an infinite number of possibilities why a mooring is lost at sea. I have questioned many of the possibilities and found myself still without an answer. In hindsight, I have discovered that the releases used in the tsunami project are mostly of the type 8202. These releases are on the order of 10+ years old, and like all electronical equipment are likely to fail now and then. Therefore it is my recommendation to use newer releases in deploying tsunami project moorings. By doing so the risk failure associated with age would be reduced.

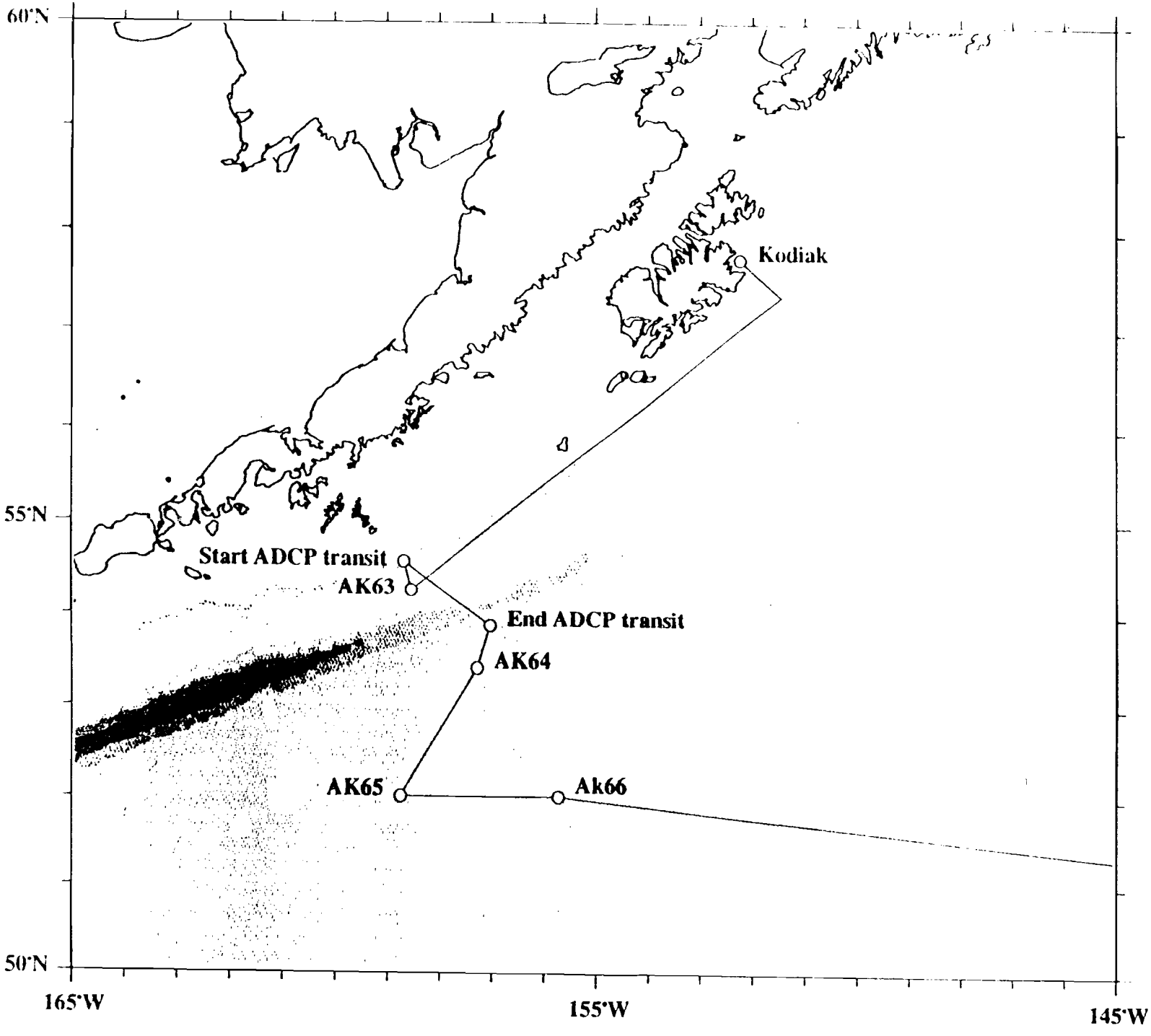
3) The inner ring of the flotaion system should be replaced and zincs attached to the new rings. Zincs also should be provided for the outer rings as well at least every other year.

4) The glue used to hold the MTR bucket ring together should be discontinued. A new possible design that proved effective onboard was a stainless screw.

LAST UPDATED 6/19/96

NOAA SHIP MILLER FREEMAN R223
TSUNAMI Cruise: MF-96-11
From Kodiak, AK
To Seatle, WA
June 2 - June 10, 1996

Activity	Latitude Deg.	Min		Longitude Deg.	Min.		Dist. (nm)	Speed (kts)	Transit (hrs)	On Sta (hrs)	Arrive Date / Time	Depart Date / Time	t CUMULATIVE (hrs)	(da)
Depart Kodiak, AK	57	43.79	N	152	31.00	W						02-Jun 13:14		
MO 'A' Buoy	57	43.90	N	152	14.40	W	8.9	8.0	1.1		02-Jun 14:20	02-Jun 14:20	1.1	0.0
Chiniak	57	40.00	N	152	04.20	W	6.7	12.0	0.6		02-Jun 14:53	02-Jun 14:53	1.7	0.1
Recover: BPR Sta 63	54	17.56	N	158	33.00	W	296.9	12.6	23.6	2.3	03-Jun 14:27	03-Jun 16:45	27.5	1.1
CTD 63	54	17.15	N	158	32.47	W	0.5	1.0	0.5	0.5	03-Jun 17:16	03-Jun 17:46	28.5	1.2
Deploy : BPR Sta 70	54	17.41	N	158	32.82	W	0.3	1.0	0.3	1.0	03-Jun 18:06	03-Jun 19:06	29.9	1.2
Start ADCP Transect 1	54	35.92	N	158	40.75	W	19.1	9.2	2.1	0.0	03-Jun 21:10	03-Jun 21:10	31.9	1.3
End ADCP Transect 1	53	51.54	N	157	02.67	W	72.5	11.5	6.3	0.0	04-Jun 03:29	04-Jun 03:29	38.3	1.6
CTD 64	53	25.42	N	157	17.36	W	27.5	10.2	2.7	0.5	04-Jun 06:11	04-Jun 06:41	41.5	1.7
Recover: BPR Sta 64	53	25.27	N	157	16.94	W	0.3	1.0	0.3	1.9	04-Jun 06:58	04-Jun 08:52	43.6	1.8
Deploy: Sta 71	53	25.53	N	157	16.82	W	0.3	0.2	1.3	1.5	04-Jun 10:13	04-Jun 11:43	46.5	1.9
Attemp. Recover: BPR Sta 65	52	02.36	N	158	45.00	W	98.8	13.3	7.4	6.2	04-Jun 19:09	05-Jun 01:21	60.1	2.5
Deploy: BPR Sta 72	52	02.35	N	158	45.08	W	0.1	1.0	0.1	2.0	05-Jun 01:24	05-Jun 03:24	62.2	2.6
CTD 65	52	02.25	N	158	44.57	W	0.3	5.0	0.1	2.8	05-Jun 03:28	05-Jun 06:16	65.0	2.7
Recover: BPR Sta 66	52	01.07	N	155	43.60	W	111.3	12.4	9.0	0.0	05-Jun 15:15	05-Jun 15:15	74.0	3.1
Deploy: BPR Sta 73	52	01.15	N	155	43.52	W	0.1	1.0	0.1	0.0	05-Jun 15:20	05-Jun 15:20	74.1	3.1
CTD 66	52	01.28	N	155	42.72	W	0.5	0.5	1.0	1.8	05-Jun 16:21	05-Jun 18:09	76.9	3.2
Straits of Juan De Fuca	48	28.00	N	124	44.00	W	1198.2	12.7	94.3	0.0	09-Jun 16:30	09-Jun 16:30	171.3	7.1
Sheringham Pt	48	12.80	N	123	57.50	W	34.4	10.0	3.4	0.0	09-Jun 19:57	09-Jun 19:57	174.7	7.3
Pt Wilson	48	11.00	N	122	47.90	W	46.4	10.0	4.6	0.0	10-Jun 00:35	10-Jun 00:35	179.4	7.5
Marrowstone Pt	48	06.55	N	122	40.20	W	6.8	10.0	0.7	0.0	10-Jun 01:16	10-Jun 01:16	180.0	7.5
Hylebos W/WayTacoma	47	17.22	N	122	24.80	W	50.4	8.0	6.3	0.0	10-Jun 07:34	10-Jun 07:34	186.3	7.8


60°N
55°N
50°N
165°W
155°W
145°W
Kodiak
Start ADCP transit
AK63
End ADCP transit
AK64
AK65
Ak66

Attachment

ACKNOWLEDGEMENTS

I would like to express my appreciation to the officers and crew for a cruise that was both enjoyable and a learning experience. All departments were extremely helpful and performed their tasks professionally and without incident. It was a pleasure to sail aboard a ship where the command was equally respected by its crew and officers.

STATISTICAL SUMMARY OF CRUISE

CTD Casts Completed	4
BPR Moorings Deployed	4
BPR Moorings Recovered	3
ADCP Transacts Completed	1

PARTICIPATING SCIENTIFIC PERSONNEL

LT(jg) Jonathan G. Wendland, Chief Scientist NOAA CORPS, PMEL

DATA DISPOSITION

Copy of: CTD Data Log Sheets, Marine Operation Abstract, Ships Deck Log, Ships Weather Log, Reversing Thermometer Log Sheet, Reversing Thermometer Calibration and History Record, NRCC Report of Calibration and AutoSal Log Sheet were retained by Lieutenant (jg) Jonathan G. Wendland for return of these data to NOAA/PMEL/OERD, Seattle, WA.

APPROVED:

Lieutenant (jg) Jonathan G. Wendland
Chief Scientist

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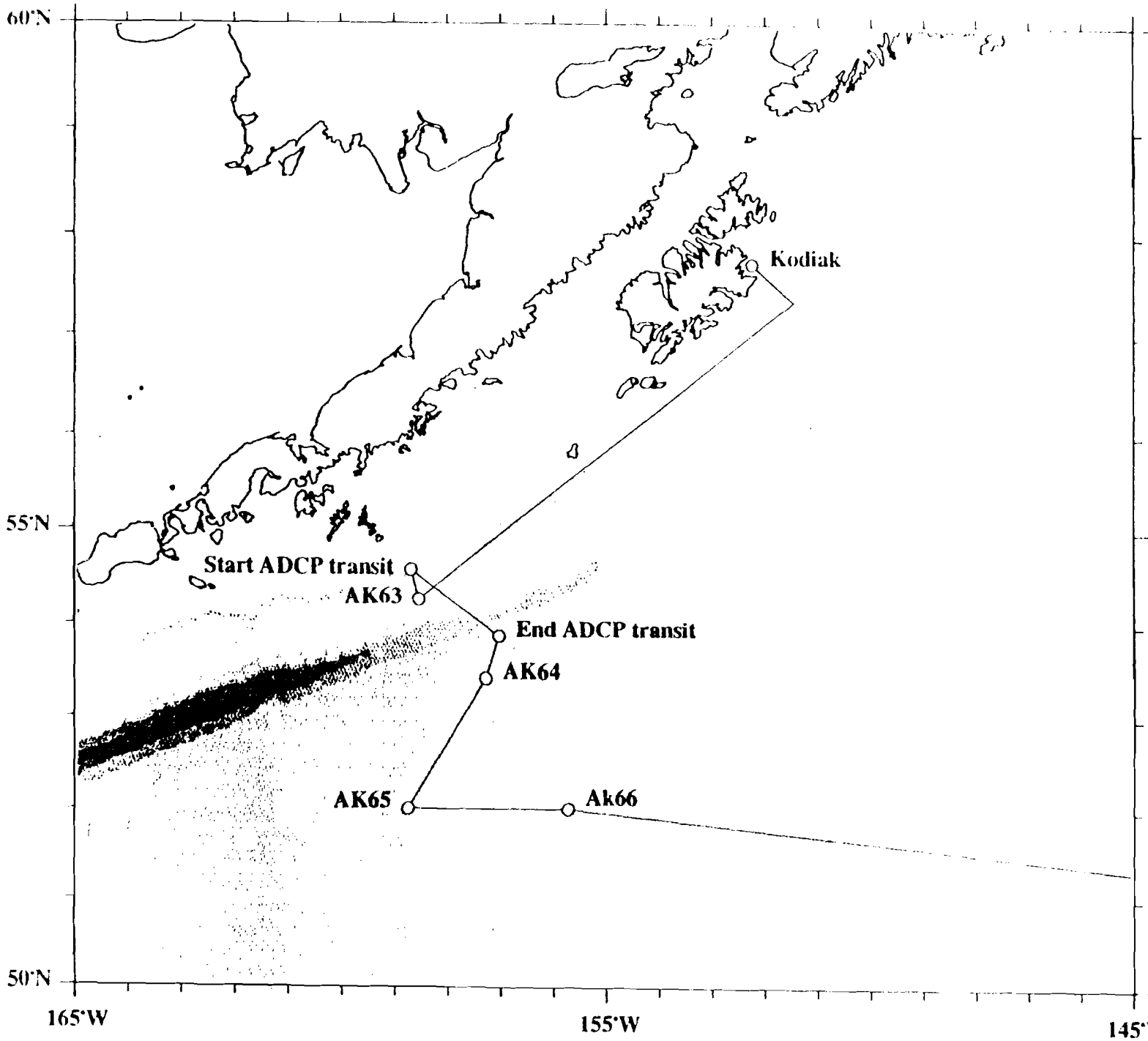
60°N
55°N
50°N
165°W
155°W
145°W
Kodiak
Start ADCP transit
AK63
End ADCP transit
AK64
AK65
Ak66

Attachment