

SE Caribbean OBS Cruise



Cruise Report April 19 – June 2, 2004 *R/V Seward Johnson II*



Table of Contents

Cruise Summary.....	3
SE Caribbean OBS Cruise Crew and Scientist List.....	6
Cruise Diary	7
OBSIP Report	10
Timing Parameters For OBS Operations	22
Preliminary Velocity Model, Profile 70W	36
Preliminary Velocity Model, Profile 67W	37
Representative Record Sections.....	38
SE Caribbean Singles Ping Pong Tournament Results.....	73
SE Caribbean Doubles Ping Pong Tournament Results	75

Cruise Summary

The SE Caribbean Margin Continental Dynamics Project is a multi-disciplinary investigation to test hypotheses related to arc-continent collision and accretion, high-pressure/low-temperature rock exhumation, and the development of folded belts and sedimentary basins. The primary hypothesis to be tested by the project is that modern continental growth results from accretion of arcs that form on oceanic plateaus. As part of this program, an active-source seismic field program acquired multi-channel reflection and wide-angle data along the Caribbean-South American plate boundary zone in order to investigate the structure of the crust in the accretion zone of the Antilles Arc as it evolves along the plate boundary.

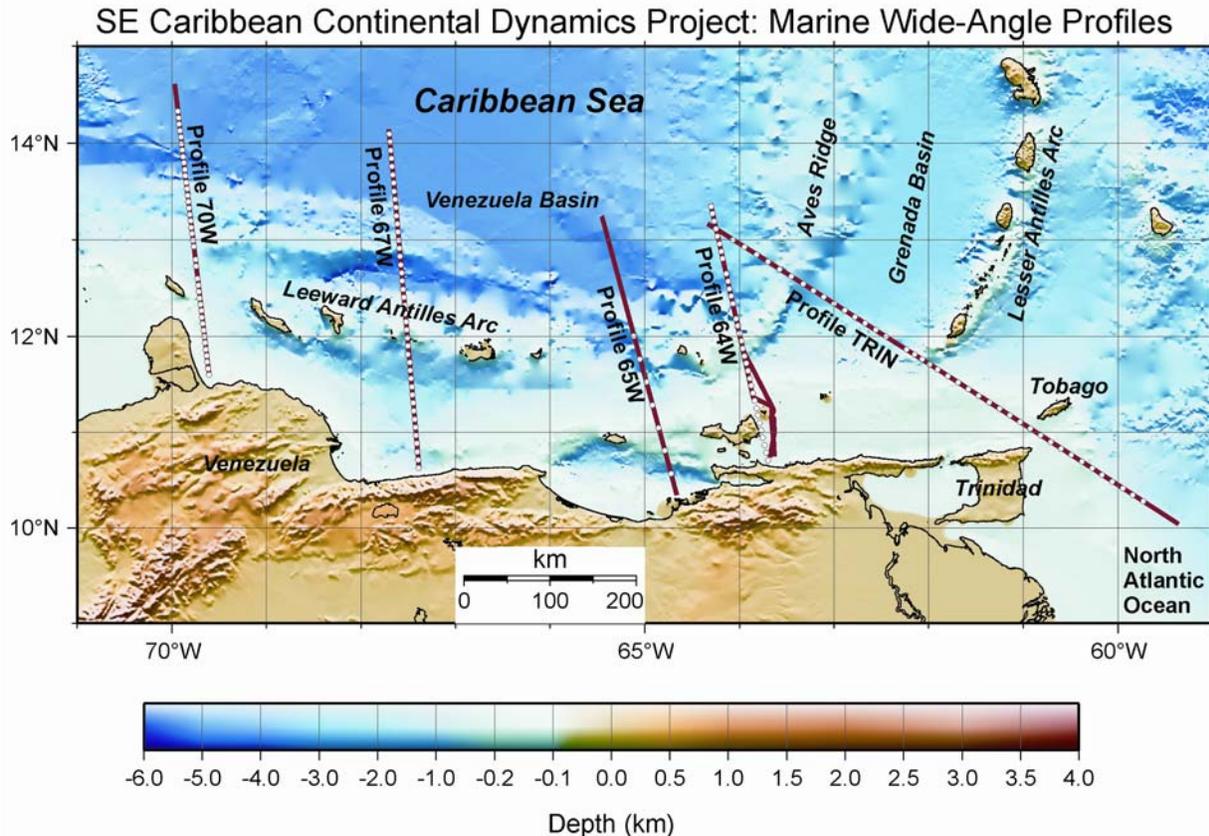


Figure 1. Location of OBSs and wide-angle profiles for the SE Caribbean seismic project.

Three teams were involved in the active-source seismic field program: 1) A science party aboard the R/V *Maurice Ewing* acquired approximately 6000 km of seismic reflection data. 2) A science party aboard the R/V *Seward Johnson II* deployed and recovered ocean bottom seis-

ometers (OBSs) along 5 transects (Fig. 1); the Ewing provided the seismic source for these instruments. 3) A science party in Venezuela and the ABC islands deployed and recovered seismographs along 4 transects and the island arc; the Ewing and 8 land shots provided the seismic source for these instruments. Communications between the three teams were conducted via e-mail and iridium phones.

The Leeward Antilles arc has been colliding obliquely along the Caribbean-South American plate boundary zone since the Eocene, starting in western Venezuela and migrating eastward with the Caribbean plate relative to South America. The boundary now consists of trenches of opposite polarity at either end of a >1000 km long shear zone; this zone connects the NW-dipping Lesser Antilles subduction zone in the east to the SE-dipping Southern Caribbean Deformation Belt (associated with the western end of the Leeward Antilles Arc) subduction zone in the east (Fig. 2).

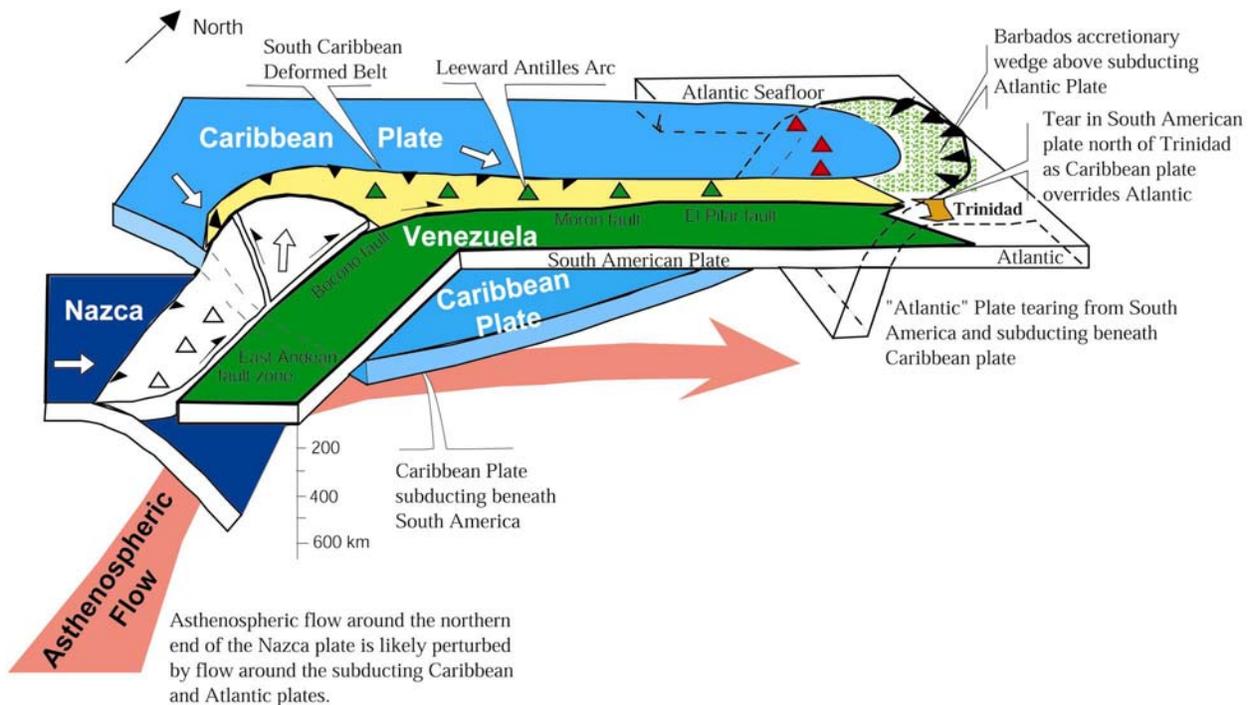


Figure 2. Block diagram illustrating the present-day geometry of subducted slabs in the southern and eastern Caribbean.

OBS operations on the R/V *Seward Johnson II* proceeded from west to east. Profile 70W is the westernmost profile (Fig. 1); at this location the Caribbean Plate is subducting beneath the South American plate (Fig. 2). Profile TRIN is the easternmost profile (Fig. 1); at this location

the "Atlantic" plate is tearing from South America and subducting beneath the Caribbean plate (Fig 2). Profiles 67W, 65W, and 64W are positioned to characterize the change in structure associated with the subduction polarity reversal.

A total of 169 OBS deployments were made during the cruise. Recovery rate was 97.9% for the Scripps LC2000 OBSs (47 deployed, 46 recovered) and 95.9% for the WHOI D2 OBSs (122 deployed, 117 recovered). Shot files were e-mailed from the Ewing allowing us to create SEG-Y files at sea; sample record sections and preliminary velocity models for Profiles 70W and 67W are included later in this report. Overall data quality for this project is excellent.

SE Caribbean OBS Cruise Crew and Scientist List

Science Party (16-17 Persons):

Gail Christeson – Chief Scientist
Steve Swift – OBSIP leader
Vic Bender – OBSIP
David DuBois – OBSIP
Rob Handy – OBSIP
Peter Lemmond – OBSIP
Jim Ryder – OBSIP
John Gerboc – Systems Analyst
Leonardo Alvarado – Venezuelan observer
Jhon Contreras Quintero – Venezuelan observer
Michael Nuñez Suárez – Venezuelan observer
Jillian Hinds – watchstander
Shawna McLallen – watchstander (April 19 – May 18)
Marc Rierola – watchstander
Joseph Beland – marine mammal observer
Sarah Stoltz – marine mammal observer (April 19 - May 18)
Howard Goldstein – marine mammal observer (May 20 – June 2)
Elizabeth Bruce – marine technician

Crew List (11 Persons):

George Gunther – Master
Michael Schoeller – Chief Mate
Gerrit Hooyenga – 2nd Mate
Richard Smith – Chief Engineer
Stewart Moreaux – Asst. Enginner
David Perkins – Asst Engineer
Michael Conda – Seaman
Michelle Hoogstra – Seaman
Martin Huntze – Seaman
Wendy Lamb – Steward
Chris Parmelee – Asst. Steward

Cruise Diary

April 19 –1300Z (0800 local) - the R/V *Seward Johnson II* leaves San Juan and begins transit to study area. The Ewing departed a day earlier.

April 20 –2300Z - we near the study area, and begin testing of the Scripps acoustic releases. The releases were placed on the hydrowire and lowered to 3000 m. Release commands were sent, and the releases were back on board at 0130Z on April 21.

April 21 – 0200Z – OBS 101 deployed. Deployments continue throughout day at 35-50 minute intervals. We receive communications that the Ewing began shooting BOL1 on schedule at 0135Z.

April 22 – OBS deployments continue. OBS 145 is deployed at 0740Z. Total time for 45 deployments is 29.7 hours, for an average of 40 minutes per deployment (scheduled time was 54 minutes per deployment). The SJII begins transit to OBS 101 location to be in position for OBS recoveries after the Ewing has shot the profile. In the early afternoon we receive word that the Ewing has a medical emergency and is pulling in their gear. We start communicating with the Ewing to determine whether we can do a small boat transfer of the injured crewmember since we are on standby mode, but then discover that they are also experiencing rudder problems. Eventually it is decided that both ships will go to Curaçao and the Ewing rudder will be inspected and their crewmember will visit a doctor.

April 23 – The Ewing and SJII dock in Willemstad, Curaçao. Divers inspect the rudder and discover that a pin is missing from the hinge of the reticulated rudder. Many plans are explored, but finally it is decided to use divers to weld plates to form a fixed rudder. This should take 2-3 days.

April 24-25 – Work commences on the Ewing.

April 26-27 – The SJII leaves Willemstad and anchors off Santa Cruz Beach, Curaçao. Our asst engineer does not sail with us as he needs to fly home on personnel leave; we plan to return for him after OBS recoveries. On April 27 we receive word that the Ewing has sailed.

April 28-29 – The SJII leaves Santa Cruz Beach and anchors off Klein Curaçao.

April 30 – 1200Z – The SJII departs Klein Curaçao and transits to OBS 145 location. Recovery of OBSs 132-145 begin.

May 1 – Recovery of OBSs 132-145 is completed. The SJII transits north to rendezvous with the Ewing. RDF units are swapped between the 2 ships; the SJII unit cannot receive all the frequencies used by the OBS radio beacons. The swap is carried out using the SJII zodiac. Transit then continues to OBS 101 location.

May 2-4 – Recovery of OBS 101-131 commences. The WHOI D2 OBSs are difficult to spot in daytime with the high swell. OBSs 101, 102, and 126 do not respond to acoustic release signal and are not recovered. OBS 129 is given multiple burn commands, but remains on the seafloor. All other OBSs are recovered, although several need multiple burn commands to release from the seafloor. OBS 103 did not record data properly. We now have 42 working OBSs.

May 4-5 – The OBSIP group decides to remove metal bands around the D2 OBSs. It is thought that these might be interfering with the acoustic signals and may be the cause for the lost OBSs.

After recovery of OBS 131 we head into the lee formed by Curaçao to improve working conditions for this operation, which is completed the morning of May 5. At 0830 local on May 5 the pilot boat brings out the asst engineer who has returned from personal leave, but we lose the chief engineer who needs to consult a doctor. By the early afternoon he returns via pilot boat, and we then steam to the southern end of Profile 67W.

May 6-7 – OBSs 201-242 are deployed from south to north along Profile 67W. We cross the Ewing's path coming south on Profile 67W shooting MCS data early on May 7. After deployments are completed we steam back to the southern end of Profile 67W.

May 8-11 - OBSs 201-242 are recovered, and the singles ping pong tournament gets underway. OBS 210 came up at night with no strobes, but was spotted after 50 minutes of searching using the RDF and searchlights. Several WHOI OBSs require multiple burns similar to Profile 70W; analysis indicates that these were all located in mud on the slope.

May 12-13 – We transit 20 hours to Profile 65W and deploy OBSs 501-507. We then anchor off Isla Cubagua for several hours while the OBS team performs surgery on several units so that we once again have 30 operational WHOI instruments. Meanwhile, the rest of us enjoy a swim call in 'refreshingly cool' waters. We proceed to Profile 64W.

May 13-15 – OBSs 301-335 are deployed at a record pace – 35 deployments in 21.5 hours for an average of 37 minutes between deployments. We then meet up with the Ewing the morning of May 15, and do a boat transfer. 3 people leave the Ewing and join the SJII – 2 members of the science party who have prior commitments and cannot stay for the extended cruise, and 1 member of the ship's crew who has a medical condition. We then proceed to Trinidad. During the transit a dead whale carcass is spotted. It has clearly been dead for many days; we take photos and inform the Ewing. This causes a shutdown of the Ewing on May 15.

May 16-18 – We dock at Port of Spain, Trinidad the morning of May 16. On May 17 we take on fresh produce and fuel. 2 new marine mammal observers also board the ship and will be placed on the Ewing. Sarah Stoltz leaves the SJII; her replacement will be Howard Goldstein from the Ewing. On the evening of May 17 we receive word that the Ewing is shooting again; experts agree that the Ewing was not responsible for the dead whale. We depart Trinidad the morning of May 18, and transit to OBS 501.

May 19 – OBSs 501-507 are recovered. We head east towards Margarita Island and Profile 64W where we will rendezvous with the Ewing.

May 20 – Rendezvous with Ewing takes place shortly after lunch. The 2 new MMOs are transferred to the Ewing, along with fresh produce from Trinidad. Christeson goes over as well for an hour to discuss operations with the science party on the Ewing. Howard Goldstein transfers to the SJII.

May 21-23 – OBSs 301-308, 310-314, and 316-342 are recovered. No response was heard from OBS 315, the first Scripps OBS to be lost on the cruise. OBS 309 was sent 20 burn commands, but did not release from the seafloor.

May 23-25 – OBSs 401-440 are deployed along the Trinidad profile. We then transit to King's Bay, Tobago, where we will stand by at anchor while we wait for the Ewing to shoot the Trinidad profile at OBS spacing.

May 26-27 – Anchored at King's Bay, Trinidad.

May 28 – Transit to OBS 440 position. The *S/V Western Patriot* is observed near the southern end of the Trinidad profile.

May 29-31 – OBSs 401-440 are recovered. We try releasing OBS 309 again, but it remains on the seafloor. Transit begins to San Juan, with mooring expected Wednesday morning.

June 2-3 - The SJII moors in San Juan the morning of June 2; the Ewing arrives June 3. The SE Caribbean cruise is officially completed.

OBSIP Report

Summary

In support of the Southeast Caribbean Continental Dynamics Project, we made 169 deployments of ocean bottom seismometers (OBSs) along five lines off the coast of Venezuela from the R/V *Seward Johnson II* between April 19, 2004 and May 31, 2004 (Table 1). The initial complement of seismometers included 12 LC2000s from IGPP/SIO and 37 D2s from WHOI. We made 122 D2 deployments and 117 recoveries; we made 47 LC200 deployments and 46 recoveries (Tables 2-6). Shots fired from a 20 airgun array towed by the R/V *Maurice Ewing* and from controlled sources on land were recorded and later converted into SEG Y files after correction for linear clock drift between offsets to GPS time at the start and end of each deployment. Shot data were recovered at-sea from 46 LC2000 deployments and from at least a portion of 114 D2 deployments. The seismometer crew from WHOI included Vic Bender, Dave DuBois, Rob Handy, Peter Lemmond, Jim Ryder, and Steve Swift.

Table 1. Summary of SECA OBS operations

Line	Profile	Number OBSs Deployed	Deployment Dates	Number OBSs Recovered	Recovery Dates
1	70W	33 D2 12 LC2000	21-22 April	29 D2 12 LC2000	1-4 May
2	67W	30 D2 12 LC2000	6-7 May	30 D2 12 LC2000	10-13 May
3	64W	30 D2 5 LC2000	13-14 May	29 D2 4 LC2000	20-22 May
4	TRIN	29 D2 11 LC2000	23-25 May	29 D2 11 LC2000	29-31 May
5	65W	7 LC2000	12-13 May	7 LC2000	19 May
Total:		Deployments: 122 D2 47 LC2000		Recoveries: 117 D2 46 LC2000	

Table 2. Line 1 (70W) Ocean bottom seismometer operations

<u>Seismo-</u> <u>meter</u>	<u>Latitude</u> <u>Longitude</u>				<u>DEPLOYMENT</u>				<u>RECOVERY</u>							
					<u>SECA</u> <u>Site</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	<u>Depth</u> <u>(m)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>		
D09	14	31.800	-69	57.595	101	21 Apr	121	0203	4215							
D02	14	27.786	-69	57.143	102	21 Apr	121	0246	4246							
D03	14	23.819	-69	56.653	103	21 Apr	121	0325	4254	14	23.84	-69	56.80	2 May	123	1224
D23	14	19.822	-69	56.158	104	21 Apr	121	0403	4237	14	19.82	-69	56.37	2 May	123	1646
D14	14	15.827	-69	55.740	105	21 Apr	121	0439	4219	14	15.79	-69	55.85	2 May	123	1856
D15	14	11.841	-69	55.197	106	21 Apr	121	0511	4259	14	11.79	-69	55.35	2 May	123	2102
D10	14	07.847	-69	54.723	107	21 Apr	121	0541	4402	14	7.80	-69	54.97	2 May	123	2315
D51	14	03.789	-69	54.305	108	21 Apr	121	0615	4394	14	3.74	-69	54.64	3 May	124	0108
D57	13	59.818	-69	53.755	109	21 Apr	121	0654	4322	13	59.75	-69	53.88	3 May	124	0320
D31	13	55.825	-69	53.268	110	21 Apr	121	0736	4525	13	55.77	-69	53.60	3 May	124	0545
D49	13	51.896	-69	52.773	111	21 Apr	121	0816	4565	13	51.99	-69	53.17	3 May	124	0756
D42	13	47.848	-69	52.322	112	21 Apr	121	0851	4848	13	47.95	-69	52.55	3 May	124	1019
D28	13	43.851	-69	51.795	113	21 Apr	121	0923	4865	13	43.89	-69	51.86	3 May	124	1234
D40	13	39.827	-69	51.352	114	21 Apr	121	0957	4899	13	39.82	-69	51.35	3 May	124	1457
D34	13	35.895	-69	50.823	115	21 Apr	121	1031	3854	13	35.96	-69	50.91	3 May	124	1720
D38	13	31.877	-69	50.380	116	21 Apr	121	1118	3741	13	31.94	-69	50.51	3 May	124	1924
D05	13	27.859	-69	49.897	117	21 Apr	121	1156	3638	13	27.90	-69	50.03	3 May	124	2116
D13	13	23.861	-69	49.399	118	21 Apr	121	1234	3285	13	23.98	-69	49.66	3 May	124	2303
D50	13	19.867	-69	48.932	119	21 Apr	121	1310	3135	13	19.92	-69	49.17	4 May	125	0247
D39	13	15.884	-69	48.434	120	21 Apr	121	1401	2939	13	16.09	-69	48.86	4 May	125	0447
D11	13	11.895	-69	47.963	121	21 Apr	121	1440	2903	13	12.04	-69	48.29	4 May	125	0027
D06	13	07.916	-69	47.464	122	21 Apr	121	1516	2069	13	8.06	-69	47.80	4 May	125	0801
D56	13	03.921	-69	47.004	123	21 Apr	121	1625	1545	13	4.05	-69	47.36	4 May	125	0921
D60	12	59.893	-69	46.516	124	21 Apr	121	1655	1538	13	0.00	-69	46.84	4 May	125	1128
D19	12	55.984	-69	46.046	125	21 Apr	121	1727	1540	12	56.03	-69	46.21	4 May	125	1246
D12	12	51.897	-69	45.559	126	21 Apr	121	1812	1444							
D01	12	47.864	-69	44.908	127	21 Apr	121	1851	1311	12	47.93	-69	45.14	4 May	125	1539
D52	12	43.928	-69	44.610	128	21 Apr	121	1924	1295	12	43.98	-69	44.78	4 May	125	1718
D54	12	39.929	-69	44.156	129	21 Apr	121	2002	1296							
D37	12	35.931	-69	43.654	130	21 Apr	121	2042	1231	12	35.93	-69	43.74	4 May	125	2216
D25	12	31.935	-69	43.178	131	21 Apr	121	2116	1093	12	31.95	-69	43.30	4 May	125	2331
D20	12	27.946	-69	42.707	132	21 Apr	121	2151	866	12	28.07	-69	42.83	1 May	122	0952
LC25	12	23.946	-69	42.434	133	21 Apr	121	2243	735	12	24.04	-69	42.61	1 May	122	0847
LC37	12	19.940	-69	41.765	134	21 Apr	121	2320	559	12	20.10	-69	41.93	1 May	122	0725
LC72	12	15.956	-69	41.254	135	22 Apr	122	0027	441	12	16.41	-69	41.78	1 May	122	0553
LC23	12	11.959	-69	40.793	136	22 Apr	122	0110	356	12	12.03	-69	40.94	1 May	122	0359

LC34	12	07.947	-69	40.320	137	22	Apr	122	0156	313	12	8.09	-69	40.58	1	May	122	0237
D30	12	03.963	-69	39.840	138	22	Apr	122	0244	281	12	4.13	-69	40.02	1	May	122	0116
LC70	11	59.965	-69	39.358	139	22	Apr	122	0332	228	12	0.07	-69	39.48	30	April	121	2356
LC07	11	55.970	-69	38.872	140	22	Apr	122	0427	188	11	56.06	-69	39.04	30	April	121	2301
LC39	11	51.973	-69	38.410	141	22	Apr	122	0510	137	11	52.04	-69	38.54	30	April	121	2209
LC41	11	47.963	-69	37.947	142	22	Apr	122	0551	124	11	48.04	-69	38.11	30	April	121	2049
LC47	11	43.976	-69	37.454	143	22	Apr	122	0627	108	11	44.01	-69	37.55	30	April	121	1953
LC66	11	39.958	-69	36.954	144	22	Apr	122	0704	113	11	39.93	-69	37.07	30	April	121	1852
LC73	11	35.979	-69	36.507	145	22	Apr	122	0741	135	11	35.97	-69	36.58	30	April	121	1754

Table 3. Line 2 (67W) Ocean bottom seismometer operations

<u>Seismo-</u> <u>meter</u>	<u>Latitude</u>		<u>Longitude</u>		<u>SECA</u> <u>Site</u>	<u>DEPLOYMENT</u>				<u>Depth</u> <u>(m)</u>	<u>RECOVERY</u>							
						<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	<u>Latitude</u>		<u>Longitude</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>				
D51	10	37.744	-67	23.339	242	06	May	126	0758	867	10	37.69	-67	23.40	8	May	129	1429
D15	10	42.838	-67	23.796	241	06	May	126	0841	869	10	42.80	-67	23.78	8	May	129	1538
D14	10	47.907	-67	24.258	240	06	May	126	0927	761	10	47.87	-67	24.23	8	May	129	1645
D23	10	52.998	-67	24.694	239	06	May	126	1008	867	10	52.97	-67	24.63	8	May	129	1750
D10	10	58.088	-67	25.139	238	06	May	126	1047	1084	10	58.09	-67	25.06	8	May	129	1906
LC23	11	03.158	-67	25.591	237	06	May	126	1144	1421	11	3.12	-67	25.45	8	May	129	2038
LC34	11	08.235	-67	26.043	236	06	May	126	1300	1697	11	8.27	-67	25.89	8	May	129	2216
LC70	11	13.302	-67	26.486	235	06	May	126	1418	1775	11	13.36	-67	26.39	8	May	129	2352
LC25	11	18.382	-67	26.942	234	06	May	126	1510	1824	11	18.41	-67	26.87	9	May	130	0127
LC72	11	23.478	-67	27.378	233	06	May	126	1619	1880	11	23.51	-67	27.36	9	May	130	0306
LC37	11	28.541	-67	27.829	232	06	May	126	1726	1927	11	28.62	-67	27.83	9	May	130	0501
LC47	11	33.630	-67	28.301	231	06	May	126	1822	1865	11	33.74	-67	28.27	9	May	130	0644
LC66	11	38.699	-67	28.777	230	06	May	126	1918	1603	11	38.70	-67	28.79	9	May	130	0830
LC73	11	43.782	-67	29.212	229	06	May	126	2013	1232	11	43.78	-67	29.27	9	May	130	1004
LC07	11	48.891	-67	30.108	228	06	May	126	2105	666	11	48.89	-67	30.17	9	May	130	1113
LC39	11	53.973	-67	30.303	227	06	May	126	2152	652	11	53.99	-67	30.40	9	May	130	1244
LC41	11	59.062	-67	30.573	226	06	May	126	2242	393	11	59.09	-67	30.61	9	May	130	1350
D20	12	04.103	-67	31.029	225	06	May	126	2322	308	12	4.10	-67	31.02	9	May	130	1449
D30	12	09.179	-67	31.470	224	06	May	126	2322	358	12	9.24	-67	31.45	9	May	130	1628
D13	12	14.247	-67	31.946	223	07	May	126	0041	751	12	14.31	-67	31.91	9	May	130	1903
D31	12	19.296	-67	32.381	222	07	May	126	0121	1505	12	19.26	-67	32.34	9	May	130	2047
D50	12	24.424	-67	32.841	221	07	May	126	0203	2956	12	24.49	-67	32.68	9	May	130	2247
D42	12	29.496	-67	33.281	220	07	May	126	0244	4644	12	29.44	-67	33.14	10	May	131	0047
D39	12	34.558	-67	33.730	219	07	May	126	0327	4656	12	34.56	-67	33.73	10	May	131	0318
D28	12	39.646	-67	34.235	218	07	May	126	0411	4468	12	39.69	-67	34.43	10	May	131	0847

D11	12	44.743	-67	34.701	217	07 May	126	0448	4286	12	44.70	-67	34.99	10 May	131	1049
D40	12	49.826	-67	35.146	216	07 May	126	0530	3482	12	49.74	-67	35.59	10 May	131	1243
D34	12	54.905	-67	35.589	215	07 May	126	0609	3220	12	54.86	-67	35.72	10 May	131	1423
D38	12	59.969	-67	36.043	214	07 May	126	0647	3698	12	59.88	-67	36.17	10 May	131	1613
D05	13	05.058	-67	36.494	213	07 May	126	0725	4021	13	4.94	-67	36.64	10 May	131	1807
D46	13	10.114	-67	36.983	212	07 May	126	0804	4014	13	9.98	-67	37.18	10 May	131	2001
D44	13	15.220	-67	37.442	211	07 May	126	0842	4435	13	15.03	-67	37.57	10 May	131	2157
D49	13	20.285	-67	37.836	210	07 May	126	0922	4775	13	19.54	-67	38.98	11 May	132	0045
D57	13	25.379	-67	38.347	209	07 May	126	1000	4778	13	25.13	-67	38.47	11 May	132	0256
D60	13	30.444	-67	38.797	208	07 May	126	1047	5000	13	30.06	-67	39.13	11 May	132	0522
D19	13	35.512	-67	39.252	207	07 May	126	1128	4998	13	35.30	-67	39.44	11 May	132	0759
D25	13	40.591	-67	39.708	206	07 May	126	1226	5016	13	40.36	-67	40.02	11 May	132	1030
D56	13	45.675	-67	40.170	205	07 May	126	1308	5011	13	45.46	-67	40.34	11 May	132	1321
D06	13	50.759	-67	40.602	204	07 May	126	1410	5010	13	50.59	-67	40.68	11 May	132	1527
D37	13	55.839	-67	41.050	203	07 May	126	1510	5014	13	55.66	-67	41.15	11 May	132	1740
D01	14	00.912	-67	41.546	202	07 May	126	1559	5015	14	0.77	-67	41.67	11 May	132	1938
D52	14	06.002	-67	42.015	201	07 May	126	1650	5020	14	5.83	-67	42.08	11 May	132	2143

Table 4. Line 3 (64W) Ocean bottom seismometer operations

<u>Seismo-</u> <u>meter</u>	<u>Latitude</u> <u>Longitude</u>				<u>DEPLOYMENT</u>				<u>RECOVERY</u>							
					<u>SECA</u> <u>Site</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	<u>Depth</u> <u>(m)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>		
D44	10	42.572	-63	41.901	335	13 May	134	2034	25	10	42.54	-63	41.90	21 May	142	1136
D30	10	47.279	-63	42.940	334	13 May	134	2113	23	10	47.26	-63	42.33	21 May	142	1233
D20	10	51.910	-63	43.980	333	13 May	134	2154	31	10	51.95	-63	43.97	21 May	142	1318
D10	10	56.574	-63	45.047	332	13 May	134	2234	22	10	56.57	-63	45.02	21 May	142	1355
D14	11	01.244	-63	46.079	331	13 May	134	2316	20	11	1.31	-63	46.08	21 May	142	1439
D23	11	05.892	-63	47.148	330	13 May	134	2352	18	11	5.34	-63	47.12	21 May	142	1514
D05	11	10.552	-63	48.190	329	14 May	135	0021	24	11	10.59	-63	48.14	21 May	142	1601
D51	11	15.208	-63	49.265	328	14 May	135	0048	33	11	15.26	-63	49.25	21 May	142	1642
D40	11	19.860	-63	50.329	327	14 May	135	0132	32	11	19.89	-63	50.30	21 May	142	1722
D11	11	24.536	-63	51.376	326	14 May	135	0201	48	11	24.57	-63	51.35	21 May	142	1806
D39	11	29.192	-63	52.444	325	14 May	135	0228	65	11	29.25	-63	52.40	21 May	142	1847
D49	11	33.848	-63	53.501	324	14 May	135	0257	175	11	34.08	-63	53.53	21 May	142	1942
D34	11	38.502	-63	54.560	323	14 May	135	0327	573	11	38.68	-63	54.60	21 May	142	2058
D28	11	43.182	-63	55.624	322	14 May	135	0400	632	11	43.29	-63	55.71	21 May	142	2157
D38	11	47.828	-63	56.683	321	14 May	135	0431	435	11	47.97	-63	57.03	21 May	142	2257
D50	11	52.510	-63	57.719	320	14 May	135	0503	353	11	52.64	-63	58.00	21 May	142	2347
LC72	11	57.151	-63	58.804	319	14 May	135	0552	320	11	57.34	-63	59.21	22 May	143	0034

LC25	12	01.809	-63	59.859	318	14 May	135	0654	897	12	1.98	-64	0.23	22 May	143	0135
LC70	12	06.486	-64	00.931	317	14 May	135	0737	1954	12	6.68	-64	1.14	22 May	143	0302
LC23	12	11.151	-64	01.995	316	14 May	135	0822	3084	12	11.39	-64	2.21	22 May	143	0452
LC34	12	15.831	-64	03.047	315	14 May	135	0910	3279							
D31	12	20.478	-64	04.080	314	14 May	135	0947	3559	12	20.60	-64	4.20	22 May	143	0834
D42	12	25.127	-64	05.208	313	14 May	135	1019	3366	12	25.27	-64	5.40	22 May	143	1009
D13	12	29.784	-64	06.252	312	14 May	135	1054	3221	12	29.97	-64	6.57	22 May	143	1338
D47	12	34.435	-64	07.319	311	14 May	135	1126	3328	12	34.50	-64	7.50	22 May	143	1508
D01	12	39.087	-64	08.417	310	14 May	135	1201	3166	12	39.07	-64	8.60	22 May	143	1648
D52	12	43.722	-64	09.449	309	14 May	135	1239	3004							
D37	12	48.457	-64	10.517	308	14 May	135	1311	3047	12	48.51	-64	10.79	23 May	144	0021
D06	12	53.019	-64	11.564	307	14 May	135	1343	3081	12	53.02	-64	11.87	23 May	144	0153
D56	12	57.693	-64	12.646	306	14 May	135	1417	3131	12	57.79	-64	12.90	23 May	144	0345
D46	13	02.371	-64	13.723	305	14 May	135	1449	3152	13	2.35	-64	13.95	23 May	144	0511
D57	13	07.032	-64	14.776	304	14 May	135	1521	3167	13	6.98	-64	15.09	23 May	144	0652
D60	13	11.703	-64	15.858	303	14 May	135	1552	3214	13	11.69	-64	16.07	23 May	144	0823
D19	13	16.351	-64	16.934	302	14 May	135	1625	3230	13	16.37	-64	17.16	23 May	144	0952
D25	13	21.005	-64	18.017	301	14 May	135	1657	3226	13	21.02	-64	18.18	23 May	144	1123

Table 5. Line 4 (TRIN) Ocean bottom seismometer operations

<u>Seismo-</u> <u>meter</u>				DEPLOYMENT					RECOVERY				
	<u>Latitude</u>	<u>Longitude</u>	<u>SECA</u> <u>Site</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	<u>Depth</u> <u>(m)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	
D20	13 00.140	-64 04.100	401	23 May	144	14:15	2970	13 0.109	-64 5.453	31 May	152	2046	
D44	12 55.577	-63 56.689	402	23 May	144	15:22	2695	12 55.631	-63 56.848	31 May	152	1859	
D47	12 51.006	-63 49.256	403	23 May	144	16:42	2020	12 51.148	-63 49.429	31 May	152	1355	
D49	12 46.452	-63 41.861	404	23 May	144	17:47	1787	12 46.653	-63 41.030	31 May	152	1226	
D10	12 41.887	-63 34.444	405	23 May	144	18:52	1000	12 42.187	-63 34.560	31 May	152	1048	
D05	12 37.326	-63 27.064	406	23 May	144	19:59	1036	12 37.858	-63 27.277	31 May	152	0934	
D23	12 32.753	-63 19.661	407	23 May	144	21:06	1551	12 33.299	-63 19.860	31 May	152	0812	
LC23	12 28.658	-63 13.073	408	23 May	144	22:11	2775	12 29.215	-63 13.421	31 May	152	0636	
LC70	12 24.558	-63 06.482	409	23 May	144	23:10	2899	12 25.011	-63 6.699	31 May	152	0432	
LC25	12 20.488	-62 59.916	410	24 May	145	00:07	2928	12 20.694	-63 0.231	31 May	152	0233	
LC72	12 16.359	-62 53.309	411	24 May	145	01:08	2942	12 16.459	-62 53.595	31 May	152	0031	
LC37	12 12.291	-62 46.754	412	24 May	145	02:04	2888	12 12.331	-62 47.061	30 May	151	2234	
LC07	12 08.188	-62 40.164	413	24 May	145	03:04	2703	12 8.163	-62 40.396	30 May	151	2019	
LC41	12 04.090	-62 33.595	414	24 May	145	04:04	2770	12 4.044	-62 33.749	30 May	151	1819	
D11	11 59.985	-62 27.055	415	24 May	145	05:06	1940	11 59.928	-62 27.075	30 May	151	1612	
D39	11 51.783	-62 13.921	416	24 May	145	07:14	1870	11 51.621	-62 14.047	30 May	151	1306	

D30	11 48.710	-62 08.991	417	24 May	145 08:05	428	11 48.618	-62 9.085	30 May	151 1147
D14	11 45.624	-62 04.105	418	24 May	145 08:52	399	11 45.624	-62 4.242	30 May	151 1052
D50	11 42.510	-61 59.168	419	24 May	145 09:43	761	11 42.427	-61 59.499	30 May	151 0954
D40	11 39.421	-61 54.286	420	24 May	145 10:34	705	11 39.378	-61 54.574	30 May	151 0852
D51	11 35.321	-61 47.729	421	24 May	145 11:44	578	11 35.011	-61 48.046	30 May	151 0658
D38	11 31.221	-61 41.173	422	24 May	145 12:58	253	11 31.255	-61 41.334	30 May	151 0515
D31	11 27.105	-61 34.638	423	24 May	145 14:09	177	11 27.160	-61 34.644	30 May	151 0338
D37	11 22.978	-61 28.113	424	24 May	145 15:30	166	11 23.052	-61 28.090	30 May	151 0158
D34	11 18.845	-61 21.530	425	24 May	145 16:51	160	11 19.337	-61 21.963	30 May	151 0013
D28	11 14.720	-61 15.032	426	24 May	145 18:04	139	11 14.892	-61 15.220	29 May	150 2245
D01	11 10.579	-61 08.500	427	24 May	145 19:22	102	11 10.693	-61 8.664	29 May	150 2140
D46	11 06.444	-61 01.977	428	24 May	145 20:38	83	11 6.556	-61 2.138	29 May	150 2045
D57	11 02.307	-60 55.461	429	24 May	145 21:48	55	11 2.471	-60 55.776	29 May	150 1954
D60	10 58.169	-60 48.942	430	24 May	145 23:07	60	10 58.278	-60 49.046	29 May	150 1859
D19	10 54.015	-60 42.420	431	25 May	146 00:12	49	10 54.095	-60 42.480	29 May	150 1803
D25	10 49.888	-60 35.915	432	25 May	146 01:17	65	10 49.938	-60 35.921	29 May	150 1703
D42	10 45.749	-60 29.397	433	25 May	146 02:27	64	10 45.860	-60 29.417	29 May	150 1608
D06	10 41.599	-60 22.894	434	25 May	146 03:47	83	10 41.676	-60 22.905	29 May	150 1511
D13	10 37.443	-60 16.385	435	25 May	146 05:34	294	10 32.512	-60 16.481	29 May	150 1414
D56	10 33.290	-60 09.899	436	25 May	146 06:46	597	10 33.342	-60 9.973	29 May	150 1308
LC39	10 29.145	-60 03.396	437	25 May	146 08:02	678	10 29.203	-60 3.449	29 May	150 1204
LC66	10 24.981	-59 56.905	438	25 May	146 09:13	761	10 25.124	-59 57.014	29 May	150 1057
LC47	10 20.803	-59 50.405	439	25 May	146 10:33	862	10 16.869	-59 44.080	29 May	150 0952
LC73	10 16.659	-59 43.918	440	25 May	146 11:59	1014	10 16.869	-59 44.080	29 May	150 0840

Table 6. Line 5 (65W) Ocean bottom seismometer operations

<u>Seismo-</u> <u>meter</u>	<u>Latitude</u> <u>Longitude</u>		<u>SECA</u> <u>Site</u>	<u>DEPLOYMENT</u>				<u>RECOVERY</u>				
				<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>	<u>Depth</u> <u>(m)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Date</u>	<u>JD</u>	<u>Time</u> <u>(GMT)</u>
LC73	12 00.205	-65 07.000	501	12 May	133	19:29	2026	12 0.25	-65 7.12	19 May	140	1111
LC47	11 45.872	-65 03.040	502	12 May	133	21:21	1811	11 45.84	-65 3.07	19 May	140	1334
LC66	11 31.532	-64 59.085	503	12 May	133	22:56	2244	11 31.50	-64 59.10	19 May	140	1630
LC41	11 17.200	-64 55.181	504	13 May	134	00:39	1182	11 17.22	-64 55.19	19 May	140	1844
LC39	11 02.874	-64 51.252	505	13 May	134	02:18	108	11 2.90	-64 51.27	19 May	140	2032
LC07	10 48.515	-64 47.334	506	13 May	134	03:56	330	10 48.53	-64 47.37	19 May	140	2219
LC37	10 34.199	-64 43.439	507	13 May	134	06:03	1379	10 34.26	-64 43.40	20 May	141	0109

Instrumentation - WHOI D2

The WHOI model D2 ocean bottom seismometer (OBS) is a compact, relatively light-weight system (Figure 3) which allows recording of three components of ground motion and one acoustic channel at sample rates up to 250 Hz. The D2 is comprised of two glass balls containing electronics and batteries enclosed within a rigid plastic housing. The system stands 39" high and weighs 115 lb in air.

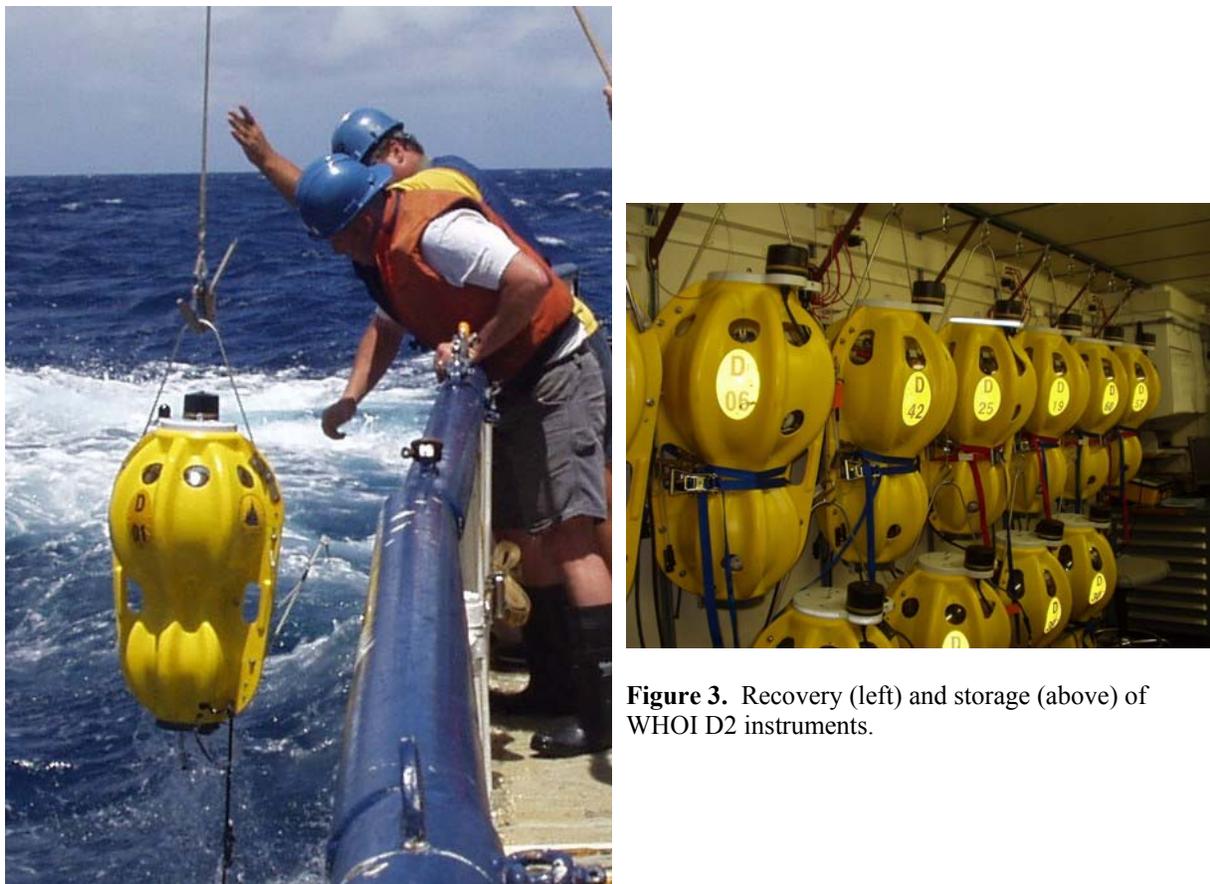


Figure 3. Recovery (left) and storage (above) of WHOI D2 instruments.

The upper glass ball (17" diameter) contains a Quanterra signal processing unit (Q330), a Quanterra 20 Gbyte hard drive containing an ethernet hub, an EdgeTech acoustic release board, GPS antennae, recovery aids, and custom electronics. A Seascan clock is located on a system control board and is accessible via a serial ASCII current loop. Recovery aids include four flashers and a programmable VHF radio with a minimum range at sealevel of ~2 nmi. The VHF antennae is attached to the inside surface of the glass ball. The Q330 includes operating software, a low-power analog-to-digital converter with 140 dB dynamic range, digital filters, clock, and 8 Mbytes of buffer memory. Engineering data and four channels of signal are continuously

recorded and intermittently logged via an ethernet connection onto the disk drive in miniSEED format. For this experiment we used a sample rate on all data channels of 100 Hz. In the lower glass ball (10" diameter) are battery packs comprised of both alkaline and lithium cells that supply power separately to the Q330 and hard drive, the recovery electronics board and aids, and to the EdgeTech release board used for acoustic ranging and supplying a current to the anchor release burn-wire. Ethernet connections can be used to change and program the operating software and to recover data from the hard drive.

The external plastic case provides protection for the glass balls and structural rigidity. An ITC 12 kHz acoustic transponder is attached to the upper cover of the case. Next to the transponder is a HighTech model HTI 1-90-U hydrophone. Three orthogonally mounted 4.5 Hz geophones are mounted in a 5" diameter (5.5" high) titanium case, which is attached by a weighted cable through the plastic case to the upper electronics ball. The case is filled with high viscosity silicone oil. Internal gimbals allow the geophones to passively orient themselves with respect to gravity through 180 degrees of motion. Prior to deployment, a bail is screwed to the seismometer case, and the bail is hooked to the tip of a 23" long fiberglass wand. The bottom of the wand is attached to the base of the plastic housing by a rotatable joint. The tip of the wand and the seismometer are raised and attached to the side of the plastic housing by a galvanic link that dissolves in seawater after ~4 hours. When the link dissolves, gravity carries the sensor can out and away from the D2. The sensor can slips from the tip of the wand, which is then pulled up and away from the can by a bungee cord.

The D2 has ~25 lb of buoyancy and is weighted by a 55 lb steel plate anchor (6"x15"x2"). The anchor plate is connected by a 9" length of stainless steel wirerope to a 2" diameter ring. The ring is held to the D2 by a lever arm. One end of the lever arm is attached to the D2 base plate by a burn-wire that can be severed by an electric current triggered by a coded acoustic signal to the EdgeTech transponder. The burn-wire and the release electronics are powered by a battery that is separate from the battery supplying power to the Q330 and the hard drive.

Instrumentation - SIO LC2000

The Institute of Geophysics and Planetary Physics at Scripps Institution of Oceanography (IGPP/SIO) provided twelve LC2000s for this experiment (Figure 4). The sensors on the LC2000 are a hydrophone and a vertical-component seismometer. Each instrument is comprised

of an anchor, a float assembly on which the recovery aids are attached, and a polyethylene frame holding the sensors, an acoustic release transponder, and a data logger. The components are stored separately and assembled prior to deployment on a square support bolted to the deck. The complete instrument weighs 275 pounds in air. The anchor is an 85 pound iron grate held to the base of the poly frame by a single 2" oval link when the release mechanism is cocked and secured. After the anchor is released, the four 12" glass balls in the float package provide sufficient buoyancy to lift the instrument at about 40 m/min to the sea surface. To increase visibility in rough seas, a flag on a 50" staff is attached to the floats. The recovery aids also include a low-pressure activated strobe light and a radio (160.725 MHz), both from Novatech, Inc.



Figure 4. Deployment of Scripps LC2000 OBS.

The acoustic release transponder is comprised of batteries, circuit boards from EdgeTech, and a ITC-3013 transducer manufactured by International Transducer Corp in a 4-5/8" aluminum pressure case. All transponders interrogate at 11 kHz and respond at 13 kHz. The transponder is powered by three strings of 12 C-cells each providing 10.5 volts. The release mechanism includes two double wire burn elements. When fresh, two battery strings are combined to provide a voltage of 21 volts to burn one release wire in about 7 minutes at water depths encountered during this experiment.

The data logger includes a 24 bit A/D converter, a hard drive, and custom electronic circuitry in 7" aluminum pressure case. The logger uses a SeaScan time base to operate the A/D con-

verter. About 5 Mbytes of data are stored in an 8 Mbyte buffer before recording on an 18 Gbyte Seagate SCSI disk drive. For this experiment, we used a sample rate of 125 Hz. The digital electronics provides a 3 dB corner frequency at 51 Hz and 130 dB at 62.5 Hz.

The two sensors are located separately within the poly frame between the two pressure cases. The seismometer is a Mark Products L22 2 Hz vertical-component geophone mounted in its own pressure case. The pressure sensor is a HiTech HTI-90-U hydrophone with internal preamp. The bandwidth at 3dB down is 50 mHz-15 kHz.

Lost Instruments

During the experiment four instruments failed to respond to acoustic commands and were not recovered. On Line 1 (70W) we lost three WHOI D2s when communications could not be established: D09 at SECA site 101, D02 at SECA site 102, and D12 at SECA site 126. On Line 3 (64W) we lost one LC2000: LC 34 at SECA site 315. At each site we tried 1-2 hours to establish communication using different Edgetech acoustic units through the ship's hull-mounted 12 kHz transducer, an over-the-side transducer, and steaming a circle around the site. We suspected that two metal bands surrounding the main instrument ball of the D2s may have been responsible for problems with acoustic communications. During a passage in the lee of Curacao on May 5 to pick-up the Assistant Engineer, we opened the hard hats of the remaining D2s and removed the metal bands. Failure to communicate with the D2s was not a problem after Line 1.

We also lost two instruments when they failed to release after repeated burn commands. Multiple burn commands were common on Lines 1 (70W), 2 (67W), and 3 (64W), especially at instruments located on the continental slope and in the deeper basins. D54 at SECA site 129 on Line 1 (70W) failed to release after twelve 15 minute burn cycles and one 1 minute burn cycle. D52 at SECA site 309 on Line 3 (64W) failed to release after twenty 15 minute burn attempts. There are many reasons that an instrument might fail to release after receiving and acknowledging a burn command. We noticed that multiple burns appeared to be more common with seismometers deployed in deeper water and with the occurrence of mud on the D2 release. This suggested that the anchors of these instruments sank in soft mud so far that mud covered the burn wires and that the mud slowed or stopped the electrolysis process, which breaks the wire and allows release of the anchor. In response, we deployed LC2000s, which have a plate on their anchor to protect the release wires from mud, on the continental slope on Lines 3 (64W), 4 (TRIN),

and 5 (65W). For the Line 4 (TRIN) deployment, we spliced an extra 4-1/2" of wire into the D2 anchor tether (total 13 1/2") to raise the burn wire higher above the mud. With this modification, most D2s on Line 4 released after one burn command and no D2s required more than two burn commands.

Instrument problems

The LC2000s did not develop any problems that we were able to detect. The WHOI D2s, however, developed problems of several types during the cruise, many of which we were able to fix. The first problem occurred during shipment from Woods Hole to Ft. Pierce, FL, where the WHOI gear was loaded on the R/V *Seward Johnson II*. When the instruments were first powered up, no internet connection could be made to the hard drive in D26. Later, parts were scavenged off D26 to repair other D2s that developed less serious problems. After recovery from Line 1 (70W), a serial connection could not be made to the release circuit board in D46. During the brief stop in the lee of Curacao while waiting to pick up the Assistant Engineer, the connection was re-established by cycling the battery and data from Line 1 was down-loaded. After recovery from Line 2 (67W), the main battery voltage was low and the battery was replaced during the anchorage behind Isla Cubagua. After recovery from Line 2 (67W) the interior of the instrument ball for D57 was covered with a fine white powder. During the Isla Cubagua repair stop, we found about 2 cups of glass powder in the ball (Figure 5) due to serious spalling on the interior of the ball within 2-3" of the cut between the two hemispheres. The ball was replaced with the ball from D26. D03 recorded for only a portion of the time it was deployed on Line 1. These data, although limited to the first part of the deployment, were successfully down-loaded. Apparently the connection between the Quaterra digitizing component and the hard drive failed. We tried replacing controlling software, but this failed to solve the problem. We also discovered spalling of the interior of the instrument ball. D03 was not deployed again and not used for parts. After recovery from Line 2 (67W) the instrument ball of D15 contained condensed moisture. There was no spare ball available for replacement, so D15 was not repaired and not used again. Before Line 1, we were unable to synchronize the instrument clocks in D47 to GPS time. The failure was traced to a faulty auxiliary board. The auxiliary board in D47 was replaced with one from D26 during the Isla Cubagua repair stop. After Line 2 (67W) the recovery board in D49 transmitted uncontrolled signals blocking the serial ASCII current loop connection and pre-

venting downloading of data. During the Isla Cubagua repair stop, D49 was opened, the recovery board disconnected, the data from Line 2 were successfully downloaded, and the recovery board was replaced with one from D26. After the Line 3 (64W) recovery, no SAIL communications with D56 could be established. During the Port of Spain stop, the instrument ball was opened, communications were reestablished, the time sync obtained, and data down-loaded. The problem was traced to a faulty cable penetrator through the instrument ball, which was replaced. As a result of repairs that we were able to make during the experiment, we were able to make deployments of at least 40 seismometers on each line, despite the losses of instruments and problems that developed.



Figure 5. Glass powder within instrument ball for D57.

On Line 4 (64W, the last line) three D2s were recovered with problems. The recovery and initial data recovery procedure went normally for D46 (SECA site 428). Despite appearing to function normally, the hard drive (“packet baler”) failed to respond to any network HTTP requests. All other network functions appeared normal. Since all data transfer is done via HTTP, it was not possible to download data while still at-sea. The status of data is unknown. Pending further tests, the data may be obtained from the hard drive back at WHOI. D49 (SECA site 404) returned to the surface with 3-4” of seawater in the instrument ball. The bottom of the hard drive was in water. The boards in the upper part of the ball functioned well enough to provide anchor release and recovery aids. We could communicate with the Q330 digitizer through the SAIL connection. The hard drive, though, was flooded inside and no connection could be established.

No data were recovered from D49. D44 (SECA site 402) was recovered and a time synch obtained visually. However, we can not access the hard drive and can not verify how much data were recorded. No data were down-loaded from D44 at-sea. Further attempts to access the hard drive will be done ashore.

Timing Parameters For OBS Operations

For the collaborative 2-ship experiment, it was important to have accurate estimates of OBS deployment, recovery, and instrument turn-around times in order to accurately plan our program. These parameters were refined as the cruise progressed; below we give our best estimates of various parameters as these may be useful for future cruise planning.

Deployments:

Transit speed – Ship speed during deployments varied from 7.5-11.5 knots, depending on weather and current conditions.

Deployment time, WHOI instruments – This averaged 8-13 minutes. Factors affecting this included the amount of time it takes to slow the ship down and turn onto a proper heading for deployment, and the amount of time it takes to put the instrument over the side. Although we were informed before the cruise that the OBSIP team would need about 1 hour between deployments to carry out the final instrument preparation, we were actually able to deploy instruments as fast as every 30 minutes.

Deployment time, Scripps instruments – This averaged 8-28 minutes. Factors were the same as for the WHOI instruments, plus the instruments had to be put together on deck. This usually resulted in a delay, as the ship turned onto a course designed to provide the best working conditions on the fantail. Thus deployment times for Scripps instruments averaged 7-16 minutes longer than for the WHOI instruments. The exception was the Trinidad profile whose orientation provided ideal deck conditions; on this profile deployment times were similar for both instrument types.

Recoveries:

Transit speed – Ship speed during recoveries varied from 9.5-11.5 knots, depending on weather and current conditions.

Instrument rise time – This was ~70 m/min for the WHOI instruments, and ~45 m/min for the Scripps instruments.

Recovery time, WHOI instruments – This averaged 25-47 minutes. Key factors effecting this time include the amount of time it takes the ship to slow down so that acoustic communication with the instrument can be established, the actual burn time of the release wire, the amount of time it takes to visually spot the instrument once it reaches the surface, the amount of time it takes to get the instrument onto the deck, and the amount of time it takes to secure the deck. Several instruments required multiple burn commands, and this proved to be the most variable of the factors. Average time between visual observation of the instrument to getting it on deck averaged 8 minutes for the first profile, 6 minutes for the next profiles, and 5.5 minutes for the last profile; actual times were as little as 91 seconds and as large as 20 minutes.

Recovery time, Scripps instruments – This averaged 15-42 minutes. Key factors were the same as for the WHOI instruments, except that no instrument required more than 2 burn commands. Securing the deck took longer than the WHOI instruments because the instruments needed to be disassembled. Visual observation was often quicker than the WHOI instruments because of the large red flag and the exterior strobe.

Tables 7-10 give predicted and actual deployment and recovery times, and our best estimate of the timing parameters.

Table 7. Profile 70W – Detailed Deployment and Recovery Times.

Assumptions:								
Transit Speed (knots):	9.5							
Dep Time, WHOI (min):	13.0							
Dep Time, Scripps (min):	20.0							
WHOI rise time rate (m/min)	70.0							
Scripps rise time rate (m/min)	45.0							
Rec Time, WHOI (min)	43.0							
Rec Time, Scripps (min)	42.0							
Activity	Latitude	Longitude	Distance (km)	Depth (m)	Duration (min)	Predicted Completion Time	Actual Completion Time	Actual Duration
Deploy WHOI OBS 101	14.53	-69.96	0.0	-4246	0.0	4/21/2004 2:03	4/21/2004 2:03	
Deploy WHOI OBS 102	14.46342	-69.95191	7.4	-4243	38	4/21/2004 2:41	4/21/2004 2:46	0:43
Deploy WHOI OBS 103	14.39682	-69.94383	7.4	-4281	38	4/21/2004 3:19	4/21/2004 3:25	0:39
Deploy WHOI OBS 104	14.33025	-69.93576	7.4	-4336	38	4/21/2004 3:57	4/21/2004 4:02	0:37
Deploy WHOI OBS 105	14.26366	-69.92768	7.4	-4360	38	4/21/2004 4:36	4/21/2004 4:36	0:34
Deploy WHOI OBS 106	14.19707	-69.91961	7.4	-4464	38	4/21/2004 5:14	4/21/2004 5:09	0:33
Deploy WHOI OBS 107	14.13049	-69.91155	7.4	-4529	38	4/21/2004 5:52	4/21/2004 5:34	0:25
Deploy WHOI OBS 108	14.0639	-69.90349	7.4	-4536	38	4/21/2004 6:31	4/21/2004 6:12	0:38
Deploy WHOI OBS 109	13.99731	-69.89544	7.4	-4511	38	4/21/2004 7:09	4/21/2004 6:54	0:42
Deploy WHOI OBS 110	13.93072	-69.88739	7.4	-4542	38	4/21/2004 7:47	4/21/2004 7:36	0:42
Deploy WHOI OBS 111	13.86413	-69.87935	7.4	-4748	38	4/21/2004 8:25	4/21/2004 8:15	0:39
Deploy WHOI OBS 112	13.79754	-69.8713	7.4	-4850	38	4/21/2004 9:04	4/21/2004 8:51	0:36
Deploy WHOI OBS 113	13.73094	-69.86327	7.4	-4919	38	4/21/2004 9:42	4/21/2004 9:23	0:32
Deploy WHOI OBS 114	13.66436	-69.85524	7.4	-4981	38	4/21/2004 10:20	4/21/2004 9:57	0:34
Deploy WHOI OBS 115	13.59776	-69.84722	7.4	-4653	38	4/21/2004 10:59	4/21/2004 10:30	0:33
Deploy WHOI OBS 116	13.53117	-69.8392	7.4	-3781	38	4/21/2004 11:37	4/21/2004 11:17	0:47
Deploy WHOI OBS 117	13.46458	-69.83118	7.4	-3614	38	4/21/2004 12:15	4/21/2004 11:55	0:38
Deploy WHOI OBS 118	13.39798	-69.82317	7.4	-3314	38	4/21/2004 12:54	4/21/2004 12:32	0:37
Deploy WHOI OBS 119	13.33139	-69.81516	7.4	-3164	38	4/21/2004 13:32	4/21/2004 13:10	0:38
Deploy WHOI OBS 120	13.26479	-69.80715	7.4	-2986	38	4/21/2004 14:10	4/21/2004 14:00	0:50
Deploy WHOI OBS 121	13.19819	-69.79915	7.4	-2872	38	4/21/2004 14:48	4/21/2004 14:38	0:38
Deploy WHOI OBS 122	13.1316	-69.79116	7.4	-2069	38	4/21/2004 15:27	4/21/2004 15:15	0:37
Deploy WHOI OBS 123	13.065	-69.78317	7.4	-1600	38	4/21/2004 16:05	4/21/2004 16:25	1:10
Deploy WHOI OBS 124	12.9984	-69.77518	7.4	-1518	38	4/21/2004 16:43	4/21/2004 16:54	0:29
Deploy WHOI OBS 125	12.93181	-69.7672	7.4	-1506	38	4/21/2004 17:22	4/21/2004 17:25	0:31

Deploy WHOI OBS 126	12.8652	-69.75922	7.4	-1434	38	4/21/2004 18:00	4/21/2004 18:11	0:46	
Deploy WHOI OBS 127	12.7986	-69.75124	7.4	-1265	38	4/21/2004 18:38	4/21/2004 18:47	0:36	
Deploy WHOI OBS 128	12.73201	-69.74327	7.4	-1271	38	4/21/2004 19:17	4/21/2004 19:23	0:36	
Deploy WHOI OBS 129	12.66541	-69.73531	7.4	-1299	38	4/21/2004 19:55	4/21/2004 20:00	0:37	
Deploy WHOI OBS 130	12.59881	-69.72735	7.4	-1218	38	4/21/2004 20:33	4/21/2004 20:41	0:41	Mean
Deploy WHOI OBS 131	12.5322	-69.71939	7.4	-1072	38	4/21/2004 21:11	4/21/2004 21:16	0:35	Duration
Deploy WHOI OBS 132	12.4656	-69.71144	7.4	-886	38	4/21/2004 21:50	4/21/2004 21:51	0:35	0:38
Deploy Scripps OBS 133	12.399	-69.70349	7.4	-716	45	4/21/2004 22:35	4/21/2004 22:42	0:51	
Deploy Scripps OBS 134	12.3324	-69.69555	7.4	-530	45	4/21/2004 23:20	4/21/2004 23:20	0:38	
Deploy Scripps OBS 135	12.26579	-69.6876	7.4	-447	45	4/22/2004 0:06	4/22/2004 0:27	1:07	
Deploy Scripps OBS 136	12.19918	-69.67967	7.4	-371	45	4/22/2004 0:51	4/22/2004 1:11	0:44	
Deploy Scripps OBS 137	12.13258	-69.67173	7.4	-319	45	4/22/2004 1:36	4/22/2004 1:56	0:45	
Deploy Scripps OBS 138	12.06598	-69.66381	7.4	-336	45	4/22/2004 2:22	4/22/2004 2:44	0:48	
Deploy Scripps OBS 139	11.99937	-69.65588	7.4	-329	45	4/22/2004 3:07	4/22/2004 3:33	0:49	
Deploy Scripps OBS 140	11.93277	-69.64796	7.4	-211	45	4/22/2004 3:52	4/22/2004 4:28	0:55	
Deploy Scripps OBS 141	11.86615	-69.64005	7.4	-137	45	4/22/2004 4:37	4/22/2004 5:10	0:42	
Deploy Scripps OBS 142	11.79954	-69.63212	7.4	-49	45	4/22/2004 5:23	4/22/2004 5:51	0:41	
Deploy Scripps OBS 143	11.73294	-69.62422	7.4	-8	45	4/22/2004 6:08	4/22/2004 6:28	0:37	Mean
Deploy Scripps OBS 144	11.66633	-69.61631	7.4	-25	45	4/22/2004 6:53	4/22/2004 7:05	0:37	Duration
Deploy Scripps OBS 145	11.59972	-69.60841	7.4	-21	45	4/22/2004 7:39	4/22/2004 7:41	0:36	0:45
					Duration				Visual
Transit From Klein Curacao					(hr)				to Deck
Recover Scripps OBS 145	11.59972	-69.60841	0.0	-21	0.7	4/30/2004 17:54	4/30/2004 17:54		0:06
Recover Scripps OBS 144	11.66633	-69.61631	7.4	-25	1.1	4/30/2004 19:01	4/30/2004 18:52	0:58	0:09
Recover Scripps OBS 143	11.73294	-69.62422	7.4	-20	1.1	4/30/2004 20:09	4/30/2004 19:53	1:01	0:07
Recover Scripps OBS 142	11.79954	-69.63212	7.4	-49	1.1	4/30/2004 21:17	4/30/2004 20:49	0:56	0:08
Recover Scripps OBS 141	11.86615	-69.64005	7.4	-137	1.2	4/30/2004 22:26	4/30/2004 22:09	1:20	0:05
Recover Scripps OBS 140	11.93277	-69.64796	7.4	-211	1.2	4/30/2004 23:36	4/30/2004 23:01	0:52	0:06
Recover Scripps OBS 139	11.99937	-69.65588	7.4	-329	1.2	5/1/2004 0:48	4/30/2004 23:56	0:55	0:06
Recover Scripps OBS 138	12.06598	-69.66381	7.4	-336	1.2	5/1/2004 2:00	5/1/2004 1:16	1:20	0:05
Recover Scripps OBS 137	12.13258	-69.67173	7.4	-319	1.2	5/1/2004 3:12	5/1/2004 2:37	1:21	0:10
Recover Scripps OBS 136	12.19918	-69.67967	7.4	-371	1.2	5/1/2004 4:25	5/1/2004 3:59	1:22	0:09
Recover Scripps OBS 135	12.26579	-69.6876	7.4	-447	1.2	5/1/2004 5:39	5/1/2004 5:53	1:54	0:09
Recover Scripps OBS 134	12.3324	-69.69555	7.4	-530	1.2	5/1/2004 6:53	5/1/2004 7:26	1:33	0:10
Recover Scripps OBS 133	12.399	-69.70349	7.4	-716	1.3	5/1/2004 8:11	5/1/2004 8:45	1:19	0:11
Recover WHOI OBS 132	12.4656	-69.71144	7.4	-886	1.3	5/1/2004 9:32	5/1/2004 9:52	1:07	0:09

Transit to OBS 101									
Recover WHOI OBS 101	14.53	-69.96	0.0	-4246	1.7	Not Recovered	Not Recovered		
Recover WHOI OBS 102	14.46342	-69.95191	7.4	-4243	2.1	Not Recovered	Not Recovered		
Recover WHOI OBS 103	14.39682	-69.94383	7.4	-4281	2.2	5/2/2004 12:24	5/2/2004 12:24		0:04
Attempt OBS 102 Release Again									
Recover WHOI OBS 104	14.33025	-69.93576	7.4	-4336	2.2	5/2/2004 16:46	5/2/2004 16:46		0:08
Recover WHOI OBS 105	14.26366	-69.92768	7.4	-4360	2.2	5/2/2004 18:56	5/2/2004 18:56	2:10	0:07
Recover WHOI OBS 106	14.19707	-69.91961	7.4	-4464	2.2	5/2/2004 21:08	5/2/2004 21:02	2:06	0:07
Recover WHOI OBS 107	14.13049	-69.91155	7.4	-4529	2.2	5/2/2004 23:21	5/2/2004 23:15	2:13	0:10
Recover WHOI OBS 108	14.0639	-69.90349	7.4	-4536	2.2	5/3/2004 1:34	5/3/2004 1:08	1:53	0:04
Recover WHOI OBS 109	13.99731	-69.89544	7.4	-4511	2.2	5/3/2004 3:47	5/3/2004 3:20	2:12	0:06
Recover WHOI OBS 110	13.93072	-69.88739	7.4	-4542	2.2	5/3/2004 6:00	5/3/2004 5:45	2:25	0:20
Recover WHOI OBS 111	13.86413	-69.87935	7.4	-4748	2.3	5/3/2004 8:16	5/3/2004 7:56	2:11	0:11
Recover WHOI OBS 112	13.79754	-69.8713	7.4	-4850	2.3	5/3/2004 10:34	5/3/2004 10:19	2:23	0:12
Recover WHOI OBS 113	13.73094	-69.86327	7.4	-4919	2.3	5/3/2004 12:52	5/3/2004 12:34	2:15	0:07
Recover WHOI OBS 114	13.66436	-69.85524	7.4	-4981	2.3	5/3/2004 15:12	5/3/2004 14:57	2:23	0:04
Recover WHOI OBS 115	13.59776	-69.84722	7.4	-4653	2.2	5/3/2004 17:27	5/3/2004 17:20	2:23	0:09
Recover WHOI OBS 116	13.53117	-69.8392	7.4	-3781	2.0	5/3/2004 19:29	5/3/2004 19:24	2:04	0:05
Recover WHOI OBS 117	13.46458	-69.83118	7.4	-3614	2.0	5/3/2004 21:29	5/3/2004 21:16	1:52	0:07
Recover WHOI OBS 118	13.39798	-69.82317	7.4	-3314	1.9	5/3/2004 23:25	5/3/2004 23:03	1:47	0:07
Recover WHOI OBS 119	13.33139	-69.81516	7.4	-3164	1.9	5/4/2004 1:18	5/4/2004 2:47	3:44	0:06
Recover WHOI OBS 120	13.26479	-69.80715	7.4	-2986	1.8	5/4/2004 3:09	5/4/2004 4:47	2:00	0:14
Recover WHOI OBS 121	13.19819	-69.79915	7.4	-2872	1.8	5/4/2004 4:58	5/4/2004 6:27	1:40	0:09
Recover WHOI OBS 122	13.1316	-69.79116	7.4	-2069	1.6	5/4/2004 6:36	5/4/2004 8:01	1:34	0:09
Recover WHOI OBS 123	13.065	-69.78317	7.4	-1600	1.5	5/4/2004 8:07	5/4/2004 9:21	1:20	0:08
Recover WHOI OBS 124	12.9984	-69.77518	7.4	-1518	1.5	5/4/2004 9:37	5/4/2004 11:28	2:07	0:06
Recover WHOI OBS 125	12.93181	-69.7672	7.4	-1506	1.5	5/4/2004 11:07	5/4/2004 12:46	1:18	0:04
Recover WHOI OBS 126	12.8652	-69.75922	7.4	-1434	1.5	Not Recovered	Not Recovered		
Recover WHOI OBS 127	12.7986	-69.75124	7.4	-1265	1.4	5/4/2004 15:39	5/4/2004 15:39		0:03
Recover WHOI OBS 128	12.73201	-69.74327	7.4	-1271	1.4	5/4/2004 17:05	5/4/2004 17:18	1:39	0:06
Recover WHOI OBS 129	12.66541	-69.73531	7.4	-1299	1.4	Not Recovered	Not Recovered		
Recover WHOI OBS 130	12.59881	-69.72735	7.4	-1218	1.4	5/4/2004 22:16	5/4/2004 22:16		0:07
Recover WHOI OBS 131	12.5322	-69.71939	7.4	-1072	1.4	5/4/2004 23:39	5/4/2004 23:31	1:15	0:07
									0:07:44

Table 8. Profile 67W – Detailed Deployment and Recovery Times; Predicted Parameters.

Assumptions:									
Transit Speed (knots):	9.5								
Dep Time, WHOI (min):	11.0								
Dep Time, Scripps (min):	28.0								
WHOI rise time rate (m/min)	70.0								
Scripps rise time rate (m/min)	45.0								
Rec Time, WHOI (min)	47.0								
Rec Time, Scripps (min)	31.0								
Activity	Latitude	Longitude	Distance (km)	Depth (m)	Duration (min)	Predicted Completion Time	Actual Completion Time	Actual Duration	
Deploy WHOI OBS 242	10.6292	-67.3888	0.0	-895		5/6/2004 7:58	5/6/2004 7:58		
Deploy WHOI OBS 241	10.7139	-67.3963	9.4	-1035	43	5/6/2004 8:41	5/6/2004 8:41	0:43	
Deploy WHOI OBS 240	10.7985	-67.4038	9.4	-838	43	5/6/2004 9:24	5/6/2004 9:28	0:47	
Deploy WHOI OBS 239	10.8832	-67.4113	9.4	-825	43	5/6/2004 10:07	5/6/2004 10:09	0:41	
Deploy WHOI OBS 238	10.9679	-67.4188	9.4	-1104	43	5/6/2004 10:50	5/6/2004 10:47	0:38	
Deploy Scripps OBS 237	11.0525	-67.4263	9.4	-1395	60	5/6/2004 11:50	5/6/2004 11:44	0:57	
Deploy Scripps OBS 236	11.1372	-67.4338	9.4	-1697	60	5/6/2004 12:50	5/6/2004 13:00	1:16	
Deploy Scripps OBS 235	11.2219	-67.4414	9.4	-1805	60	5/6/2004 13:50	5/6/2004 14:18	1:18	
Deploy Scripps OBS 234	11.3065	-67.4489	9.4	-1887	60	5/6/2004 14:50	5/6/2004 15:10	0:52	
Deploy Scripps OBS 233	11.3912	-67.4564	9.4	-1877	60	5/6/2004 15:50	5/6/2004 16:19	1:09	
Deploy Scripps OBS 232	11.4758	-67.4639	9.4	-1925	60	5/6/2004 16:50	5/6/2004 17:26	1:07	
Deploy Scripps OBS 231	11.5605	-67.4715	9.4	-1776	60	5/6/2004 17:50	5/6/2004 18:22	0:56	
Deploy Scripps OBS 230	11.6452	-67.479	9.4	-1562	60	5/6/2004 18:50	5/6/2004 19:17	0:55	
Deploy Scripps OBS 229	11.7298	-67.4866	9.4	-966	60	5/6/2004 19:50	5/6/2004 20:13	0:56	
Deploy Scripps OBS 228	11.8145	-67.4941	9.4	-742	60	5/6/2004 20:50	5/6/2004 21:05	0:52	
Deploy Scripps OBS 227	11.8992	-67.5017	9.4	-709	60	5/6/2004 21:50	5/6/2004 21:51	0:46	
Deploy Scripps OBS 226	11.9838	-67.5093	9.4	-273	60	5/6/2004 22:50	5/6/2004 22:42	0:51	
Deploy WHOI OBS 225	12.0685	-67.5168	9.4	-288	43	5/6/2004 23:34	5/6/2004 23:22	0:40	
Deploy WHOI OBS 224	12.1531	-67.5244	9.4	-402	43	5/7/2004 0:17	5/7/2004 0:00	0:38	
Deploy WHOI OBS 223	12.2378	-67.532	9.4	-731	43	5/7/2004 1:00	5/7/2004 0:41	0:41	
Deploy WHOI OBS 222	12.3224	-67.5396	9.4	-1650	43	5/7/2004 1:43	5/7/2004 1:21	0:40	
Deploy WHOI OBS 221	12.4071	-67.5472	9.4	-2734	43	5/7/2004 2:26	5/7/2004 2:03	0:42	
Deploy WHOI OBS 220	12.4917	-67.5547	9.4	-4708	43	5/7/2004 3:09	5/7/2004 2:44	0:41	
Deploy WHOI OBS 219	12.5764	-67.5623	9.4	-4691	43	5/7/2004 3:52	5/7/2004 3:27	0:43	
Deploy WHOI OBS 218	12.661	-67.57	9.4	-4593	43	5/7/2004 4:35	5/7/2004 4:11	0:44	
									Mean Duration 0:59

Recover Scripps OBS 226	11.9838	-67.5093	9.4	-273	1.2	5/9/2004 13:49	5/9/2004 13:50	1:06	0:03
Recover WHOI OBS 225	12.0685	-67.5168	9.4	-288	1.4	5/9/2004 14:49	5/9/2004 14:49	0:59	0:03
Recover WHOI OBS 224	12.1531	-67.5244	9.4	-402	1.4	5/9/2004 16:13	5/9/2004 16:28	1:39	0:07
Recover WHOI OBS 223	12.2378	-67.532	9.4	-731	1.5	5/9/2004 17:43	5/9/2004 19:03	2:35	0:06
Recover WHOI OBS 222	12.3224	-67.5396	9.4	-1650	1.7	5/9/2004 19:25	5/9/2004 20:47	1:44	0:07
Recover WHOI OBS 221	12.4071	-67.5472	9.4	-2734	2.0	5/9/2004 21:24	5/9/2004 22:47	2:00	0:07
Recover WHOI OBS 220	12.4917	-67.5547	9.4	-4708	2.4	5/9/2004 23:50	5/10/2004 0:47	2:00	0:05
Recover WHOI OBS 219	12.5764	-67.5623	9.4	-4691	2.4	5/10/2004 2:16	5/10/2004 3:18	2:31	0:03
Recover WHOI OBS 218	12.661	-67.57	9.4	-4593	2.4	5/10/2004 4:41	5/10/2004 8:47	5:29	0:10
Recover WHOI OBS 217	12.7457	-67.5776	9.4	-4353	2.4	5/10/2004 7:02	5/10/2004 10:49	2:02	0:06
Recover WHOI OBS 216	12.8303	-67.5852	9.4	-3629	2.2	5/10/2004 9:13	5/10/2004 12:43	1:54	0:05
Recover WHOI OBS 215	12.915	-67.5928	9.4	-3285	2.1	5/10/2004 11:19	5/10/2004 14:23	1:40	0:03
Recover WHOI OBS 214	12.9996	-67.6004	9.4	-3731	2.2	5/10/2004 13:31	5/10/2004 16:13	1:50	0:06
Recover WHOI OBS 213	13.0843	-67.608	9.4	-3919	2.3	5/10/2004 15:46	5/10/2004 18:07	1:54	0:05
Recover WHOI OBS 212	13.1689	-67.6157	9.4	-4027	2.3	5/10/2004 18:03	5/10/2004 20:01	1:54	0:07
Recover WHOI OBS 211	13.2536	-67.6233	9.4	-4505	2.4	5/10/2004 20:26	5/10/2004 21:57	1:56	0:05
Recover WHOI OBS 210	13.3382	-67.6309	9.4	-5023	2.5	5/10/2004 22:57	5/11/2004 0:45	2:48	0:03
Recover WHOI OBS 209	13.4229	-67.6386	9.4	-4962	2.5	5/11/2004 1:27	5/11/2004 2:56	2:11	0:04
Recover WHOI OBS 208	13.5075	-67.6463	9.4	-5046	2.5	5/11/2004 3:58	5/11/2004 5:22	2:26	0:18
Recover WHOI OBS 207	13.5922	-67.6539	9.4	-5049	2.5	5/11/2004 6:29	5/11/2004 7:59	2:37	0:08
Recover WHOI OBS 206	13.6768	-67.6616	9.4	-5050	2.5	5/11/2004 9:00	5/11/2004 10:30	2:31	0:09
Recover WHOI OBS 205	13.7614	-67.6693	9.4	-5057	2.5	5/11/2004 11:32	5/11/2004 13:21	2:51	0:05
Recover WHOI OBS 204	13.8461	-67.6769	9.4	-5059	2.5	5/11/2004 14:03	5/11/2004 15:27	2:06	0:04
Recover WHOI OBS 203	13.9307	-67.6846	9.4	-5063	2.5	5/11/2004 16:34	5/11/2004 17:40	2:13	0:05
Recover WHOI OBS 202	14.0154	-67.6923	9.4	-5061	2.5	5/11/2004 19:06	5/11/2004 19:38	1:58	0:06
Recover WHOI OBS 201	14.1	-67.7	9.4	-5182	2.6	5/11/2004 21:39	5/11/2004 21:43	2:05	0:05
									0:05:56

Table 9. Profiles 65W and 64W – Detailed Deployment and Recovery Times; Predicted Parameters.

Assumptions:									
Transit Speed uc (knots):	10.0								
Transit Speed dc (knots):	11.5								
Dep Time, WHOI (min):	8.0								
Dep Time, Scripps (min):	17.0								
WHOI rise time rate (m/min)	70.0								
Scripps rise time rate (m/min)	45.0								
Rec Time, WHOI (min)	25.0								
Rec Time, Scripps (min)	25.0								
Activity	Latitude	Longitude	Distance (km)	Depth (m)	Duration (min)	Predicted Completion Time	Actual Completion Time	Actual Duration	
Deploy Scripps OBS 501	12.0032	-65.1161		-2235		5/12/2004 19:30	5/12/2004 19:30		
Deploy Scripps OBS 502	11.7643	-65.0504	27.4	-2022	105.7	5/12/2004 21:15	5/12/2004 21:18	1:48	
Deploy Scripps OBS 503	11.5255	-64.9848	27.4	-2236	105.7	5/12/2004 23:01	5/12/2004 22:58	1:40	
Deploy Scripps OBS 504	11.2866	-64.9193	27.4	-1012	105.7	5/13/2004 0:47	5/13/2004 0:39	1:41	
Deploy Scripps OBS 505	11.0478	-64.854	27.4	-160	105.6	5/13/2004 2:32	5/13/2004 2:18	1:39	Mean
Deploy Scripps OBS 506	10.8089	-64.7887	27.4	-352	105.7	5/13/2004 4:18	5/13/2004 3:56	1:38	Duration
Deploy Scripps OBS 507	10.57	-64.7236	27.4	-1356	105.7	5/13/2004 6:04	5/13/2004 6:04	2:08	1:45
OBS Repairs / Swim Call									
Deploy WHOI OBS 335	10.70987	-63.69775		-101	8.0	5/13/2004 20:33	5/13/2004 20:33		
Deploy WHOI OBS 334	10.78755	-63.7153	8.8	-50	32.8	5/13/2004 21:05	5/13/2004 21:13	0:40	
Deploy WHOI OBS 333	10.86522	-63.73286	8.8	-89	32.8	5/13/2004 21:38	5/13/2004 21:54	0:41	
Deploy WHOI OBS 332	10.9429	-63.75043	8.8	-20	32.8	5/13/2004 22:11	5/13/2004 22:34	0:40	
Deploy WHOI OBS 331	11.02057	-63.76801	8.8	-14	32.8	5/13/2004 22:44	5/13/2004 23:16	0:42	
Deploy WHOI OBS 330	11.09823	-63.7856	8.8	-20	32.8	5/13/2004 23:17	5/13/2004 23:52	0:36	
Deploy WHOI OBS 329	11.17591	-63.80319	8.8	-167	32.8	5/13/2004 23:49	5/14/2004 0:21	0:29	
Deploy WHOI OBS 328	11.25357	-63.8208	8.8	-65	32.8	5/14/2004 0:22	5/14/2004 0:48	0:27	
Deploy WHOI OBS 327	11.33123	-63.83842	8.8	-28	32.8	5/14/2004 0:55	5/14/2004 1:32	0:44	
Deploy WHOI OBS 326	11.4089	-63.85604	8.8	-40	32.8	5/14/2004 1:28	5/14/2004 2:00	0:28	
Deploy WHOI OBS 325	11.48657	-63.87368	8.8	-64	32.8	5/14/2004 2:01	5/14/2004 2:28	0:28	
Deploy WHOI OBS 324	11.56422	-63.89133	8.8	-109	32.8	5/14/2004 2:33	5/14/2004 2:57	0:29	
Deploy WHOI OBS 323	11.64189	-63.90899	8.8	-622	32.8	5/14/2004 3:06	5/14/2004 3:26	0:29	
Deploy WHOI OBS 322	11.71955	-63.92664	8.8	-592	32.8	5/14/2004 3:39	5/14/2004 4:00	0:34	Mean
Deploy WHOI OBS 321	11.79719	-63.94432	8.8	-454	32.8	5/14/2004 4:12	5/14/2004 4:31	0:31	Duration
Deploy WHOI OBS 320	11.87486	-63.96201	8.8	-360	32.8	5/14/2004 4:45	5/14/2004 5:03	0:32	0:33
Deploy Scripps OBS 319	11.95251	-63.9797	8.8	-293	32.8	5/14/2004 5:52	5/14/2004 5:52	0:49	

Deploy Scripps OBS 318	12.03016	-63.99741	8.8	-1096	32.8	5/14/2004 6:33	5/14/2004 6:53	1:01	Mean Duration
Deploy Scripps OBS 317	12.10781	-64.01512	8.8	-2123	32.8	5/14/2004 7:15	5/14/2004 7:37	0:44	
Deploy Scripps OBS 316	12.18546	-64.03284	8.8	-2948	32.8	5/14/2004 7:57	5/14/2004 8:22	0:45	0:49
Deploy Scripps OBS 315	12.26311	-64.05058	8.8	-3326	32.8	5/14/2004 8:39	5/14/2004 9:10	0:48	
Deploy WHOI OBS 314	12.34076	-64.06833	8.8	-3453	32.8	5/14/2004 9:47	5/14/2004 9:47	0:37	
Deploy WHOI OBS 313	12.4184	-64.08609	8.8	-3514	32.8	5/14/2004 10:19	5/14/2004 10:18	0:31	
Deploy WHOI OBS 312	12.49604	-64.10385	8.8	-3412	32.8	5/14/2004 10:52	5/14/2004 10:53	0:35	
Deploy WHOI OBS 311	12.57368	-64.12163	8.8	-3266	32.8	5/14/2004 11:25	5/14/2004 11:26	0:33	
Deploy WHOI OBS 310	12.65132	-64.13942	8.8	-3045	32.8	5/14/2004 11:58	5/14/2004 12:00	0:34	
Deploy WHOI OBS 309	12.72896	-64.15721	8.8	-3017	32.8	5/14/2004 12:31	5/14/2004 12:38	0:38	
Deploy WHOI OBS 308	12.8066	-64.17502	8.8	-3033	32.8	5/14/2004 13:03	5/14/2004 13:11	0:33	
Deploy WHOI OBS 307	12.88423	-64.19284	8.8	-3019	32.8	5/14/2004 13:36	5/14/2004 13:48	0:37	
Deploy WHOI OBS 306	12.96186	-64.21067	8.8	-3134	32.8	5/14/2004 14:09	5/14/2004 14:21	0:33	
Deploy WHOI OBS 305	13.0395	-64.22852	8.8	-3218	32.8	5/14/2004 14:42	5/14/2004 14:53	0:32	
Deploy WHOI OBS 304	13.11712	-64.24637	8.8	-3279	32.8	5/14/2004 15:15	5/14/2004 15:24	0:31	
Deploy WHOI OBS 303	13.19475	-64.26424	8.8	-3242	32.8	5/14/2004 15:47	5/14/2004 15:52	0:28	
Deploy WHOI OBS 302	13.27238	-64.28211	8.8	-3211	32.8	5/14/2004 16:20	5/14/2004 16:25	0:33	
Deploy WHOI OBS 301	13.35	-64.3	8.8	-3233	32.8	5/14/2004 16:53	5/14/2004 16:57	0:32	
Fueling in Trinidad									
					<u>Duration</u> (hr)				<u>Visual</u> <u>To Deck</u>
Recover Scripps OBS 501	12.0032	-65.1161	0.0	-2235		5/19/2004 11:11	5/19/2004 11:11		0:05
Recover Scripps OBS 502	11.7643	-65.0504	27.4	-2022	2.6	5/19/2004 13:49	5/19/2004 13:34	2:23	0:04
Recover Scripps OBS 503	11.5255	-64.9848	27.4	-2236	2.7	5/19/2004 16:32	5/19/2004 16:30	2:56	0:06
Recover Scripps OBS 504	11.2866	-64.9193	27.4	-1012	2.3	5/19/2004 18:49	5/19/2004 18:44	2:14	0:06
Recover Scripps OBS 505	11.0478	-64.854	27.4	-160	2.0	5/19/2004 20:46	5/19/2004 20:32	1:48	0:04
Recover Scripps OBS 506	10.8089	-64.7887	27.4	-352	2.0	5/19/2004 22:47	5/19/2004 22:14	1:42	0:03
Recover Scripps OBS 507	10.57	-64.7236	27.4	-1356	2.4	5/20/2004 1:11	5/20/2004 1:09	2:55	0:03
Transit to OBS 335									
Recover WHOI OBS 335	10.7099	-63.6977	0.0	-101		5/21/2004 11:36	5/21/2004 11:36		0:06
Recover WHOI OBS 334	10.7875	-63.7153	8.8	-50	0.8	5/21/2004 12:26	5/21/2004 12:33	0:57	0:05
Recover WHOI OBS 333	10.8652	-63.7329	8.8	-89	0.9	5/21/2004 13:17	5/21/2004 13:18	0:45	0:02
Recover WHOI OBS 332	10.9429	-63.7504	8.8	-20	0.8	5/21/2004 14:07	5/21/2004 13:55	0:37	0:02
Recover WHOI OBS 331	11.0206	-63.768	8.8	-14	0.8	5/21/2004 14:57	5/21/2004 14:39	0:44	0:04
Recover WHOI OBS 330	11.0982	-63.7856	8.8	-20	0.8	5/21/2004 15:47	5/21/2004 15:14	0:35	0:02
Recover WHOI OBS 329	11.1759	-63.8032	8.8	-167	0.9	5/21/2004 16:39	5/21/2004 16:01	0:47	0:10
Recover WHOI OBS 328	11.2536	-63.8208	8.8	-65	0.8	5/21/2004 17:30	5/21/2004 16:42	0:41	0:04
Recover WHOI OBS 327	11.3312	-63.8384	8.8	-28	0.8	5/21/2004 18:20	5/21/2004 17:22	0:40	0:04

Recover WHOI OBS 326	11.4089	-63.856	8.8	-40	0.8	5/21/2004 19:11	5/21/2004 18:06	0:44	0:05
Recover WHOI OBS 325	11.4866	-63.8737	8.8	-64	0.8	5/21/2004 20:01	5/21/2004 18:47	0:41	0:04
Recover WHOI OBS 324	11.5642	-63.8913	8.8	-109	0.9	5/21/2004 20:53	5/21/2004 19:42	0:55	0:10
Recover WHOI OBS 323	11.6419	-63.909	8.8	-622	1.0	5/21/2004 21:52	5/21/2004 20:58	1:16	0:08
Recover WHOI OBS 322	11.7195	-63.9266	8.8	-592	1.0	5/21/2004 22:50	5/21/2004 21:57	0:59	0:05
Recover WHOI OBS 321	11.7972	-63.9443	8.8	-454	0.9	5/21/2004 23:46	5/21/2004 22:57	1:00	0:07
Recover WHOI OBS 320	11.8749	-63.962	8.8	-360	0.9	5/22/2004 0:41	5/21/2004 23:47	0:50	0:06
Recover Scripps OBS 319	11.9525	-63.9797	8.8	-293	0.9	5/22/2004 0:34	5/22/2004 0:34	0:47	0:08
Recover Scripps OBS 318	12.0302	-63.9974	8.8	-1096	1.2	5/22/2004 1:48	5/22/2004 1:35	1:01	0:07
Recover Scripps OBS 317	12.1078	-64.0151	8.8	-2123	1.6	5/22/2004 3:25	5/22/2004 3:02	1:27	0:06
Recover Scripps OBS 316	12.1855	-64.0328	8.8	-2948	1.9	5/22/2004 5:20	5/22/2004 4:52	1:50	0:07
Recover Scripps OBS 315	12.2631	-64.0506	8.8	-3326	2.1	Not Recovered	Not Recovered		
Recover WHOI OBS 314	12.3408	-64.0683	8.8	-3453	1.7	5/22/2004 8:34	5/22/2004 8:34		0:08
Recover WHOI OBS 313	12.4184	-64.0861	8.8	-3514	1.7	5/22/2004 10:14	5/22/2004 10:09	1:35	0:05
Recover WHOI OBS 312	12.496	-64.1038	8.8	-3412	1.6	5/22/2004 11:52	5/22/2004 13:38	3:29	0:08
Recover WHOI OBS 311	12.5737	-64.1216	8.8	-3266	1.6	5/22/2004 13:29	5/22/2004 15:08	1:30	0:06
Recover WHOI OBS 310	12.6513	-64.1394	8.8	-3045	1.6	5/22/2004 15:02	5/22/2004 16:48	1:40	0:02
Recover WHOI OBS 309	12.729	-64.1572	8.8	-3017	1.5	Not Recovered	Not Recovered		
Recover WHOI OBS 308	12.8066	-64.175	8.8	-3033	1.6	5/23/2004 0:21	5/23/2004 0:21		0:07
Recover WHOI OBS 307	12.8842	-64.1928	8.8	-3019	1.5	5/23/2004 1:53	5/23/2004 1:53	1:32	0:13
Recover WHOI OBS 306	12.9619	-64.2107	8.8	-3134	1.6	5/23/2004 3:28	5/23/2004 3:45	1:52	0:10
Recover WHOI OBS 305	13.0395	-64.2285	8.8	-3218	1.6	5/23/2004 5:04	5/23/2004 5:11	1:26	0:06
Recover WHOI OBS 304	13.1171	-64.2464	8.8	-3279	1.6	5/23/2004 6:40	5/23/2004 6:52	1:41	0:13
Recover WHOI OBS 303	13.1948	-64.2642	8.8	-3242	1.6	5/23/2004 8:17	5/23/2004 8:23	1:31	0:07
Recover WHOI OBS 302	13.2724	-64.2821	8.8	-3211	1.6	5/23/2004 9:52	5/23/2004 9:52	1:29	0:05
Recover WHOI OBS 301	13.35	-64.3	8.8	-3233	1.6	5/23/2004 11:28	5/23/2004 11:23	1:31	0:04
									0:05:55

Table 10. Profile TRIN – Detailed Deployment and Recovery Times; Predicted Parameters.

Assumptions:									
Transit Speed uc (knots):	7.5								
Transit Speed dc (knots):	11.5								
Dep Time, WHOI (min):	8.0								
Dep Time, Scripps (min):	8.0								
WHOI rise time rate (m/min)	70.0								
Scripps rise time rate (m/min)	45.0								
Rec Time, WHOI (min)	31.0								
Rec Time, Scripps (min)	15.0								
Activity	Latitude	Longitude	Distance (km)	Depth (m)	Duration (min)	Predicted Completion Time	Actual Completion Time	Actual Duration	
Deploy WHOI OBS 401	13.00210	-64.06800	0.0	-2962	8.0	5/23/2004 14:14	5/23/2004 14:14		
Deploy WHOI OBS 402	12.92610	-63.94440	15.8	-2667	76.4	5/23/2004 15:30	5/23/2004 15:21	1:07	
Deploy WHOI OBS 403	12.85010	-63.82090	15.8	-2058	76.3	5/23/2004 16:46	5/23/2004 16:41	1:20	
Deploy WHOI OBS 404	12.77410	-63.69750	15.8	-1772	76.3	5/23/2004 18:03	5/23/2004 17:46	1:05	
Deploy WHOI OBS 405	12.69800	-63.57420	15.8	-974	76.3	5/23/2004 19:19	5/23/2004 18:50	1:04	Mean
Deploy WHOI OBS 406	12.62180	-63.45090	15.8	-1043	76.4	5/23/2004 20:35	5/23/2004 19:59	1:09	Duration
Deploy WHOI OBS 407	12.54550	-63.32770	15.8	-2009	76.4	5/23/2004 21:52	5/23/2004 21:07	1:08	1:11
Deploy Scripps OBS 408	12.47750	-63.21790	14.1	-2897	68.9	5/23/2004 23:01	5/23/2004 22:11	1:04	
Deploy Scripps OBS 409	12.40940	-63.10810	14.1	-2854	69.0	5/24/2004 0:10	5/23/2004 23:10	0:59	
Deploy Scripps OBS 410	12.34120	-62.99840	14.1	-2962	69.0	5/24/2004 1:18	5/24/2004 0:07	0:57	
Deploy Scripps OBS 411	12.27300	-62.88870	14.1	-2947	69.0	5/24/2004 2:27	5/24/2004 1:08	1:01	
Deploy Scripps OBS 412	12.20480	-62.77910	14.1	-2913	69.0	5/24/2004 3:36	5/24/2004 2:04	0:56	Mean
Deploy Scripps OBS 413	12.13650	-62.66950	14.1	-2834	69.0	5/24/2004 4:45	5/24/2004 3:04	1:00	Duration
Deploy Scripps OBS 414	12.06820	-62.56000	14.1	-2488	69.0	5/24/2004 5:54	5/24/2004 4:03	0:59	1:06
Deploy WHOI OBS 415	11.99990	-62.45060	14.1	-2211	68.9	5/24/2004 7:03	5/24/2004 5:04	1:01	
Deploy WHOI OBS 416	11.86300	-62.23190	28.2	-1516	129.9	5/24/2004 9:13	5/24/2004 7:16	2:12	
Deploy WHOI OBS 417	11.81160	-62.14980	10.6	-440	53.8	5/24/2004 10:07	5/24/2004 8:05	0:49	
Deploy WHOI OBS 418	11.76010	-62.06780	10.6	-335	53.8	5/24/2004 11:01	5/24/2004 8:52	0:47	
Deploy WHOI OBS 419	11.70870	-61.98590	10.6	-693	53.7	5/24/2004 11:55	5/24/2004 9:42	0:50	
Deploy WHOI OBS 420	11.65740	-61.90420	10.6	-741	53.6	5/24/2004 12:48	5/24/2004 10:32	0:50	
Deploy WHOI OBS 421	11.58880	-61.79510	14.1	-558	69.0	5/24/2004 13:57	5/24/2004 11:45	1:13	
Deploy WHOI OBS 422	11.52010	-61.68600	14.1	-194	69.0	5/24/2004 15:06	5/24/2004 12:58	1:13	
Deploy WHOI OBS 423	11.45140	-61.57700	14.1	-183	69.0	5/24/2004 16:15	5/24/2004 14:09	1:11	
Deploy WHOI OBS 424	11.38270	-61.46810	14.1	-188	68.9	5/24/2004 17:24	5/24/2004 15:30	1:21	
Deploy WHOI OBS 425	11.31390	-61.35920	14.1	-173	69.0	5/24/2004 18:33	5/24/2004 16:51	1:21	

Deploy WHOI OBS 426	11.24510	-61.25030	14.1	-152	69.0	5/24/2004 19:42	5/24/2004 18:04	1:13	
Deploy WHOI OBS 427	11.17620	-61.14150	14.1	-118	69.0	5/24/2004 20:51	5/24/2004 19:22	1:18	
Deploy WHOI OBS 428	11.10730	-61.03280	14.1	-84	68.9	5/24/2004 22:00	5/24/2004 20:38	1:16	
Deploy WHOI OBS 429	11.03840	-60.92410	14.1	-91	69.0	5/24/2004 23:09	5/24/2004 21:48	1:10	
Deploy WHOI OBS 430	10.96940	-60.81540	14.1	-67	69.0	5/25/2004 0:18	5/24/2004 23:07	1:19	
Deploy WHOI OBS 431	10.90040	-60.70680	14.1	-122	69.0	5/25/2004 1:27	5/25/2004 0:12	1:05	
Deploy WHOI OBS 432	10.83130	-60.59830	14.1	-82	69.0	5/25/2004 2:36	5/25/2004 1:17	1:05	
Deploy WHOI OBS 433	10.76220	-60.48980	14.1	-68	69.0	5/25/2004 3:45	5/25/2004 2:28	1:11	
Deploy WHOI OBS 434	10.69310	-60.38130	14.1	-77	69.0	5/25/2004 4:54	5/25/2004 3:47	1:19	
Deploy WHOI OBS 435	10.62390	-60.27300	14.1	-185	68.9	5/25/2004 6:03	5/25/2004 5:35	1:48	
Deploy WHOI OBS 436	10.55470	-60.16460	14.1	-513	69.0	5/25/2004 7:12	5/25/2004 6:45	1:10	
Deploy Scripps OBS 437	10.48550	-60.05630	14.1	-694	69.0	5/25/2004 8:21	5/25/2004 8:00	1:15	
Deploy Scripps OBS 438	10.41620	-59.94800	14.1	-806	69.0	5/25/2004 9:30	5/25/2004 9:12	1:12	
Deploy Scripps OBS 439	10.34680	-59.83980	14.1	-864	69.0	5/25/2004 10:39	5/25/2004 10:32	1:20	
Deploy Scripps OBS 440	10.27750	-59.73170	14.1	-1046	68.9	5/25/2004 11:48	5/25/2004 12:00	1:28	
					<u>Duration</u>				<u>Visual</u>
					<u>(hr)</u>				<u>To Deck</u>
Recover Scripps OBS 440	10.27750	-59.73170	0.0	-1046	0.6	5/29/2004 8:40	5/29/2004 8:40		0:07
Recover Scripps OBS 439	10.34680	-59.83980	14.1	-864	1.2	5/29/2004 9:53	5/29/2004 9:52	1:12	0:04
Recover Scripps OBS 438	10.41620	-59.94800	14.1	-806	1.2	5/29/2004 11:06	5/29/2004 10:57	1:05	0:05
Recover Scripps OBS 437	10.48550	-60.05630	14.1	-694	1.2	5/29/2004 12:16	5/29/2004 12:04	1:07	0:02
Recover WHOI OBS 436	10.55470	-60.16460	14.1	-513	1.3	5/29/2004 13:34	5/29/2004 13:08	1:04	0:06
Recover WHOI OBS 435	10.62390	-60.27300	14.1	-185	1.2	5/29/2004 14:48	5/29/2004 14:14	1:06	0:08
Recover WHOI OBS 434	10.69310	-60.38130	14.1	-77	1.2	5/29/2004 16:00	5/29/2004 15:11	0:57	0:05
Recover WHOI OBS 433	10.76220	-60.48980	14.1	-68	1.2	5/29/2004 17:11	5/29/2004 16:08	0:57	0:06
Recover WHOI OBS 432	10.83130	-60.59830	14.1	-82	1.2	5/29/2004 18:23	5/29/2004 17:03	0:55	0:03
Recover WHOI OBS 431	10.90040	-60.70680	14.1	-122	1.2	5/29/2004 19:36	5/29/2004 18:03	1:00	0:04
Recover WHOI OBS 430	10.96940	-60.81540	14.1	-67	1.2	5/29/2004 20:48	5/29/2004 18:59	0:56	0:05
Recover WHOI OBS 429	11.03840	-60.92410	14.1	-91	1.2	5/29/2004 22:00	5/29/2004 19:54	0:55	0:05
Recover WHOI OBS 428	11.10730	-61.03280	14.1	-84	1.2	5/29/2004 23:12	5/29/2004 20:45	0:51	0:03
Recover WHOI OBS 427	11.17620	-61.14150	14.1	-118	1.2	5/30/2004 0:24	5/29/2004 21:40	0:55	0:04
Recover WHOI OBS 426	11.24510	-61.25030	14.1	-152	1.2	5/30/2004 1:37	5/29/2004 22:45	1:05	0:03
Recover WHOI OBS 425	11.31390	-61.35920	14.1	-173	1.2	5/30/2004 2:50	5/30/2004 0:13	1:28	0:09
Recover WHOI OBS 424	11.38270	-61.46810	14.1	-188	1.2	5/30/2004 4:04	5/30/2004 1:58	1:45	0:02
Recover WHOI OBS 423	11.45140	-61.57700	14.1	-183	1.2	5/30/2004 5:17	5/30/2004 3:38	1:40	0:04
Recover WHOI OBS 422	11.52010	-61.68600	14.1	-194	1.2	5/30/2004 6:31	5/30/2004 5:15	1:37	0:07
Recover WHOI OBS 421	11.58880	-61.79510	14.1	-558	1.3	5/30/2004 7:49	5/30/2004 6:58	1:43	0:05

Recover WHOI OBS 420	11.65740	-61.90420	14.1	-741	1.4	5/30/2004 9:11	5/30/2004 8:52	1:54	0:05
Recover WHOI OBS 419	11.70870	-61.98590	10.6	-693	1.2	5/30/2004 10:21	5/30/2004 9:54	1:02	0:04
Recover WHOI OBS 418	11.76010	-62.06780	10.6	-335	1.1	5/30/2004 11:27	5/30/2004 10:52	0:58	0:06
Recover WHOI OBS 417	11.81160	-62.14980	10.6	-440	1.1	5/30/2004 12:34	5/30/2004 11:47	0:55	0:03
Recover WHOI OBS 416	11.86300	-62.23190	10.6	-1516	1.4	5/30/2004 13:57	5/30/2004 13:06	1:19	0:04
Recover WHOI OBS 415	11.99990	-62.45060	28.2	-2211	2.4	5/30/2004 16:19	5/30/2004 16:12	3:06	0:07
Recover Scripps OBS 414	12.06820	-62.56000	14.1	-2488	1.8	5/30/2004 18:09	5/30/2004 18:19	2:07	0:07
Recover Scripps OBS 413	12.13650	-62.66950	14.1	-2834	2.0	5/30/2004 20:06	5/30/2004 20:19	2:00	0:04
Recover Scripps OBS 412	12.20480	-62.77910	14.1	-2913	2.0	5/30/2004 22:06	5/30/2004 22:34	2:15	0:06
Recover Scripps OBS 411	12.27300	-62.88870	14.1	-2947	2.0	5/31/2004 0:06	5/31/2004 0:31	1:57	0:03
Recover Scripps OBS 410	12.34120	-62.99840	14.1	-2962	2.0	5/31/2004 2:07	5/31/2004 2:33	2:02	0:08
Recover Scripps OBS 409	12.40940	-63.10810	14.1	-2854	2.0	5/31/2004 4:05	5/31/2004 4:32	1:59	0:10
Recover Scripps OBS 408	12.47750	-63.21790	14.1	-2897	2.0	5/31/2004 6:04	5/31/2004 6:03	1:31	0:16
Recover WHOI OBS 407	12.54550	-63.32770	14.1	-2009	1.7	5/31/2004 7:44	5/31/2004 8:12	2:09	0:09
Recover WHOI OBS 406	12.62180	-63.45090	15.8	-1043	1.5	5/31/2004 9:14	5/31/2004 9:34	1:22	0:06
Recover WHOI OBS 405	12.69800	-63.57420	15.8	-974	1.5	5/31/2004 10:44	5/31/2004 10:48	1:14	0:03
Recover WHOI OBS 404	12.77410	-63.69750	15.8	-1772	1.7	5/31/2004 12:24	5/31/2004 12:26	1:38	0:03
Recover WHOI OBS 403	12.85010	-63.82090	15.8	-2058	1.7	5/31/2004 14:09	5/31/2004 13:55	1:29	0:04
Attempt to Release OBS 309									
Recover WHOI OBS 402	12.92610	-63.94440	15.8	-2667	1.9	5/31/2004 16:03	5/31/2004 18:59		0:05
Recover WHOI OBS 401	13.00210	-64.06800	15.8	-2962	2.0	5/31/2004 18:01	5/31/2004 20:46	1:47	0:12
									0:05:33

Preliminary Velocity Model, Profile 70W

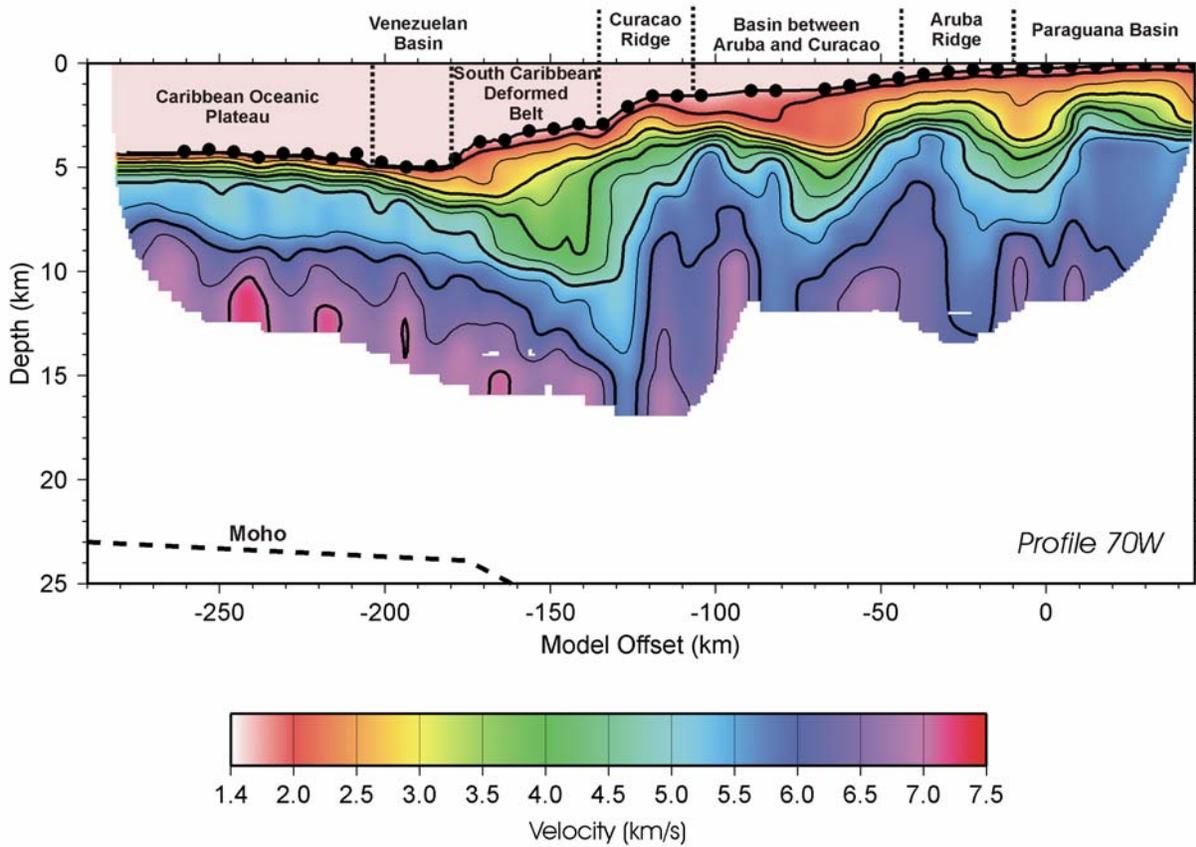


Figure 6. Preliminary velocity model for Profile 70W

Profile 70W is a north-south transect located between the islands of Aruba and Curacao. The northern end of the profile is located over the Caribbean oceanic plateau; there the Moho is located at ~23 km depth. A preliminary velocity model was constructed using a tomographic inversion of first arrival times, and is displayed in Figure 6. *PmP* arrivals were used to estimate a crustal thickness of ~18 km.

Preliminary Velocity Model, Profile 67W

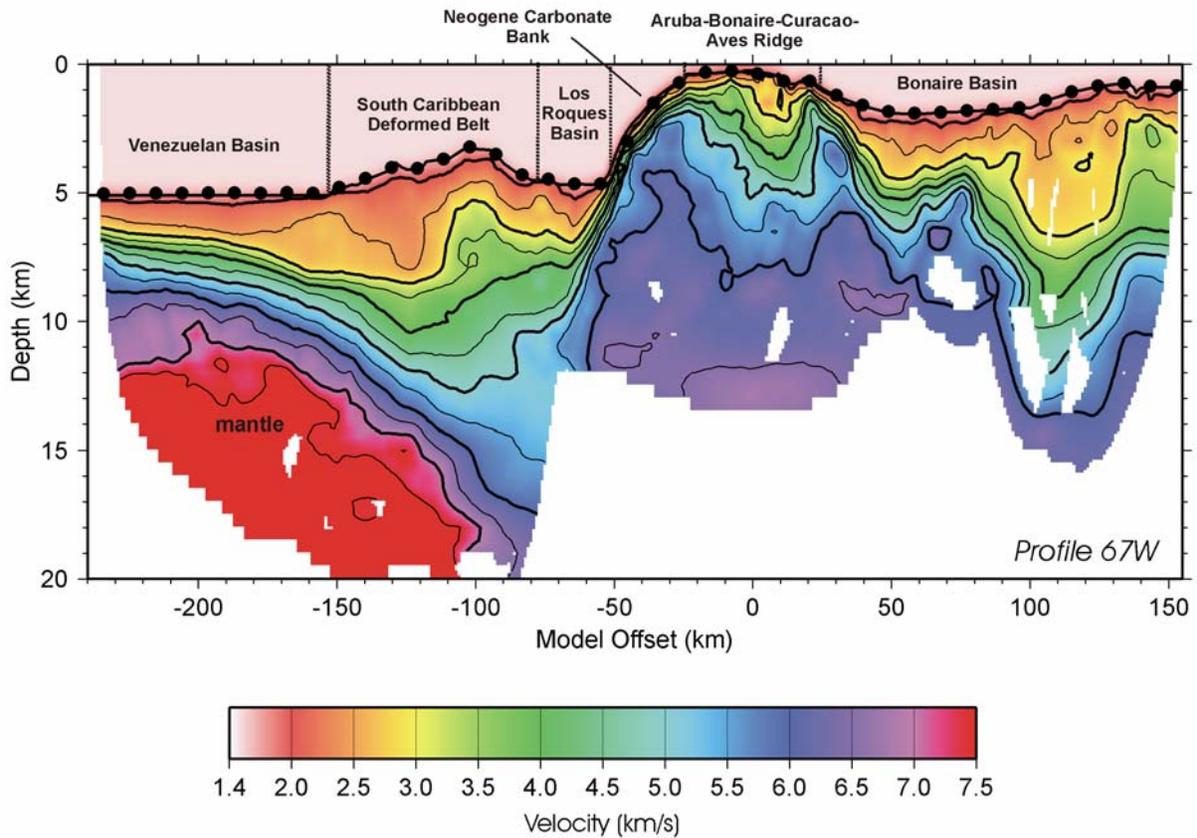


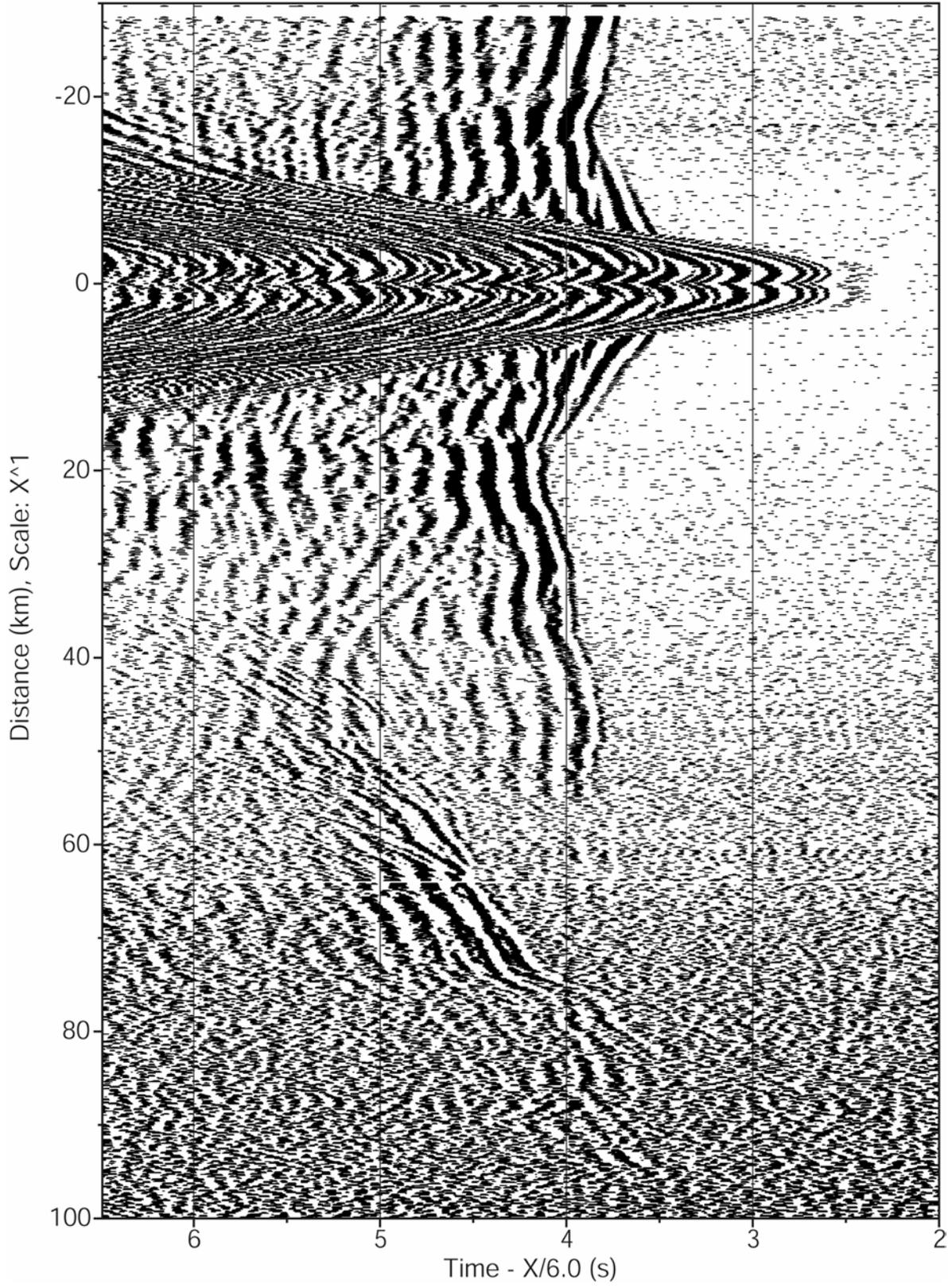
Figure 7. Preliminary velocity model for Profile 67W.

Profile 67W is a north-south transect that passes near the Aves Islands of Venezuela. A tomographic inversion of first arrival times was used to produce a preliminary velocity model which is displayed in Figure 7. In contrast to Profile 70W, no thickened Caribbean plateau crust is observed on the northern end of the profile.

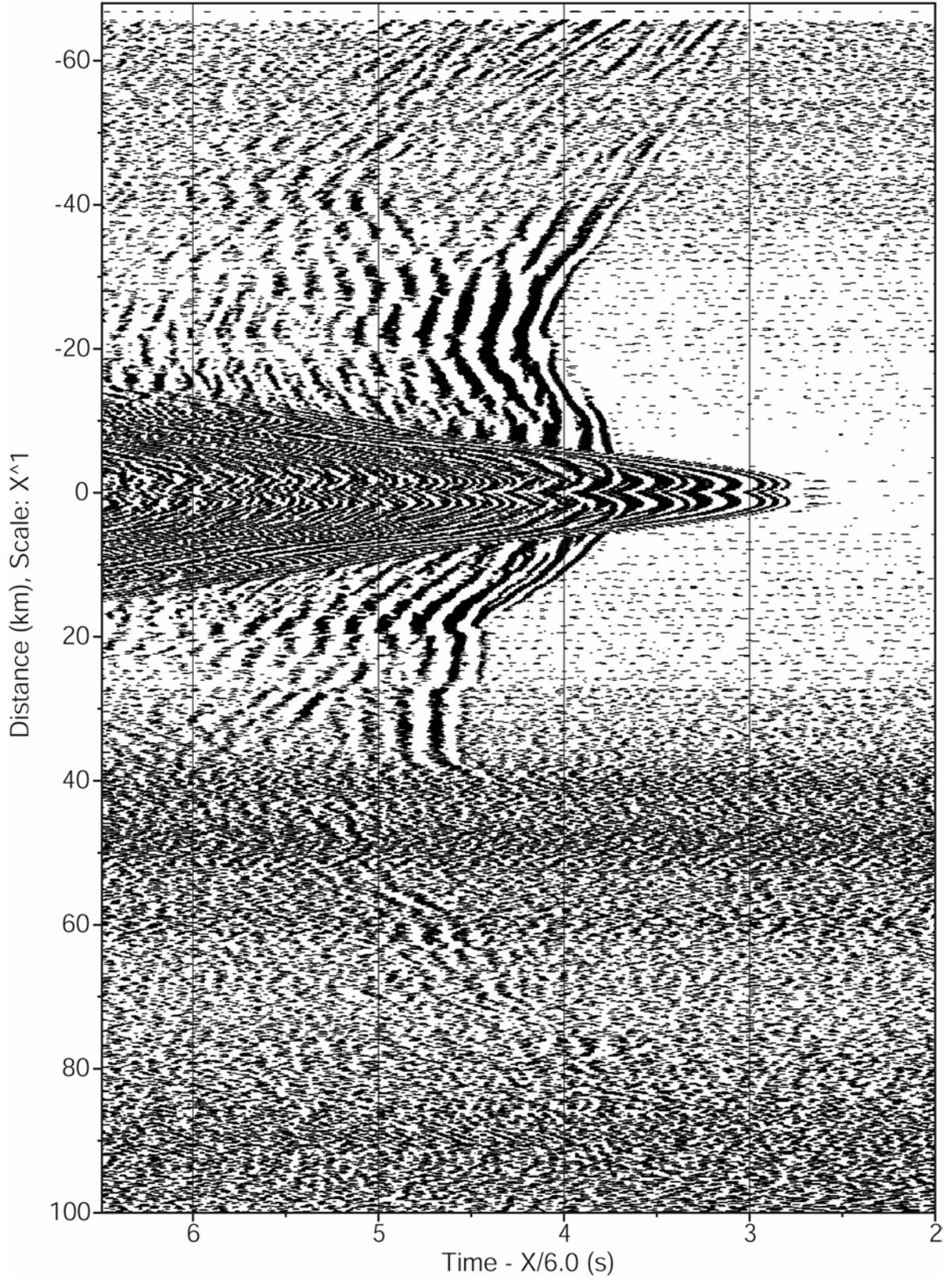
Representative Record Sections

Sample OBS record sections are displayed for ~20% of the instruments. The 150-m shot spacing is displayed for all profiles, except for the northern end of Profile 65W (e.g. OBS 501) where only 50-m shot spacing data is available. Note that no near offset data are available for some Profile 64W instruments (e.g. OBS 330) because the Ewing track was east of Los Frailes (Figure 1). Overall data quality for both WHOI D2 and Scripps LC2000 instruments is excellent.

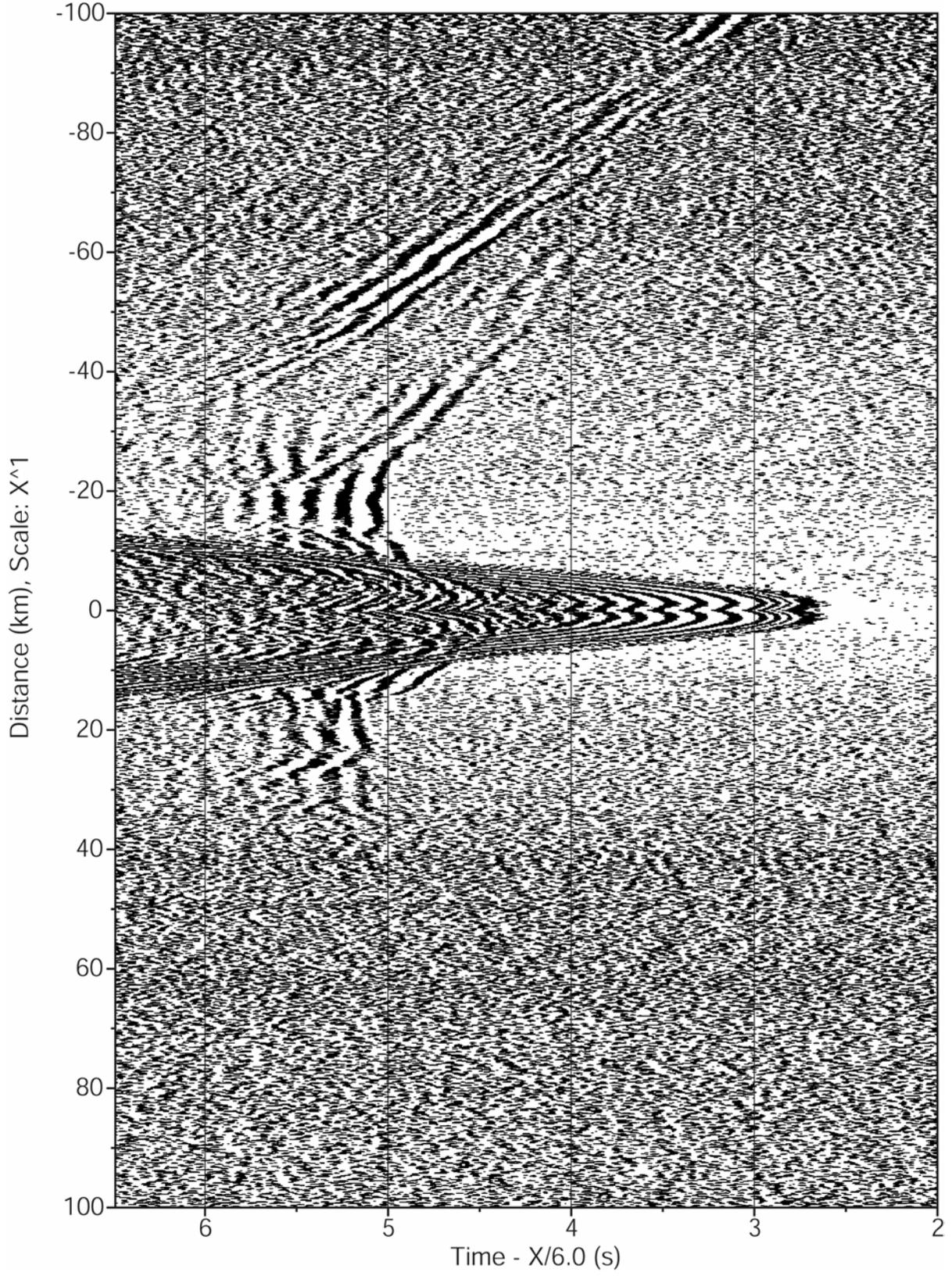
- File obs105_70w_150m.segy.f.v



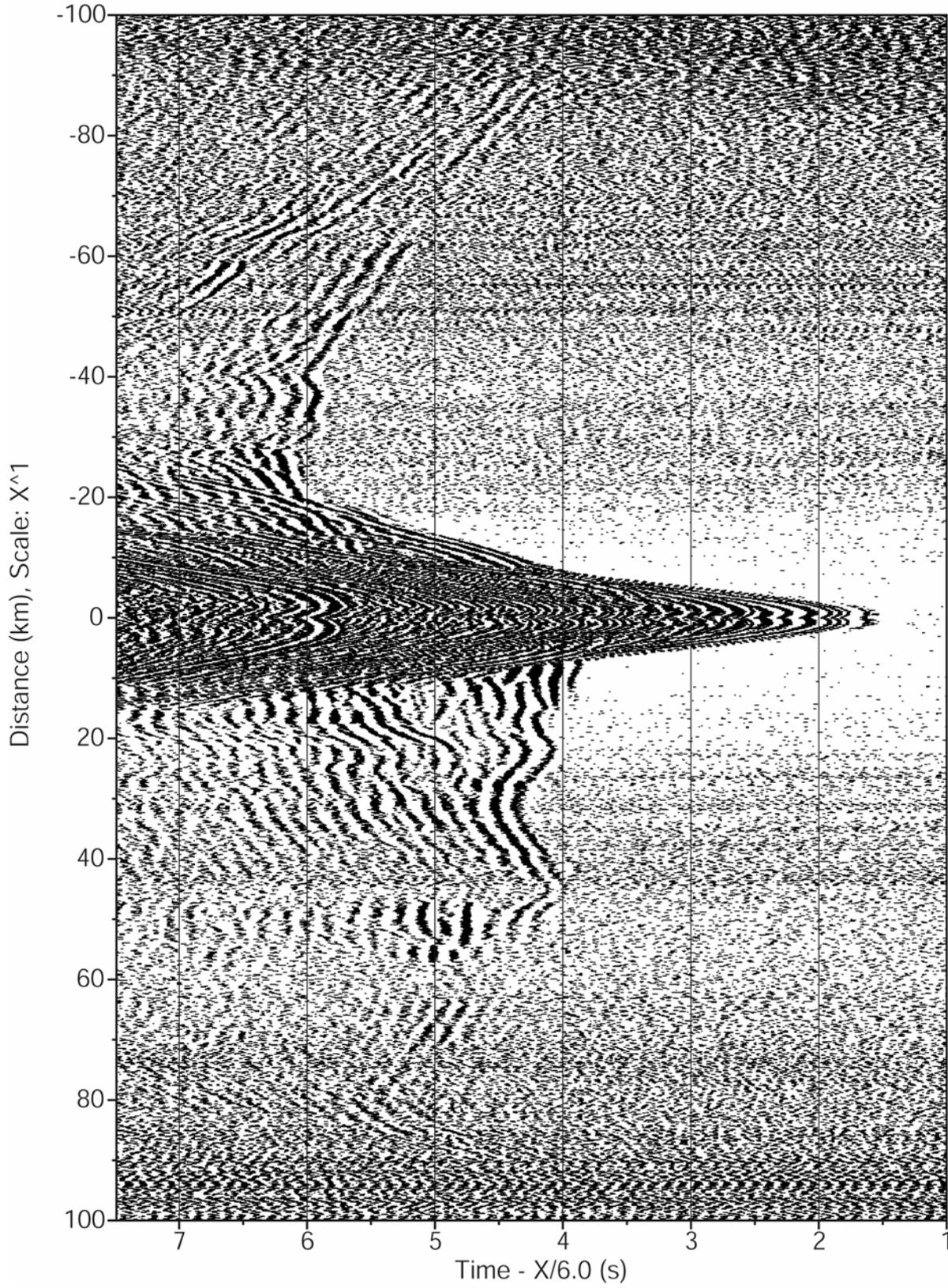
- File obs110_70w_150m.segy.f.v



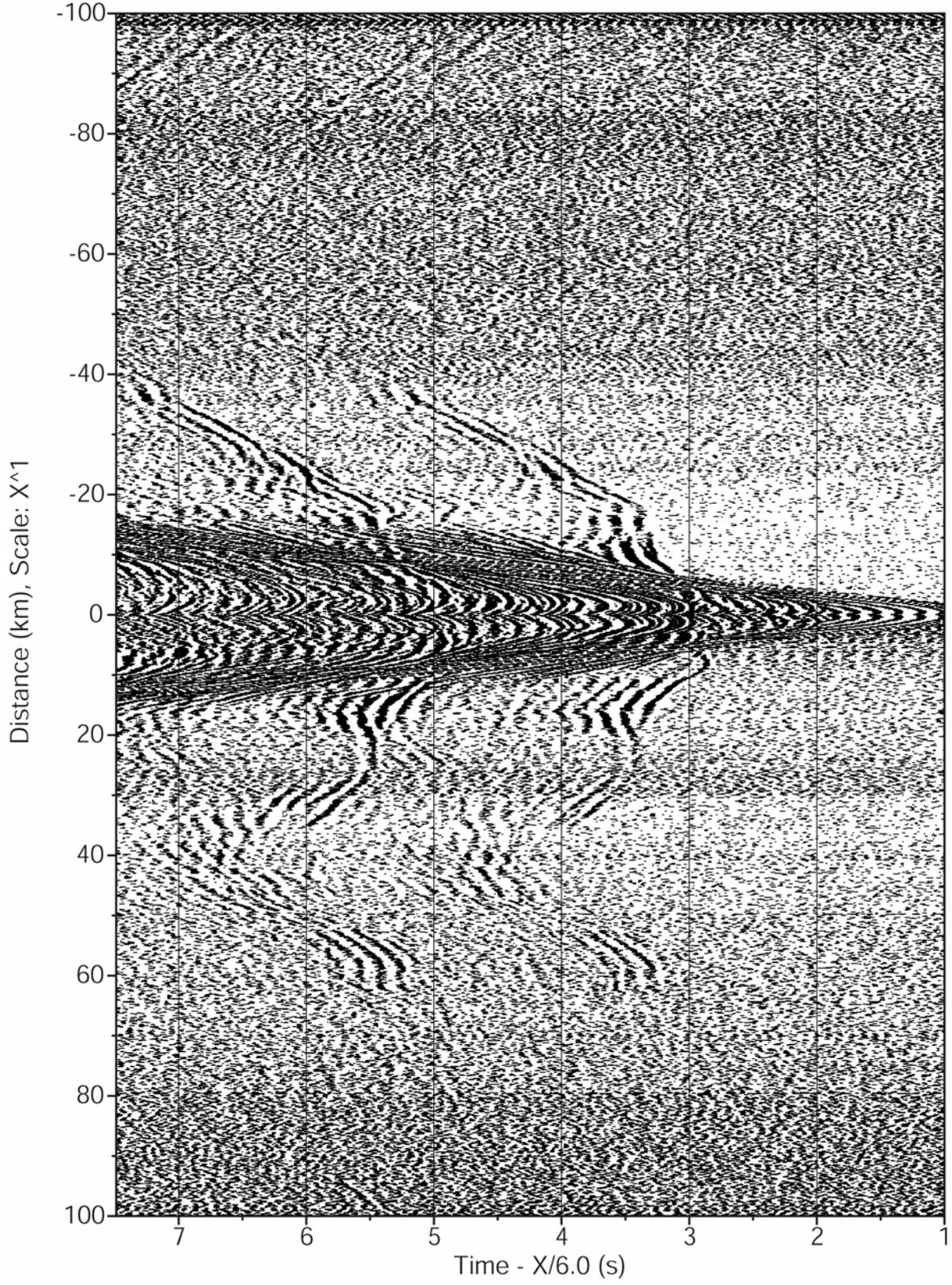
- File obs115_70w_150m.segy.f.h



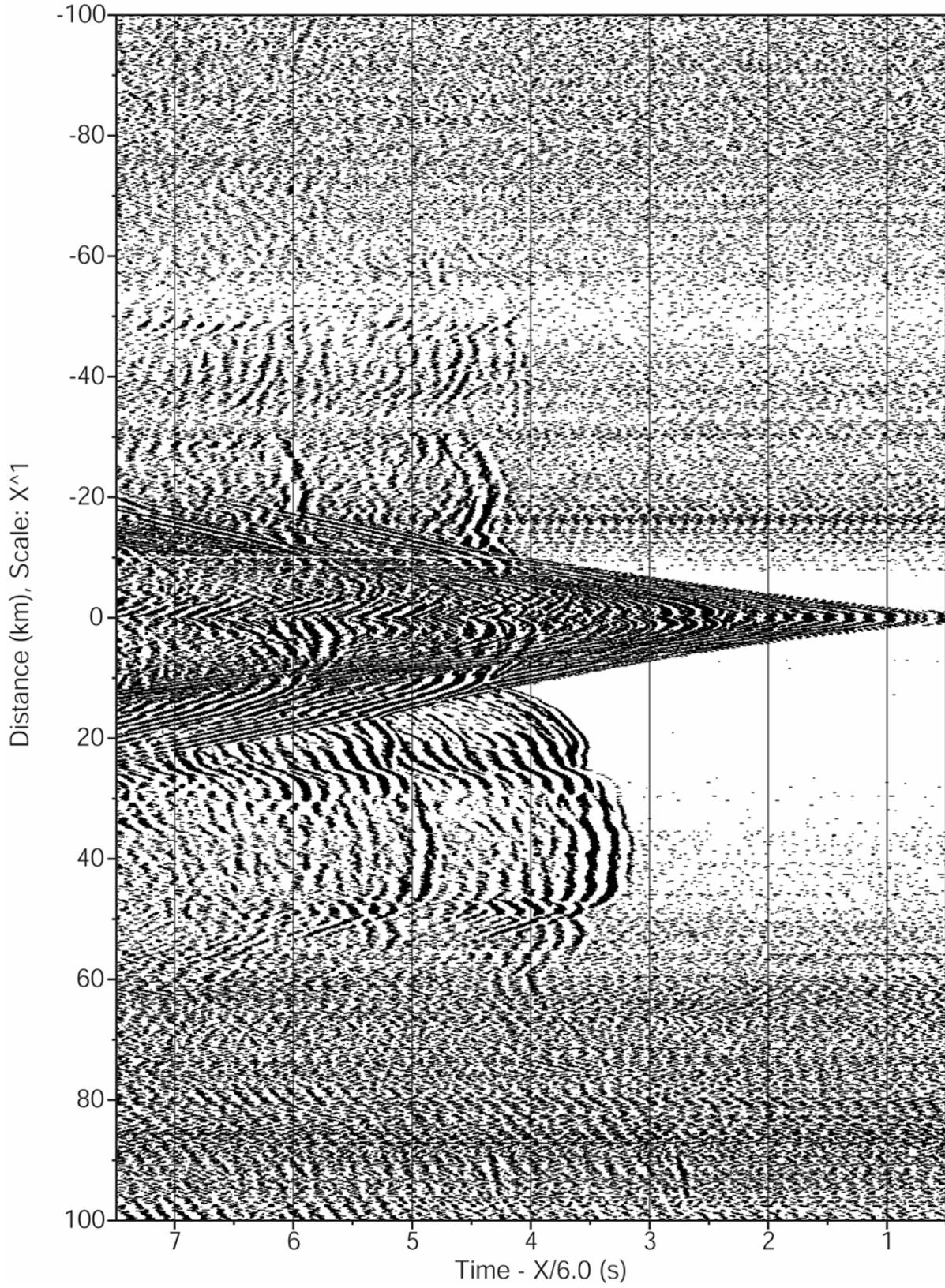
- File obs120_70w_150m.segy.f.v



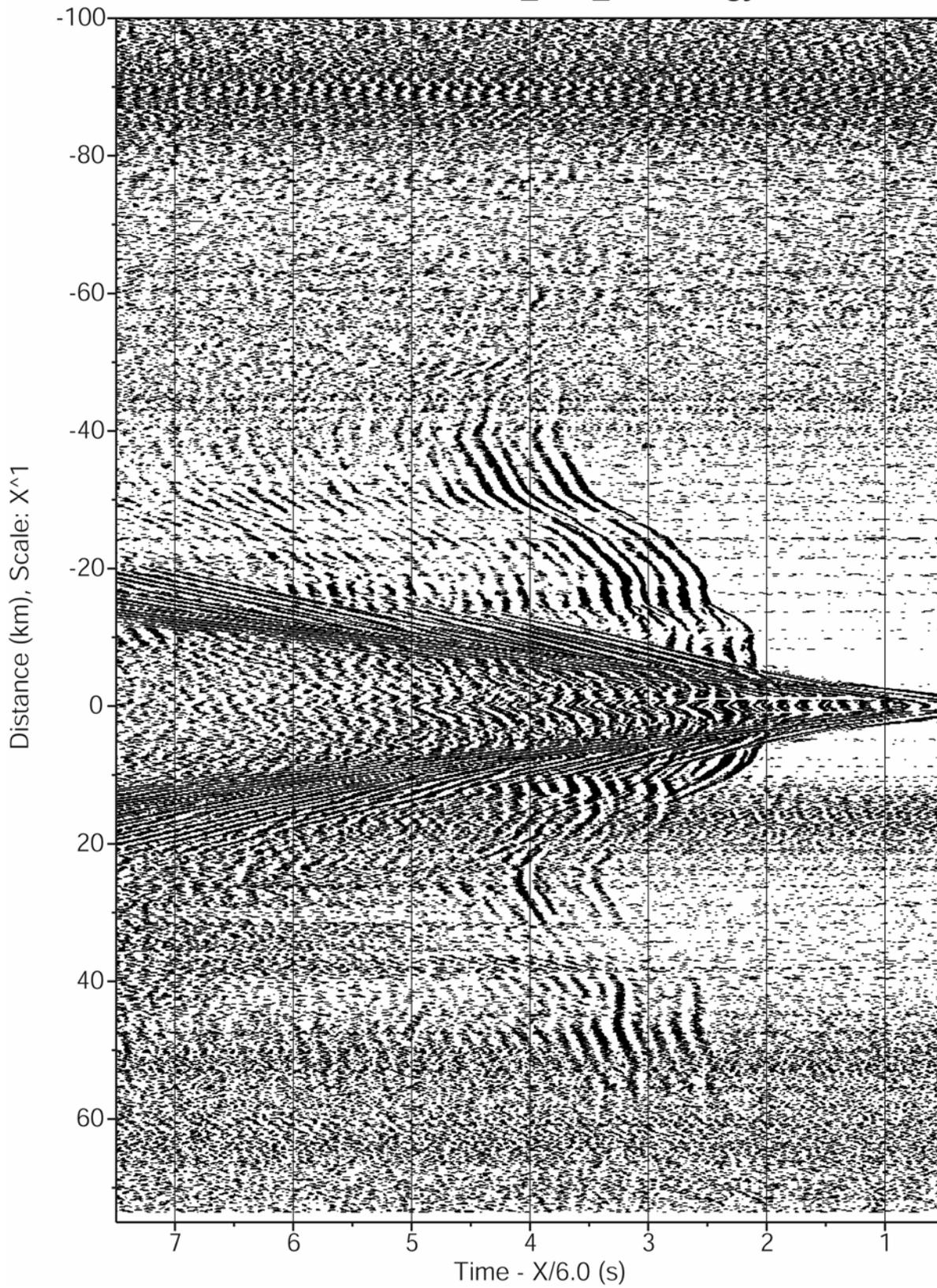
- File obs125_70w_150m.segy.f.h



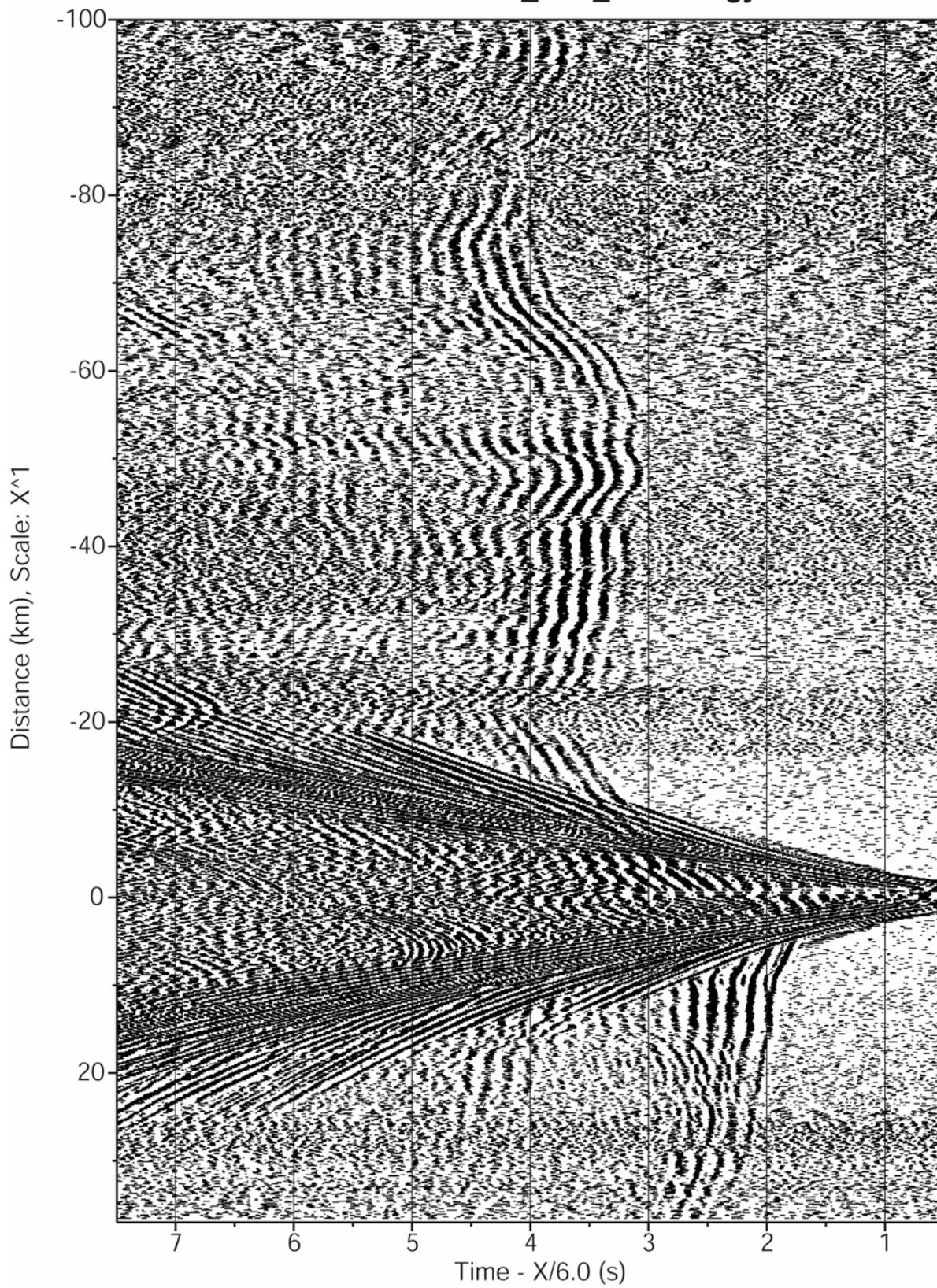
- File obs130_70w_150m.segy.f.v



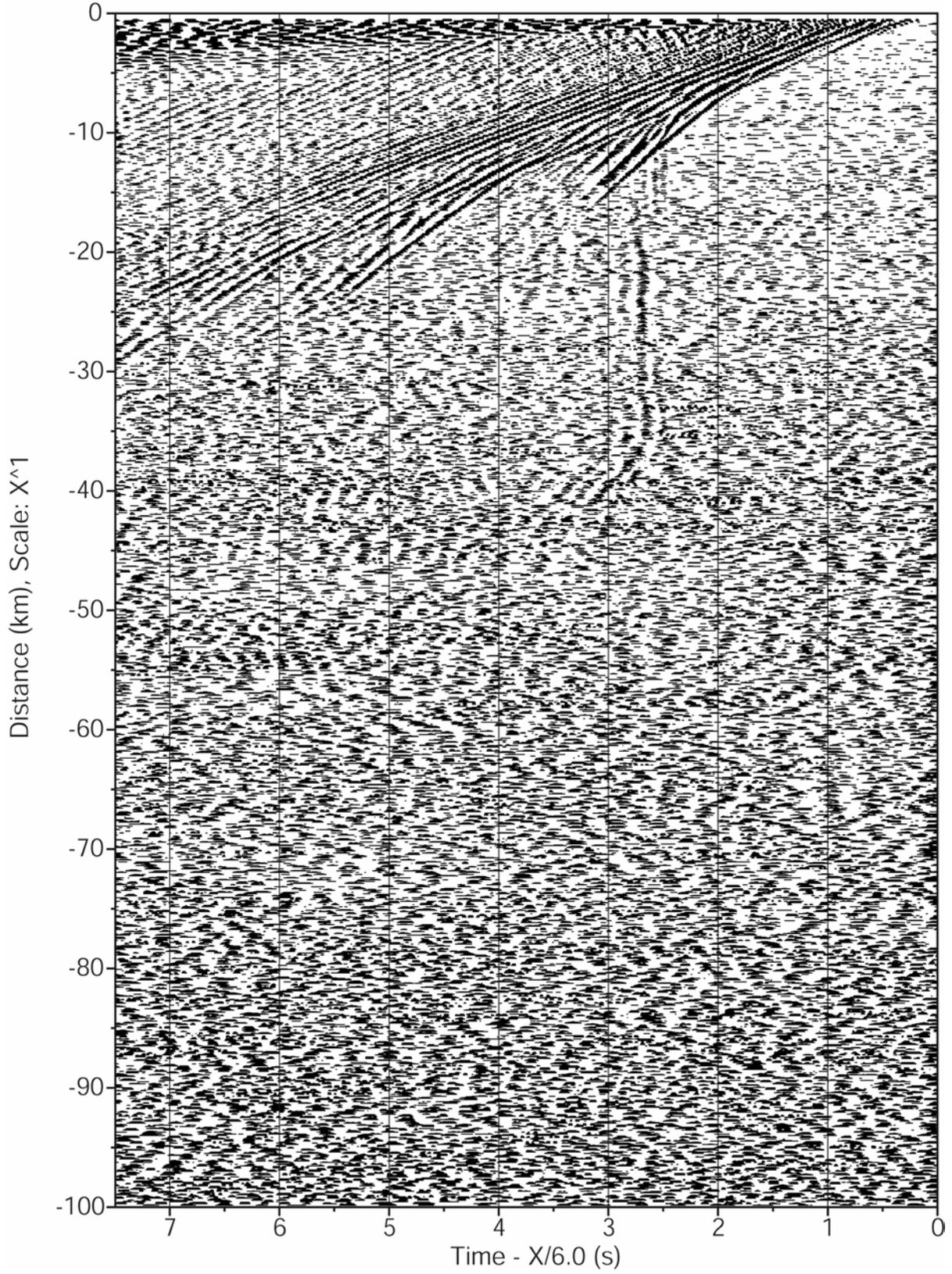
- File obs135_70w_150m.segy.f.h



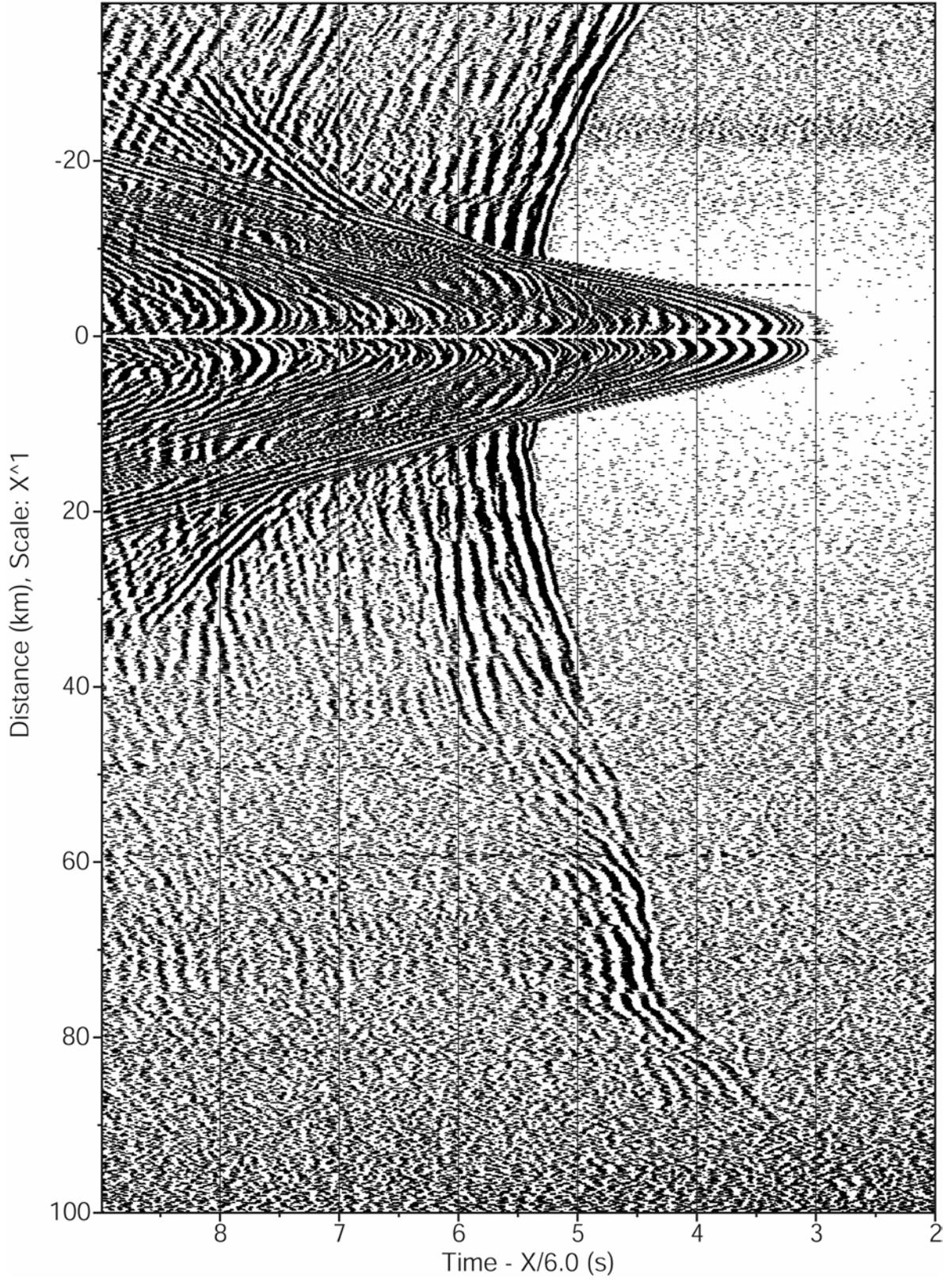
- File obs140_70w_150m.segy.f.h



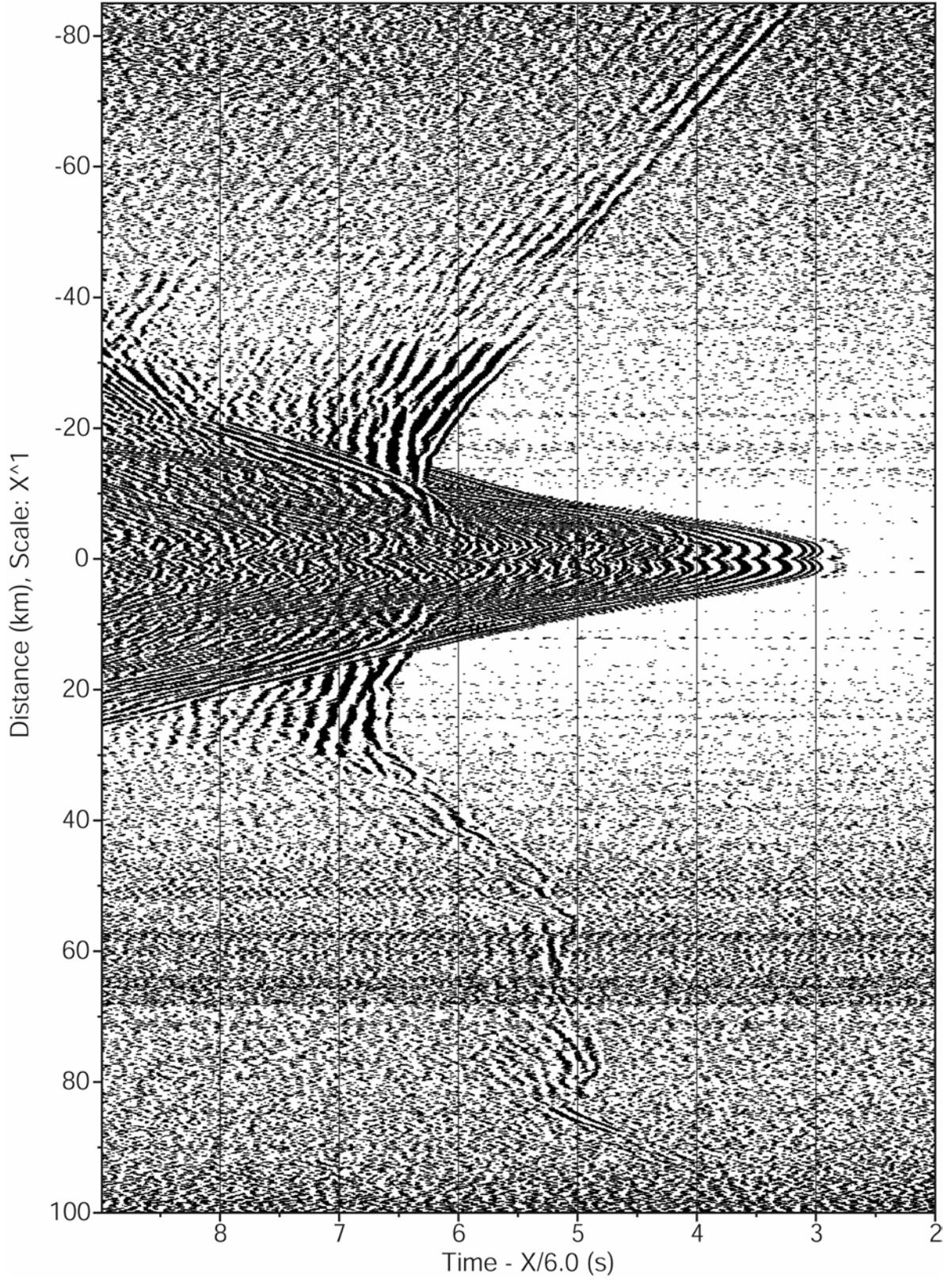
- File obs145_70w_150m.segy.f.v



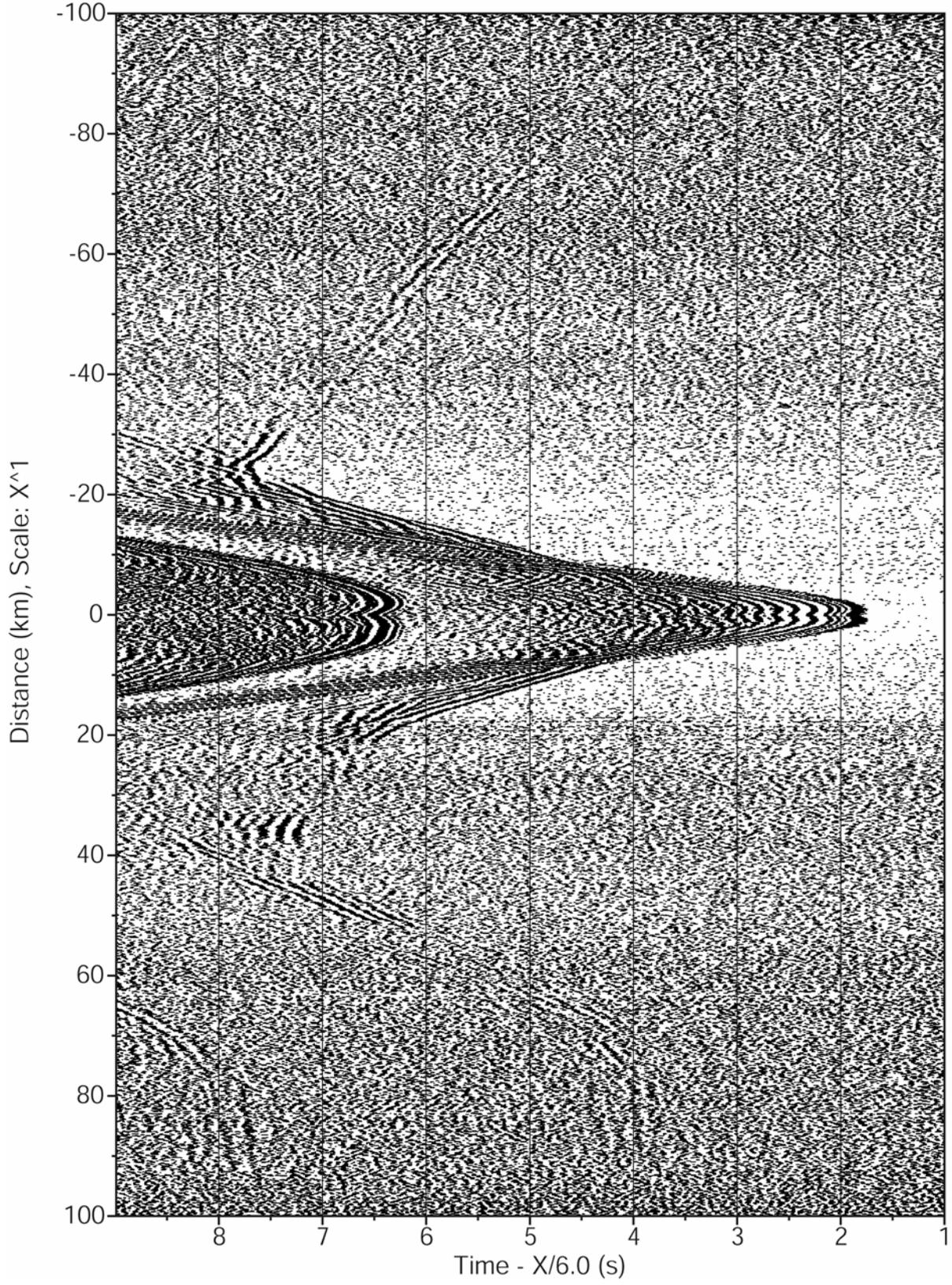
- File obs205_67w_150m.segy.f.v



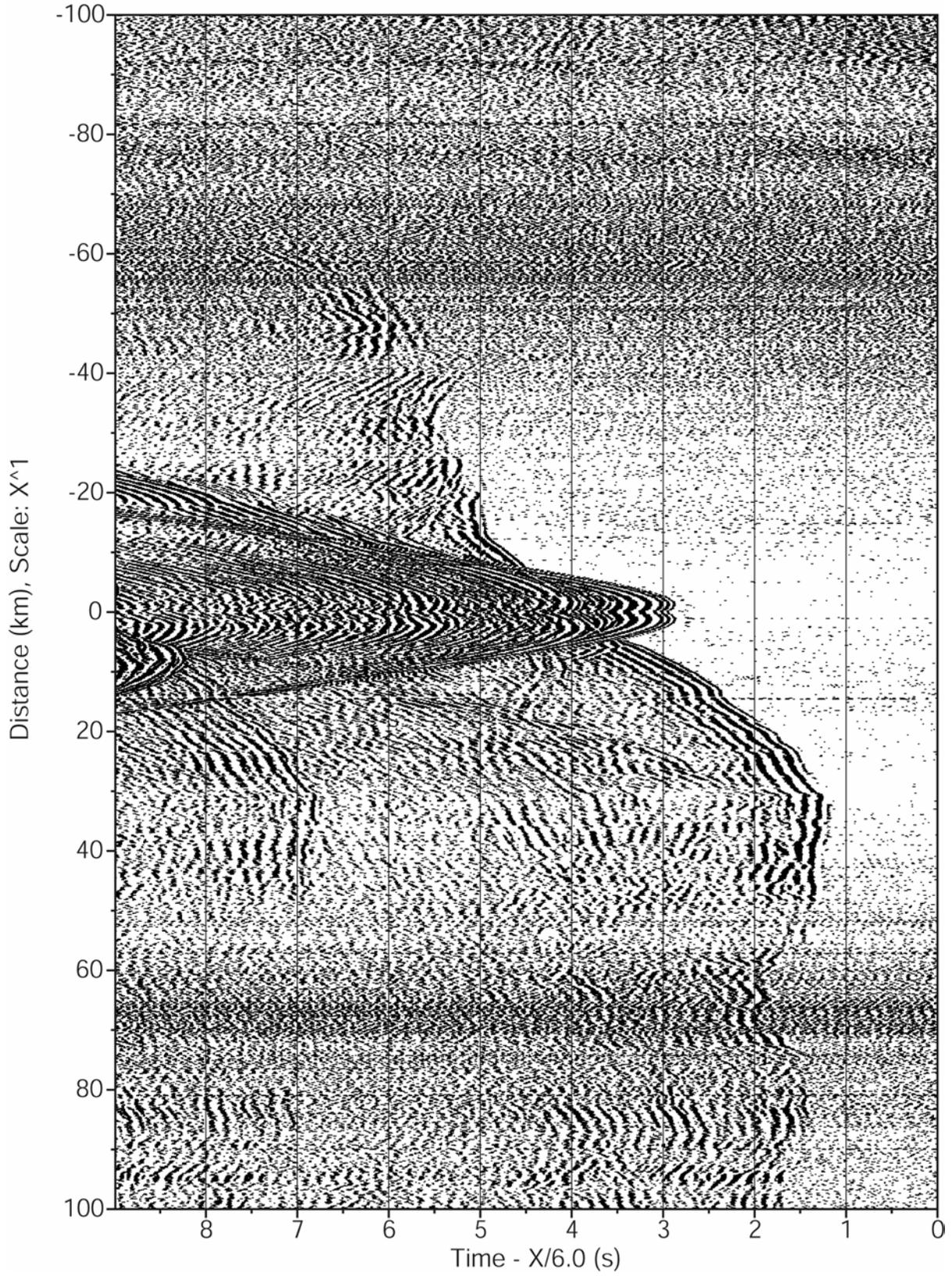
- File obs210_67w_150m.segy.f.v



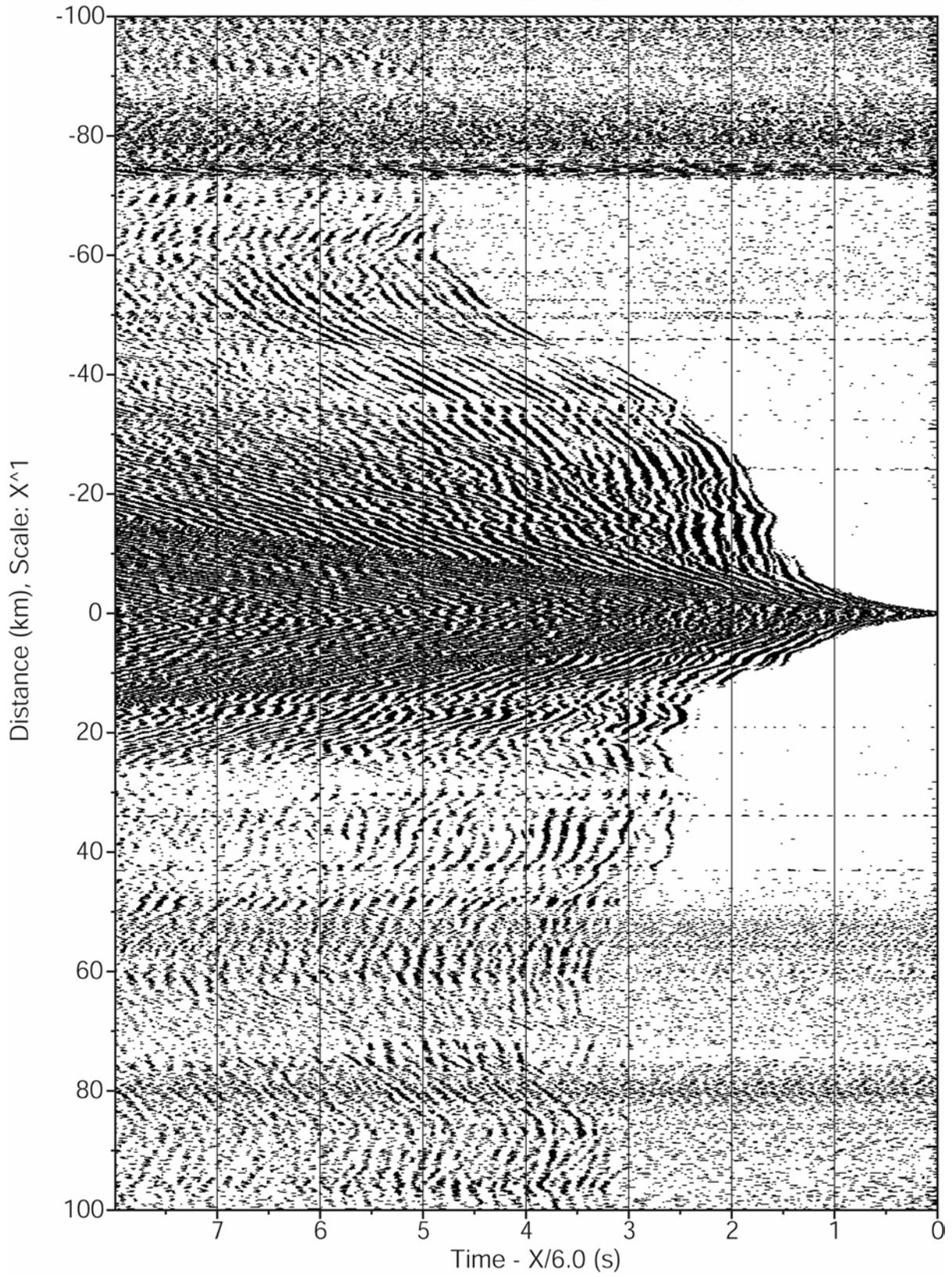
- File obs215_67w_150m.segy.f.h



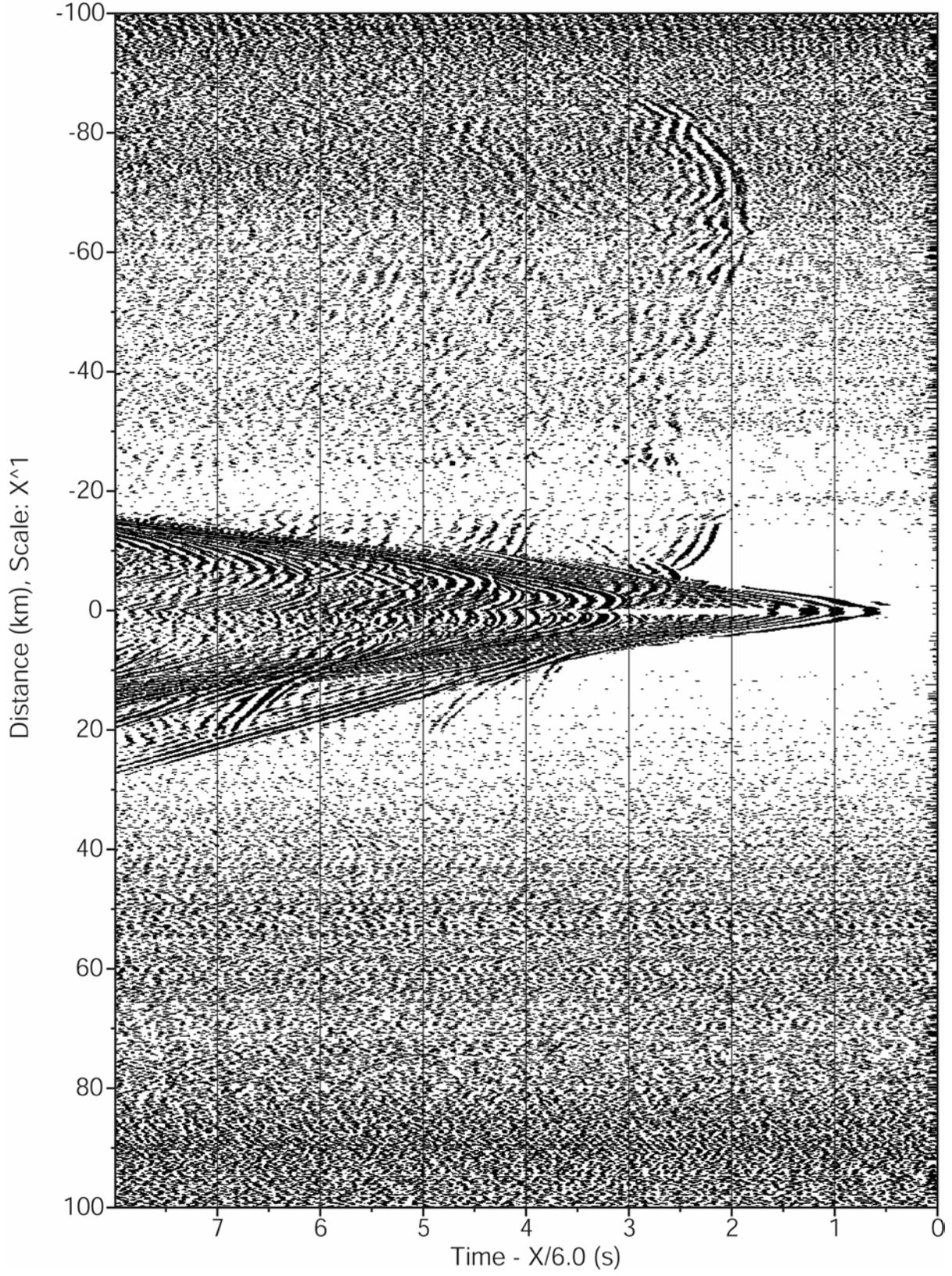
- File obs220_67w_150m.segy.f.v



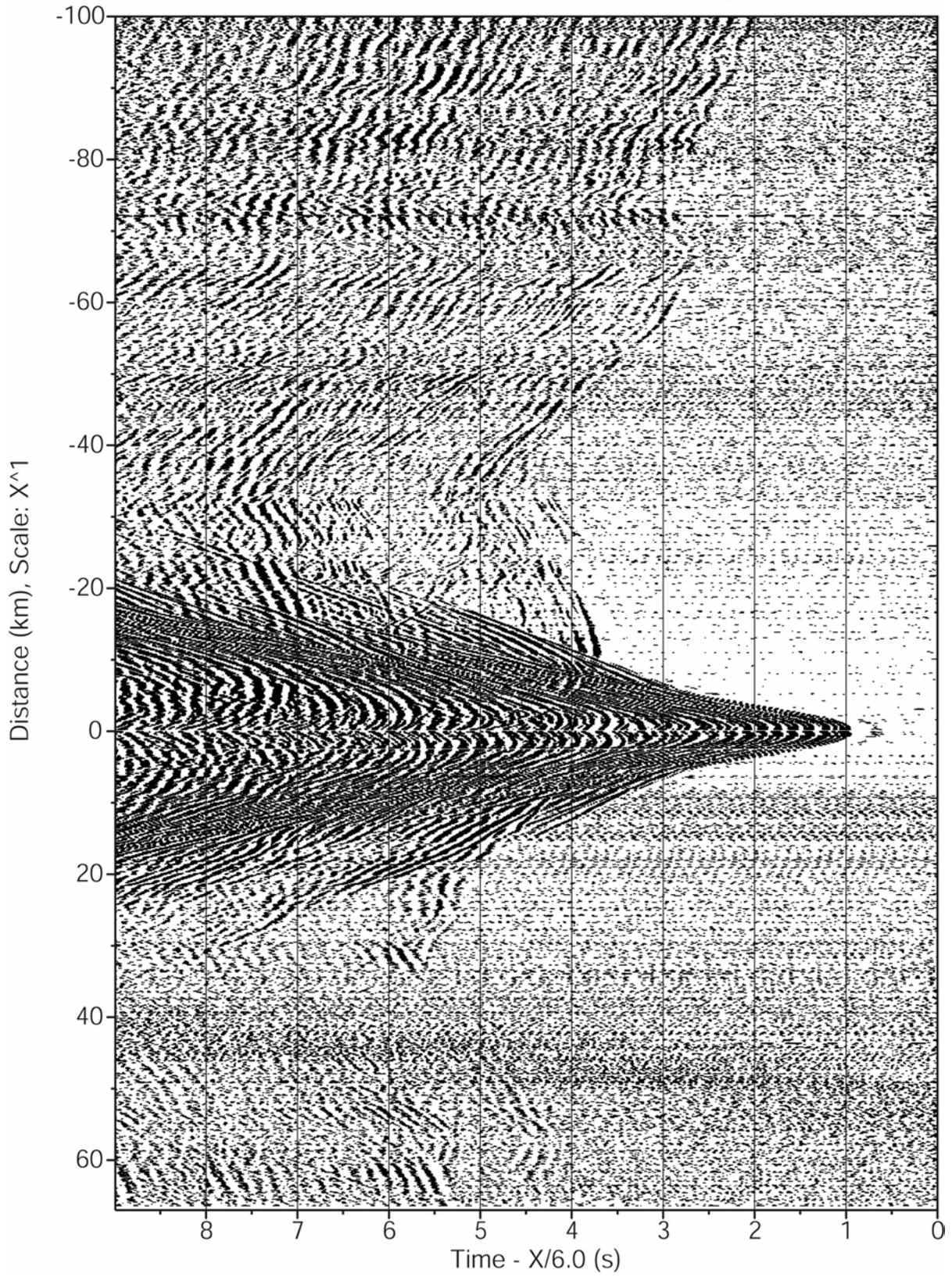
- File obs225_67w_150m.segy.f.v



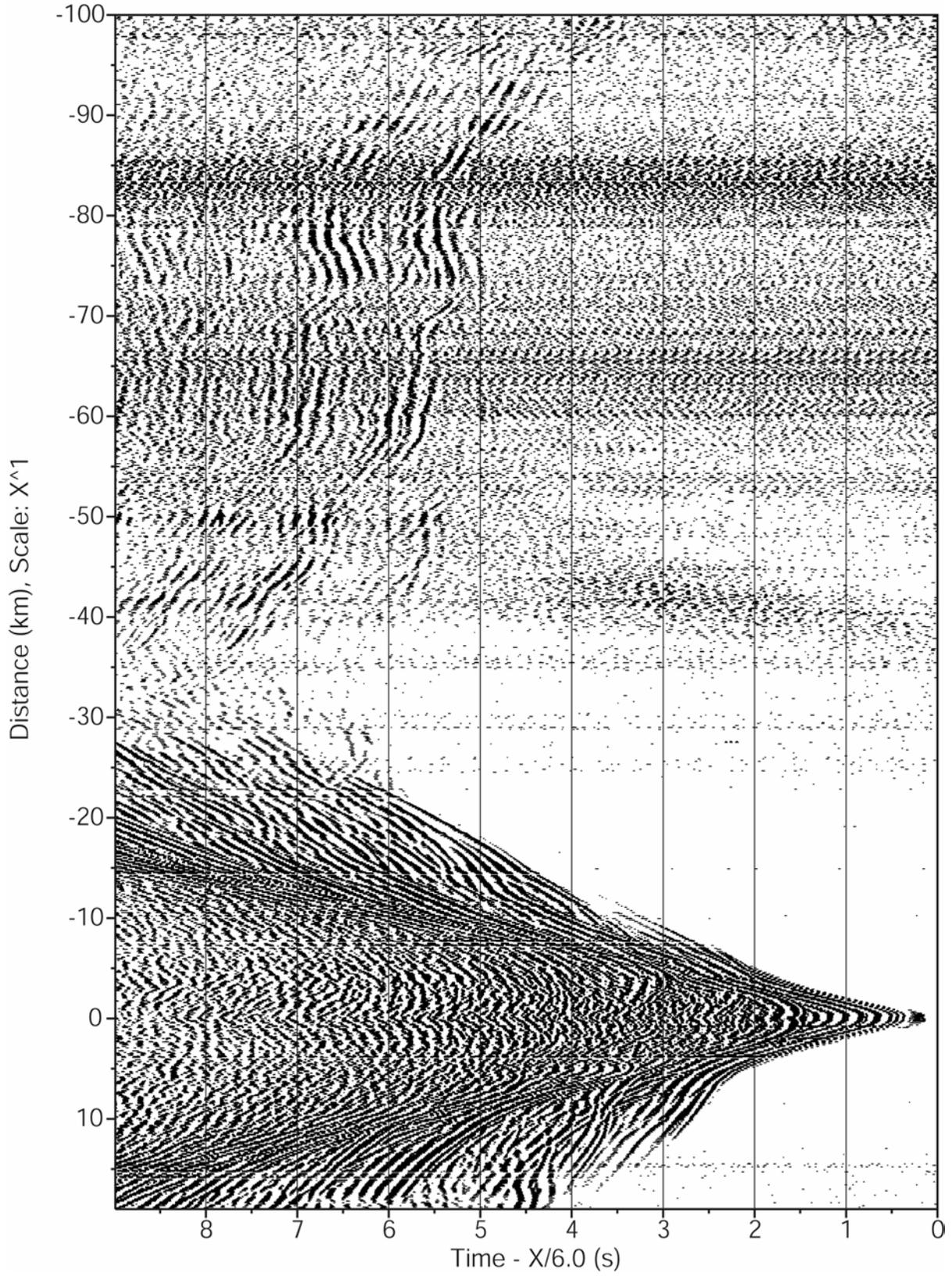
- File obs230_67w_150m.segy.f.h



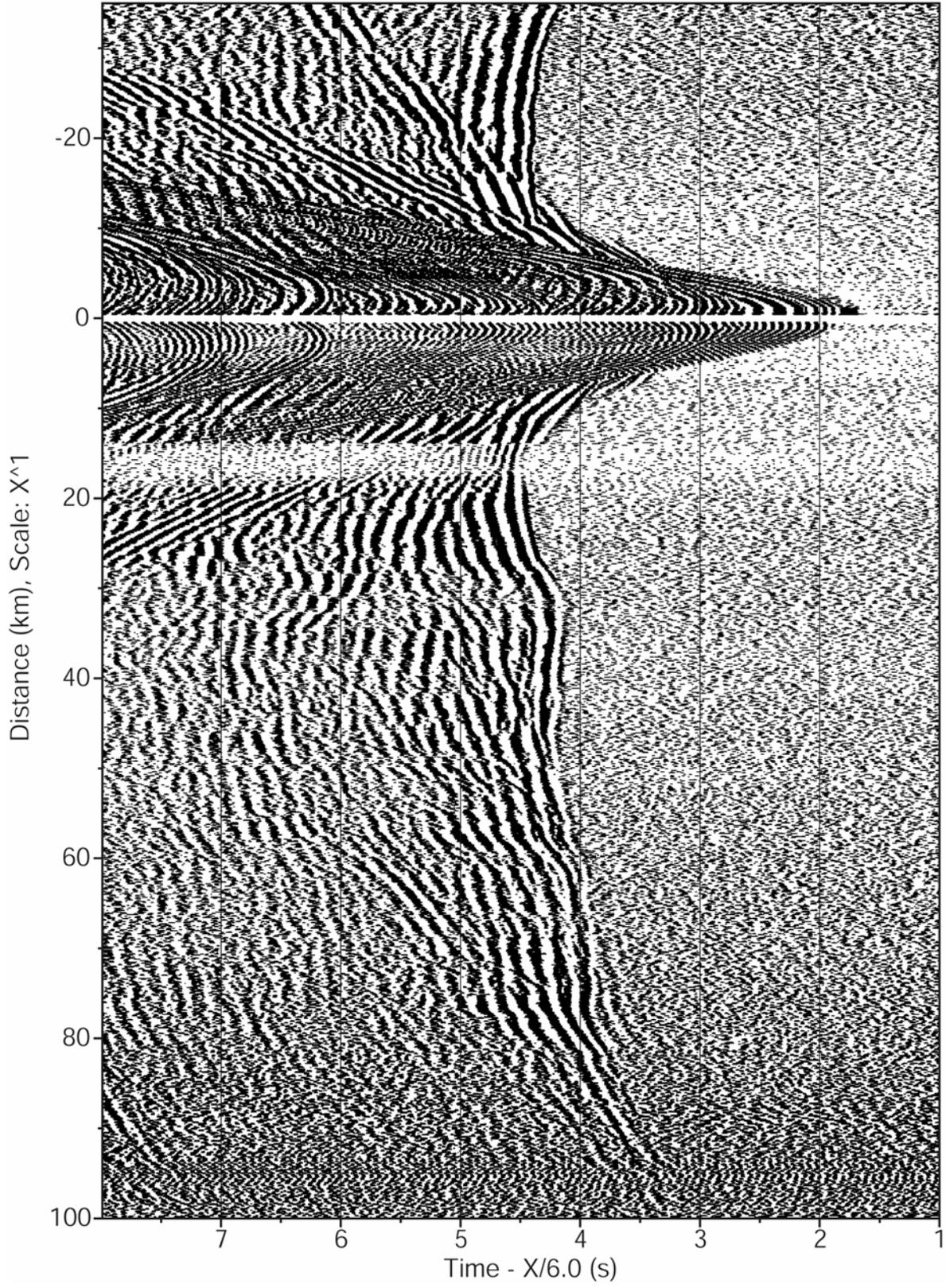
- File obs235_67w_150m.segy.f.v



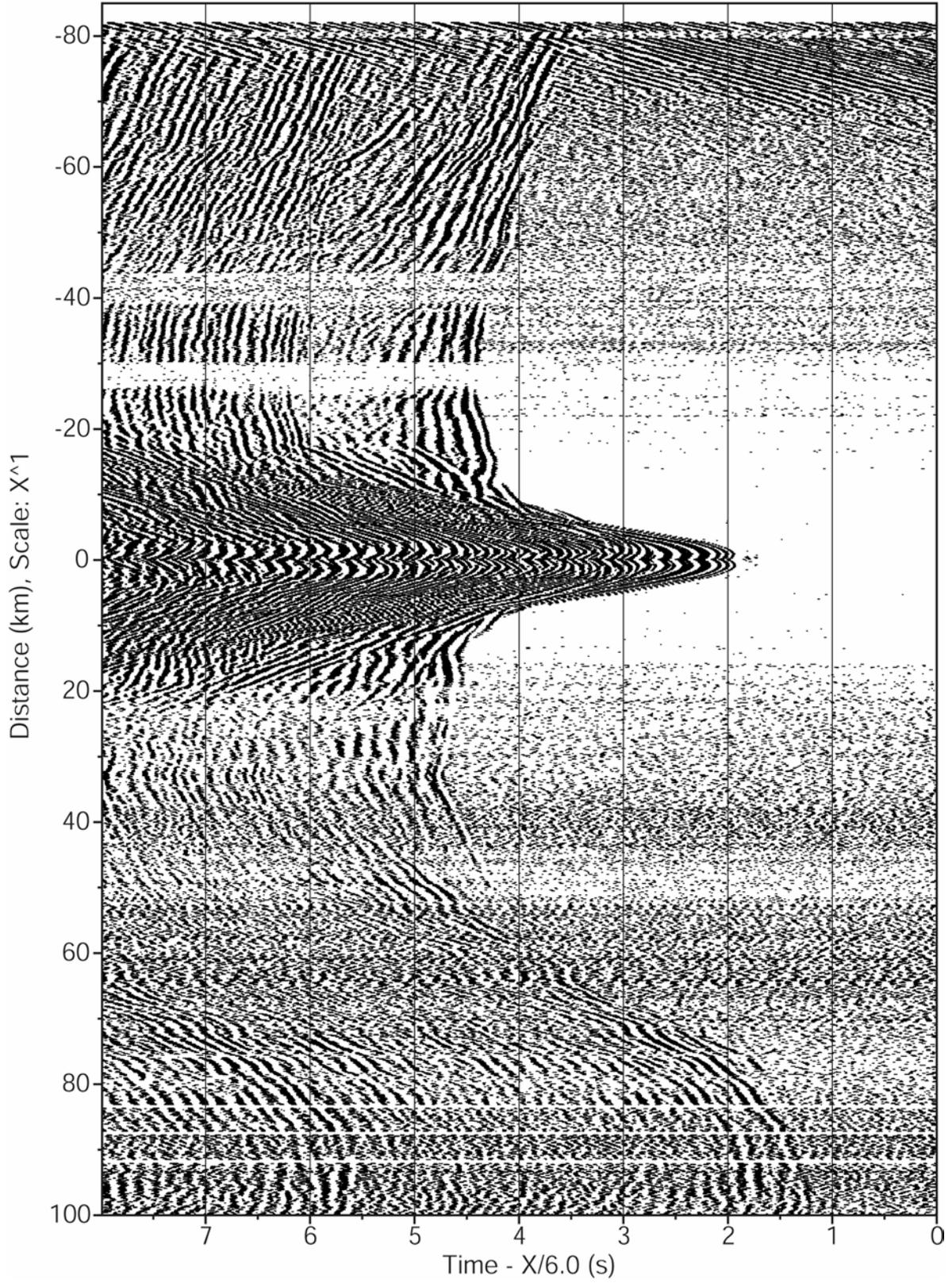
- File obs240_67w_150m.segy.f.v



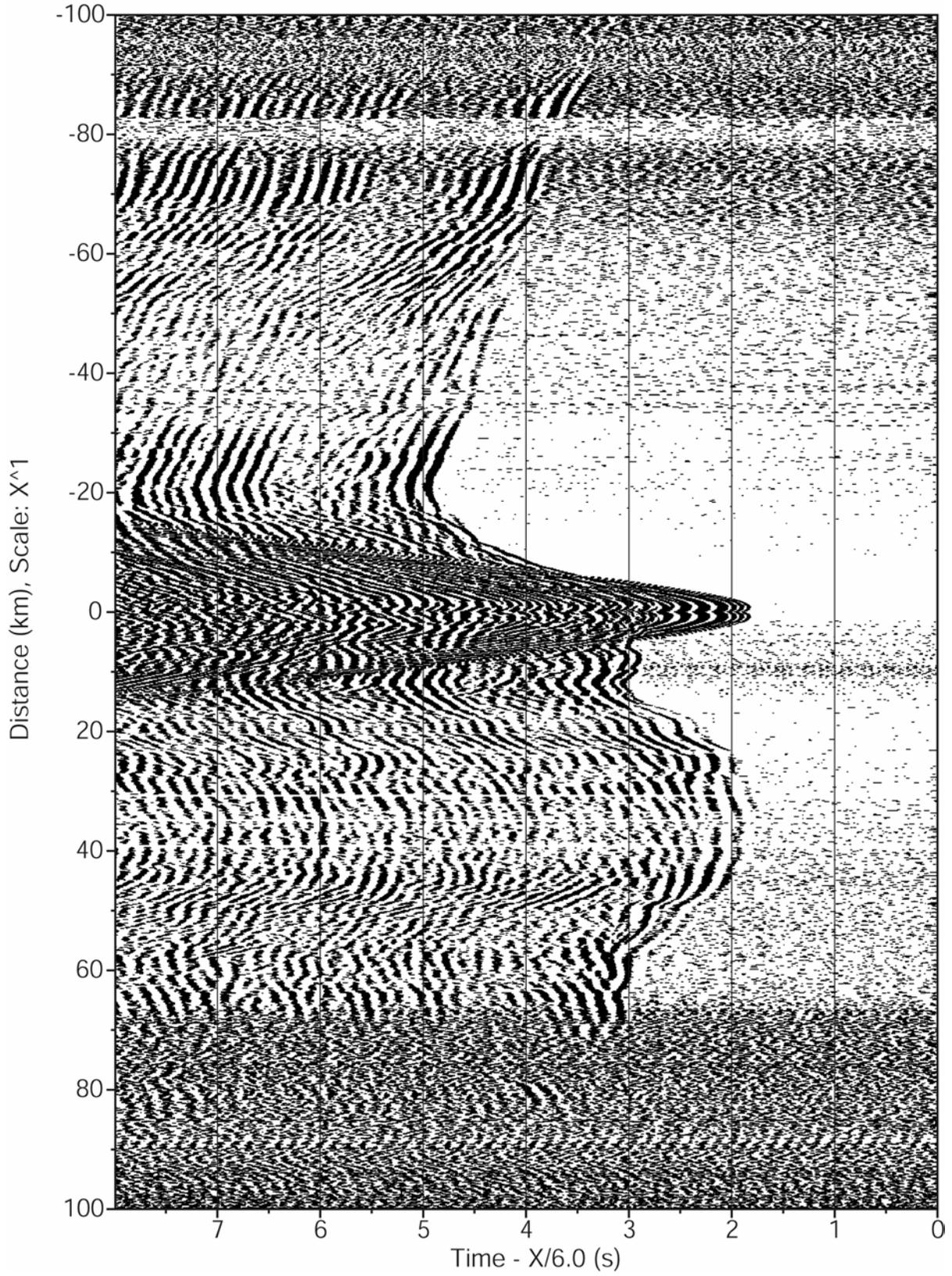
- File obs305_64w_150m.segy.f.v



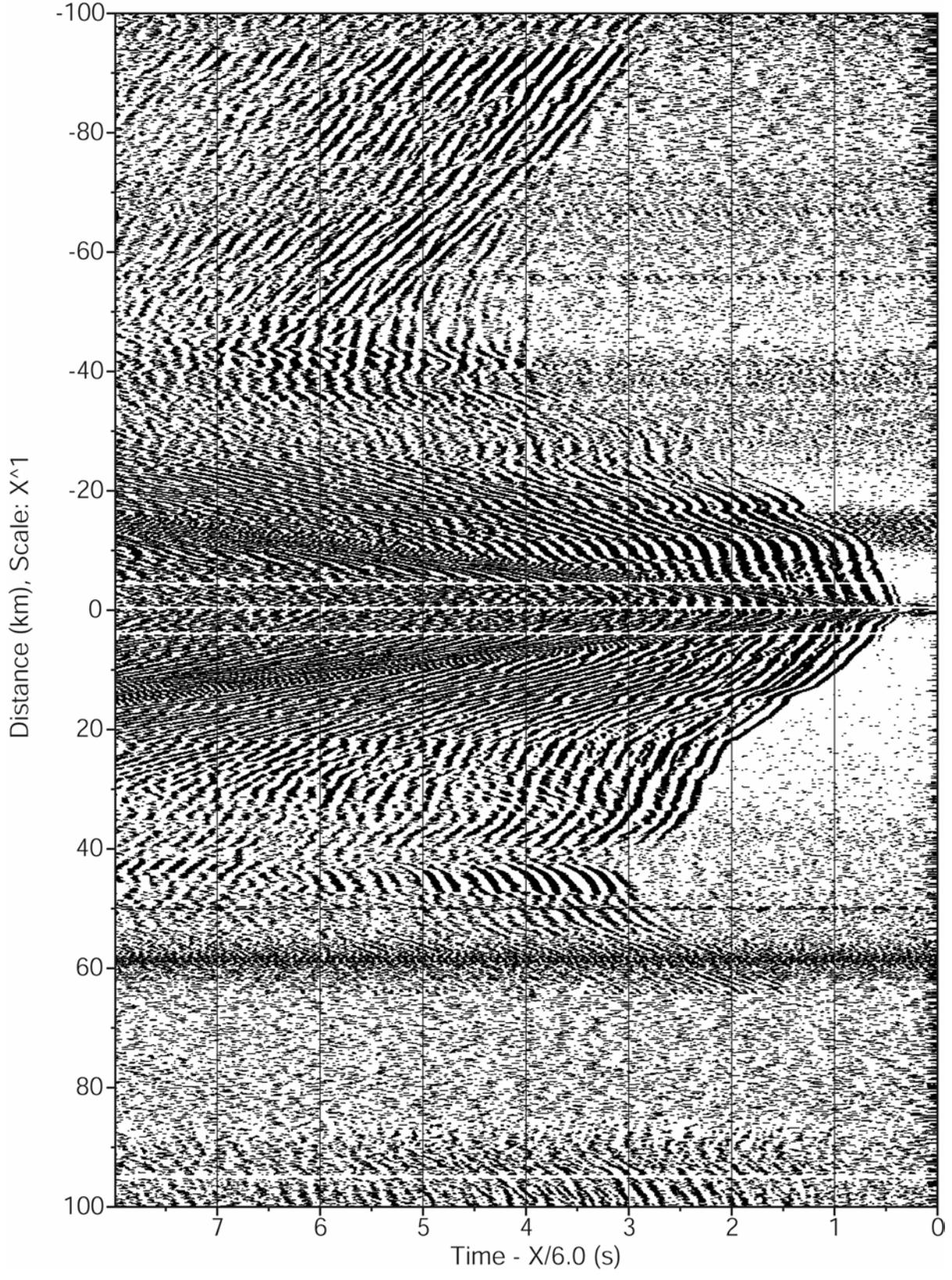
- File obs310_64w_150m.segy.f.v



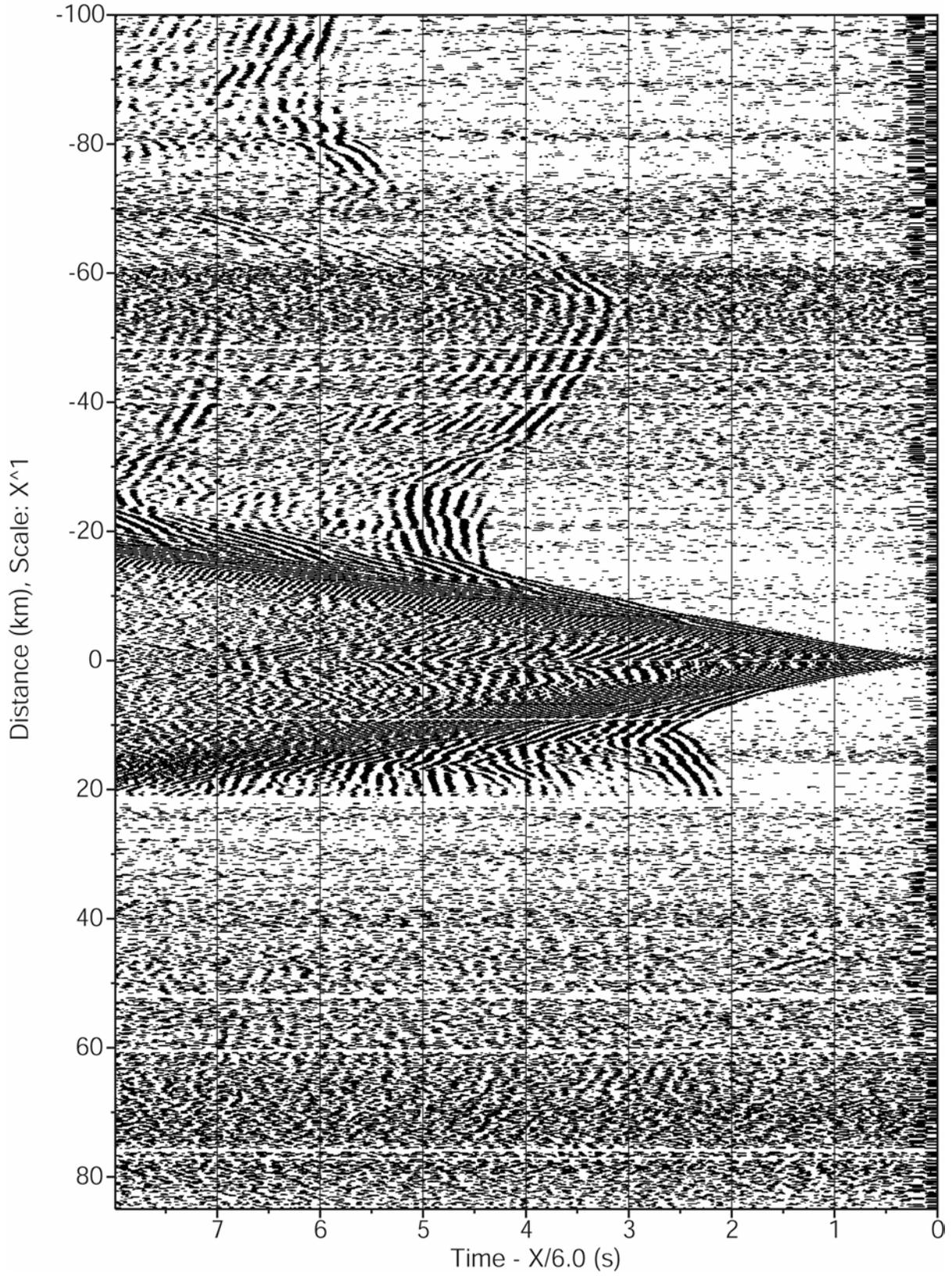
- File obs316_64w_150m.segy.f.v



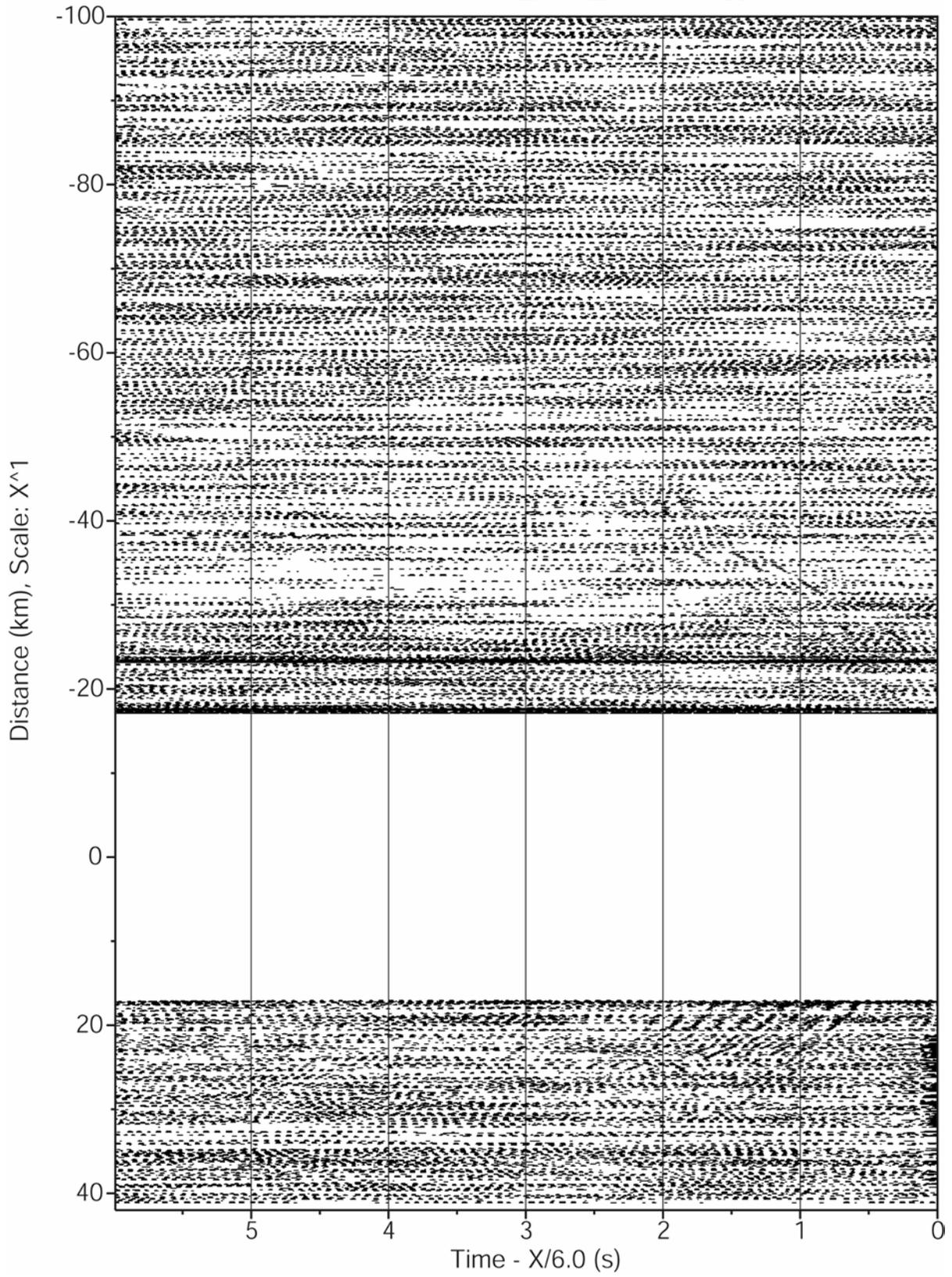
- File obs320_64w_150m.segy.f.h



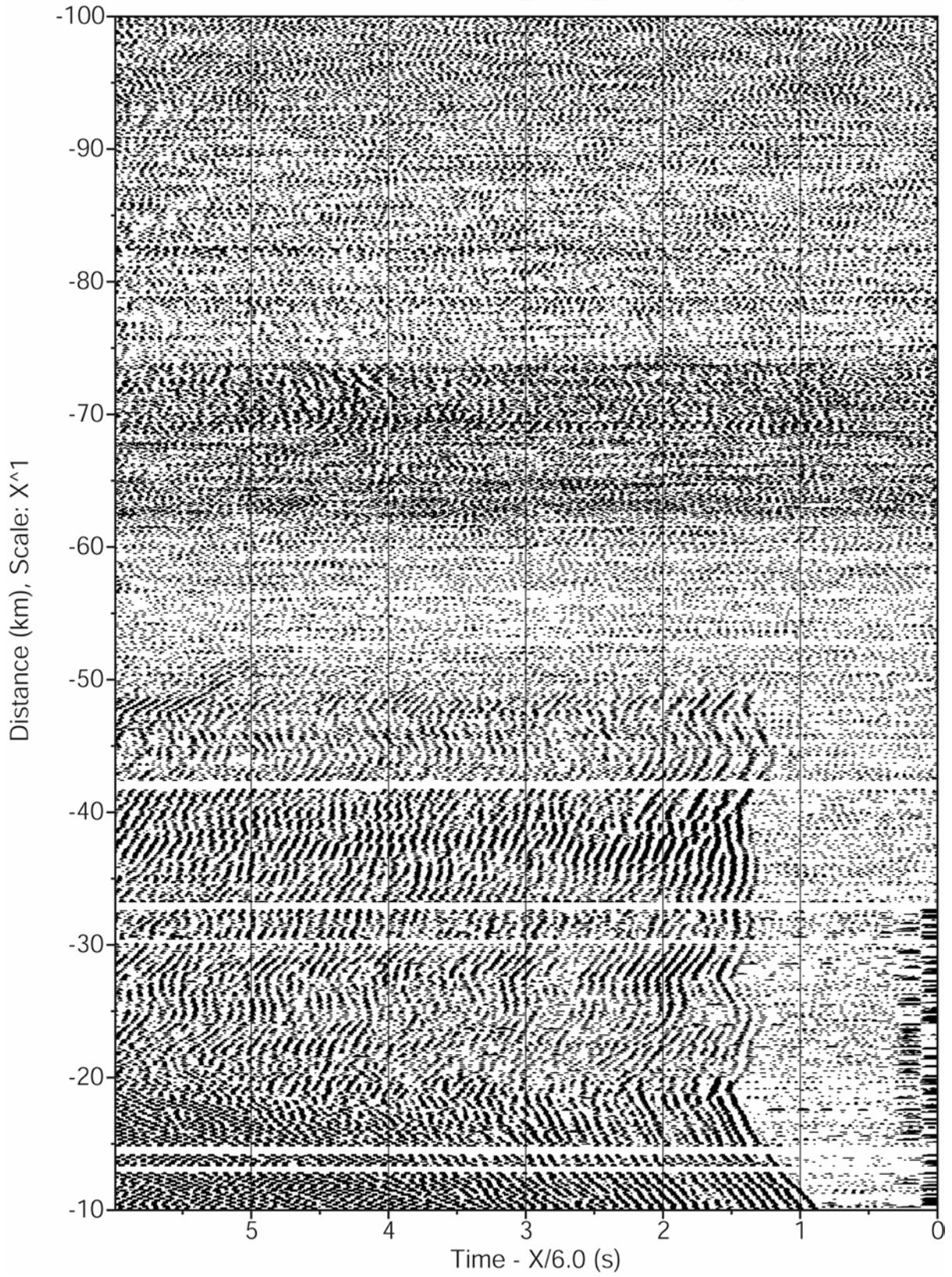
- File obs325_64w_150m.segy.f.h



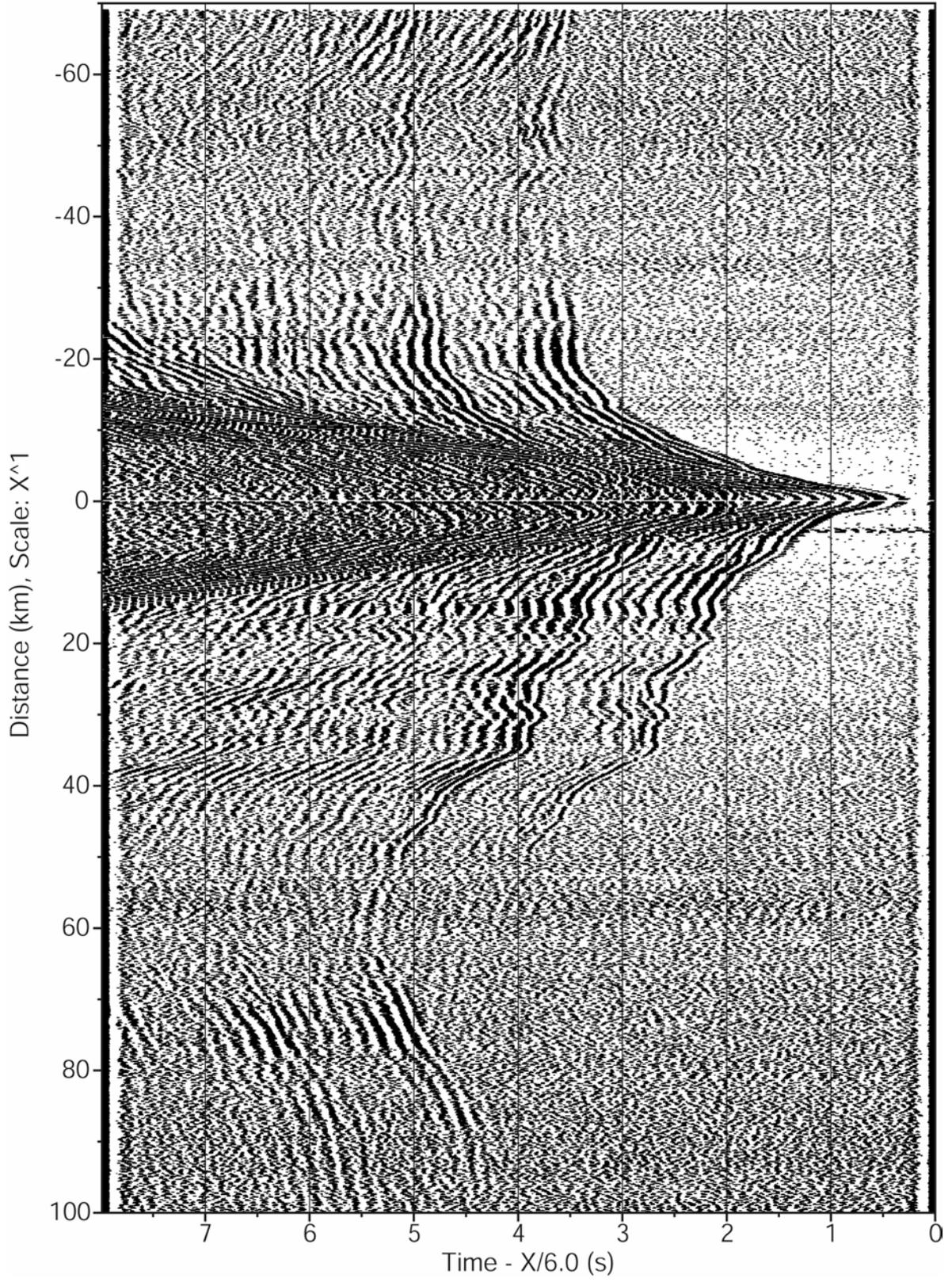
- File obs330_64w_150m.segy.f.v



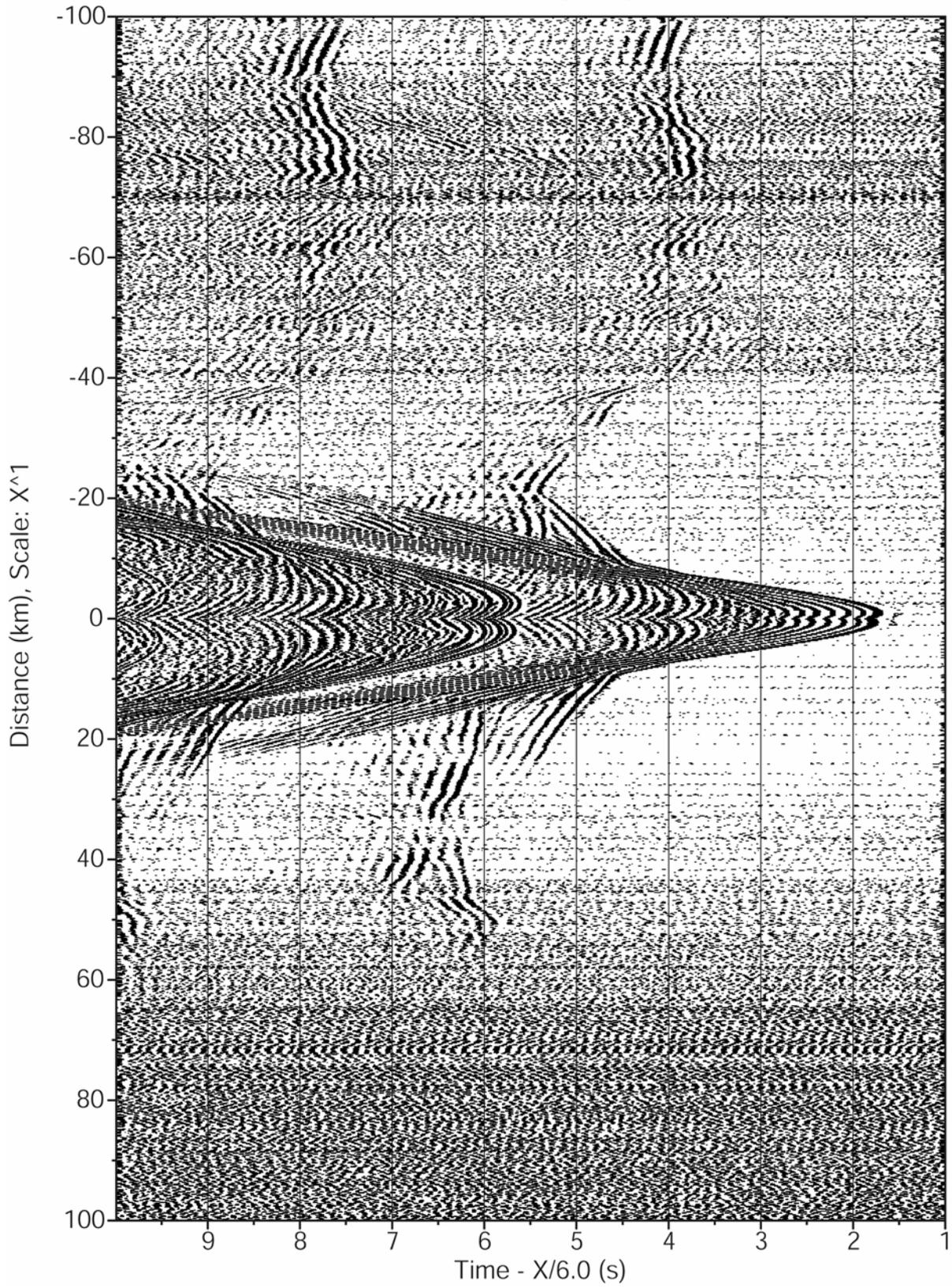
- File obs335_64w_150m.segy.f.v



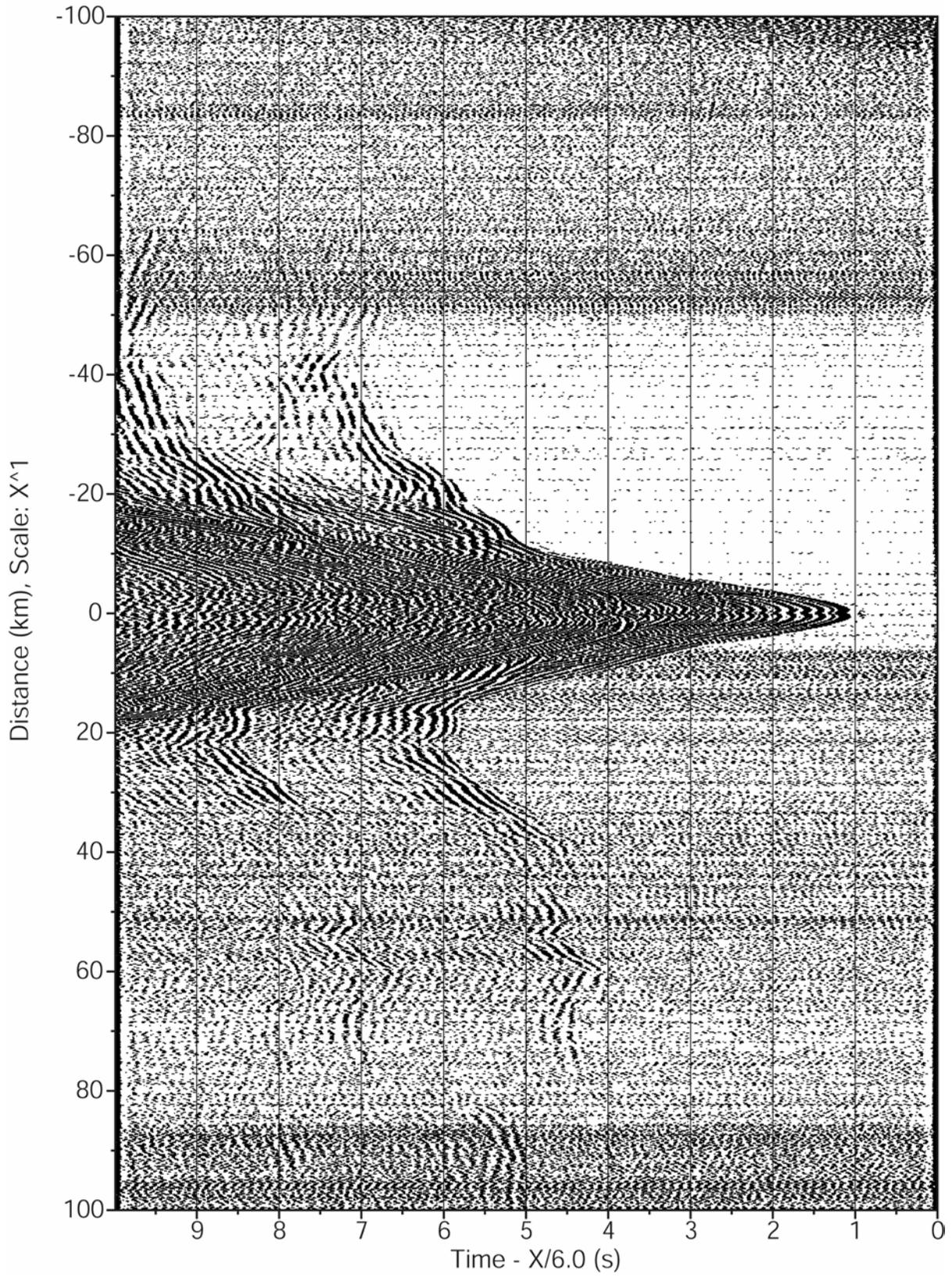
OBS 405, Hydrophone



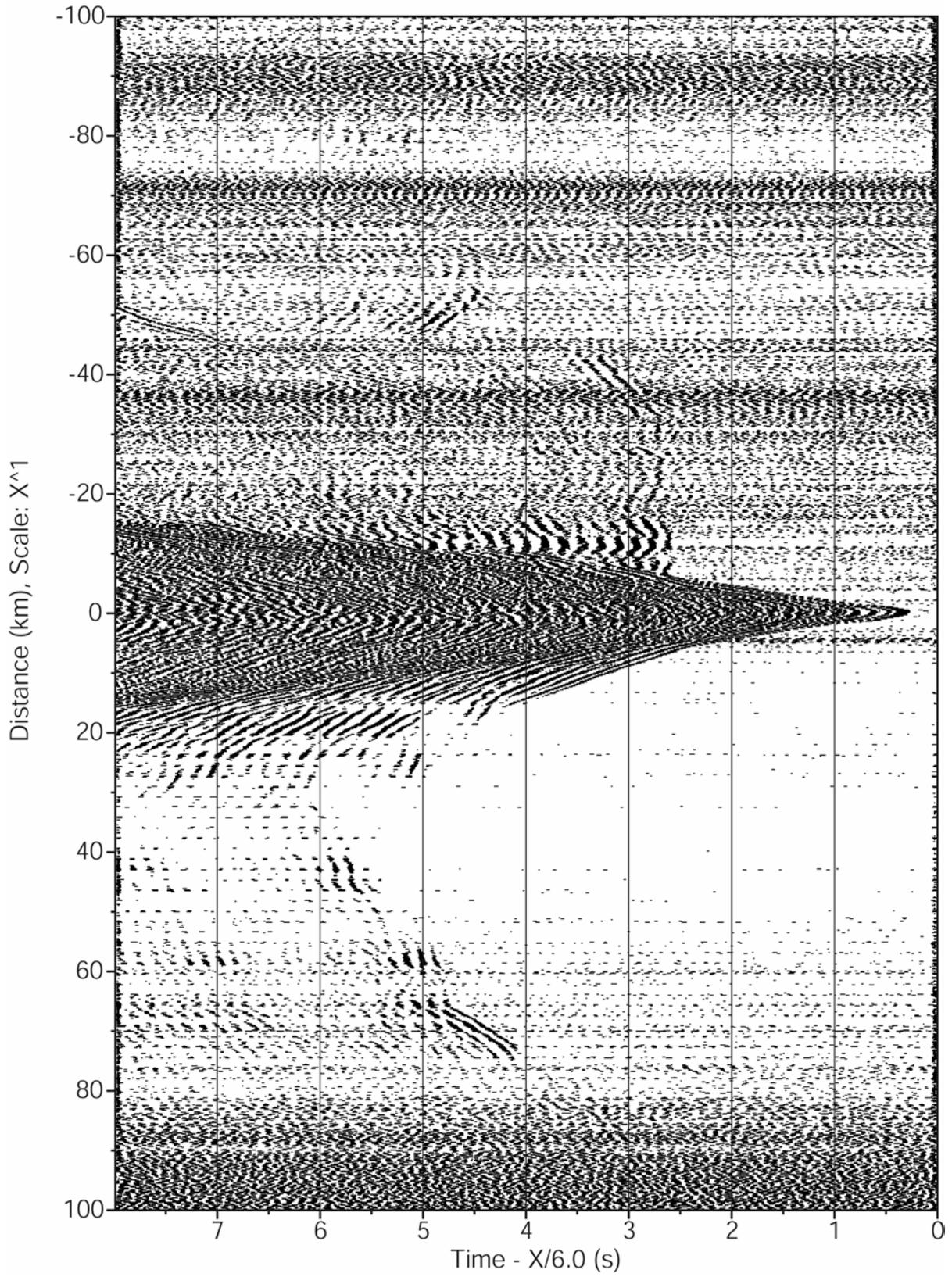
OBS 410, Hydrophone



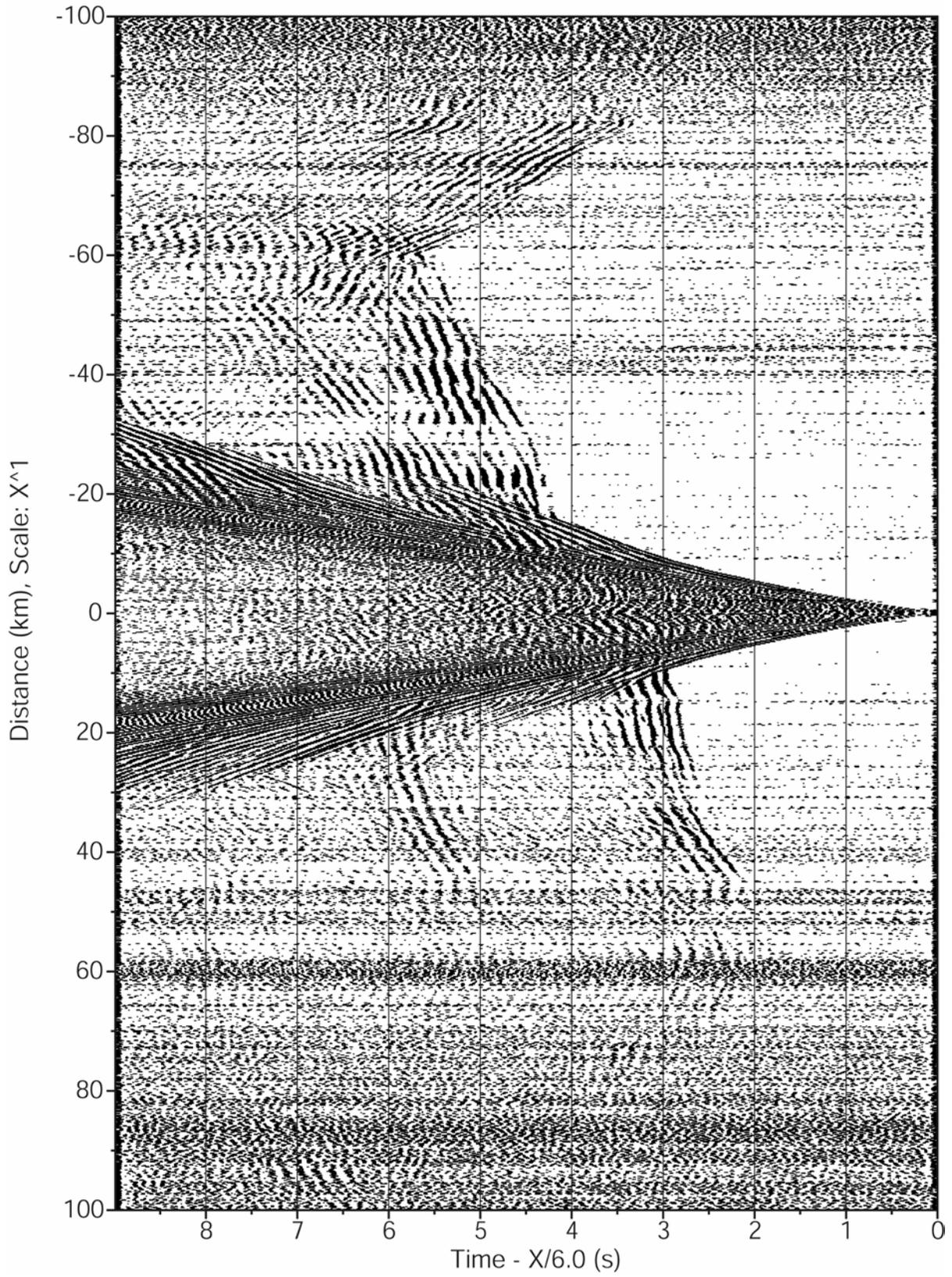
OBS 415, Vertical



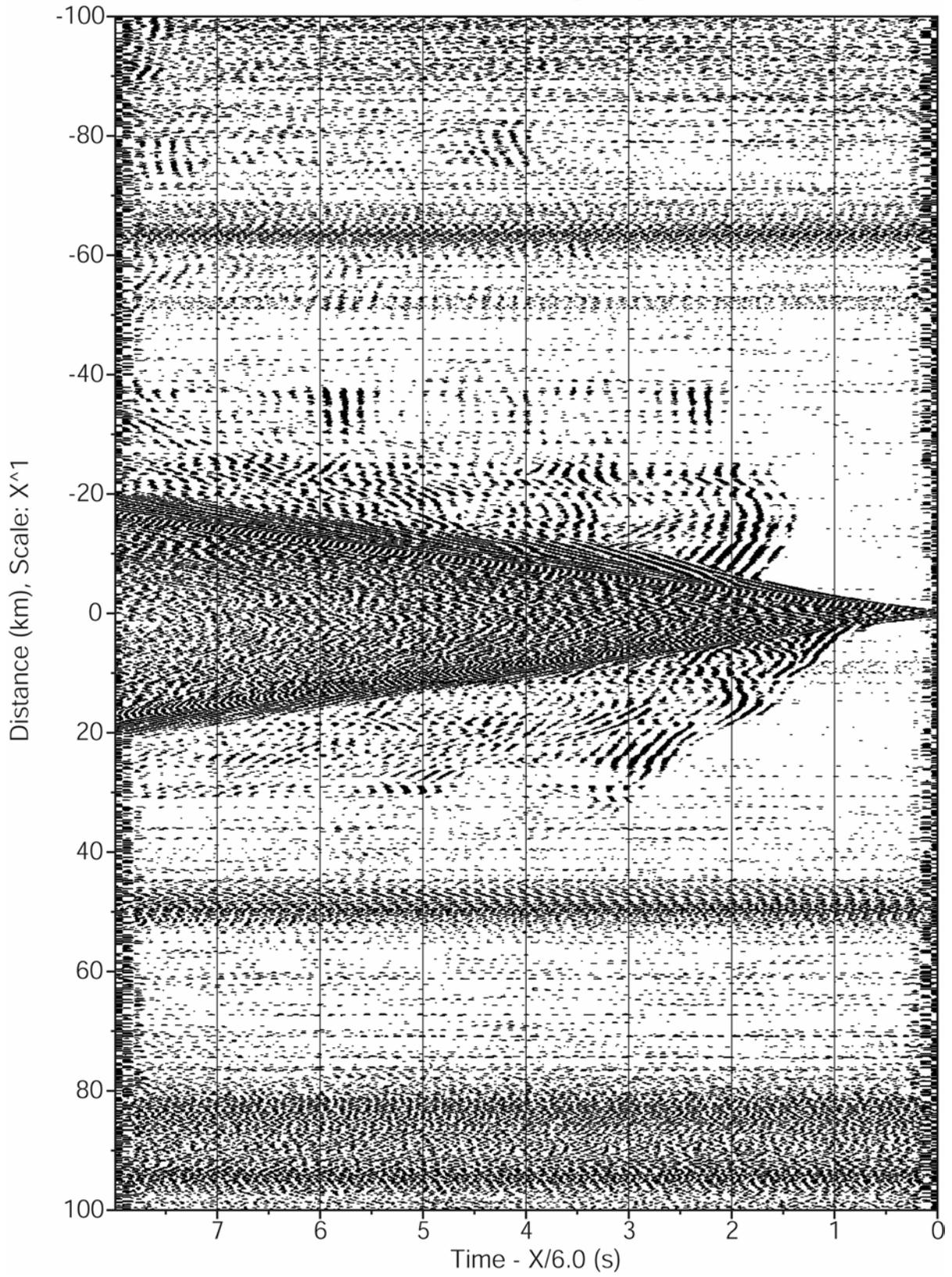
OBS 420, Vertical



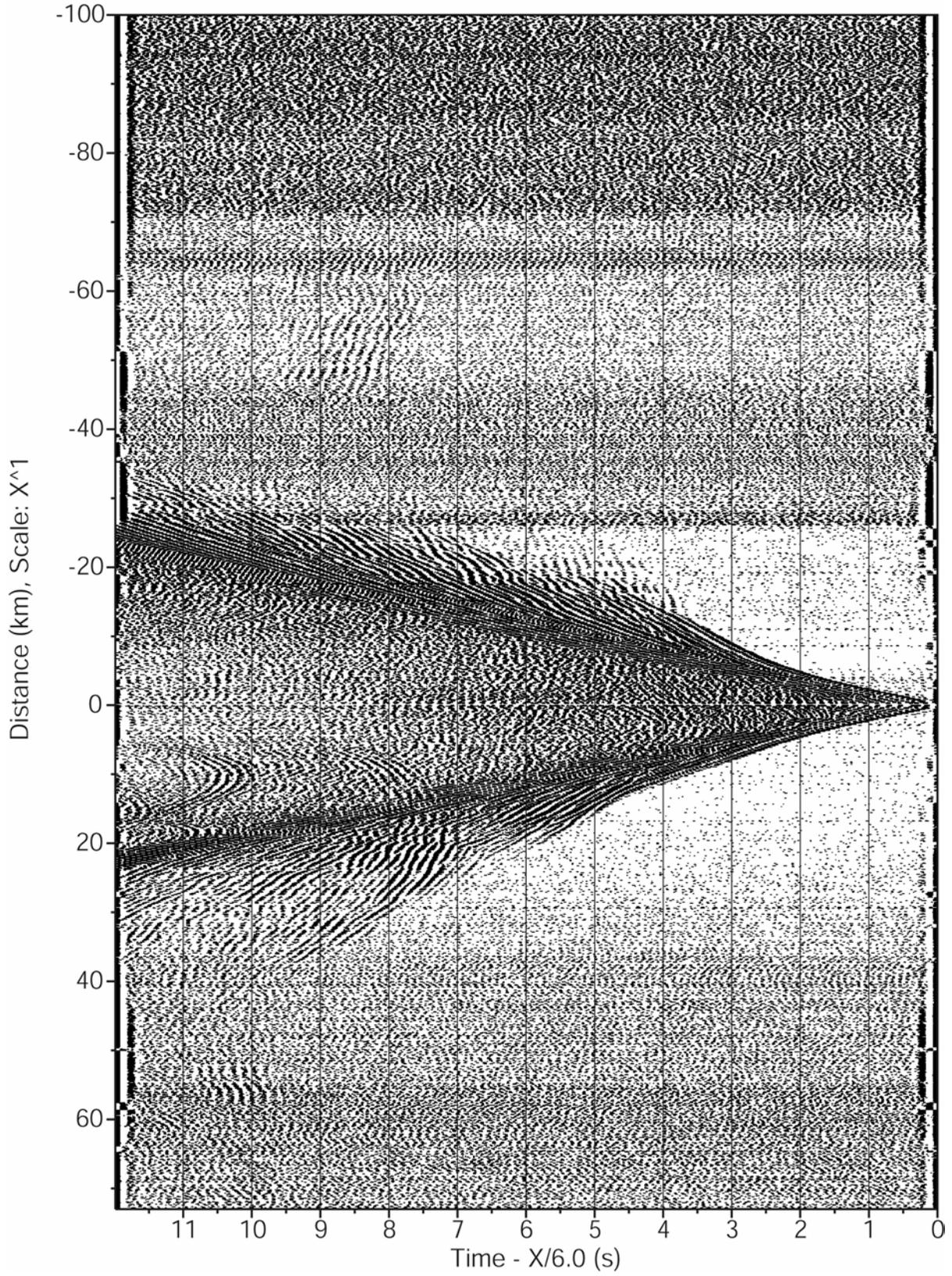
OBS 425, Vertical



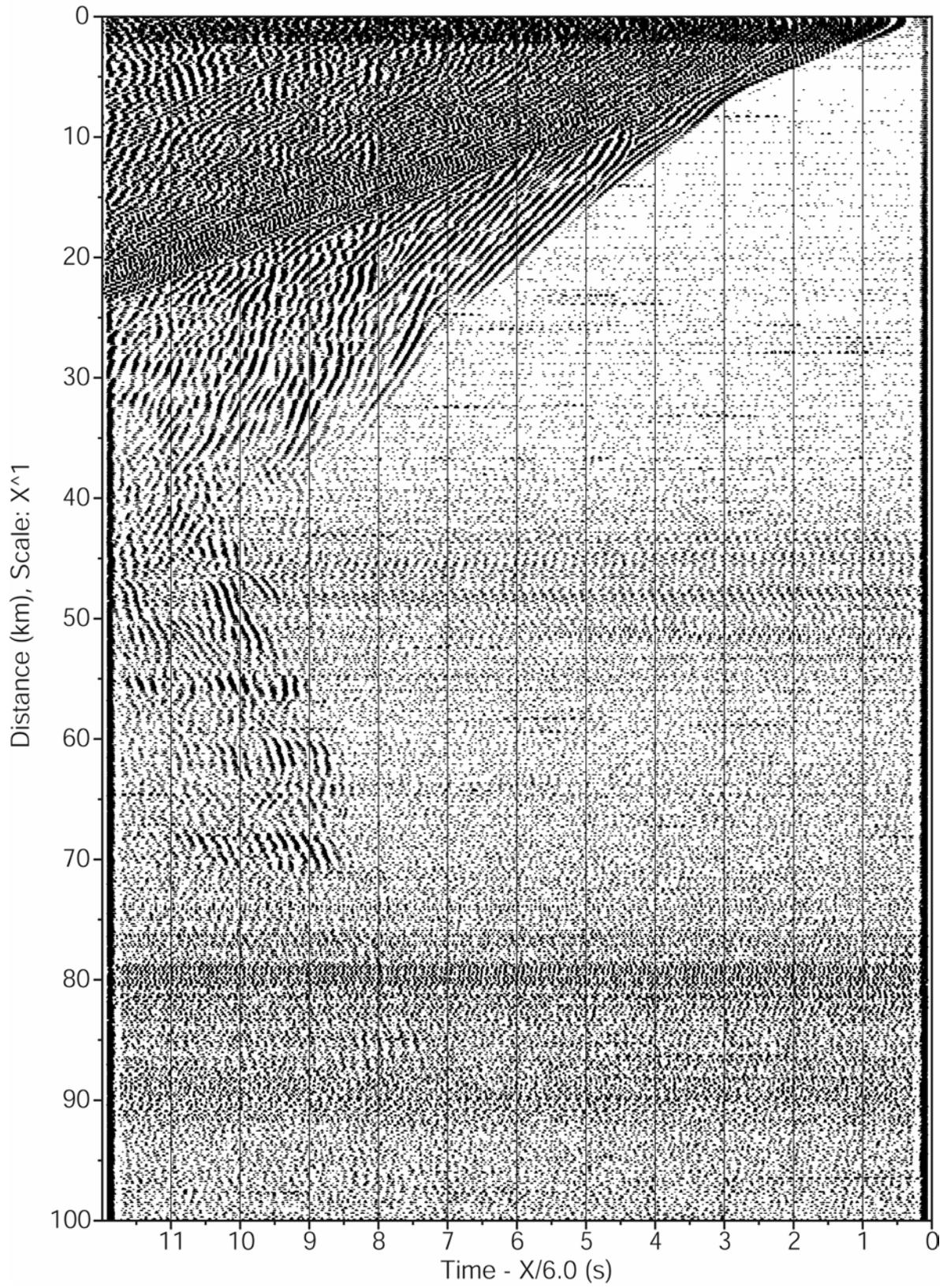
OBS 430, Hydrophone



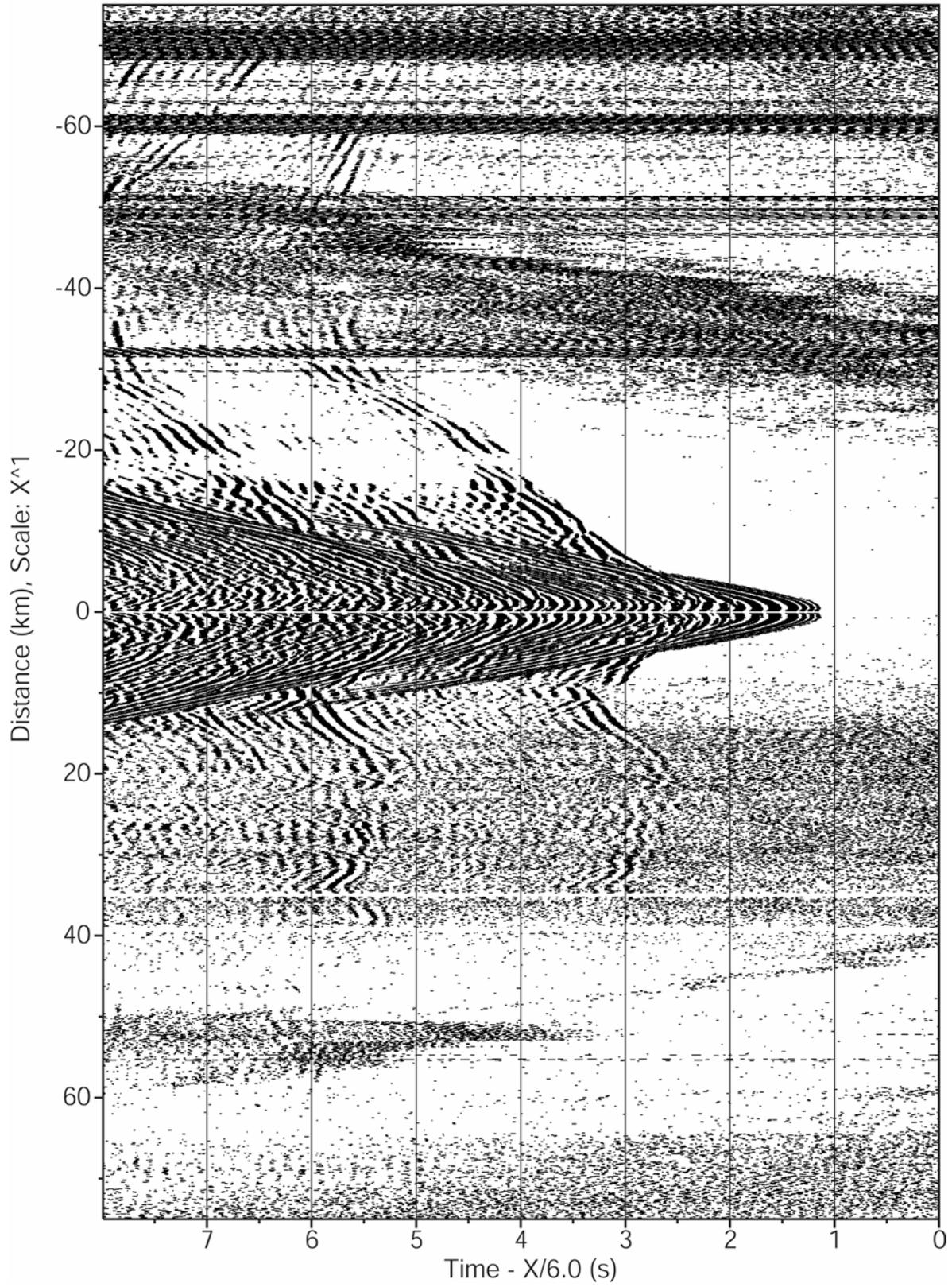
OBS 435, Hydrophone



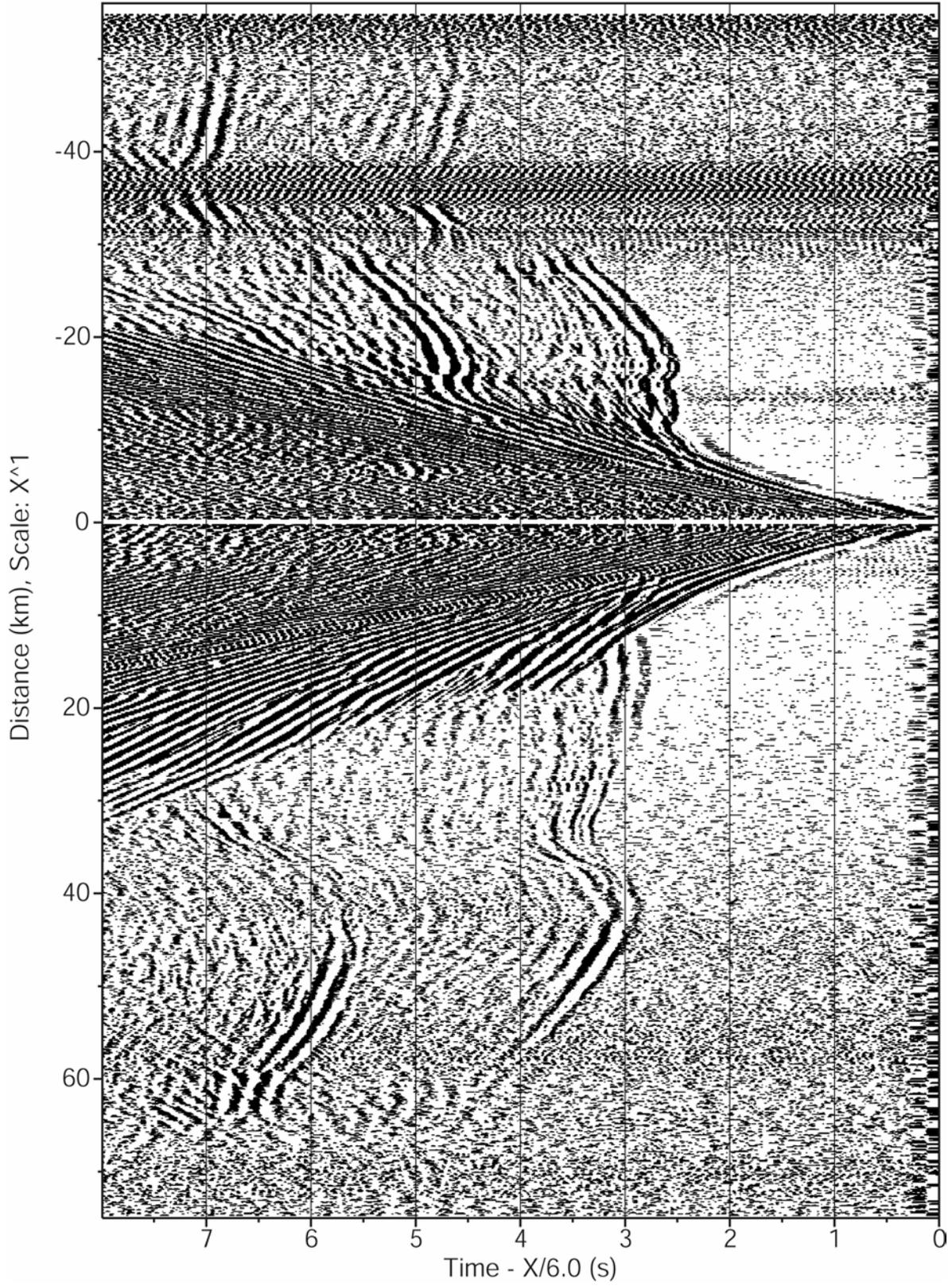
OBS 440, Vertical



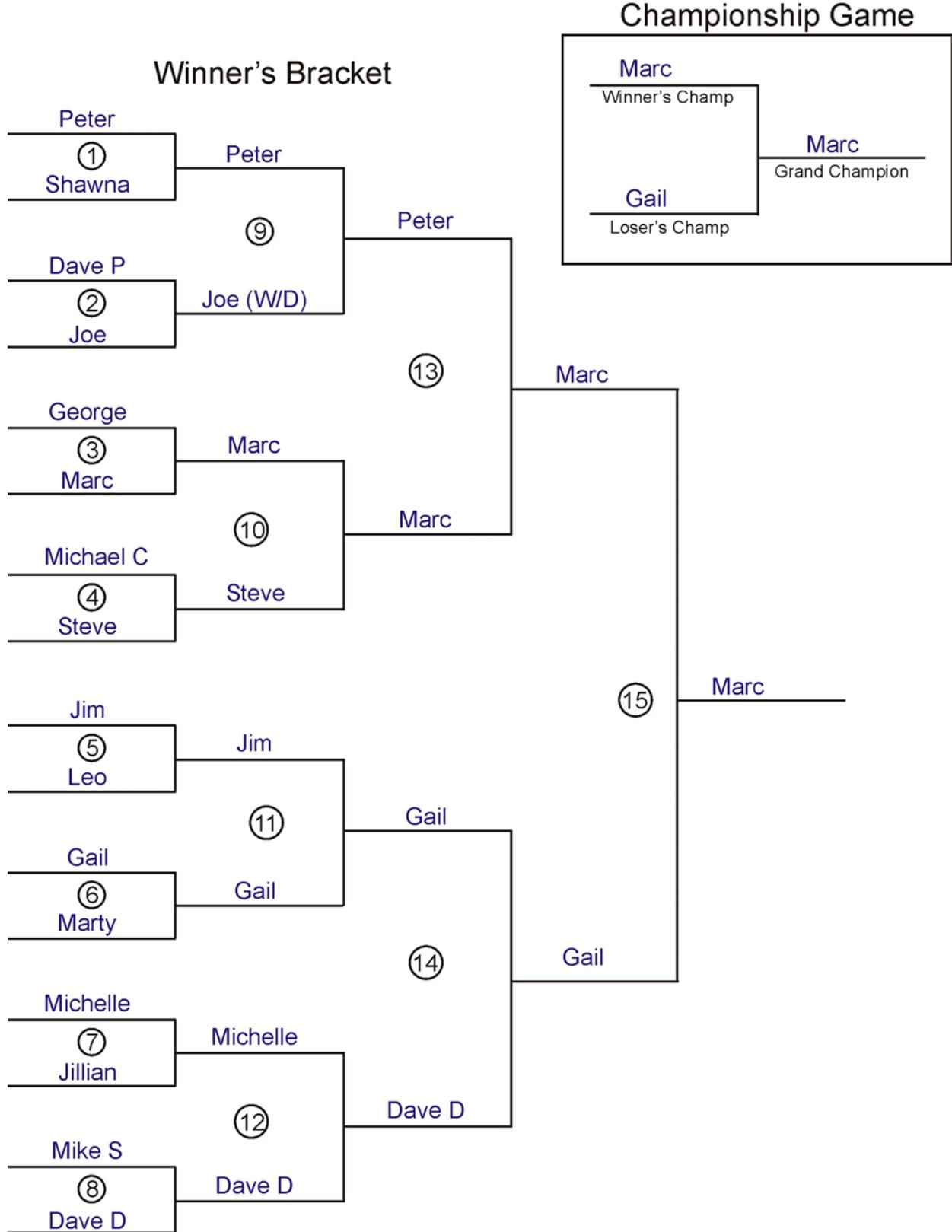
- File obs501_65w_50m.segy.f.v



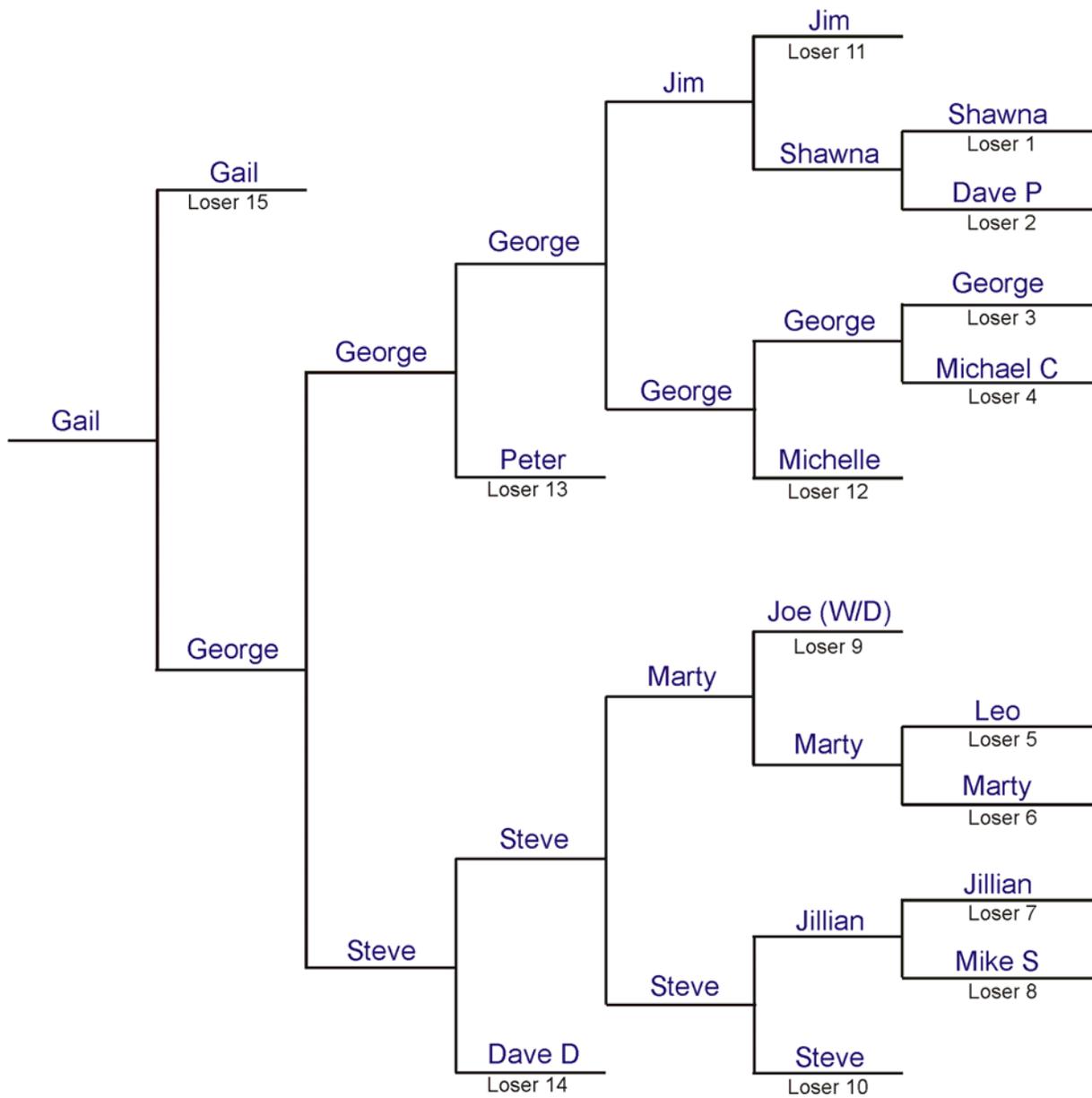
- File obs505_65w_150m.segy.f.h



SE Caribbean Singles Ping Pong Tournament Results



Loser's Bracket



SE Caribbean Doubles Ping Pong Tournament Results

