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SONOBUOY REFRACTION DATA NEAR KODIAK, ALASKA

By

Mark L. Holmes, Charles A. Meeder,
and Kenneth C. Creager

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SUMMARY

A total of 88 unreversed sonobuoy refraction lines were shot over the continental shelf and slope near Kodiak, Alaska, in 1976 and 1977. Useful results were obtained from 59 of these attempts. The field measurements were carried out aboard the USGS research vessel SAMUEL P. LEE. The refraction lines were concentrated in three major areas: (1) the outer continental shelf from Portlock Bank to Chirikof Island; (2) Shelikof Strait; and (3) the continental slope between Kodiak Seamount and Portlock Bank.

Sound sources used during the refraction survey included 1326 and 2501 cubic inch air gun arrays, and a 160 kilojoule arcer. Most of the sonobuoys employed were U. S. Navy SSQ-41A and SSQ-41B models; a few commercial buoys (Refraction Technology and Fairfield Industries) were also used. Line lengths ranged from 5 to 30 km, and maximum subbottom penegration was 5.1 km.

The field data were recorded on magnetic tape as well as a conventional facsimile recorder. Data reduction was accomplished using the slope-intercept method with the assumption of plane layers. A computer program was used to calculate interval velocities, thicknesses, reflection times, and critical distances for each of the refracting layers; the program also generated a travel time plot showing refracted arrivals as well as wide angle reflections associated with each of the interfaces.

INTRODUCTION

A program of sonobuoy refraction measurements near Kodiak Island was initiated in July 1976, as part of an integrated survey designed to accurately assess the resource potential of the continental shelf in the western Gulf of Alaska. Refraction profiles were also obtained over a portion of the continental slope in order to investigate the structure of a convergent continental margin. An attempt was made to deploy sonobuoys at regular intervals along the tracklines so that the interval velocities obtained from the refraction work could be used to verify and supplement stacking velocities derived from multichannel trace gathers.

Two-ship refraction surveys utilizing explosives as the sound sources were carried out in 1956 and 1957 by Shor (1962) over the continental shelf and slope east of Kodiak Island. The results of the five reversed lines and one unreversed line obtained from these surveys have been discussed by Shor (1962, 1972) and Shor and von Huene (1972). Mantle arrivals were observed on all of the reversed profiles; the crustal section constructed by Shor and von Huene (1972) show that mantle depth increases from about 7.5 km beneath the trench to more than 23 km beneath Kodiak Island. Shor and von Huene (1972) also concluded on the basis of these data that oceanic basement (5.3 km/sec) has a shallow dip northwestward across the continental margin and then rises sharply toward Kodiak Island to a depth of about 4.5 km.

The sonobuoy refraction measurements discussed in this report were obtained on two cruises of the U. S. Geological Survey Research Vessel S. P. LEE. The first cruise (L4-76-WG) was from 11 to 25 July 1976. A

total of 24 successful unreversed refraction profiles were obtained out of 32 attempts. Fifty-five sonobuoys were deployed during the second cruise (L7-77-WG) between 3 and 21 July 1977; useful results were obtained from 35 of these unreversed profiles.

Additional geophysical data collected during these expeditions consisted of gravity, single channel reflection (high and low resolution), and common depth point (24-channel) reflection seismic. Magnetic field measurements were made over portions of some of the tracklines. These geophysical studies were concentrated in three major areas on the continental shelf and slope near Kodiak Island. Thirty-five sonobuoy lines were obtained over the outer continental shelf from Portlock Bank (Fig. 1) to Chirikof Island, and ten of the profiles were shot in the southwestern part of Shelikof Strait. The other 14 refraction lines were over the continental slope, with most of them lying roughly between Kodiak Seamount and Portlock Bank (Fig. 1).

INSTRUMENTATION AND DATA ACQUISITION

Navigation System

A fully integrated navigation system utilizing navigational satellite, Loran-C, and doppler sonar was used for positional control during the sonobuoy refraction work. The navigation system was also used to fire the air gun array every 50 m along the trackline whenever this sound source was used.

In shallow water (less than 300-m depth) the satellite navigator and doppler sonar gave very precise control. The accuracy of fixes over the shelf areas is probably on the order of ± 50 m. This precision was also

reflected by the straight water break arrival on the sonobuoy records. In deeper water over the continental slope the doppler sonar system was forced to operate in the water (scattering) mode, and the fix accuracy became more dependent on satellite and Loran-C control. Some slight variation in ship speed and/or firing interval could be seen on the water break trace of the sonobuoy records. Positional accuracy in these deeper water areas was probably ± 100 m.

Sonobuoy Refraction System

Three different sound sources were used in the refraction studies in 1976 and 1977. A 1326 in^3 (21.73ℓ) tuned air gun array was used for all but two of the successful 1976 profiles. A 160 kilojoule arcer was employed on two near-shore profiles in shallow water. During the 1977 survey a 2501 in^3 (40.98ℓ) air gun array was used on 7 lines and the 1326 in^3 (21.73ℓ) tuned array on 27 lines. An 1132 in^3 (18.55ℓ) air gun array was used on one of the refraction runs due to a failure of the 194 in^3 air gun (3.18ℓ).

Both commercial and U.S. Navy (SSQ-41A,B) sonobuoys were employed in the course of the survey. Of the 59 successful buoys, 47 were military models, 11 were manufactured by Fairfield Industries, and one by Refraction Technology. The three most common reasons for failure of the sonobuoys were: (1) signal loss shortly after launch (probably due to a water leak); (2) hydrophone suspension fouling on CDP streamer depth controller birds or tail buoy; or (3) failure of the 20 minute delayed hydrophone release mechanism in some of the commercial buoys.

Aboard ship the military sonobuoy signals were processed using a Nems-Clarke receiver and an Aquatronics (Fairfield Industries) STR-70 2-channel receiver. The STR-70 was used only to amplify and filter the seismic signal from the Nems-Clarke, and to provide separate water break amplification controls. When using commercial sonobuoys the STR-70 crystal-controlled receivers were used in the normal way. Lo-cut filters were normally set at 5 Hz, and the hi-cut at 62 Hz. The STR-70 receiver gain and water break amplification controls were used to optimize signal levels and record clarity.

The filtered output of the STR-70 receiver was displayed on a Raytheon UGR-196C graphic recorder operating in the single sweep (stop-start) mode. Sweep speeds were set at 6 or 8 seconds when using the air gun arrays, and 3 seconds when the arcer sound source was employed. The air gun array was fired at 50 m (about 18 second) intervals by the integrated navigation system. Firing interval for the arcer was controlled by the recorder operating on a 3 second continuous sweep.

A Hewlett-Packard 3968A 8-track tape recorder was used to record the data for subsequent play-back with different gain and filter settings. Five of the FM channels recorded single channel reflection data, the filtered sonobuoy signal, the unfiltered sonobuoy signal, the tape recorder servo sync signal, and the air gun trigger pulse. Direct (AM) recording channels were used for 1 second time ticks from a cesium clock and for voice annotation.

Surface (4-m depth) temperatures were monitored continuously during refraction operations, and sound velocity in the water was computed by a

velocimeter mounted in the hull. These measurements were supplemented by a few expendable bathythermograph casts to insure proper hydrophone depth with respect to the thermocline.

DATA REDUCTION METHODS AND RESULTS

Data from the 59 unreversed refraction profiles were reduced using the slope-intercept method. No corrections for dipping interfaces or sea-floor topographic irregularities were incorporated in the results. Several points representing travel time and distance (water-wave time) were picked along each of the refracted arrival (head wave) lines observed on the facsimile records. Mean horizontal and vertical water velocities were calculated from velocimeter and temperature information. Using these data points and water velocities a computer program was then used to calculate intercept times, apparent interval velocities, depths and reflection times to the various interfaces, and critical distances for each of the refracted head waves. A computer plot was then produced showing travel time versus distance (water-wave time) for each of the refracted arrivals. Wide angle reflection curves from zero time to critical distance were also plotted for each of the layers.

The locations of the 59 refraction lines are shown in Figure 1, and the results are summarized in Table 1. The refraction results were used to compute second order polynomial curves of reflection time versus depth below the seafloor for the outer continental shelf (Fig. 2), Shelikof Strait (Fig. 3), and the continental slope between Kodiak Seamount and Portlock Bank (Figs. 4, 5).

Figure 2 shows considerable scatter of the data points, as might be expected from refraction results over sedimentary basins and deformed zones where thicknesses of the upper low velocity layers vary considerably. The second order polynomial relationship between depth and reflection time is shown to be:

$$D = 0.90\ T + 0.24\ T^2$$

The Shelikof Strait data show less scatter (Fig. 3). A second order polynomial curve fitting the points gives the relationship:

$$D = 1.07\ T + 0.19\ T^2$$

The depth versus reflection time curve for the continental slope data is shown in Figure 4. The scatter is a result of thick low-velocity sections measured along profiles 51 and 55. If these points are removed, the plot shown in Figure 5 results. The equation for the curve fit is:

$$D = 0.94\ T + 0.26\ T^2$$

These curves for the three main physiographic areas covered in the refraction survey show a close similarity. Depths corresponding to a given reflection time vary by a maximum of only 200 m (at 4.5 km sub-bottom depth) if points from the anomalous low velocity zones beneath the slope are omitted from the plots.

Appendix 1 contains the time-distance computer plots for the individual refraction profiles. The solutions for intercept time, interface depth, interval velocity, reflection time, and critical distance are shown above each plot. Other parameters such as sonobuoy number, sound source used, and sonobuoy type are also shown. Layer 1 represents the water column. Depths and reflection times (TT INC) are shown to the base of

each layer. Depths are in kilometers and velocities in kilometers/second. The horizontal distance (seconds) shown on the plots can be converted to true distance using the horizontal water velocity shown for layer 1. The small tick mark along the individual reflection/refraction traces on the time-distance plots indicate the critical distance for the refracted arrivals.

A forthcoming paper will be devoted to an interpretation of these sonobuoy refraction data. Vertical and horizontal (areal) extent of the major acoustic units will be discussed, as well as the geologic and tectonic significance of these data regarding continental shelf and slope structure and development.

ACKNOWLEDGEMENTS

We would like to express our thanks to the master, crew, and scientific parties of the S. P. LEE for their assistance during cruises L4-76-BS and L7-77-BS. The U. S. Geological Survey resource assessment program in the western Gulf of Alaska is being directed by Roland von Huene. Alan Cooper and Jon Childs, USGS, furnished us with the sonobuoy reduction program, to which we subsequently made minor modifications.

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Shor, G. G., Jr., 1972, Travel-time plots for refraction stations near Kodiak, Alaska: Marine Physical Laboratory Technical Memorandum 233, University of California (SIO), San Diego, 8 p.

Shor, G. G., Jr., and R. von Huene, 1972, Marine seismic refraction studies near Kodiak, Alaska: Geophysics, v. 37, p. 697-700.

Table 1. Western Gulf of Alaska Sonobuoy Results

Location	Profile	Velocity (km/sec)						Water Depth (km)	Thickness (km)					Lat N	Long W
		V_2	V_3	V_4	V_5	V_6	V_7		h_2	h_3	h_4	h_5	h_6		
M. Albatross Bank	76-1	1.95	2.18	3.84	4.15	..	..	0.09	0.42	0.27	1.56	..	..	57°12.0	152°20.5'
N. Albatross Bank	76-2	1.81	2.23	4.47	5.06	6.06	..	0.08	0.34	1.26	1.20	1.17	..	57°36.5'	151°30.0'
"	76-4	2.07	2.80	4.24	4.68	4.90	..	0.12	0.53	1.10	1.27	0.85	..	57°58.1'	150°52.8'
Portlock Bank	76-5	2.01	2.55	..	..	..	..	0.13	0.43	..	..	..	..	58°32.8'	149°40.5'
"	76-6	2.02	2.33	2.78	..	..	..	0.13	0.26	0.64	..	..	..	58°18.4'	149°01.5'
"	76-7	2.10	2.54	2.91	3.46	3.88	..	0.12	0.42	0.64	0.94	0.79	..	58°14.5'	149°08.9'
N. Albatross Bank	76-10	1.99	2.22	..	..	..	..	0.13	0.35	..	..	..	..	57°35.1'	150°29.2'
"	76-11	2.05	2.25	2.57	3.64	..	..	0.10	0.08	1.12	0.34	..	..	57°32.2'	150°35.3'
M. Albatross Bank	76-12	2.00	2.21	2.48	3.65	..	..	0.09	0.48	0.51	0.53	..	..	56°58.3'	152°02.5'
"	76-14	2.00	2.33	2.58	4.36	4.63	..	0.13	0.58	0.24	0.76	0.64	..	57°07.0'	152°12.5'
S. Albatross Bank	76-16	1.95	2.26	2.50	..	..	..	0.09	0.32	1.17	..	..	..	56°43.6'	153°04.0'
"	76-17	1.88	..	..	..	..	..	0.11	..	..	..	..	..	56°34.7'	153°24.7'
"	76-18	2.17	2.64	3.49	4.78	6.30	..	0.14	0.91	0.96	0.80	2.18	..	56°31.5'	153°31.8'
"	76-19	1.97	2.19	2.51	2.82	4.56	6.06	0.16	0.33	0.50	1.27	0.39	1.84	56°13.9'	153°58.3'
"	76-20	2.10	2.33	2.77	..	..	..	0.08	0.19	0.48	..	..	..	56°25.4'	153°31.9'
"	76-21	2.10	2.18	2.30	2.91	3.53	3.93	0.08	0.60	0.51	0.24	0.83	0.95	56°26.6'	153°29.0'
"	76-22	2.06	2.57	3.26	5.01	..	..	0.10	0.61	1.32	1.29	..	..	56°32.8'	153°16.0'
"	76-23	2.00	2.28	2.65	3.30	4.27	..	0.13	0.33	0.76	0.57	1.26	..	56°38.0'	153°05.1'
Chiniak Trough	76-24	2.16	2.65	2.93	3.69	4.14	5.67	0.10	0.44	0.55	0.80	1.00	1.85	57°17.5'	151°25.0'
Cont.Slope	76-27	1.85	2.67	3.00	..	..	..	0.90	0.35	0.54	..	..	..	57°33.0'	149°50.7'
"	76-29	2.89	3.31	4.24	5.23	..	..	2.17	0.50	1.21	1.92	..	..	57°26.0'	149°28.3'
"	76-30	2.36	2.89	3.18	4.04	5.17	..	2.38	0.66	0.35	1.23	1.04	..	57°20.8'	149°30.4'
M. Albatross Bank	76-32	3.97	..	..	..	..	..	0.09	..	..	..	..	..	57°29.2'	152°03.0'
N. Albatross Bank	76-33	1.83	2.15	2.35	2.90	3.45	..	0.09	0.34	0.23	0.07	0.56	..	57°47.0'	151°51.4'

Table 1. (cont)

Location	Profile	Velocity (km/sec)						Water Depth	Thickness (km)					Lat N	Long W
		V_2	V_3	V_4	V_5	V_6	V_7	(km)	h_2	h_3	h_4	h_5	h_6		
N. Albatross Bank	77-3	2.00	2.80	3.80	..	..	..	0.07	0.81	1.15	..	..	..	57°54.5'	151°48.0'
"	77-4	1.73	2.33	2.97	5.20	..	..	0.07	0.21	0.31	0.94	..	..	58°01.9'	151°35.0'
"	77-6	1.94	2.32	3.89	..	..	..	0.06	0.27	1.08	..	..	..	57°37.3'	150°58.8'
M. Albatross Bank	77-7	2.25	2.68	3.30	..	..	..	0.09	0.88	0.71	..	..	..	57°09.8'	151°32.3'
"	77-8	1.99	4.19	5.31	..	..	..	0.10	0.26	1.39	..	..	..	57°20.2'	152°31.5'
Kiliuda Trough	77-9	1.97	2.46	4.28	4.85	..	..	0.14	0.67	0.44	0.93	..	..	56°57.5'	152°31.0'
S. Albatross Bank	77-10	1.99	2.47	3.07	3.35	..	..	0.05	0.04	0.23	1.65	..	..	56°24.8'	153°03.4'
Cont. Shelf	77-12	1.71	1.79	2.66	..	..	..	0.11	0.25	0.79	..	..	..	55°57.7'	153°44.5'
Cont. Shelf	77-14	2.04	2.18	2.80	5.01	..	..	0.02	0.30	0.78	1.08	..	..	55°55.5'	155°20.3'
Cont. Slope	77-16	1.80	2.40	2.56	3.18	..	..	0.33	0.29	0.39	1.27	..	..	55°36.4'	154°55.2'
Cont. Shelf	77-19	1.82	2.00	3.28	4.05	..	..	0.31	0.32	0.34	0.96	..	..	56°04.1'	154°32.8'
" "	77-22	1.69	2.02	4.72	6.23	..	..	0.20	0.11	0.62	2.52	..	..	55°32.6'	155°53.1'
Shelikof Strait	77-23	1.89	2.18	5.21	..	..	..	0.21	0.12	0.58	..	..	..	56°30.7'	156°20.2'
"	77-25	1.93	2.15	3.11	..	..	..	0.14	0.11	0.43	..	..	..	56°40.0'	156°21.0'
"	77-26	2.07	2.22	2.86	..	..	..	0.24	0.25	0.40	..	..	..	56°51.9'	156°11.1'
"	77-28	1.95	3.06	3.57	..	..	..	0.23	0.40	1.05	..	..	..	57°31.2'	155°08.6'
"	77-29	1.68	2.24	3.25	3.47	5.33	..	0.20	0.17	0.58	0.46	3.19	..	57°48.3'	154°36.5'
"	77-30	1.60	2.47	2.92	3.86	5.72	..	0.28	0.06	0.45	1.23	3.26	..	57°56.6'	154°22.9'
"	77-31	1.72	4.31	5.04	..	..	..	0.12	0.36	0.36	..	..	..	57°44.6'	154°00.1'
"	77-32	1.99	3.52	4.11	4.51	..	..	0.23	0.09	0.16	0.95	..	..	57°49.4'	154°59.0'
"	77-33	1.60	2.16	3.22	3.79	7.09	..	0.28	0.09	0.61	1.01	2.93	..	57°36.2'	155°11.5'
"	77-34	1.88	2.09	4.79	..	..	..	0.27	0.06	0.20	..	..	..	57°15.8'	155°09.2'
Cont. Shelf	77-38	2.37	3.00	4.29	4.86	..	..	0.11	0.36	0.78	2.37	..	..	56°12.2'	154°45.0'
S. Albatross Bank	77-41	3.55	4.73	..	..	..	..	0.07	0.67	..	..	..	..	56°27.5'	153°51.1'

Table 1. (cont)

Location	Profile	Velocity (km/sec)						Water Depth (km)	Thickness (km)					Lat N	Long W
		V_2	V_3	V_4	V_5	V_6	V_7		h_2	h_3	h_4	h_5	h_6		
Cont. Slope	77-43	2.16	3.15	3.98	..	..	..	4.19	0.79	1.58	..	..	..	55°49.8'	152°55.5'
Portlock Bank	77-44	1.81	2.00	2.35	2.52	2.76	..	0.09	0.08	0.21	0.24	0.52	..	58°01.3'	149°04.9'
Cont. Slope	77-45	2.00	2.47	2.72	3.23	..	..	3.54	0.48	0.26	0.53	..	..	57°20.6'	148°42.9'
"	77-46	2.12	2.75	..	..	..	..	2.79	0.71	..	..	..	..	57°27.6'	148°26.0'
"	77-47	2.40	3.82	..	..	..	..	3.68	1.24	..	..	..	..	57°34.0'	148°13.0'
"	77-48	2.36	3.15	3.75	5.68	..	..	3.40	0.70	1.01	2.97	..	..	57°45.5'	148°06.4'
"	77-50	2.22	2.62	3.42	..	..	..	3.11	0.36	0.77	..	..	..	57°20.4'	148°59.7'
"	77-51	1.71	2.04	2.18	2.59	6.00	..	1.41	0.11	0.33	0.32	3.33	..	57°28.5'	149°43.7'
"	77-52	2.00	2.69	3.37	3.88	5.45	..	1.66	0.46	0.62	1.83	0.76	..	57°46.4'	149°00.2'
"	77-53	2.24	2.82	4.49	5.60	..	..	2.36	0.72	1.37	2.82	..	..	57°53.8'	148°09.5'
"	77-55	1.71	2.04	3.06	4.00	4.31	..	2.78	0.92	0.50	1.25	2.44	..	57°40.2'	148°25.9'

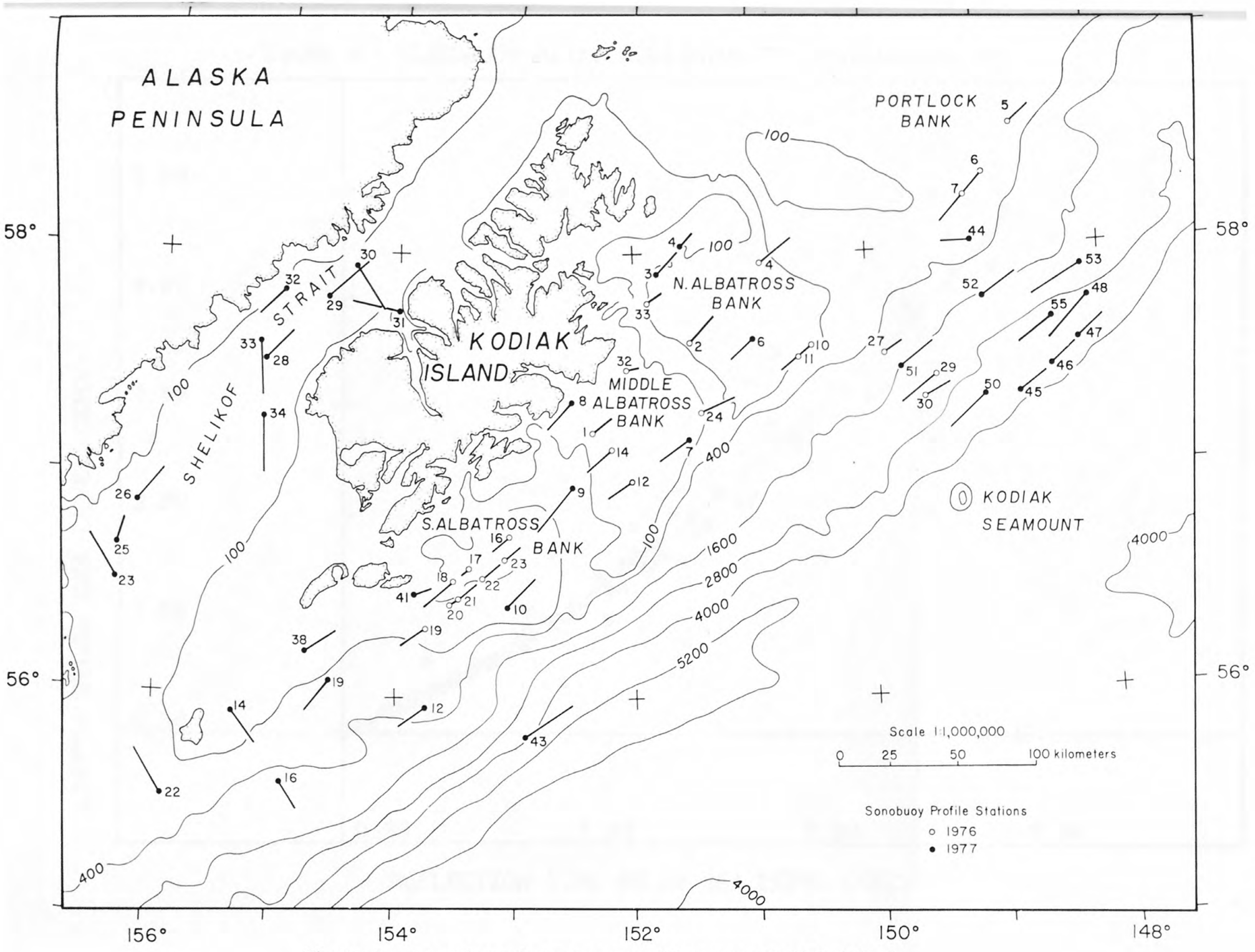


Figure 1. Location of sonobuoy profiles near Kodiak Island.

FIGURE 2. SONOBUOY DATA, KODIAK OUTER CONTINENTAL SHELF

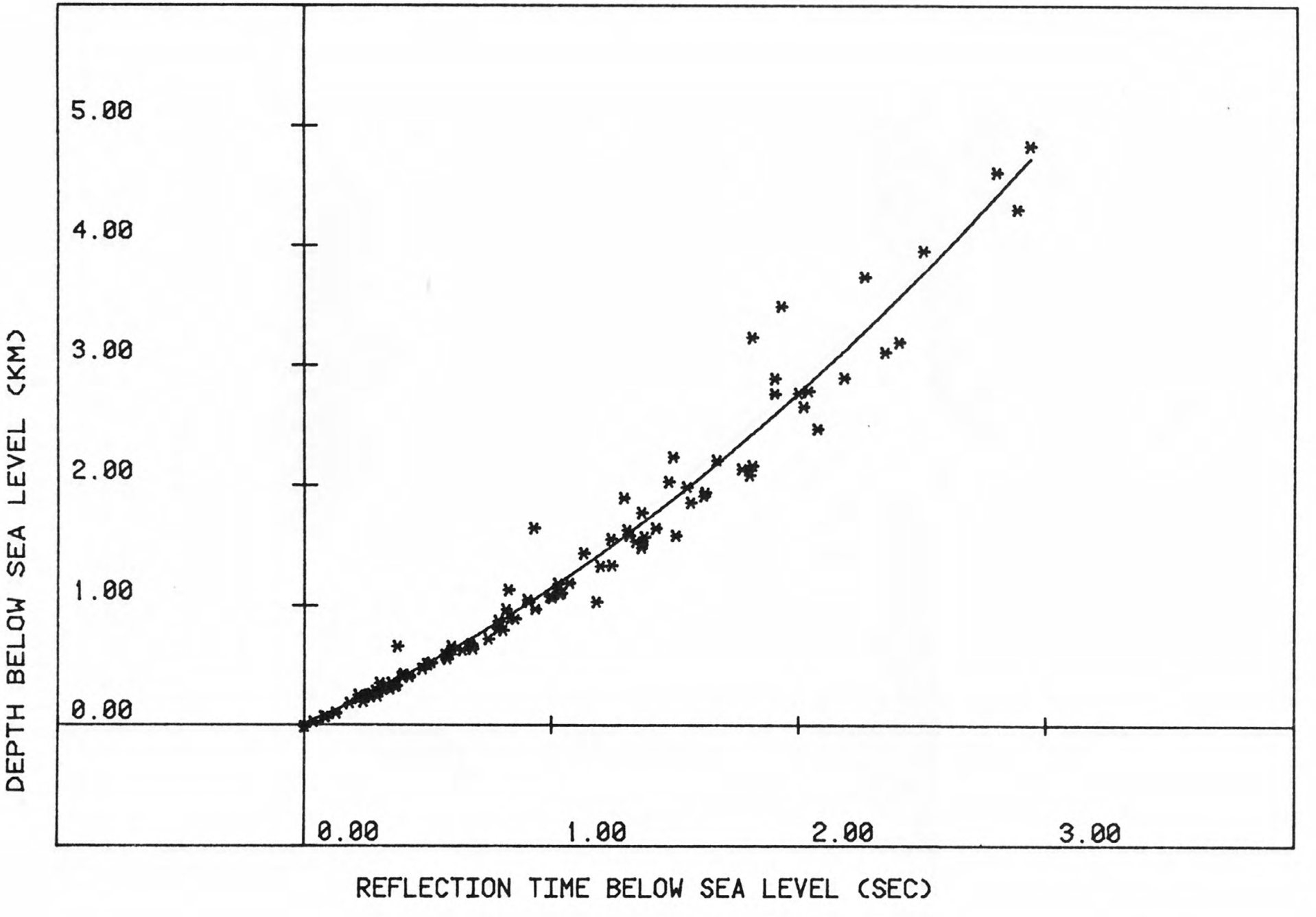


FIGURE 3. SONOBUOY DATA, SHELIKOF STRAIT

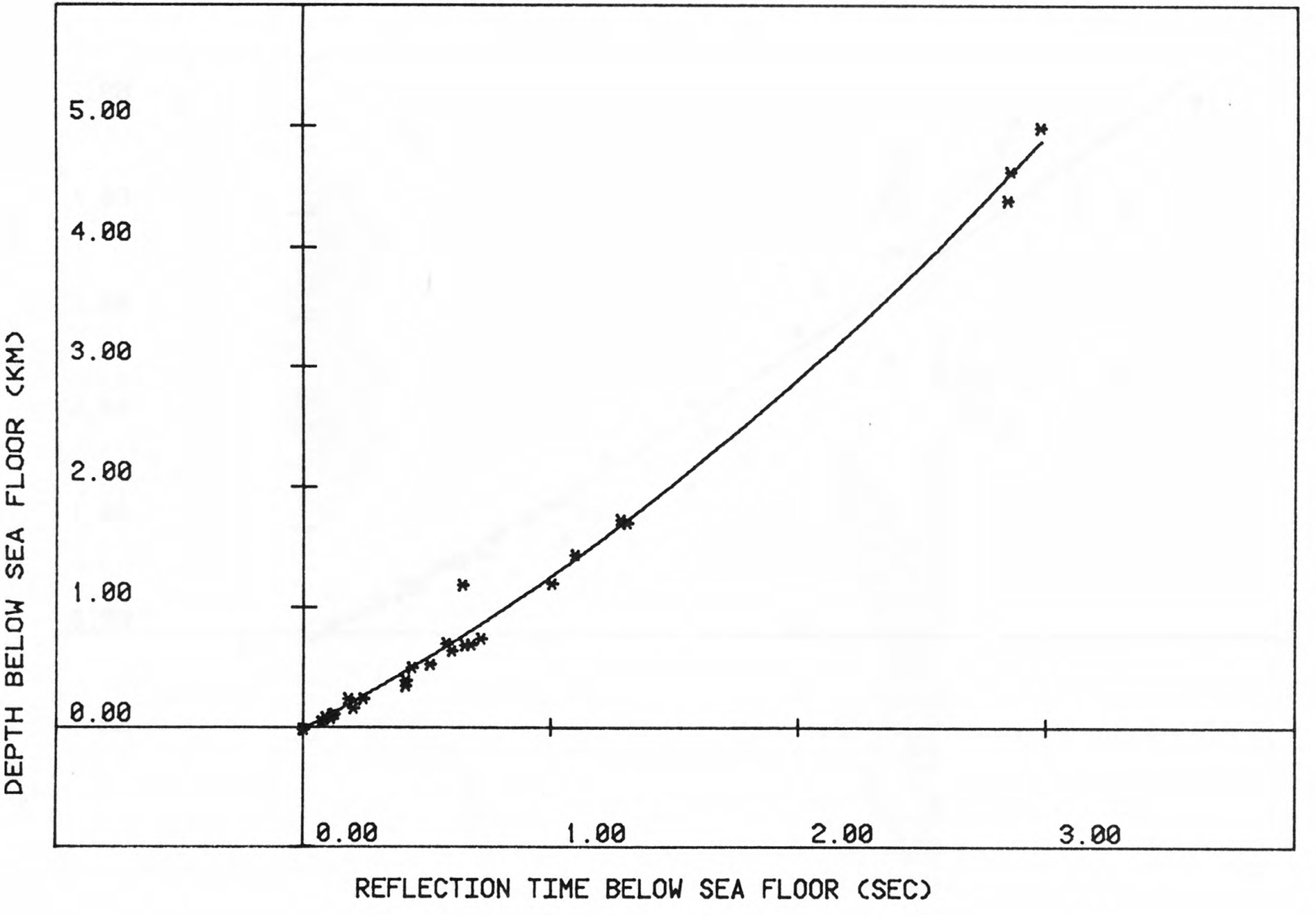


FIGURE 4. SONOBOUY DATA, KODIAK CONTINENTAL SLOPE

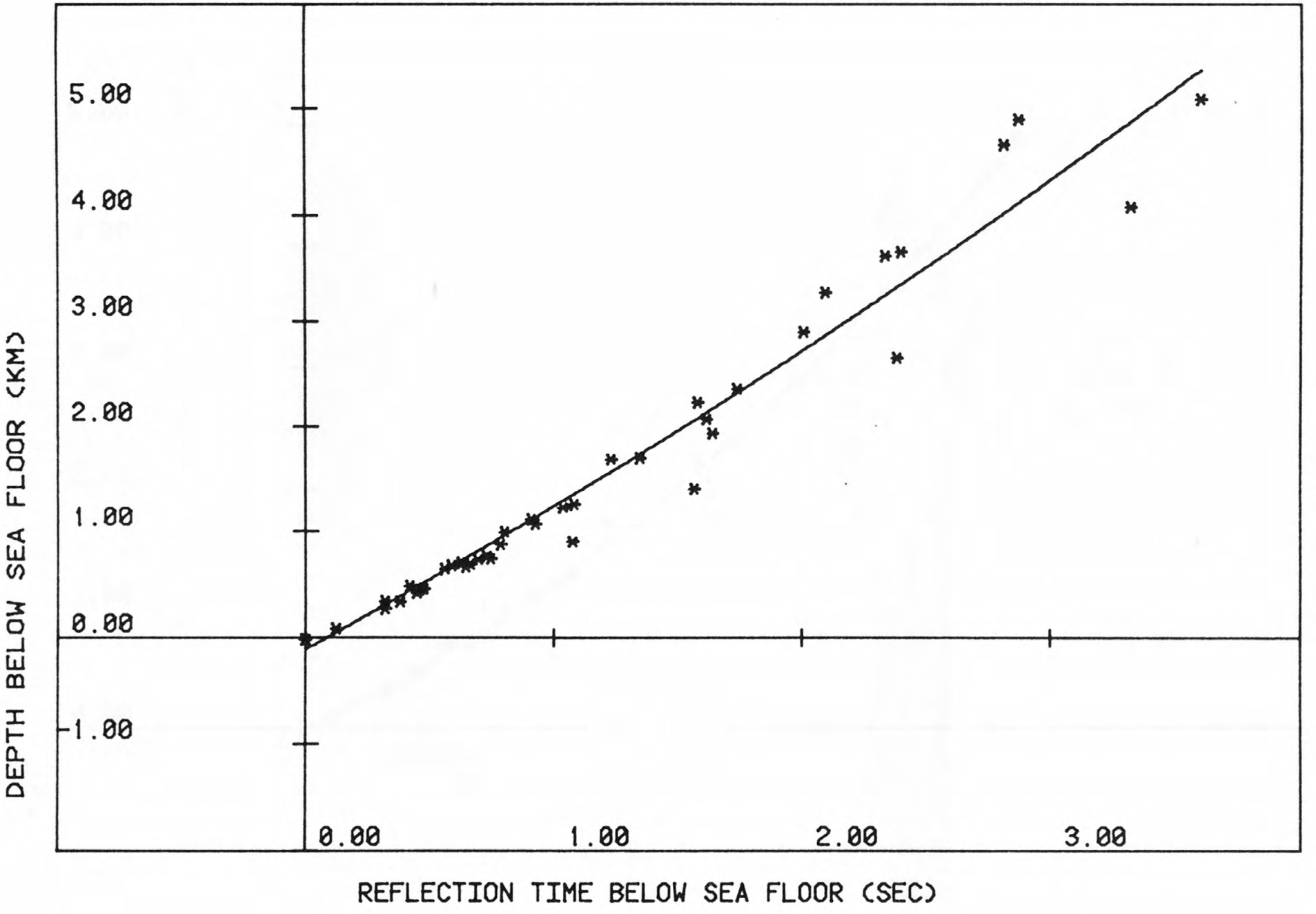
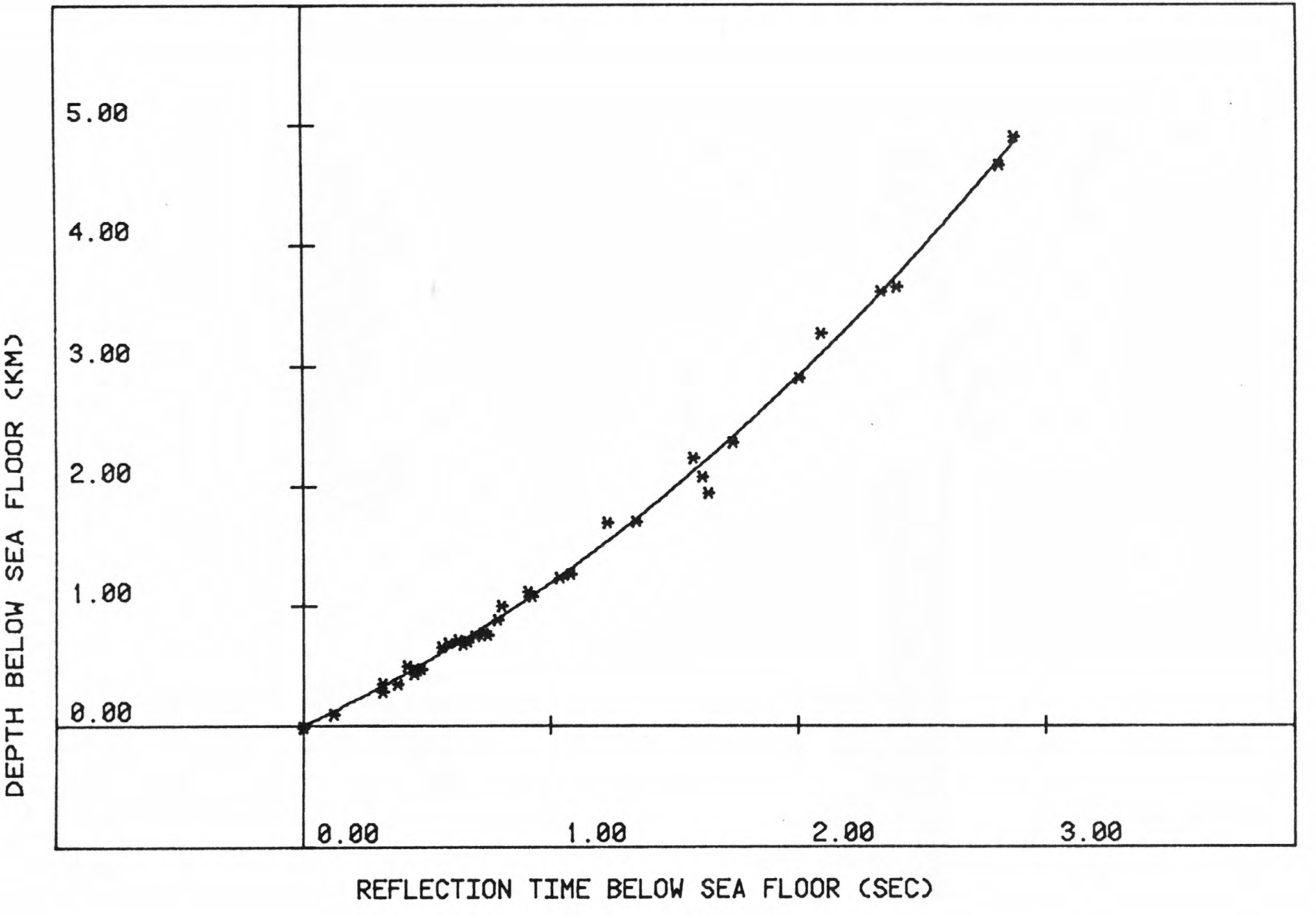


FIGURE 5. SONOBUOY DATA, KODIAK CONTINENTAL SLOPE (OMIT 51, 55)

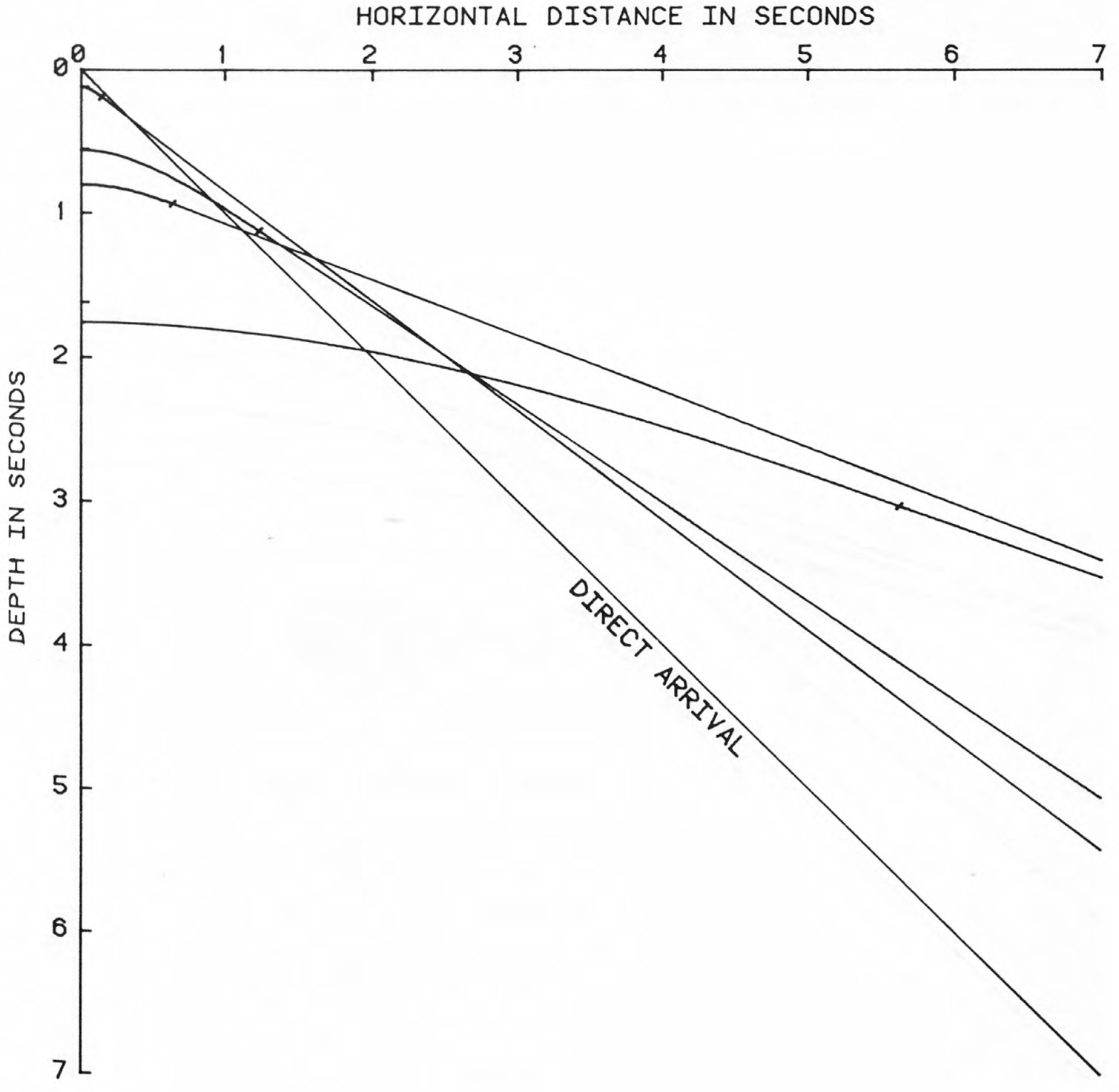


APPENDIX 1

	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.092	1.490	0.124	0.000
LAYER 2	0.080	0.508	1.951	0.550	0.218
LAYER 3	0.281	0.781	2.182	0.801	1.835
LAYER 4	0.687	2.344	3.836	1.616	0.947
LAYER 5	1.017		4.153		8.382

CRUISE : L4-76-WG
DATE/TIME : JD 194,1150
LINE : 611
SONOBUOY : 1
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

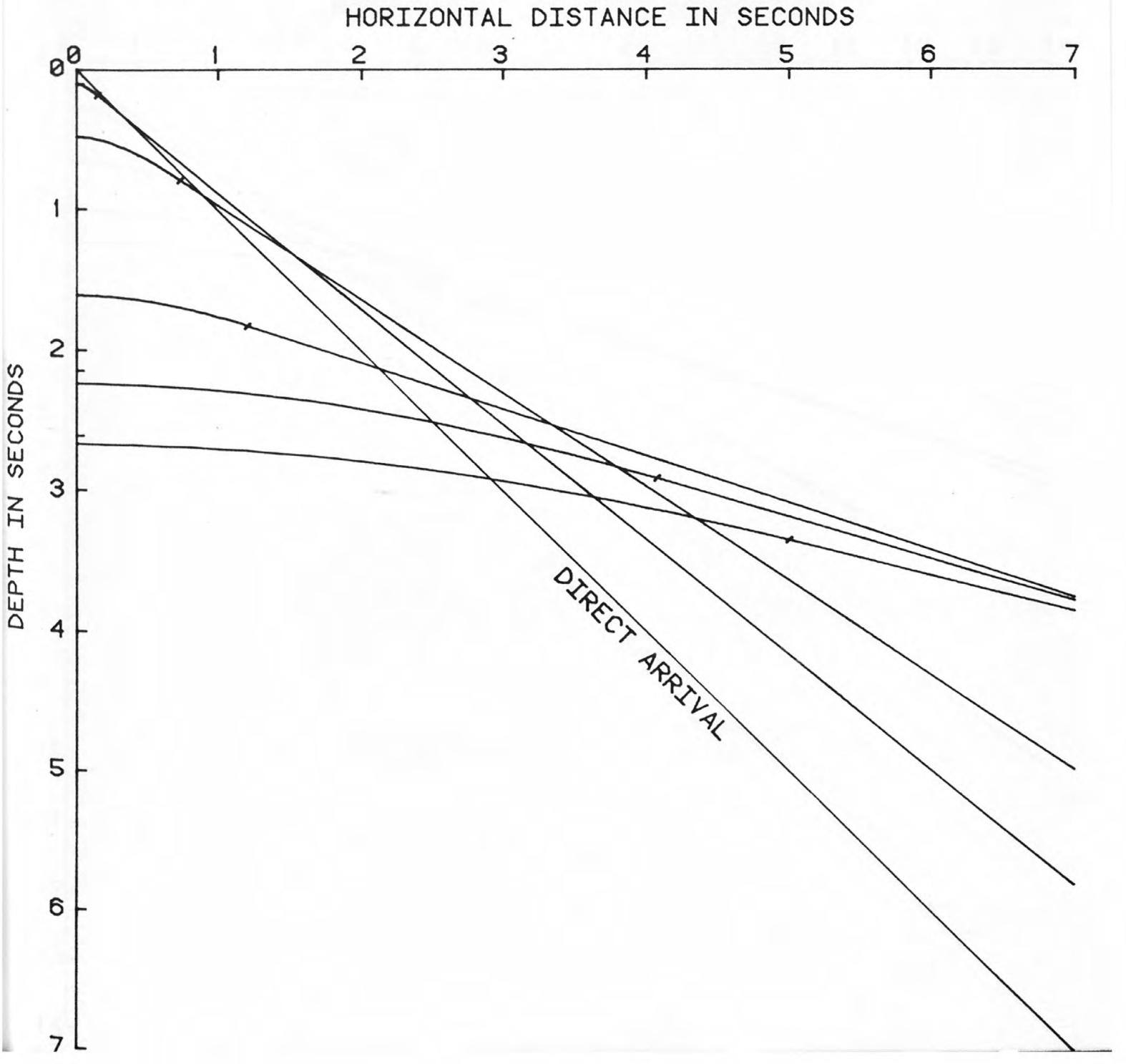
LINFT
12/16/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.078	1.490	0.105	0.000
LAYER 2	0.060	0.417	1.814	0.479	0.226
LAYER 3	0.295	1.674	2.227	1.608	1.092
LAYER 4	1.420	2.877	4.474	2.146	1.799
LAYER 5	1.715	4.050	5.062	2.609	6.083
LAYER 6	2.125		6.056		7.457

CRUISE : L4-76-WG
DATE/TIME : JD 194,1907
LINE : 611
SONOBUOY : 2
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

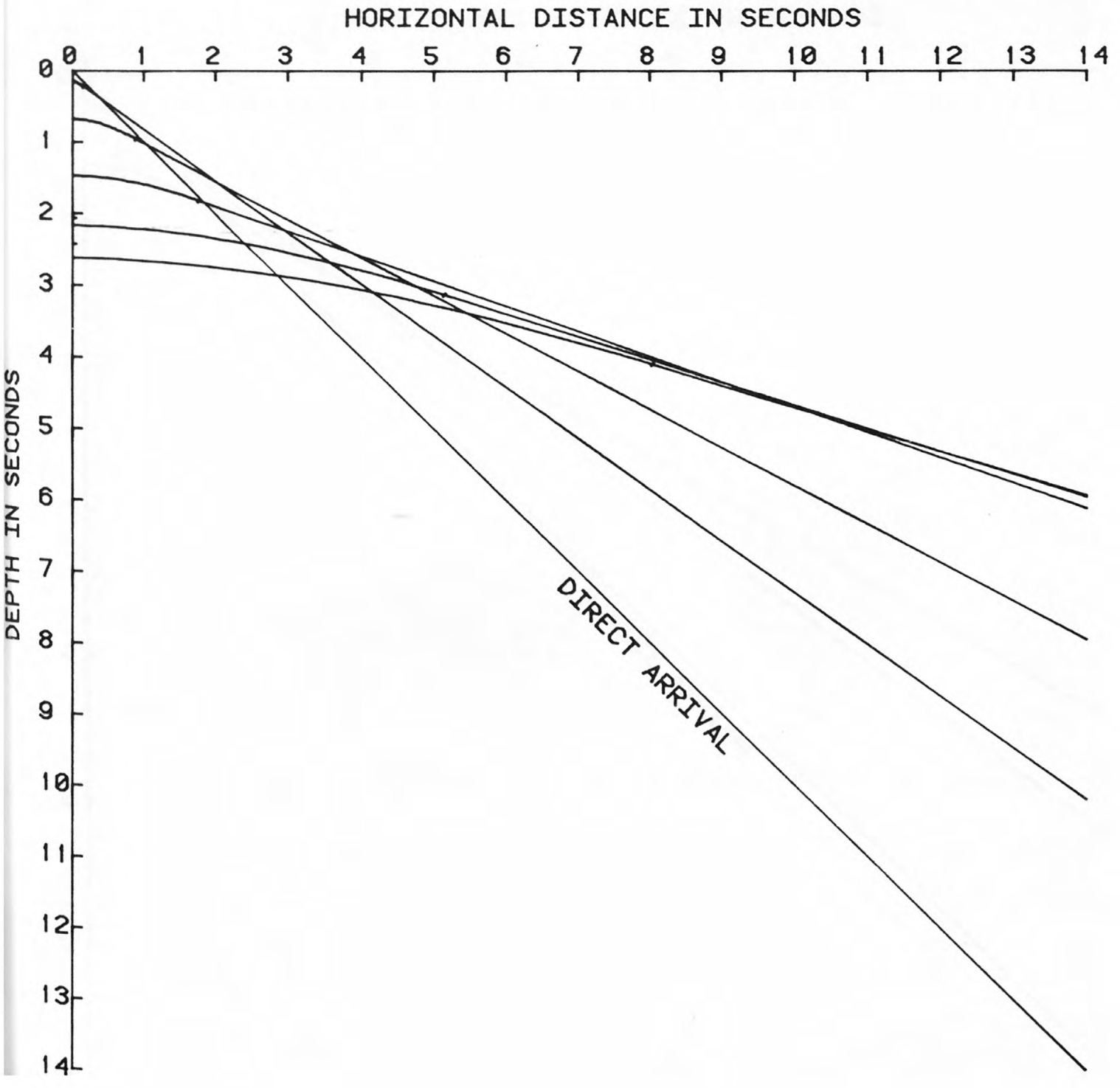
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.118	1.490	0.158	0.000
LAYER 2	0.110	0.651	2.070	0.673	0.245
LAYER 3	0.480	1.755	2.795	1.463	1.324
LAYER 4	1.191	3.026	4.237	2.063	2.623
LAYER 5	1.500	3.876	4.680	2.426	7.671
LAYER 6	1.675		4.900		11.965

CRUISE : L4-76-WG
DATE/TIME : JD 195,0015
LINE : 611
SONOBUOY : 4
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

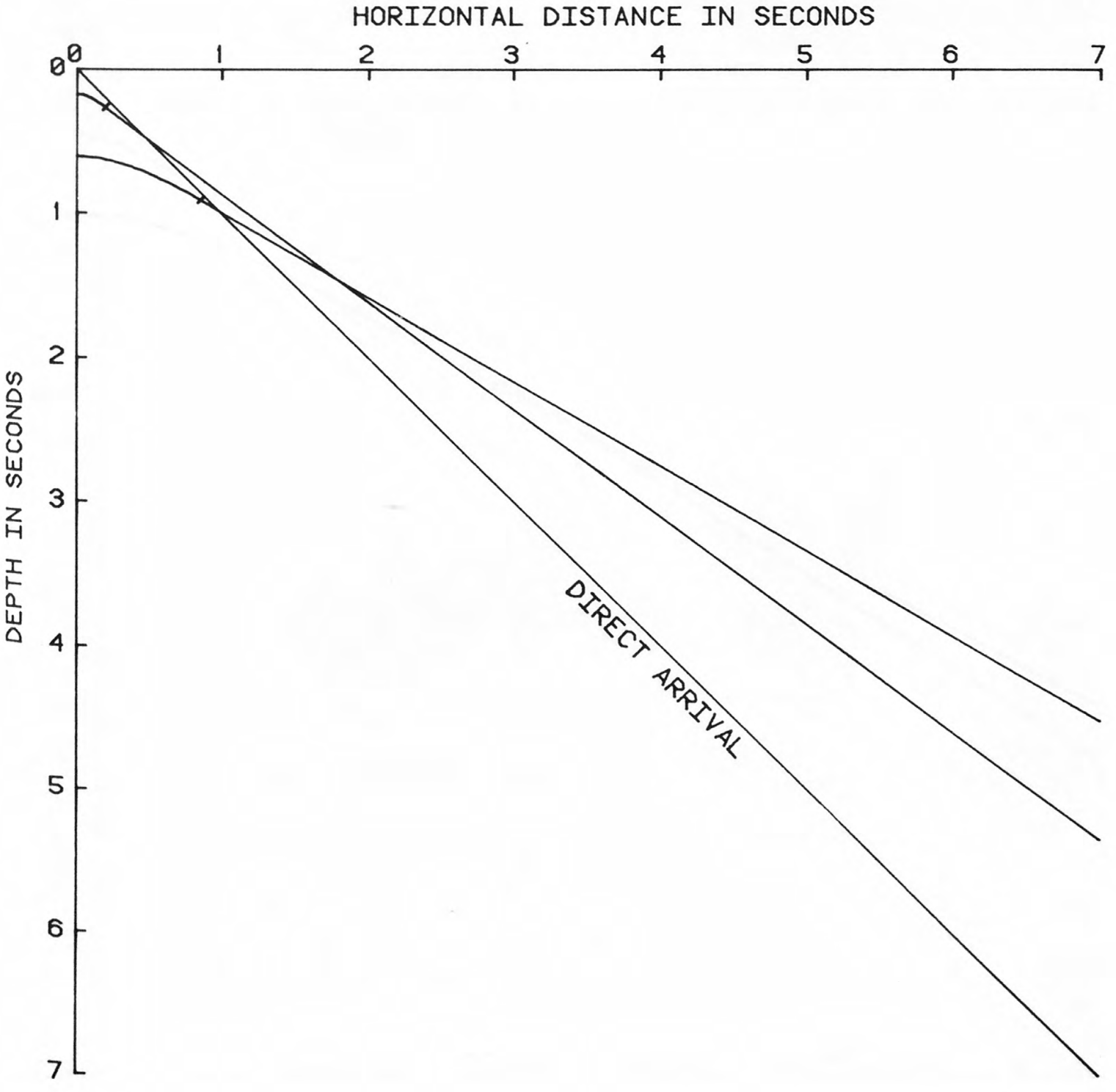
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.132	1.500	0.176	0.000
LAYER 2	0.117	0.559	2.007	0.601	0.297
LAYER 3	0.405		2.553		1.278

CRUISE : L4-76-WG
DATE/TIME : JD 195,1403
LINE : 611
SONOBUOY : 5
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

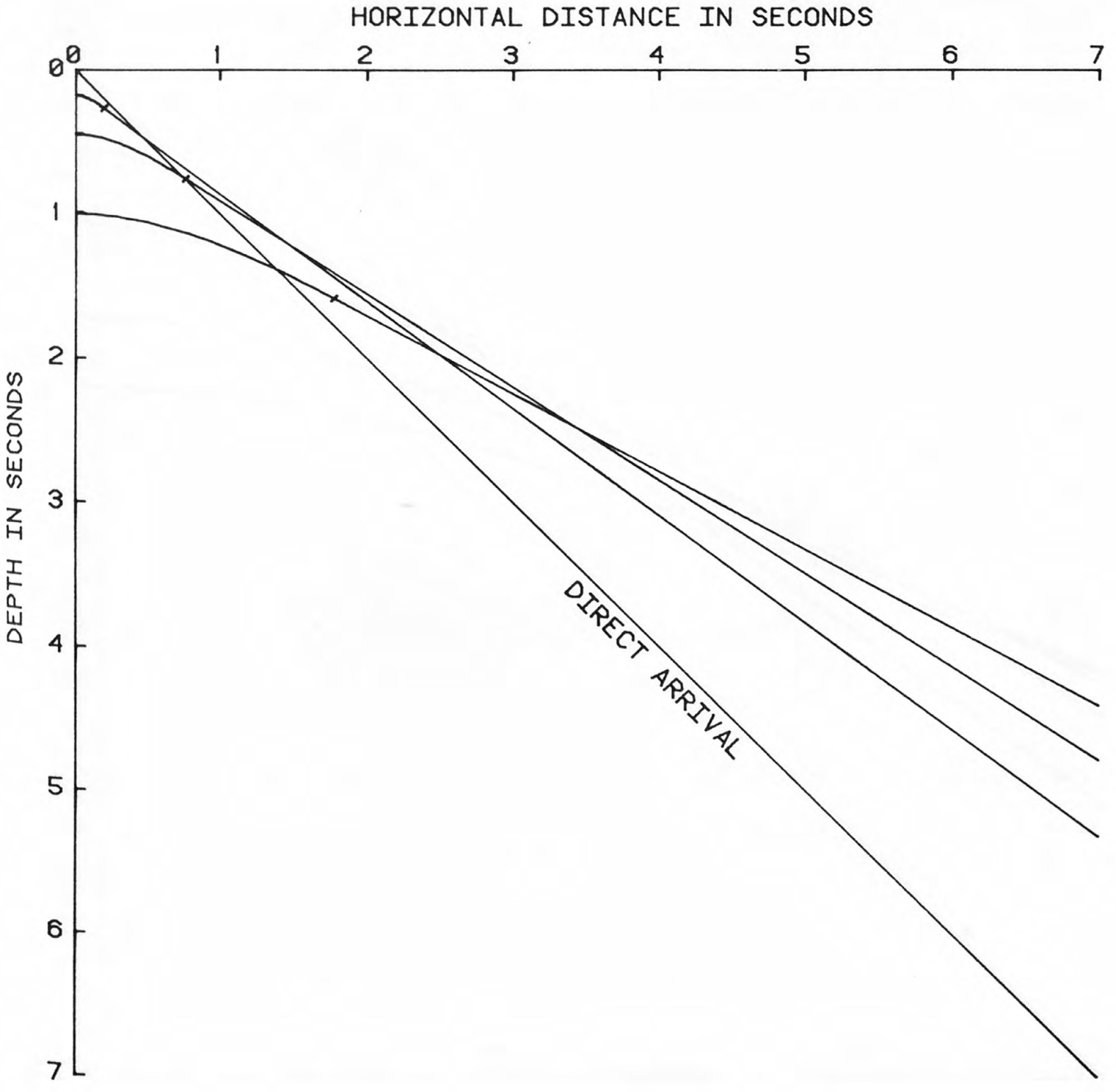
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.134	1.500	0.179	0.000
LAYER 2	0.120	0.396	2.020	0.438	0.298
LAYER 3	0.265	1.034	2.325	0.988	1.143
LAYER 4	0.631		2.784		2.664

CRUISE : L4-76-WG
DATE/TIME : JD 196,1036
LINE : 614
SONOBUOY : 6
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : SELECT

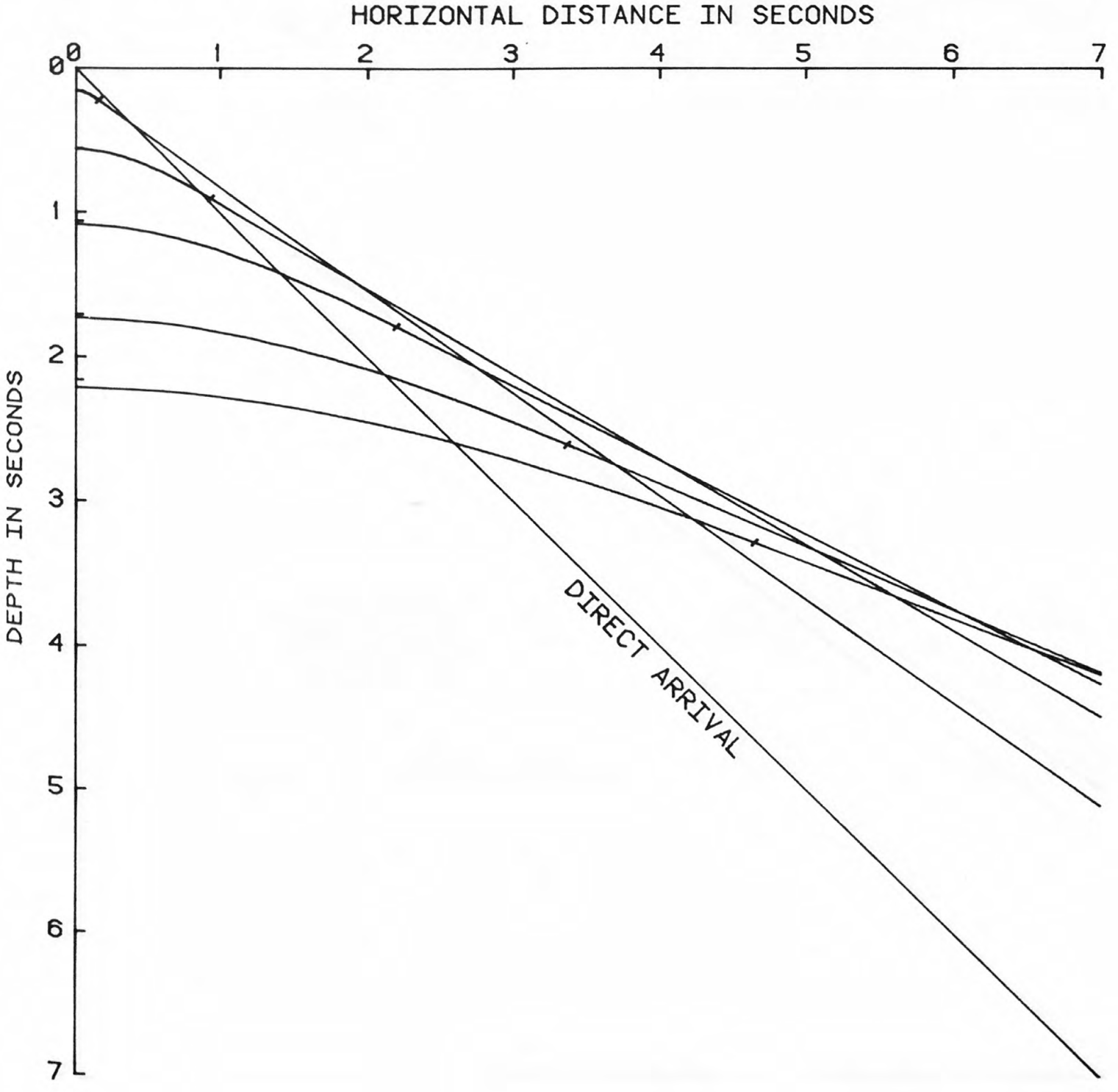
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.118	1.500	0.157	0.000
LAYER 2	0.110	0.534	2.101	0.553	0.240
LAYER 3	0.349	1.177	2.539	1.060	1.398
LAYER 4	0.657	2.116	2.913	1.705	3.296
LAYER 5	1.149	2.901	3.462	2.159	5.063
LAYER 6	1.492		3.881		6.981

CRUISE : L4-76-WG
DATE/TIME : JD 196,1143
LINE : 614
SONOBUOY : 7
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

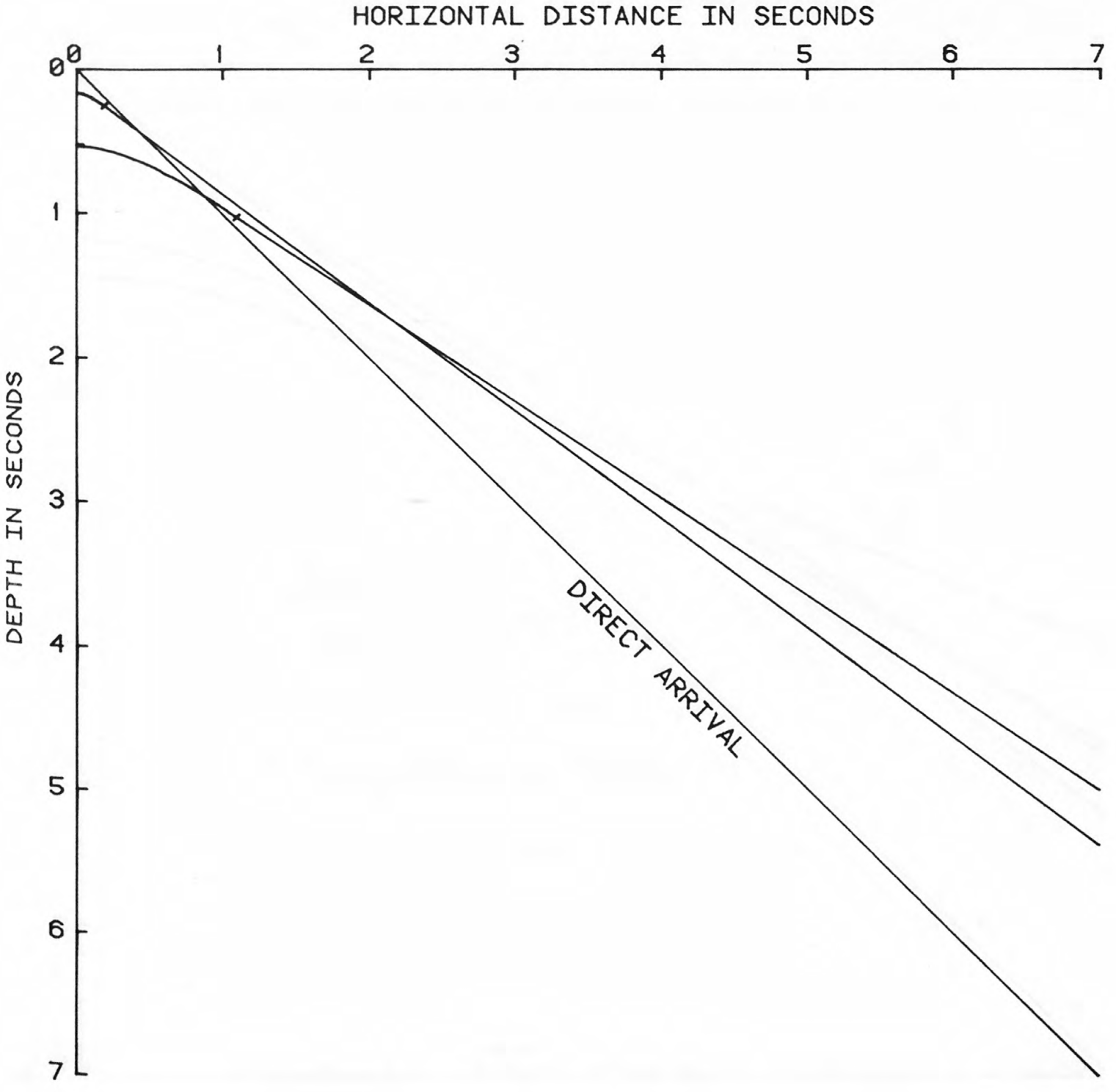
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.125	1.500	0.167	0.000
LAYER 2	0.110	0.478	1.991	0.521	0.287
LAYER 3	0.281		2.224		1.648

CRUISE : L4-76-WG
DATE/TIME : JD 196,2234
LINE : 614
SONOBUOY : 10
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : SELECT

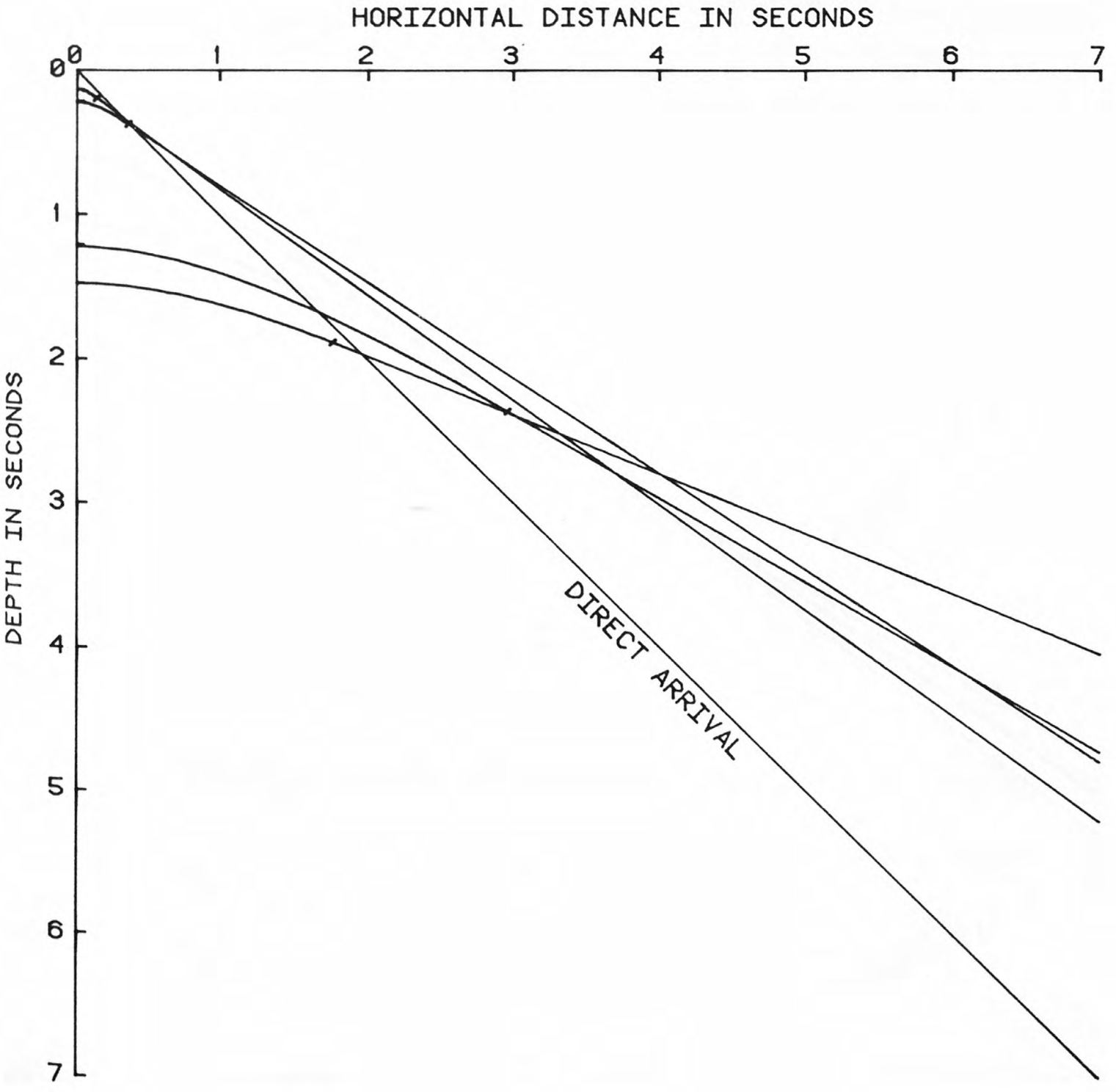
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.099	1.500	0.132	0.000
LAYER 2	0.090	0.182	2.051	0.213	0.212
LAYER 3	0.132	1.300	2.252	1.205	0.543
LAYER 4	0.632	1.644	2.567	1.473	4.450
LAYER 5	1.157		3.641		2.646

CRUISE : L4-76-WG
DATE/TIME : JD 196,2325
LINE : 614
SONOBUOY : 11
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

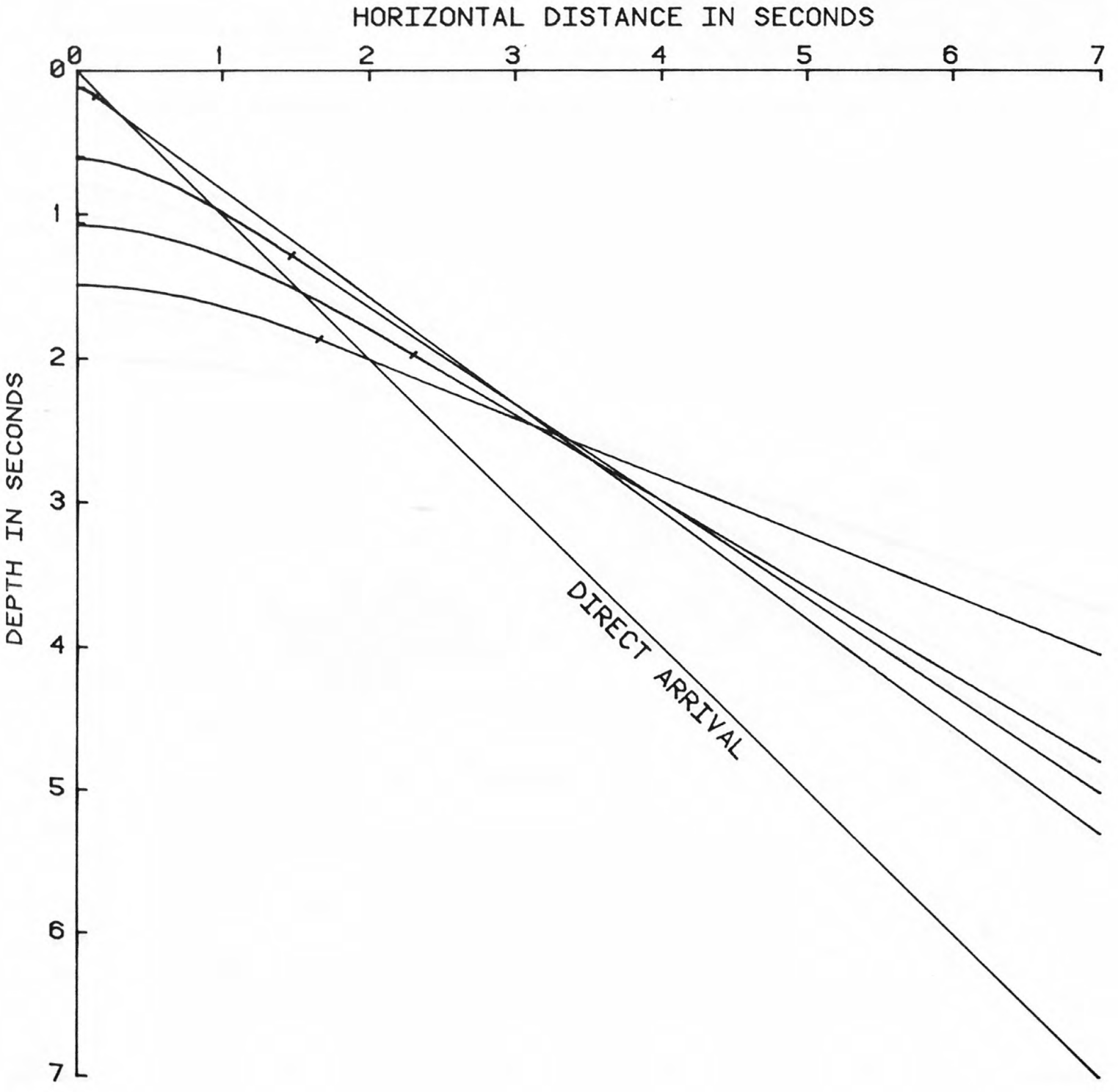
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.089	1.490	0.120	0.000
LAYER 2	0.080	0.568	2.000	0.599	0.200
LAYER 3	0.293	1.073	2.212	1.056	2.189
LAYER 4	0.585	1.607	2.479	1.486	3.438
LAYER 5	1.189		3.648		2.466

CRUISE : L4-76-WG
DATE/TIME : JD 197,1018
LINE : 614
SONOBUOY : 12
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

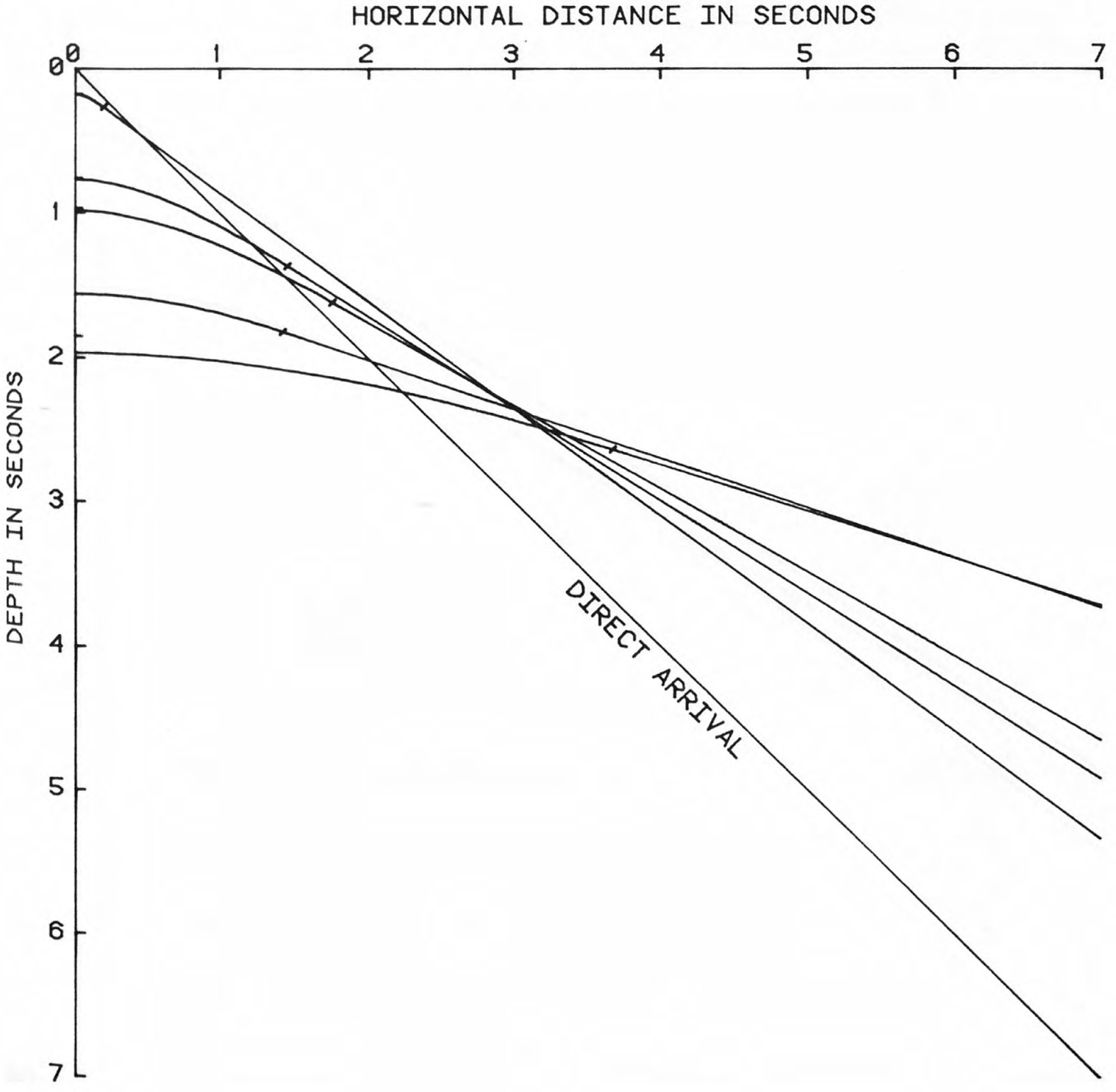
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.134	1.490	0.180	0.000
LAYER 2	0.120	0.711	2.001	0.757	0.299
LAYER 3	0.433	0.952	2.328	0.964	2.164
LAYER 4	0.600	1.714	2.580	1.555	2.616
LAYER 5	1.332	2.357	4.355	1.850	2.119
LAYER 6	1.461		4.634		5.484

CRUISE : L4-76-WG
DATE/TIME : JD 197,2336
LINE : 613
SONOBUOY : 14
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

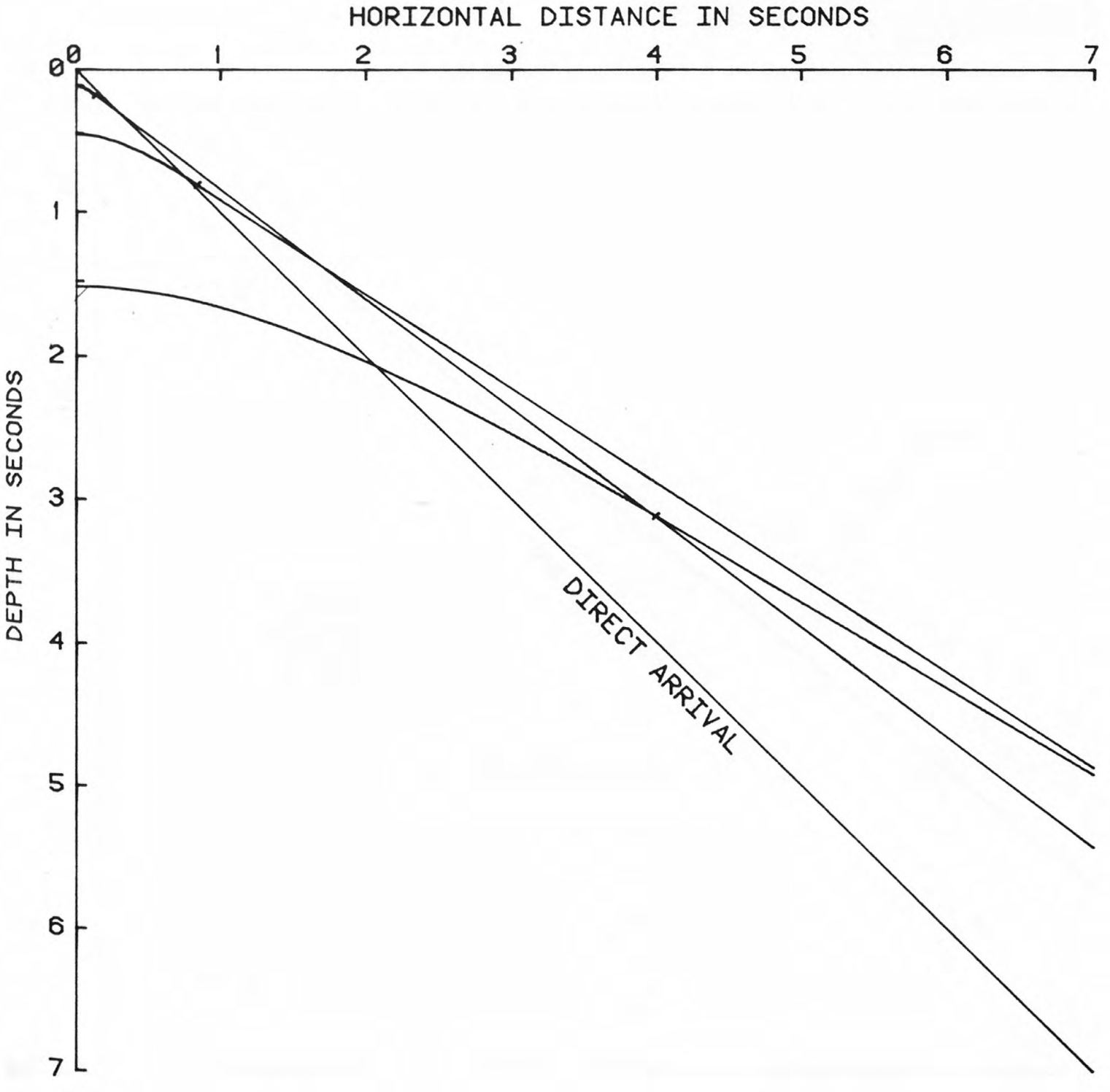
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.087	1.490	0.116	0.000
LAYER 2	0.075	0.407	1.950	0.445	0.205
LAYER 3	0.254	1.577	2.261	1.479	1.245
LAYER 4	0.735		2.495		5.956

CRUISE : L4-76-WG
DATE/TIME : JD 198,0614
LINE : 613
SONOBUOY : 16
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : SELECT

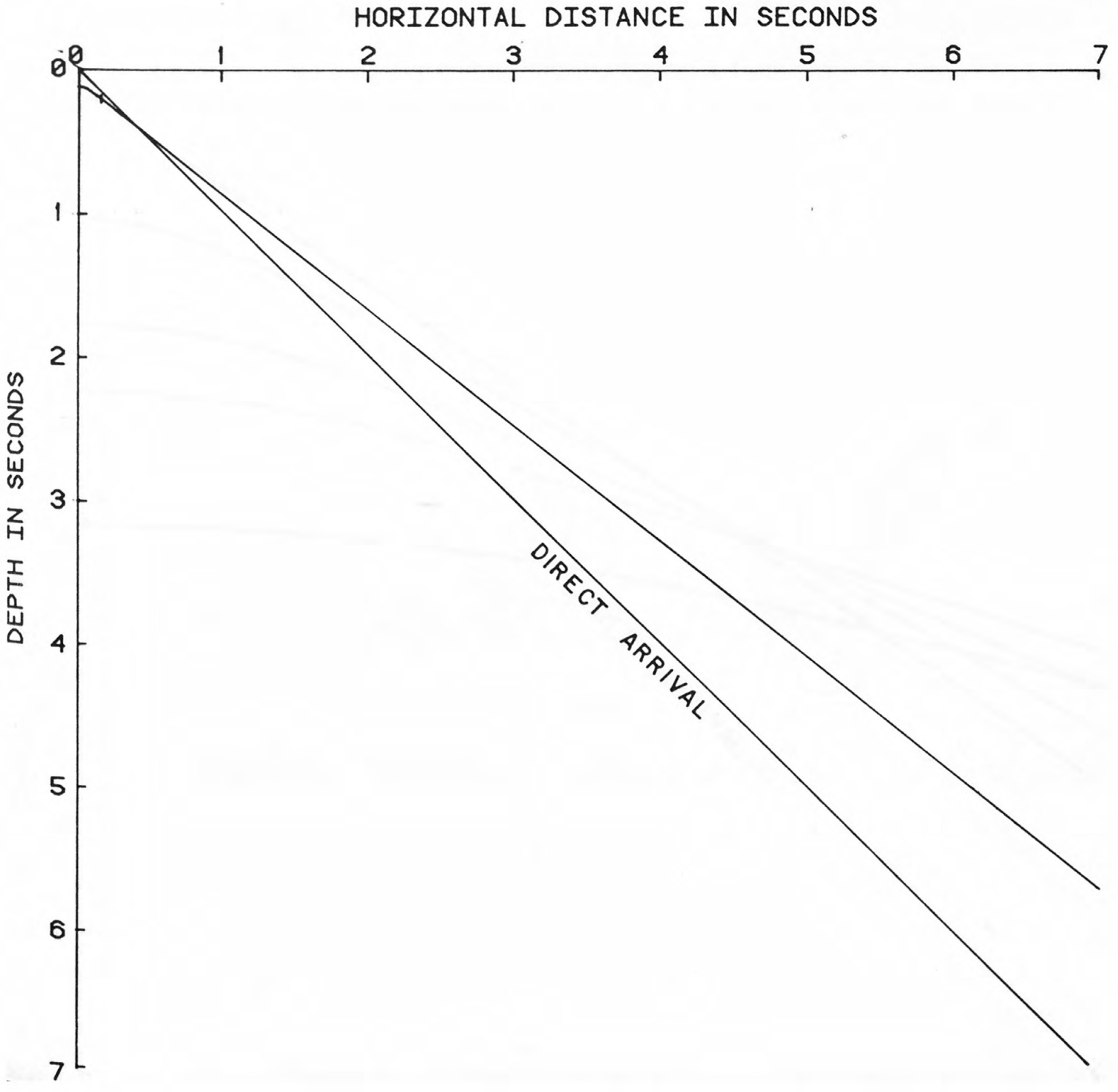
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.110	1.490	0.147	0.000
LAYER 2	0.090		1.880		

CRUISE : L4-76-WG
DATE/TIME : JD 198,0858
LINE : 613
SONOBUOY : 17
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

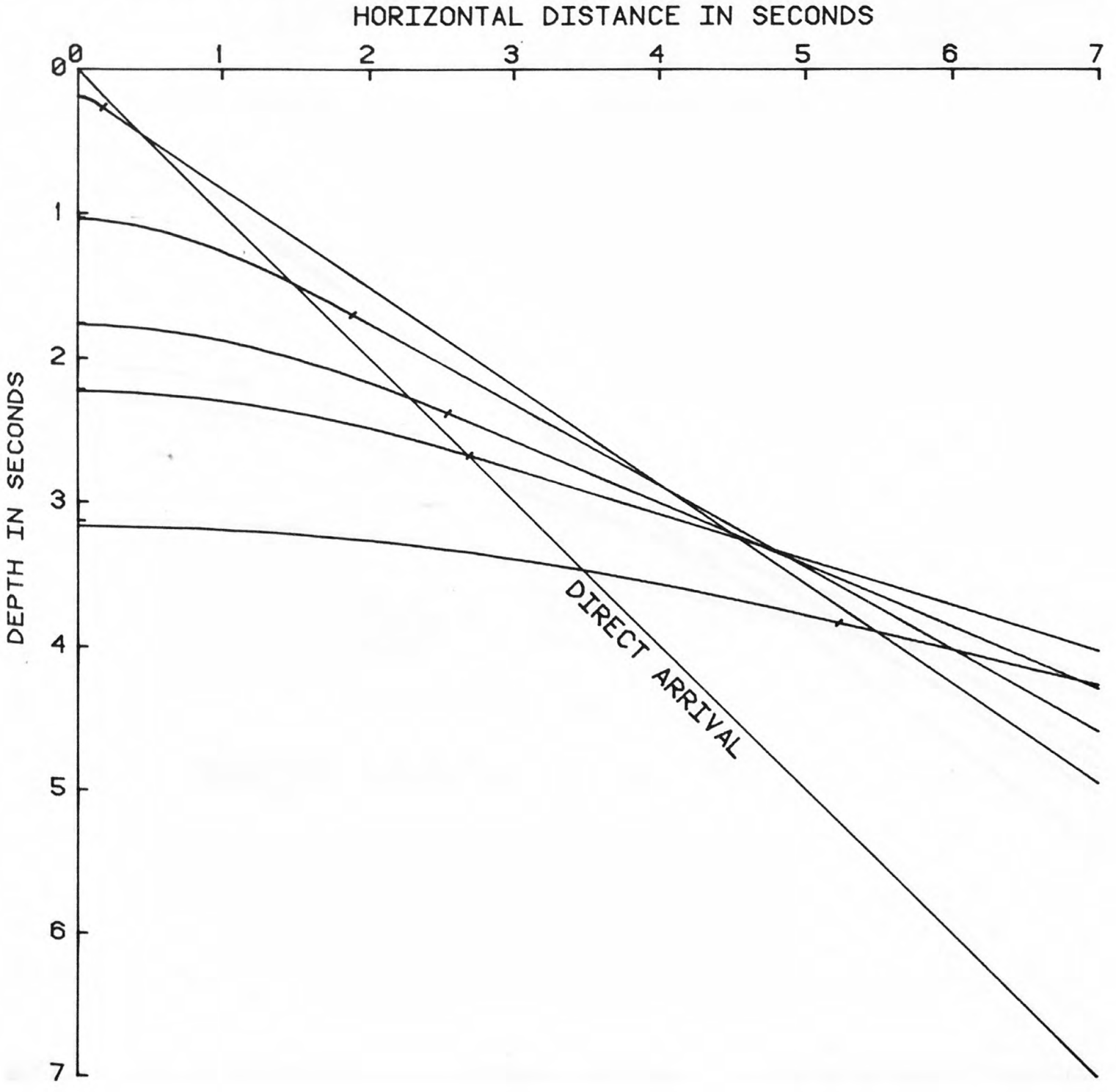
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.143	1.490	0.193	0.000
LAYER 2	0.140	1.049	2.170	1.028	0.271
LAYER 3	0.634	2.010	2.639	1.756	2.815
LAYER 4	1.306	2.812	3.494	2.215	3.785
LAYER 5	1.848	4.992	4.782	3.127	4.005
LAYER 6	2.607		6.295		7.786

CRUISE : L4-76-WG
DATE/TIME : JD 198,0955
LINE : 613
SONOBUOY : 18
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

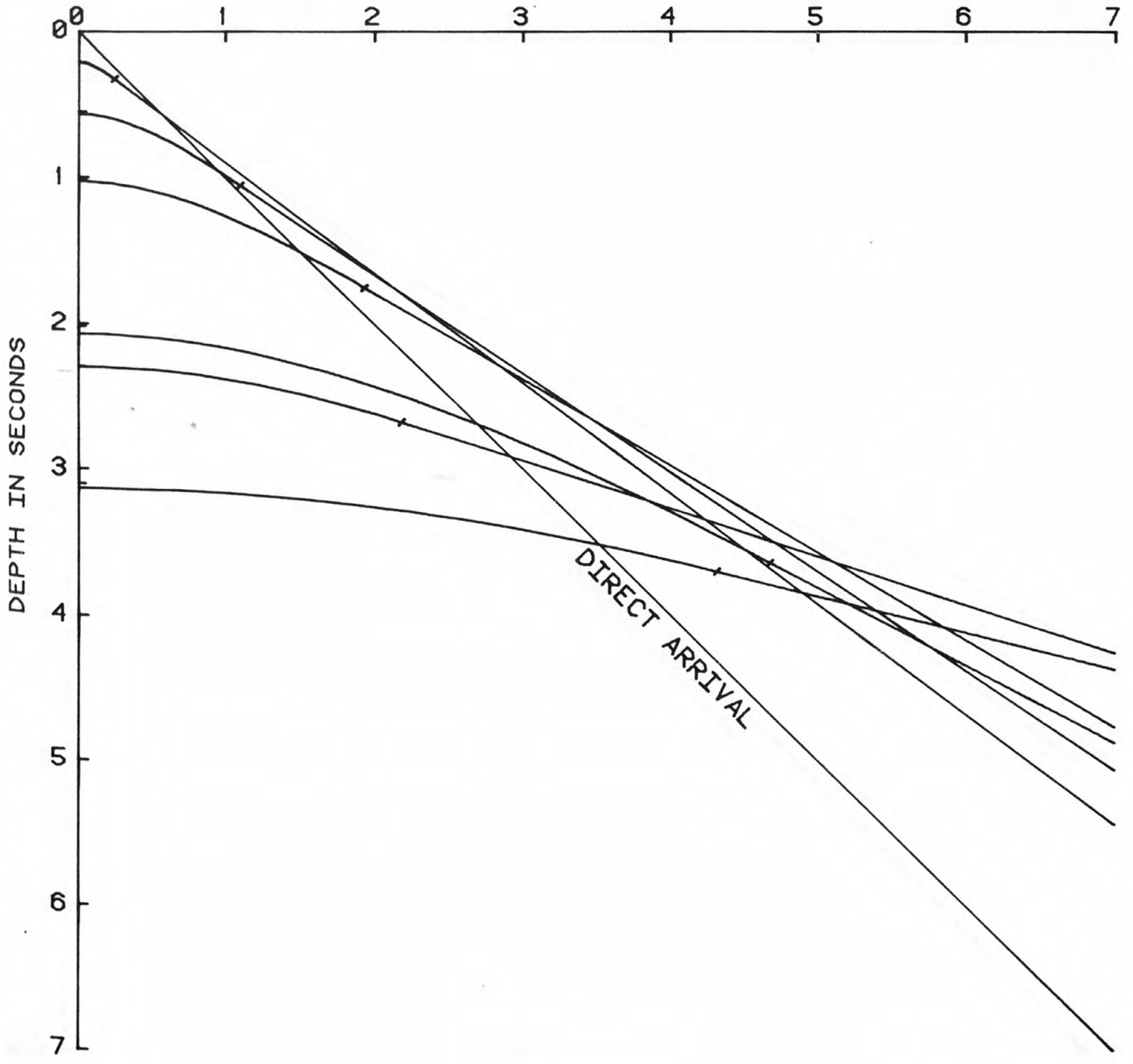
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.160	1.490	0.214	0.000
LAYER 2	0.140	0.490	1.969	0.549	0.370
LAYER 3	0.305	0.990	2.193	1.005	1.640
LAYER 4	0.600	2.258	2.505	2.017	2.889
LAYER 5	1.174	2.645	2.821	2.292	6.978
LAYER 6	1.966	4.480	4.556	3.097	3.257
LAYER 7	2.646		6.060		6.440

CRUISE : L4-76-WG
DATE/TIME : JD 198,1620
LINE : 612
SONOBUOY : 19
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

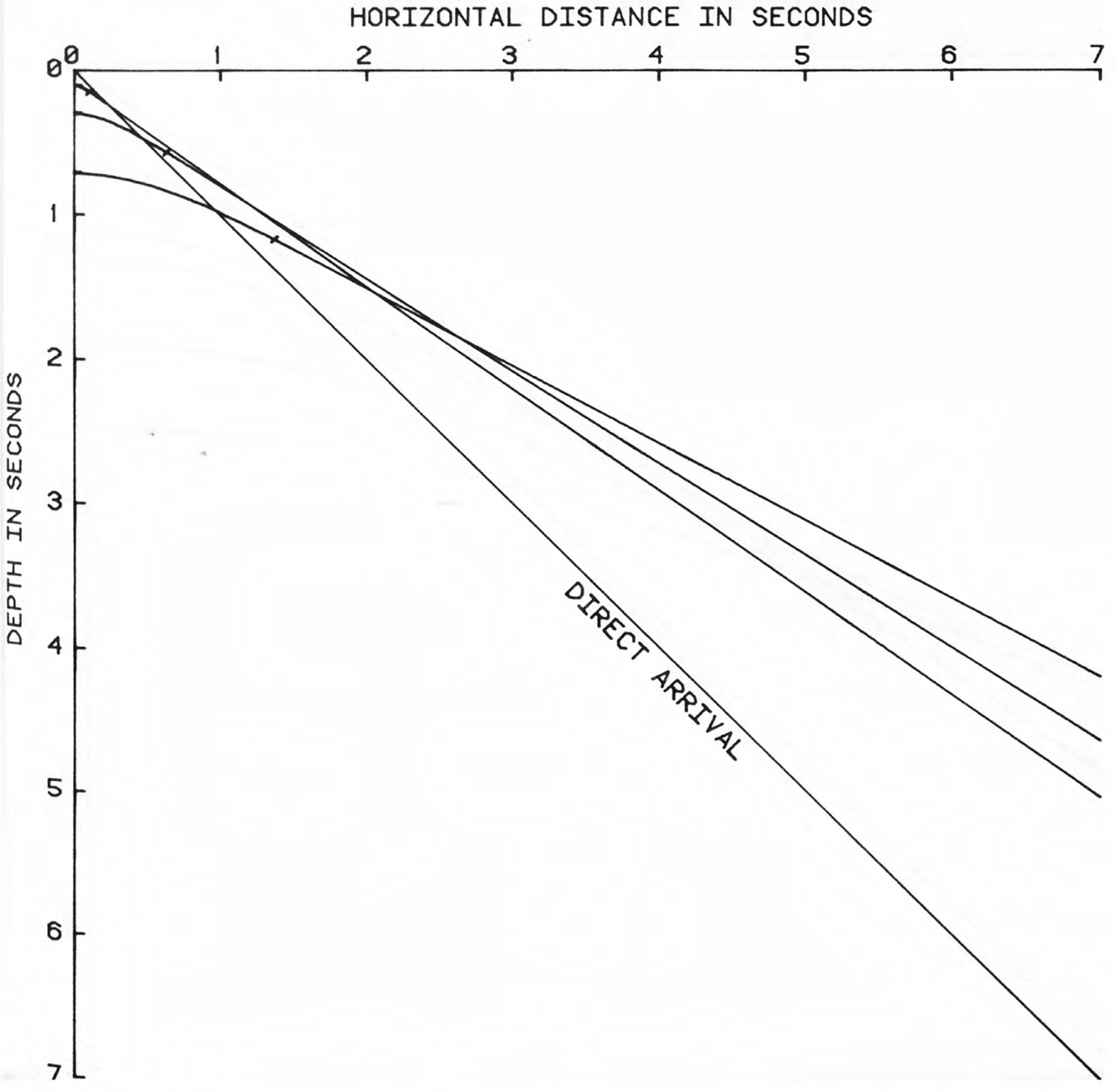
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.079	1.490	0.106	0.000
LAYER 2	0.075	0.273	2.102	0.290	0.159
LAYER 3	0.161	0.753	2.329	0.703	0.942
LAYER 4	0.434		2.774		2.037

CRUISE : L4-76-WG
DATE/TIME : JD 198,2004
LINE : 612
SONOBUOY : 20
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

LINFT
12/15/77

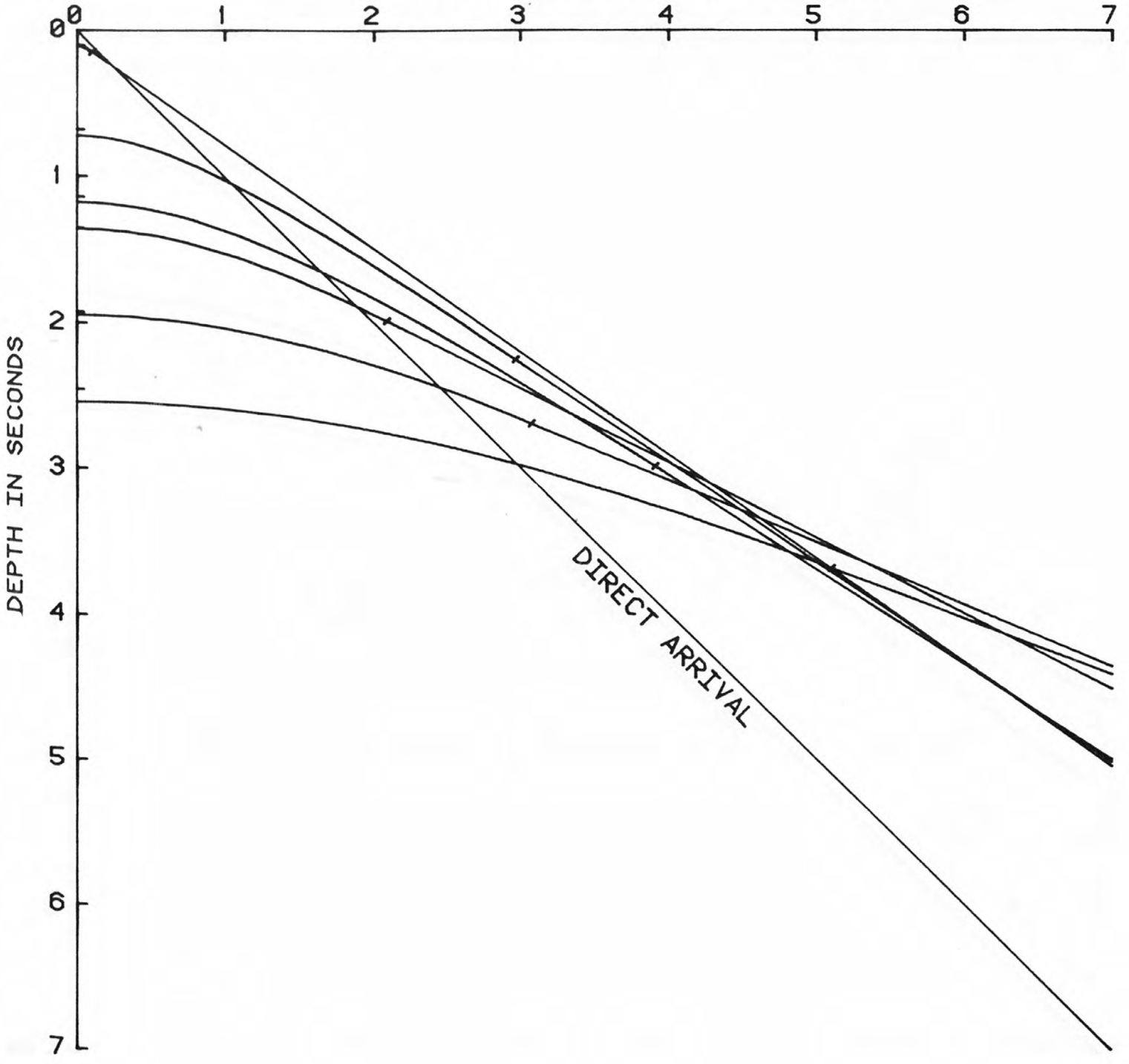


	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.079	1.490	0.106	0.000
LAYER 2	0.075	0.679	2.101	0.677	0.159
LAYER 3	0.232	1.184	2.183	1.139	4.426
LAYER 4	0.461	1.427	2.302	1.350	5.829
LAYER 5	0.922	2.258	2.911	1.921	3.117
LAYER 6	1.403	3.204	3.534	2.457	4.586
LAYER 7	1.752		3.925		7.607

CRUISE : L4-76-WG
DATE/TIME : JD 198,2027
LINE : 612
SONOBUOY : 21
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

LINFT
12/15/77

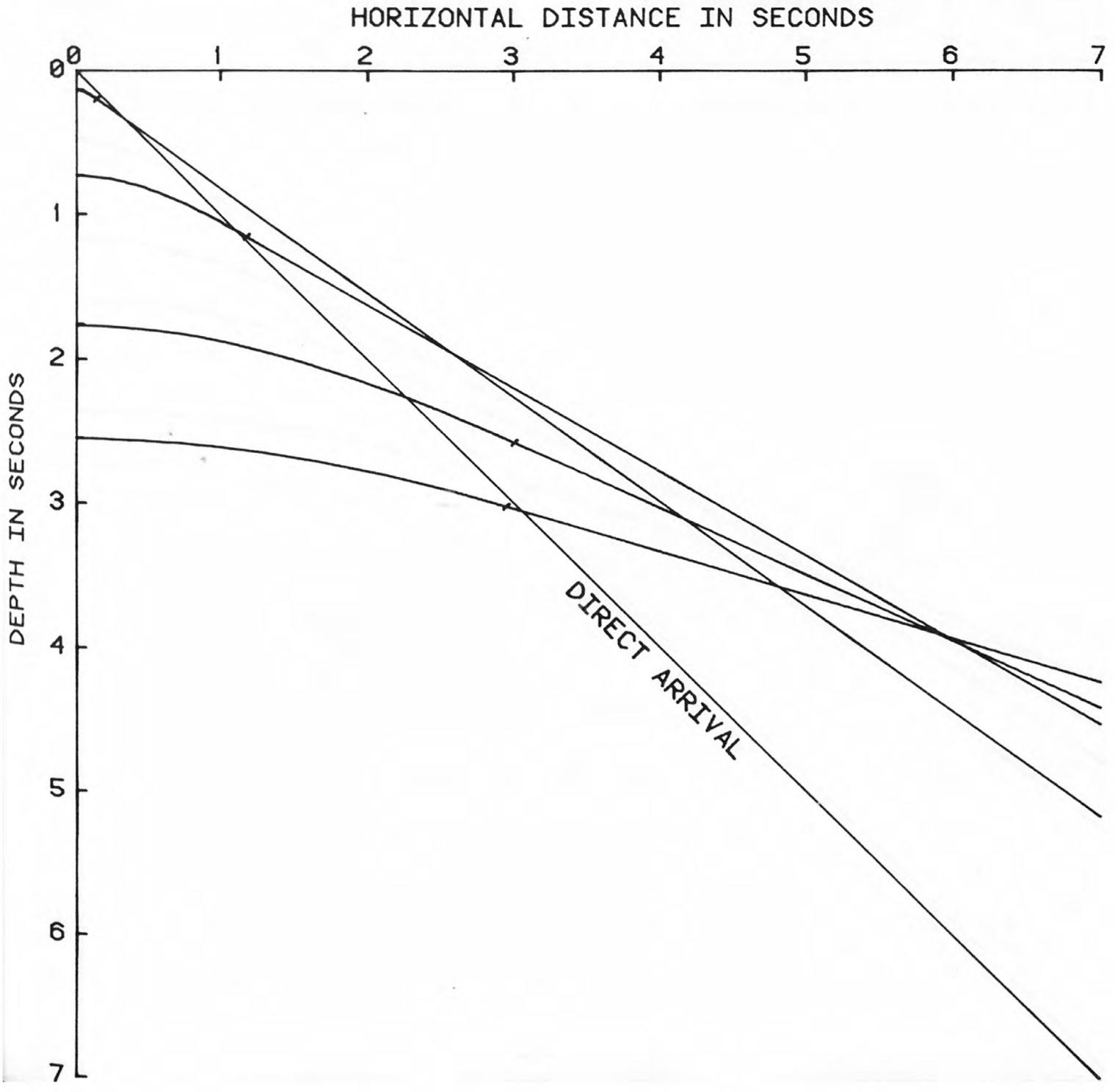
HORIZONTAL DISTANCE IN SECONDS



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.102	1.490	0.136	0.000
LAYER 2	0.094	0.708	2.056	0.726	0.214
LAYER 3	0.465	2.027	2.569	1.753	1.761
LAYER 4	1.210	3.315	3.257	2.544	4.476
LAYER 5	2.150		5.006		4.395

CRUISE : L4-76-WG
DATE/TIME : JD 198,2219
LINE : 612
SONOBUOY : 22
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

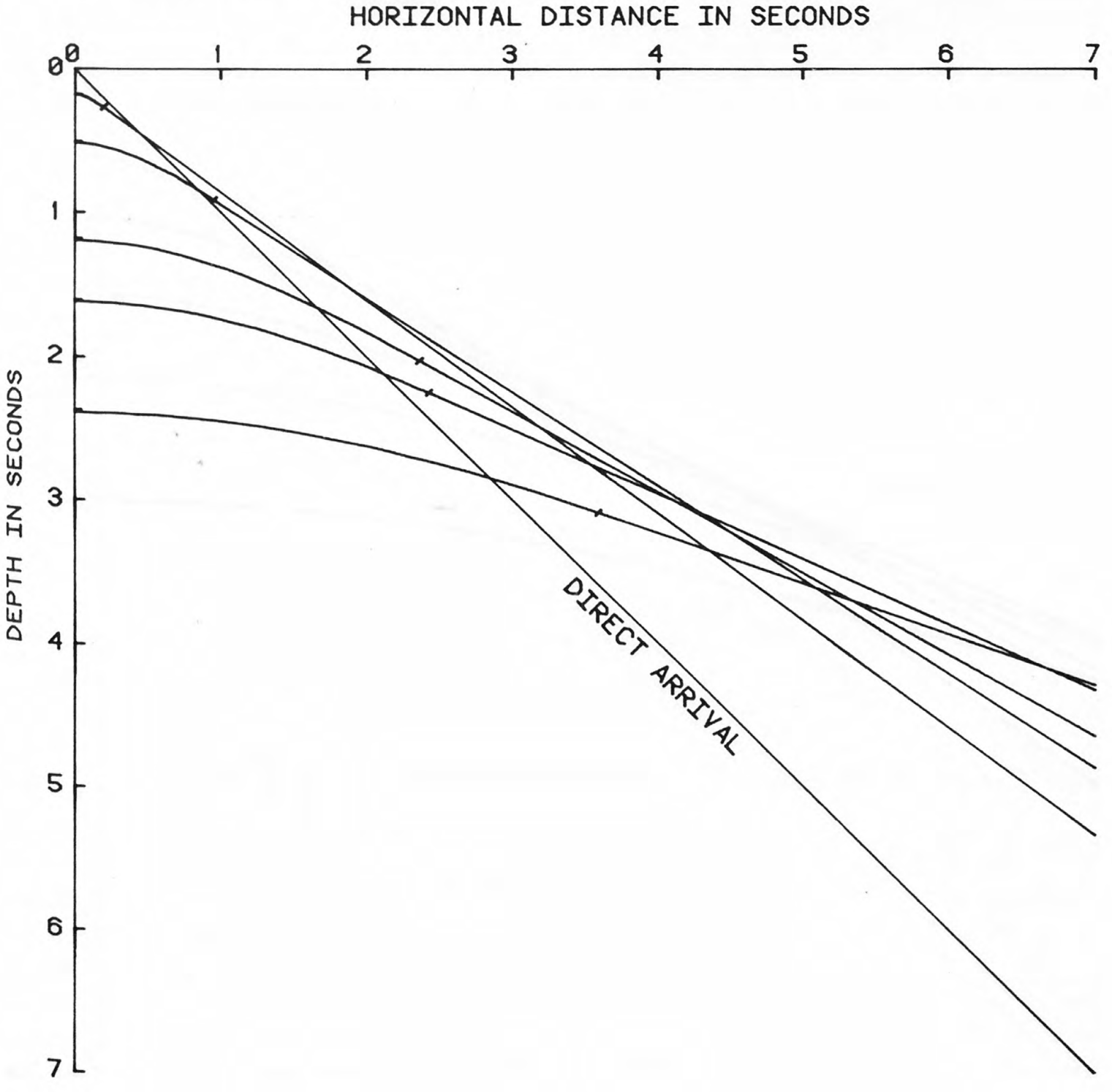
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.134	1.490	0.180	0.000
LAYER 2	0.120	0.459	2.001	0.505	0.299
LAYER 3	0.292	1.222	2.281	1.174	1.417
LAYER 4	0.701	1.789	2.648	1.602	3.523
LAYER 5	1.157	3.046	3.297	2.365	3.622
LAYER 6	1.842		4.272		5.358

CRUISE : L4-76-WG
DATE/TIME : JD 198,2349
LINE : 612
SONOBUOY : 23
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

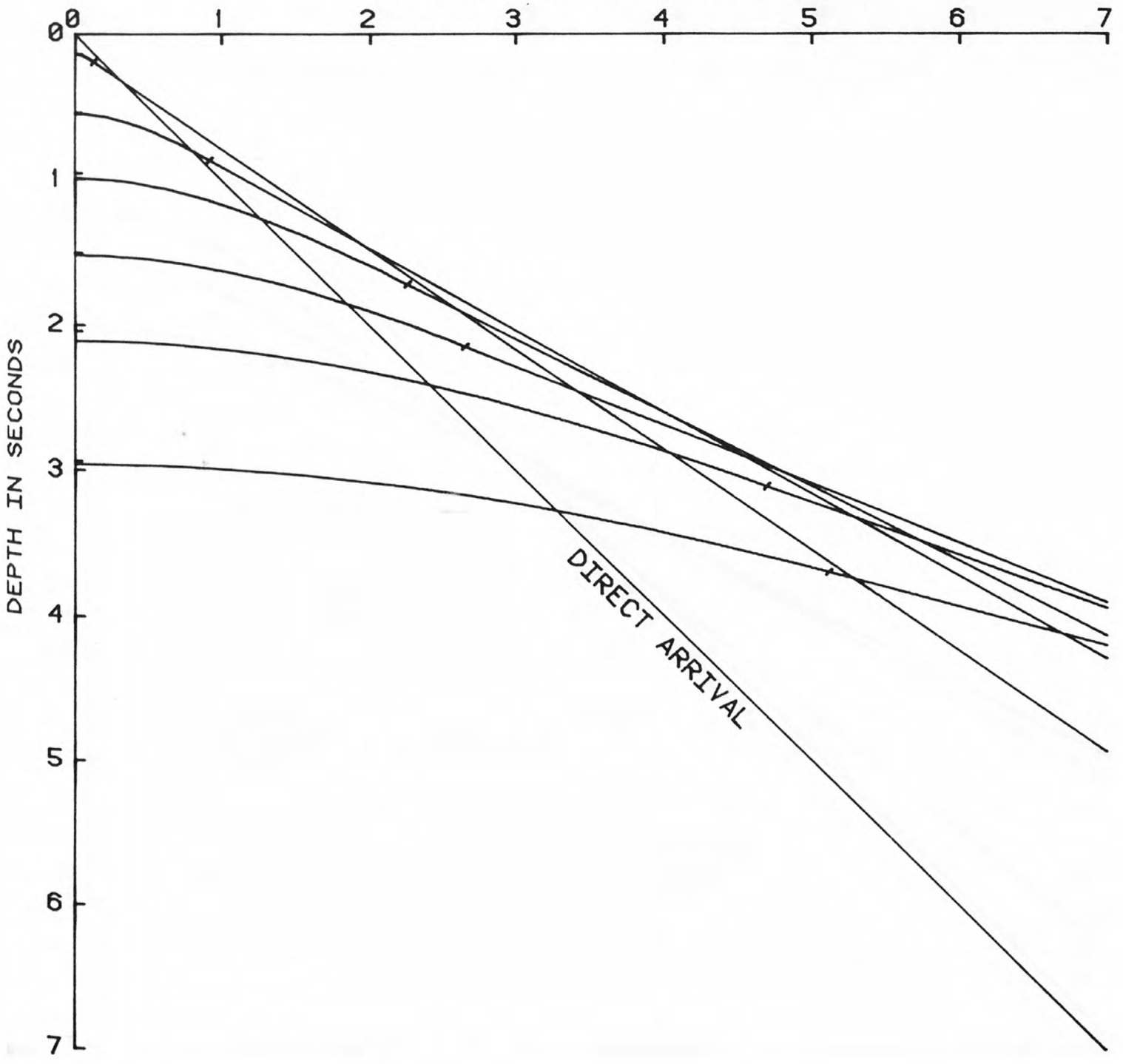
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.103	1.490	0.138	0.000
LAYER 2	0.100	0.538	2.159	0.541	0.196
LAYER 3	0.347	1.086	2.645	0.955	1.370
LAYER 4	0.570	1.889	2.931	1.503	3.367
LAYER 5	1.074	2.884	3.685	2.043	3.957
LAYER 6	1.426	4.735	4.143	2.937	7.001
LAYER 7	2.362		5.670		7.627

CRUISE : L4-76-WG
DATE/TIME : JD 200,0706
LINE : 612
SONOBUOY : 24
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : SELECT

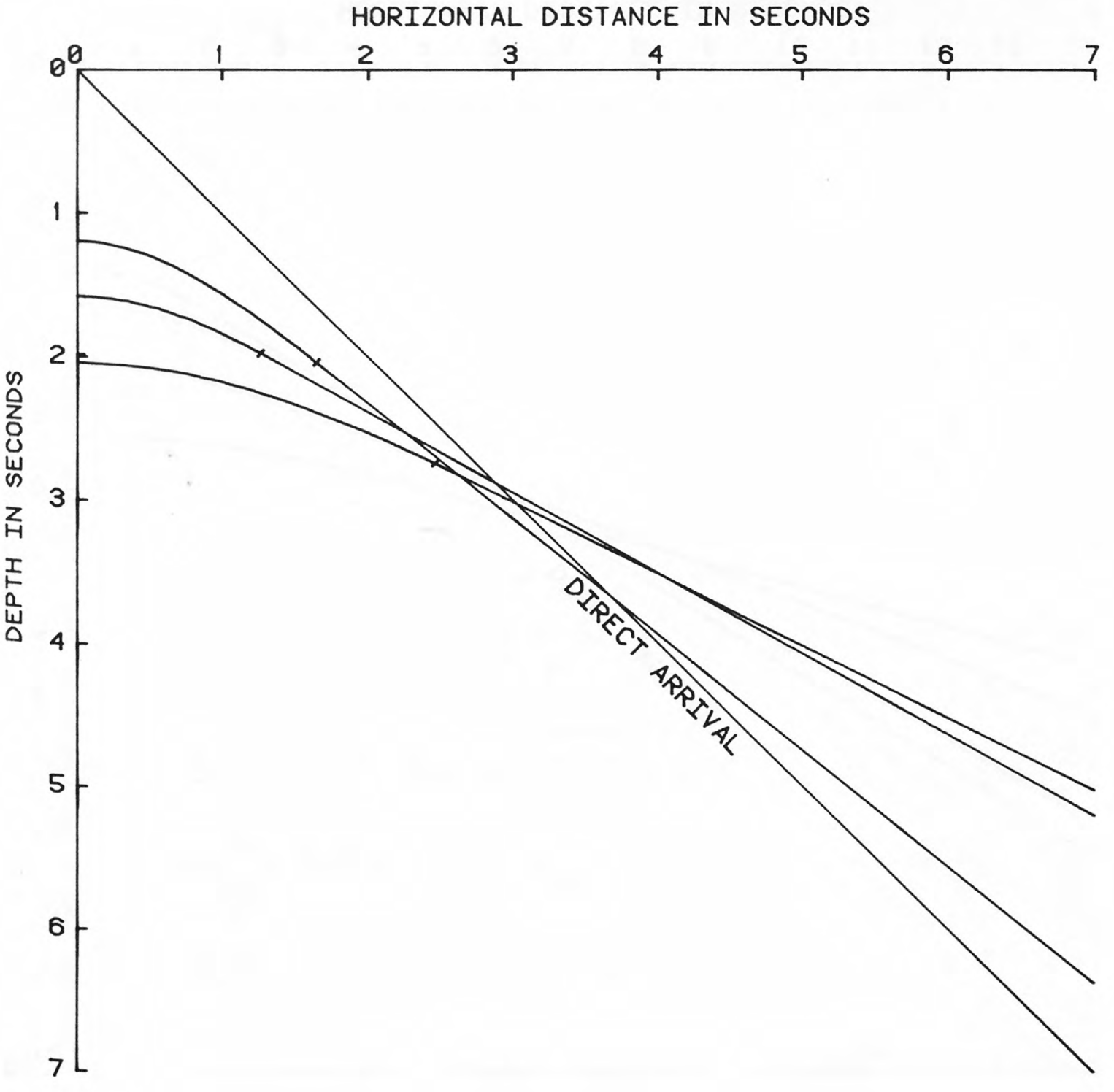
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.896	1.500	1.195	0.000
LAYER 2	0.700	1.249	1.851	1.577	2.478
LAYER 3	1.263	1.788	2.669	1.981	1.898
LAYER 4	1.519		2.999		3.688

CRUISE : L4-76-WG
DATE/TIME : JD 201,2045
LINE : 51
SONOBUOY : 27
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

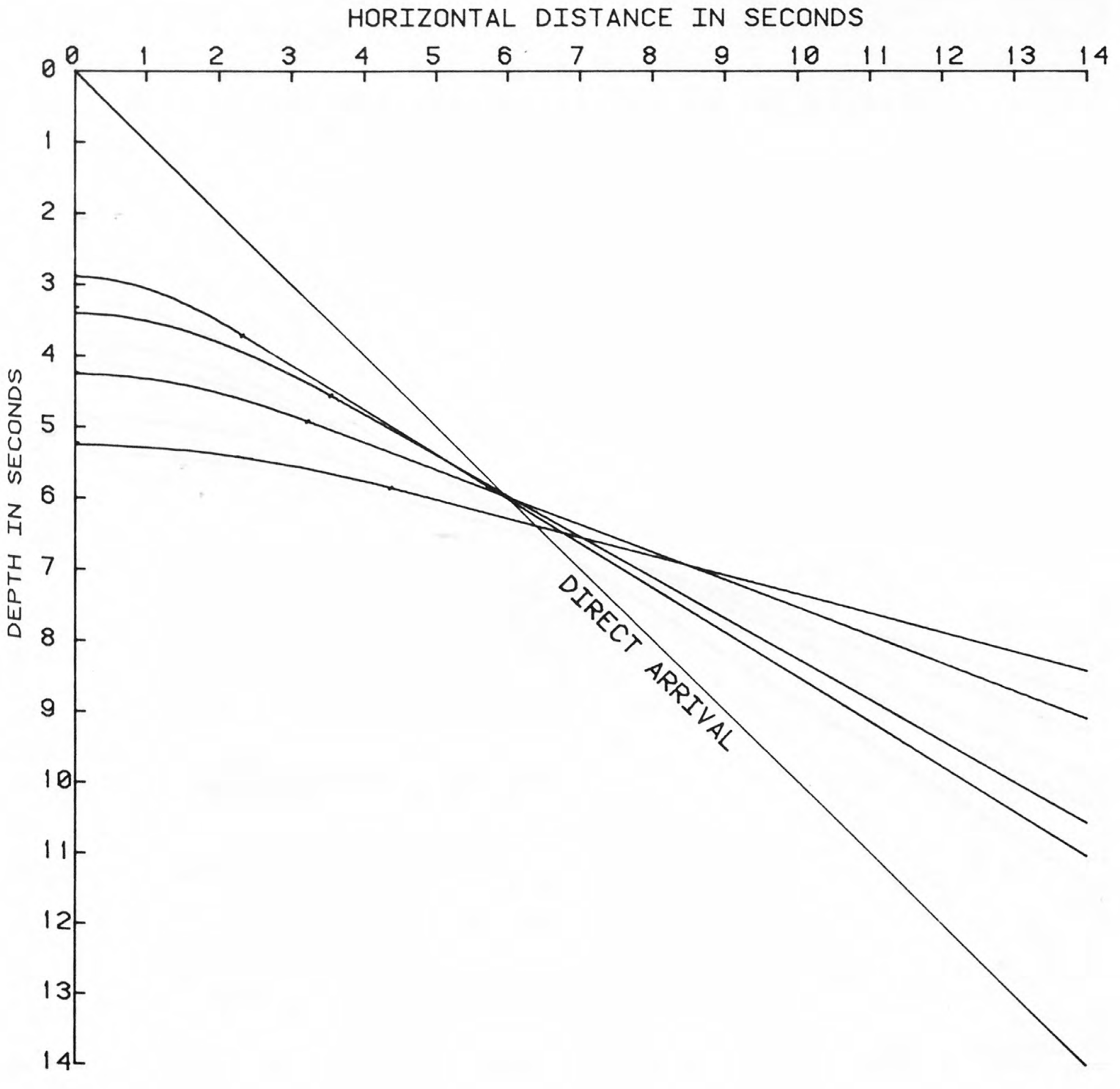
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	2.167	1.500	2.889	0.000
LAYER 2	2.250	2.671	2.391	3.310	3.492
LAYER 3	2.538	3.881	2.616	4.236	5.303
LAYER 4	3.679	5.798	3.877	5.225	4.821
LAYER 5	4.707		5.650		6.544

CRUISE : L4-76-WG
DATE/TIME : JD 202,1717
LINE : 54
SONOBUOY : 29
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

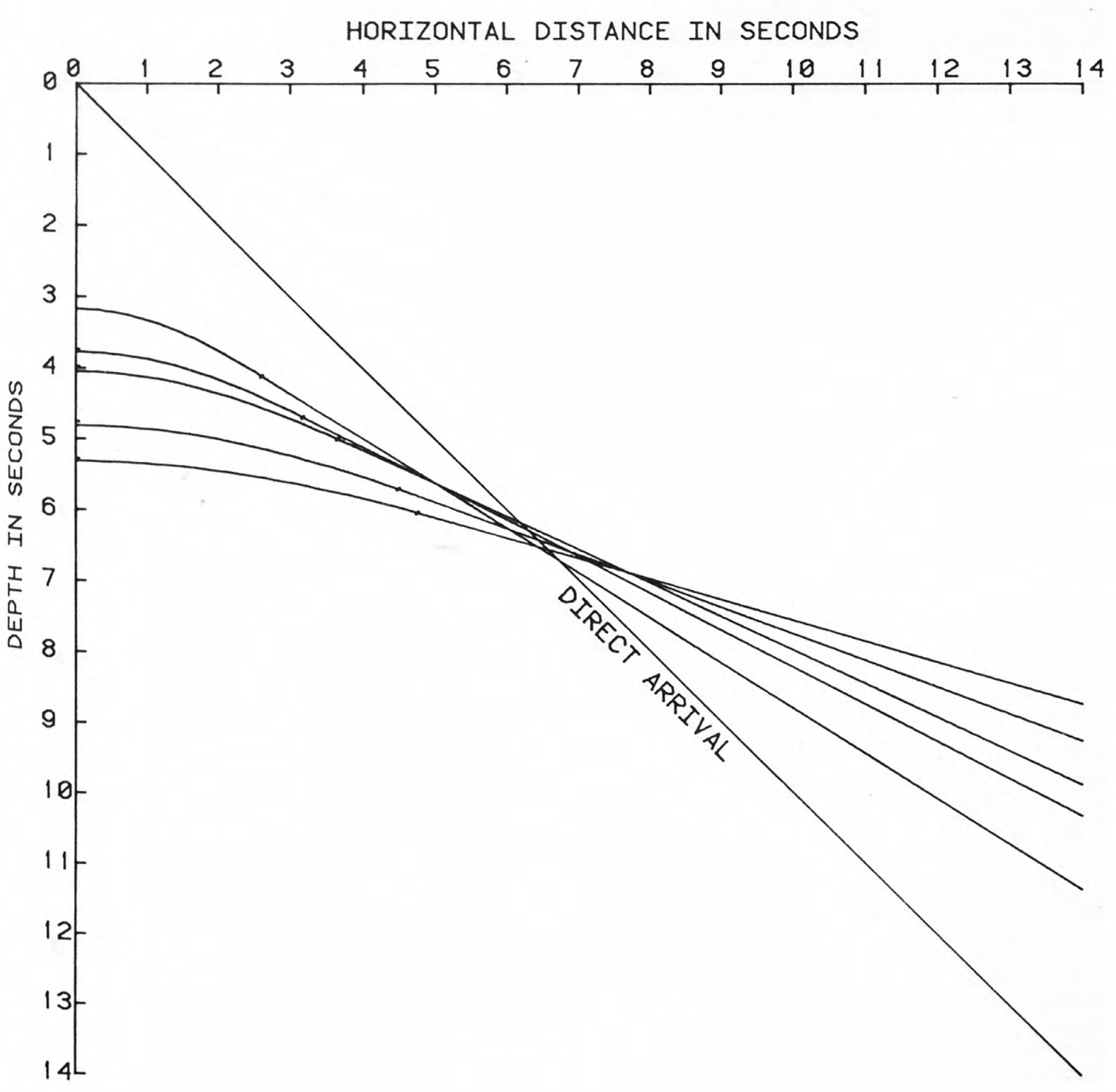
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	2.381	1.500	3.174	0.000
LAYER 2	2.450	3.044	2.359	3.736	3.923
LAYER 3	3.035	3.392	2.885	3.977	4.782
LAYER 4	3.279	4.626	3.183	4.753	5.500
LAYER 5	4.049	5.669	4.037	5.270	6.736
LAYER 6	4.671		5.166		7.136

CRUISE : L4-76-WG
DATE/TIME : JD 202,2148
LINE : 55
SONOBUOY : 30
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

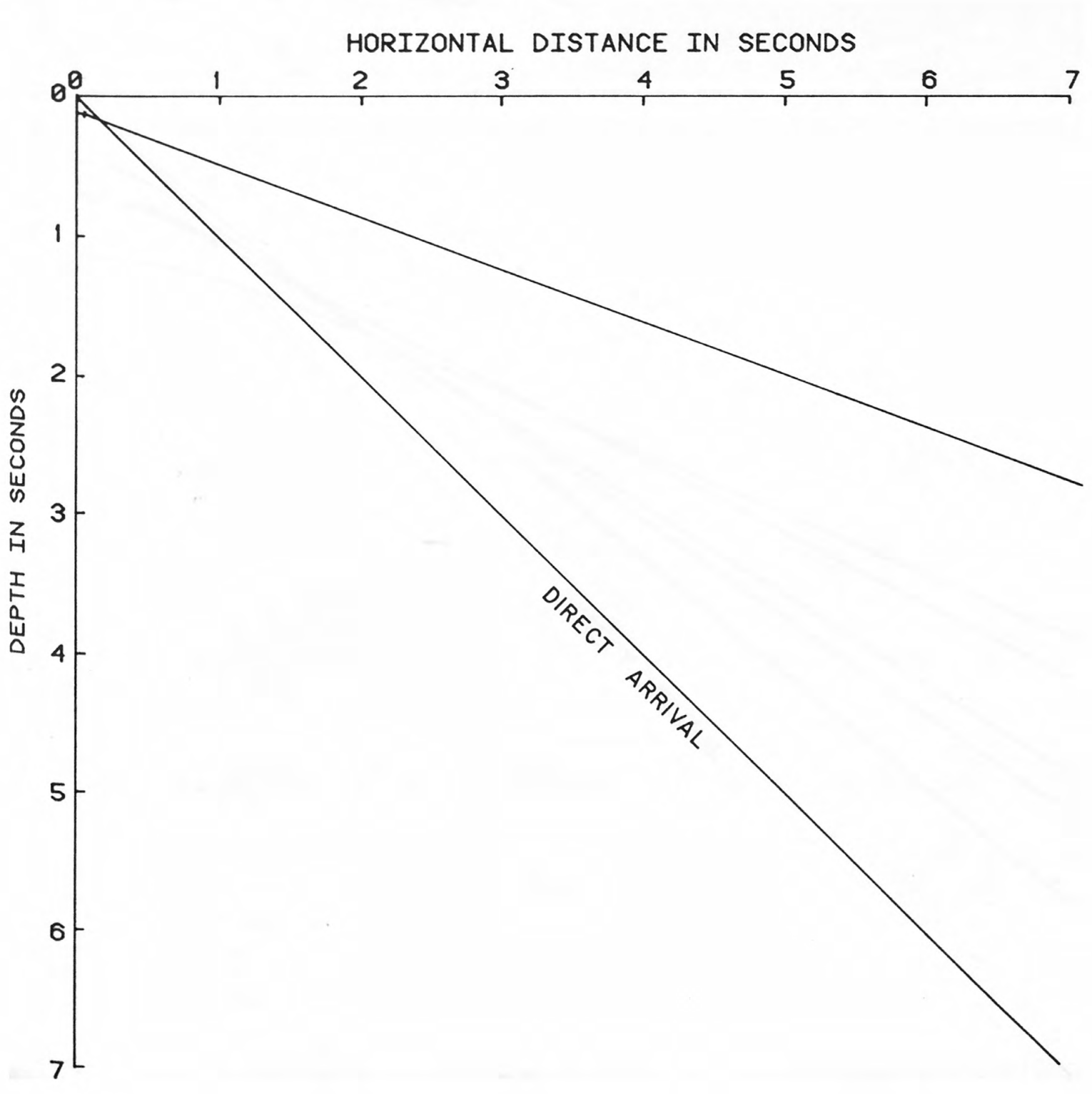
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.088	1.490	0.119	0.000
LAYER 2	0.110		3.970		

CRUISE : L4-76-WG
DATE/TIME : JD 207,0250
LINE : 633
SONOBUOY : 32
SOURCE : 160 KJ ARCER
BUOY TYPE : NAVY

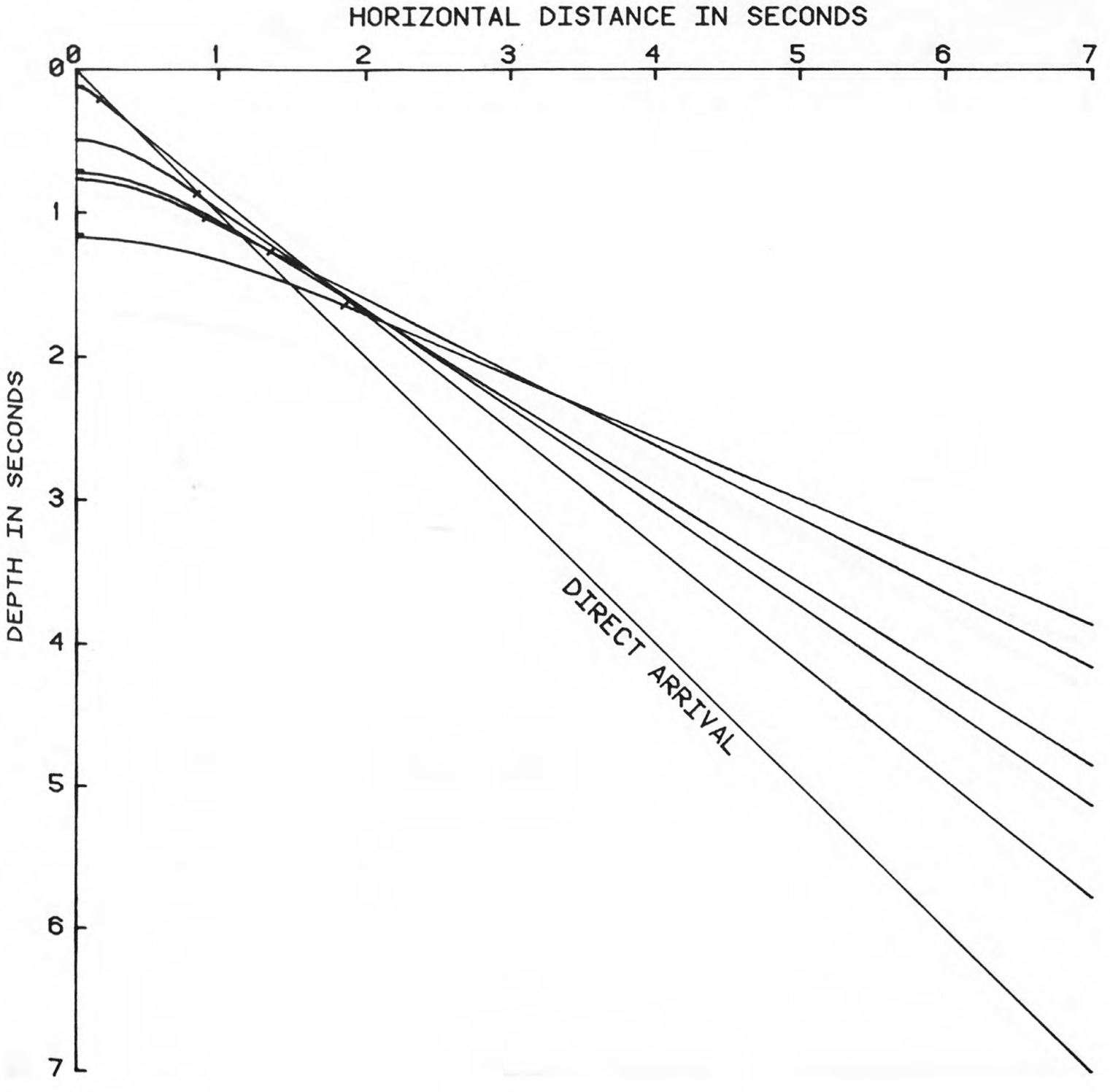
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.090	1.490	0.121	0.000
LAYER 2	0.070	0.427	1.829	0.489	0.253
LAYER 3	0.281	0.654	2.152	0.701	1.259
LAYER 4	0.410	0.727	2.351	0.763	2.015
LAYER 5	0.568	1.287	2.904	1.148	1.357
LAYER 6	0.839		3.446		2.759

CRUISE : L4-76-WG
DATE/TIME : JD 207,0915
LINE : 635
SONOBUOY : 33
SOURCE : 160 KJ ARCER
BUOY TYPE : REFTEK

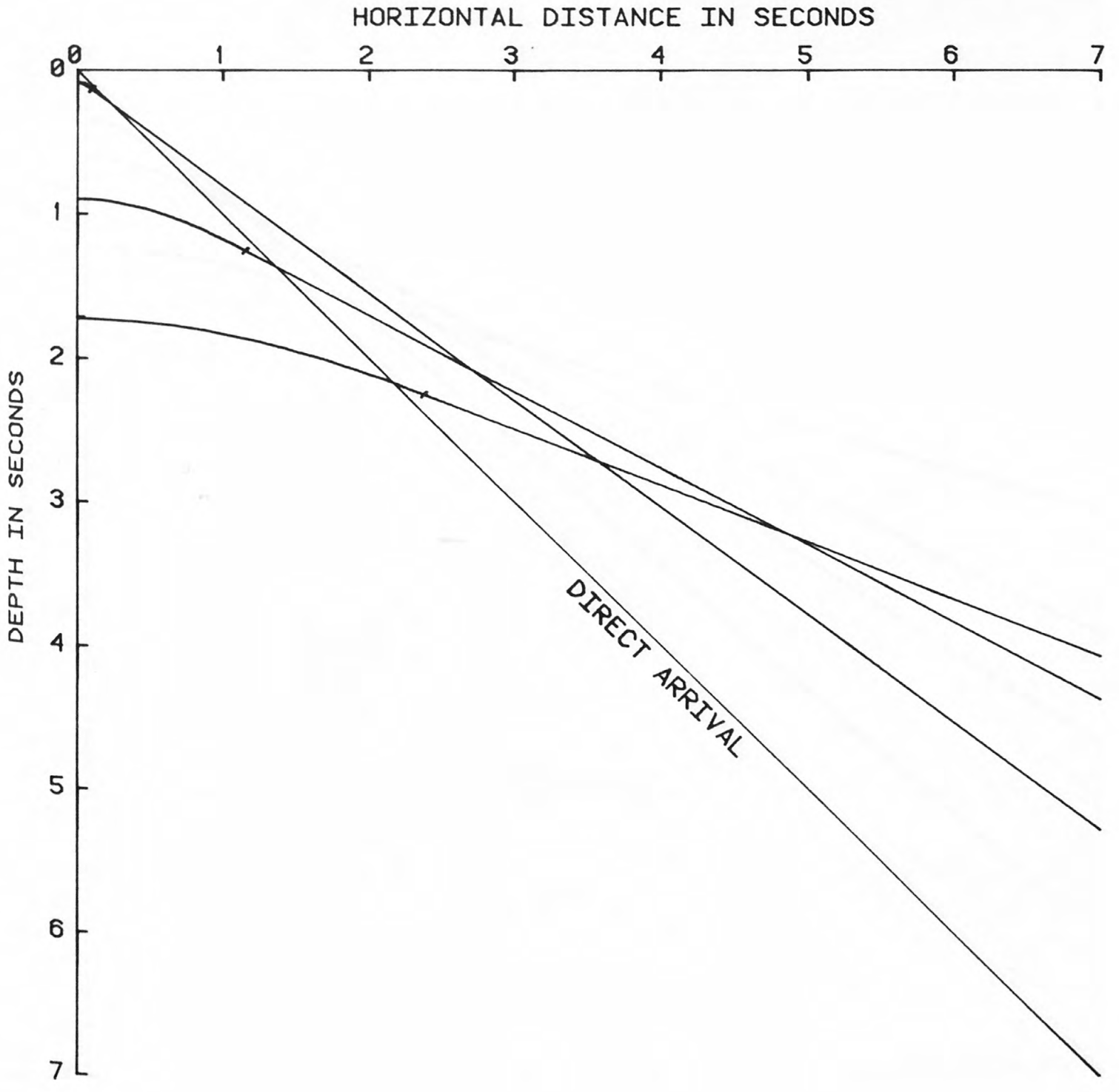
LINFT
12/15/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.067	1.490	0.090	0.000
LAYER 2	0.060	0.872	2.000	0.895	0.150
LAYER 3	0.640	2.018	2.800	1.713	1.728
LAYER 4	1.320		3.796		3.560

CRUISE : L7-77-WG
DATE/TIME : JD 185,0330
LINE : 1
SONOBUOY : 3
SOURCE : 2501 CU IN
BUOY TYPE : NAVY

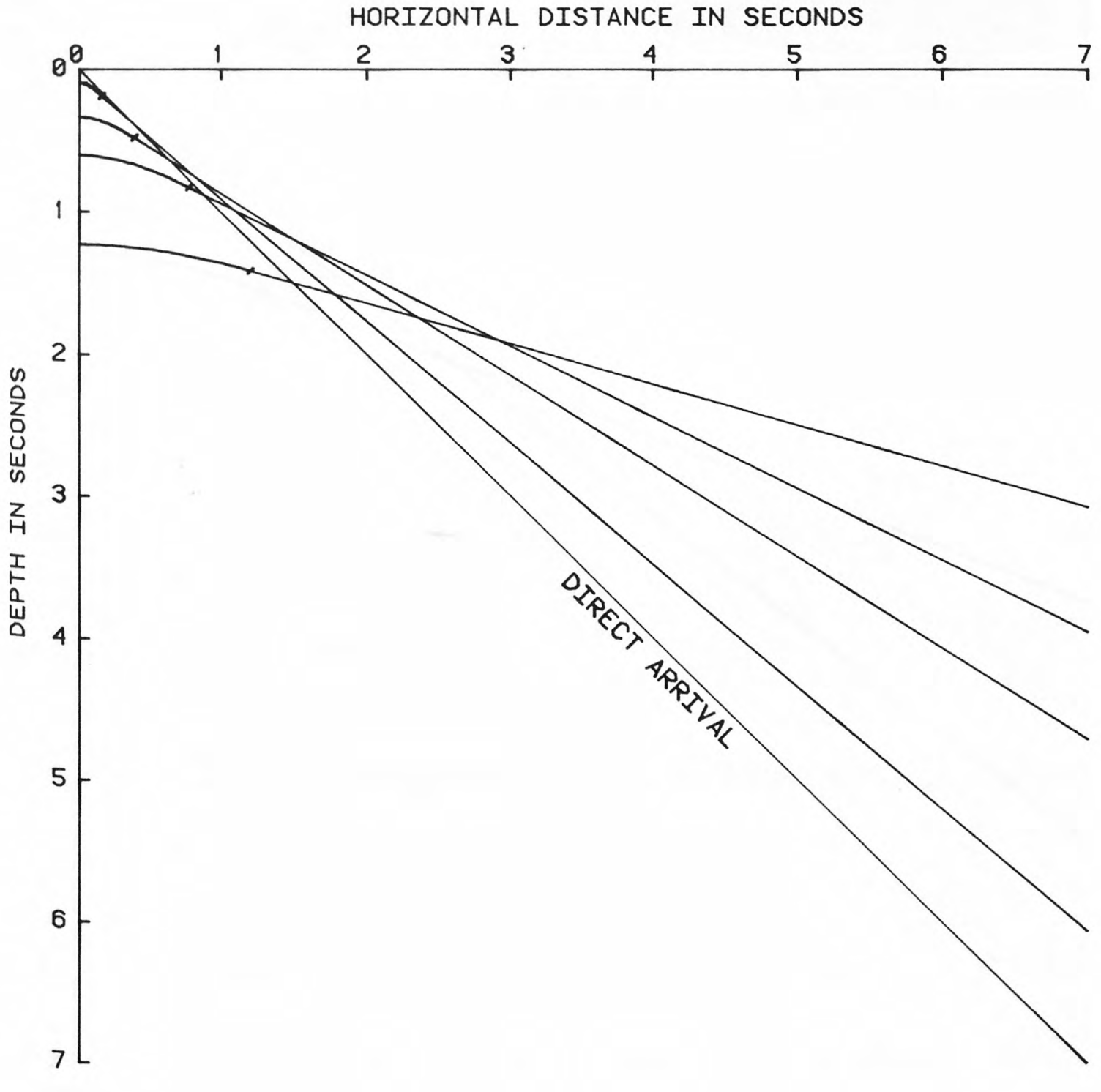
LINFT
9/12/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.073	1.490	0.098	0.000
LAYER 2	0.050	0.280	1.734	0.337	0.245
LAYER 3	0.235	0.587	2.332	0.600	0.582
LAYER 4	0.442	1.522	2.973	1.229	1.156
LAYER 5	1.070		5.198		1.802

CRUISE : L7-77-WG
DATE/TIME : JD 185,0539
LINE : 1
SONOBUOY : 4
SOURCE : 2501 CU IN
BUOY TYPE : NAVY

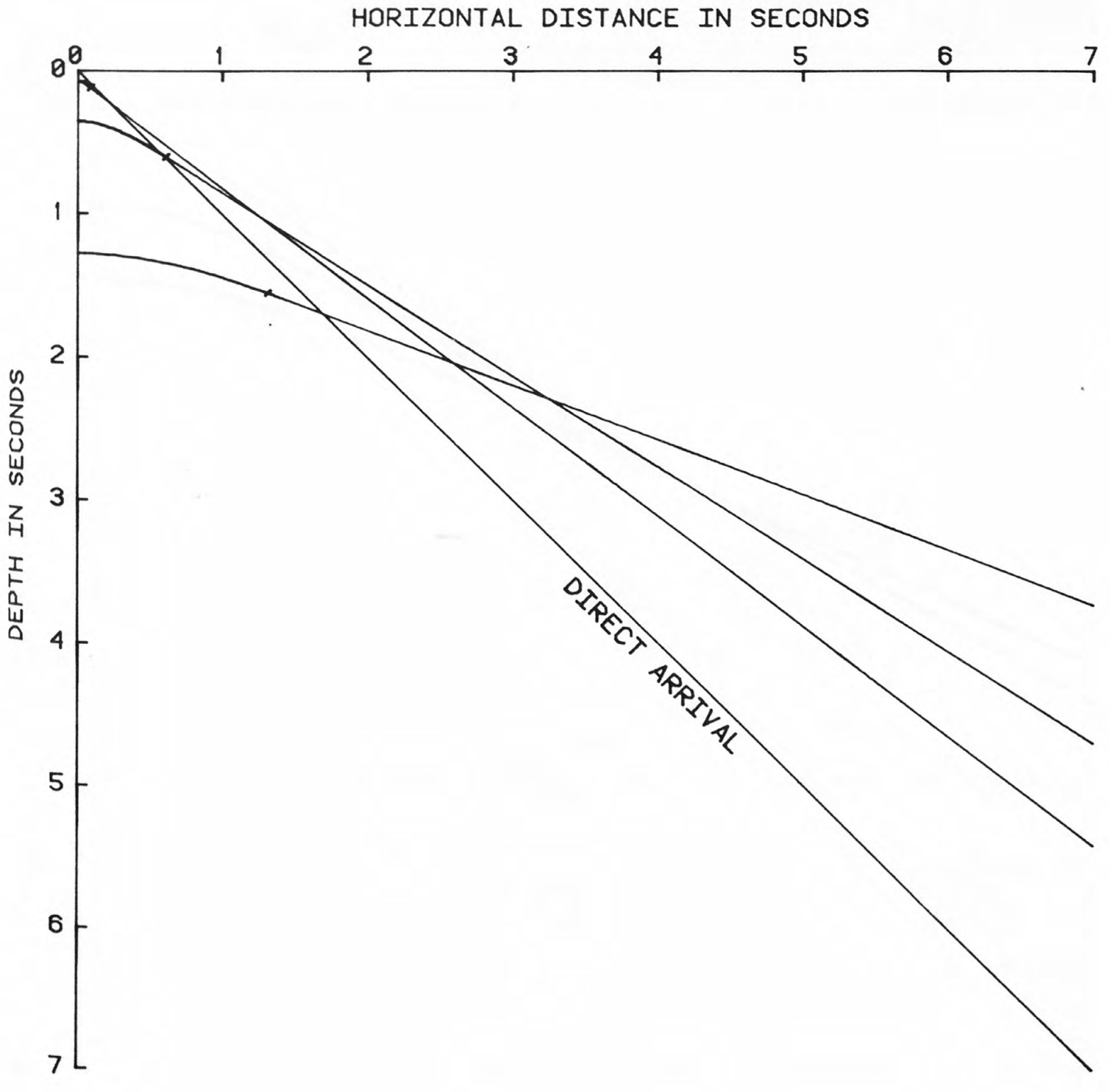
LINFT
9/12/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.058	1.490	0.078	0.000
LAYER 2	0.050	0.324	1.943	0.352	0.139
LAYER 3	0.210	1.399	2.324	1.276	0.909
LAYER 4	1.050		3.885		1.960

CRUISE : L7-77-WG
DATE/TIME : 185 JD, 1246
LINE : 2
SONOBUOY : 6
SOURCE : 2501
BUOY TYPE : NAVY

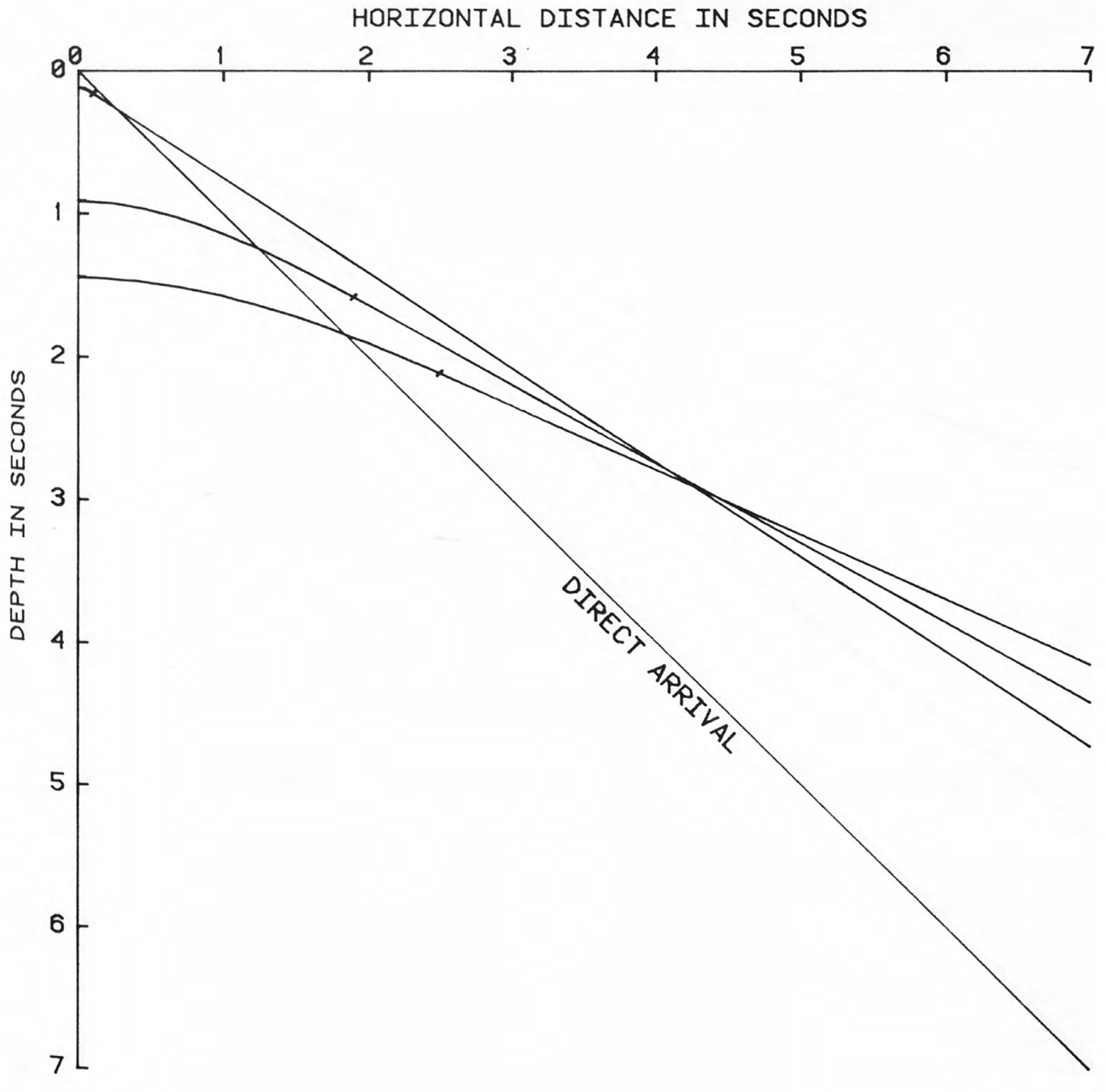
LINFT
8/22/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.090	1.490	0.120	0.000
LAYER 2	0.090	0.974	2.248	0.907	0.159
LAYER 3	0.530	1.683	2.684	1.435	2.830
LAYER 4	0.990		3.299		3.723

CRUISE : L7-77-WG
DATE/TIME : JD 185,1750
LINE : 3
SONOBUOY : 7
SOURCE : 2501
BUOY TYPE : NAVY

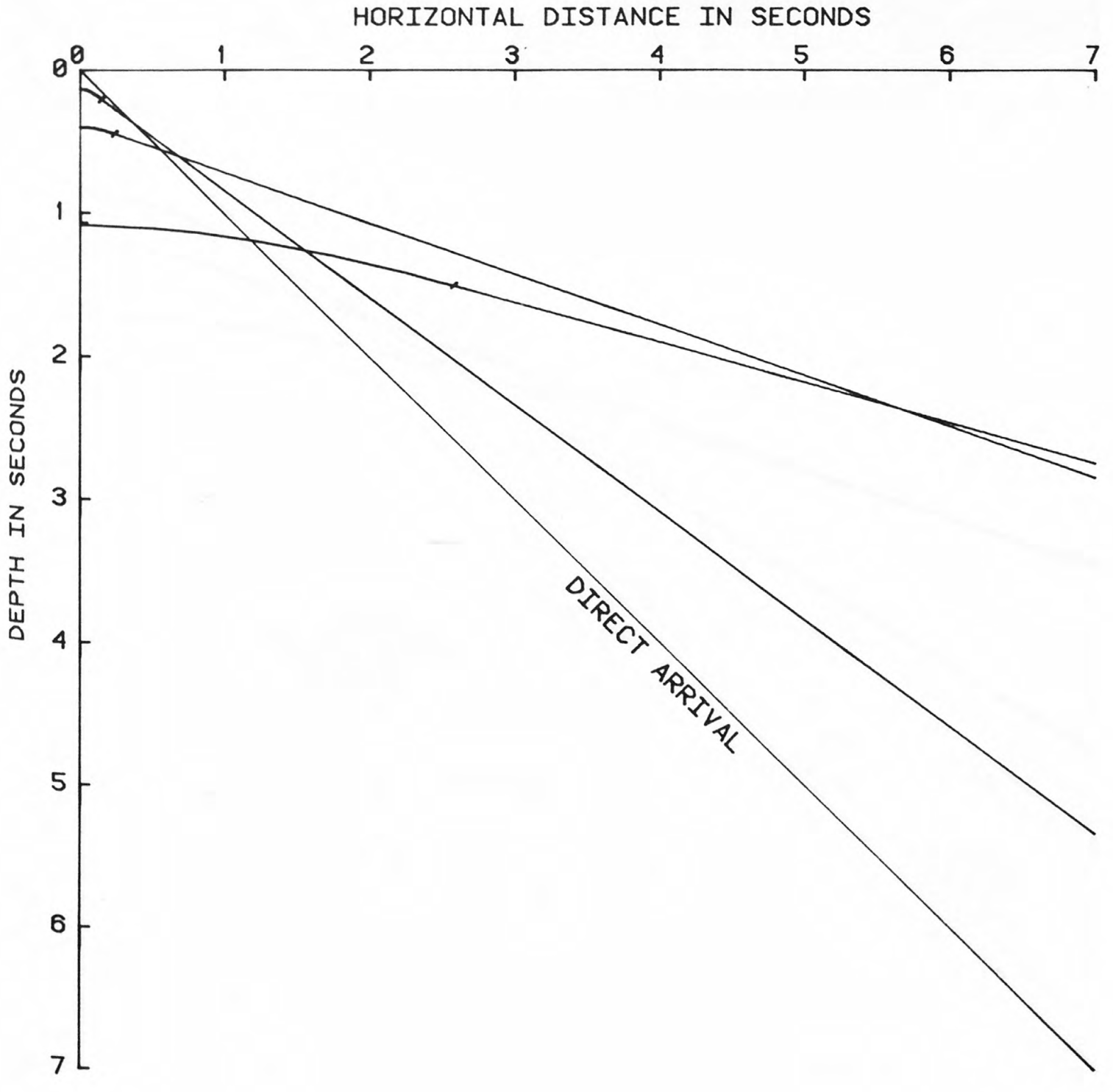
LINFT
10/ 6/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.101	1.490	0.136	0.000
LAYER 2	0.090	0.364	1.987	0.400	0.230
LAYER 3	0.360	1.758	4.191	1.065	0.360
LAYER 4	0.785		5.314		3.846

CRUISE : L7-77-WG
DATE/TIME : JD 185 ,2337
LINE : 4
SONOBUOY : 8
SOURCE : 2501 CU IN
BUOY TYPE : SELECT

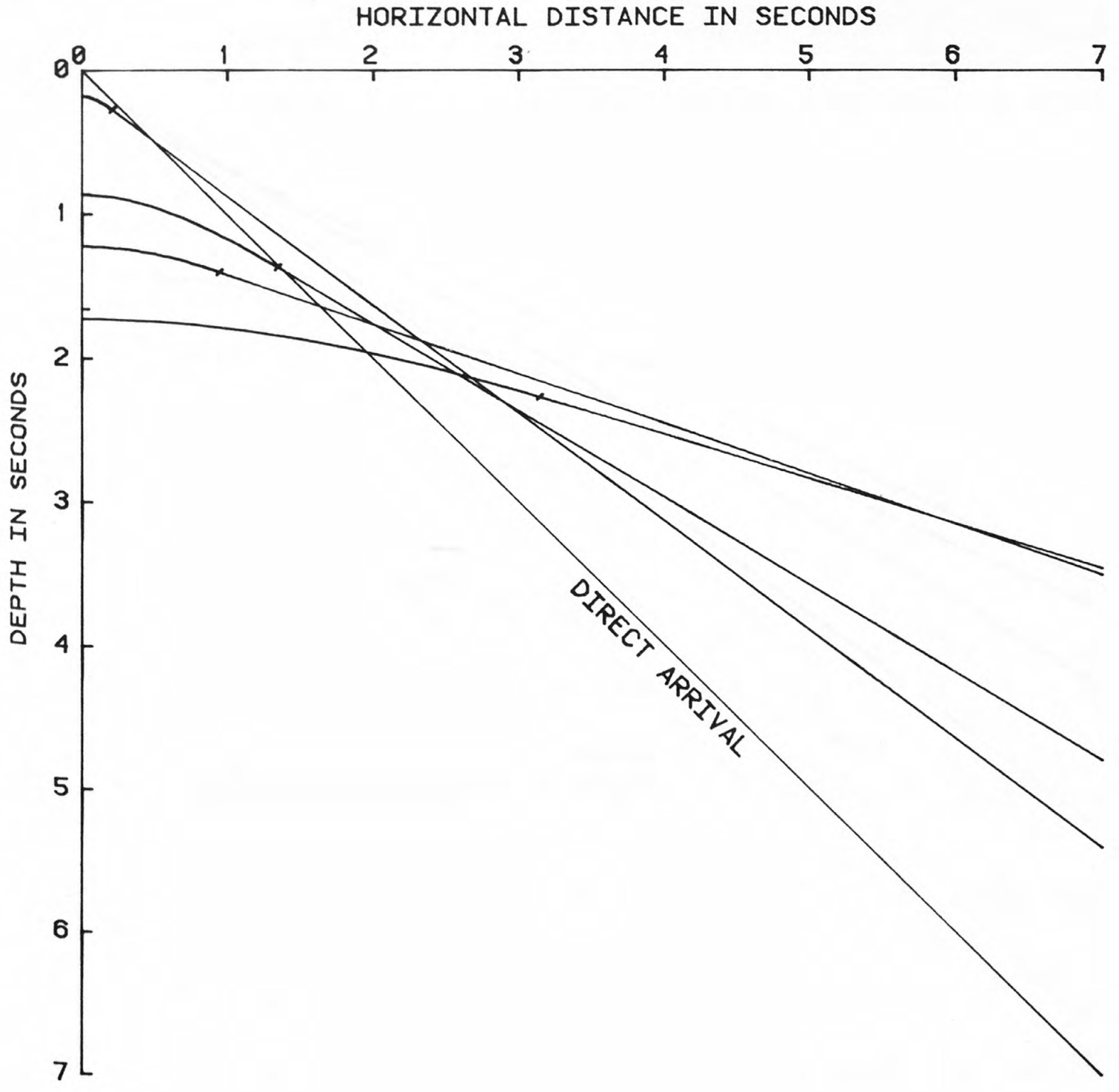
LINFT
10/ 7/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.136	1.490	0.183	0.000
LAYER 2	0.120	0.806	1.973	0.862	0.314
LAYER 3	0.550	1.250	2.456	1.223	2.013
LAYER 4	1.070	2.178	4.280	1.657	1.419
LAYER 5	1.310		4.849		4.691

CRUISE : L7-77-WG
DATE/TIME : 186 JD,0729
LINE : 5
SONOBUOY : 9
SOURCE : 2501
BUOY TYPE : SELECT

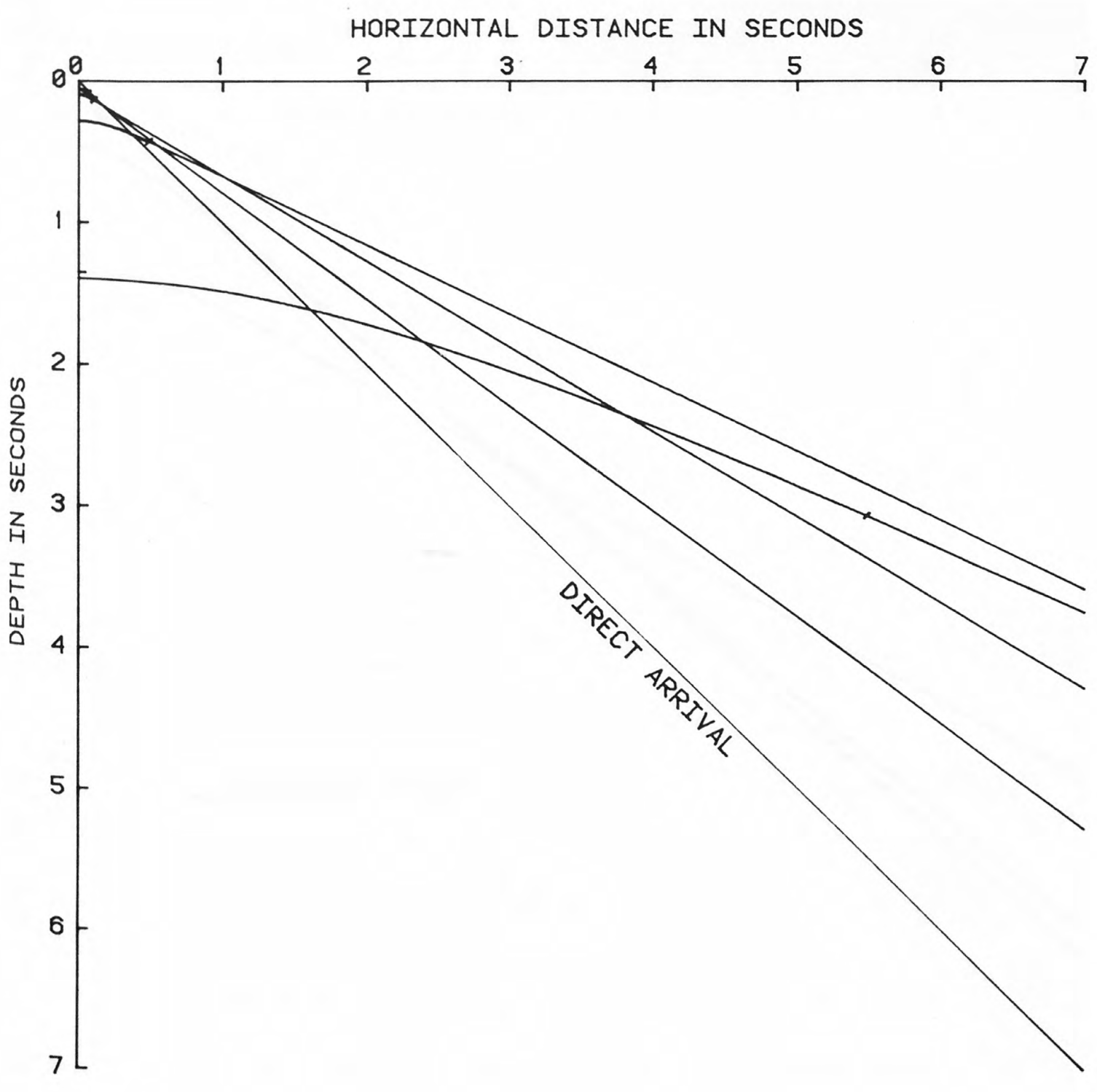
LINFT
8/22/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.045	1.490	0.060	0.000
LAYER 2	0.040	0.081	1.987	0.096	0.102
LAYER 3	0.070	0.310	2.474	0.281	0.166
LAYER 4	0.190	1.955	3.069	1.353	0.735
LAYER 5	0.635		3.345		8.176

CRUISE : L7-77-WG
DATE/TIME : JD 186,1407
LINE : 6
SONOBUOY : 10
SOURCE : 2501 CU IN
BUOY TYPE : SELECT

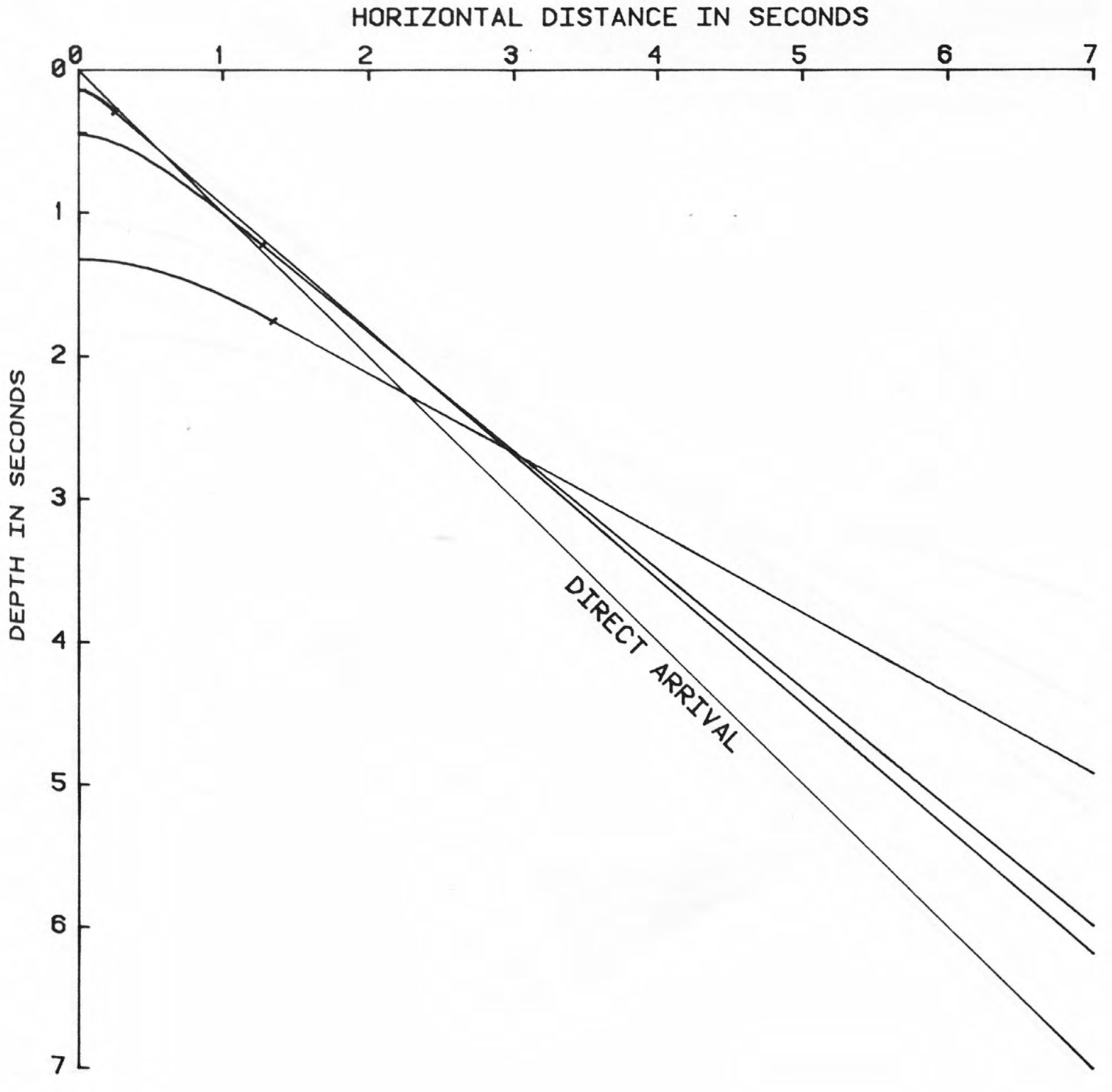
LINFT
10/ 5/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.107	1.490	0.144	0.000
LAYER 2	0.070	0.359	1.705	0.440	0.385
LAYER 3	0.170	1.151	1.791	1.325	1.895
LAYER 4	1.000		2.659		2.009

CRUISE : L7-77-WG
DATE/TIME : JD 187,2328
LINE : 711
SONOBUOY : 12
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

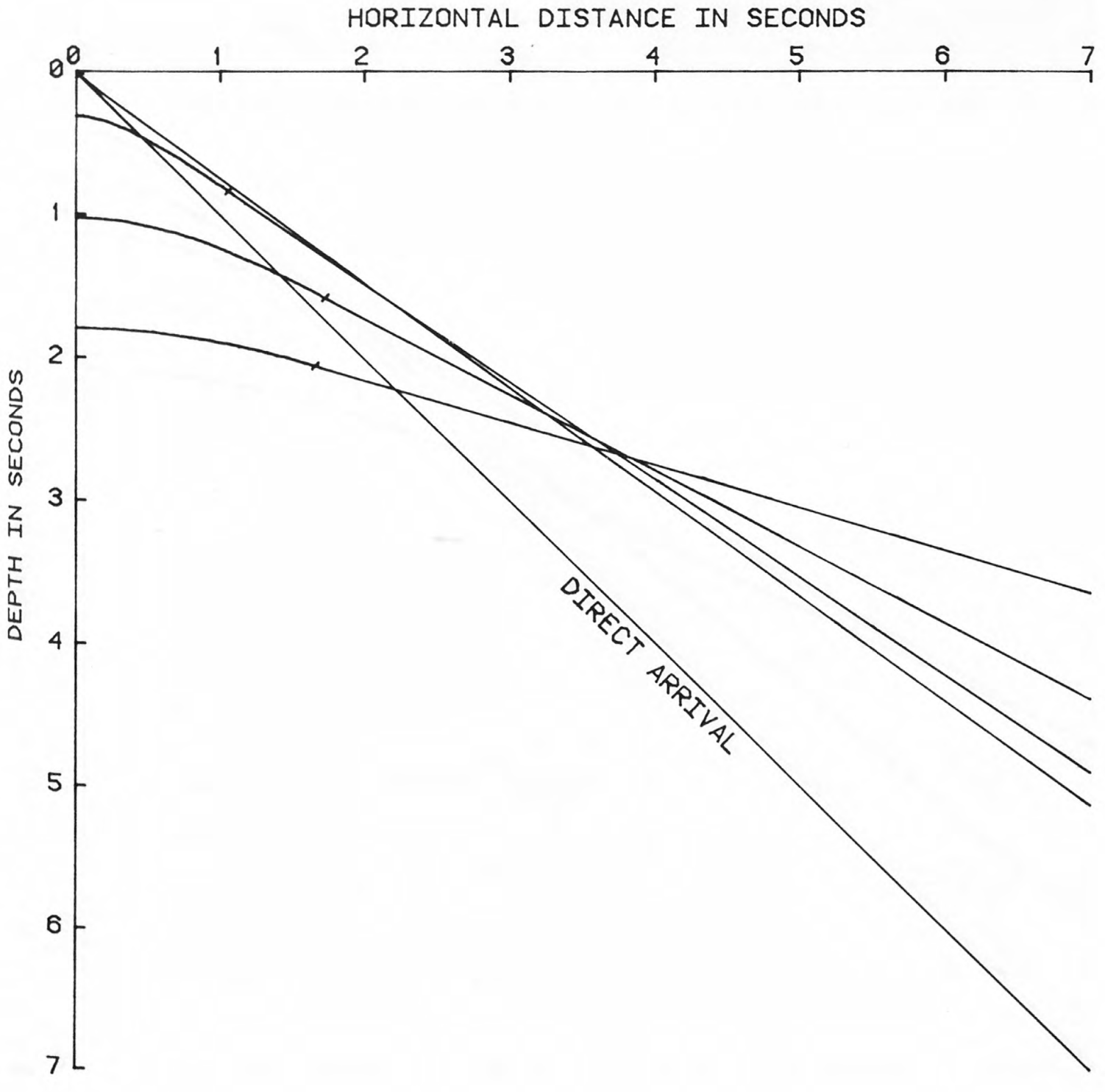
LINFT
10/ 5/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.016	1.490	0.022	0.000
LAYER 2	0.015	0.313	2.038	0.313	0.035
LAYER 3	0.120	1.090	2.182	1.025	1.578
LAYER 4	0.665	2.167	2.801	1.794	2.579
LAYER 5	1.565		5.005		2.482

CRUISE : L7-77-WG
DATE/TIME : JD 189,0755
LINE : 703
SONOBUOY : 14
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

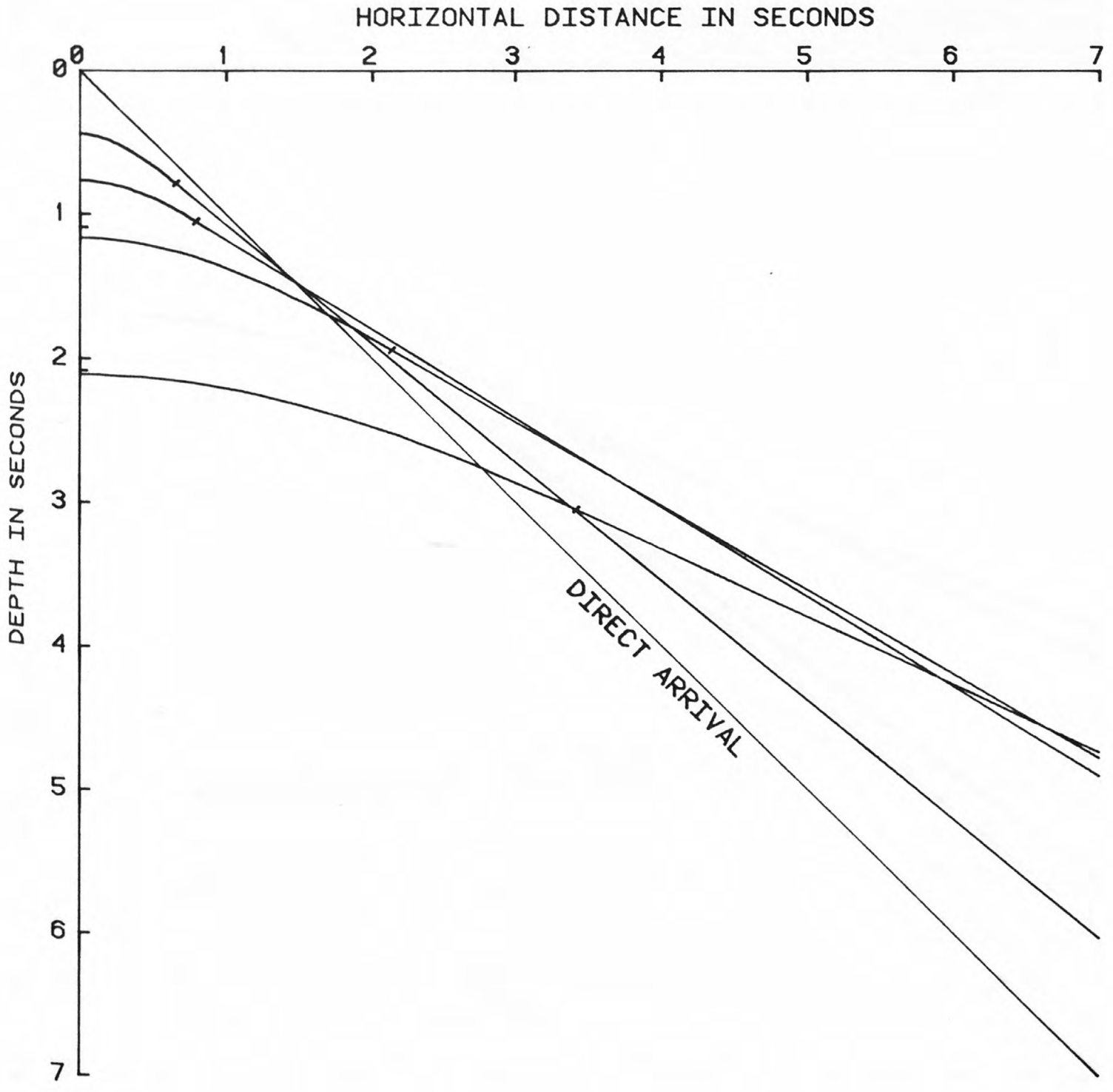
LINFT
12/ 5/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.330	1.490	0.444	0.000
LAYER 2	0.250	0.620	1.804	0.765	0.969
LAYER 3	0.560	1.011	2.403	1.091	1.179
LAYER 4	0.700	2.281	2.559	2.084	3.188
LAYER 5	1.458		3.179		5.099

CRUISE : L7-77-WG
DATE/TIME : JD 189,1246
LINE : 703
SONOBUOY : 16
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

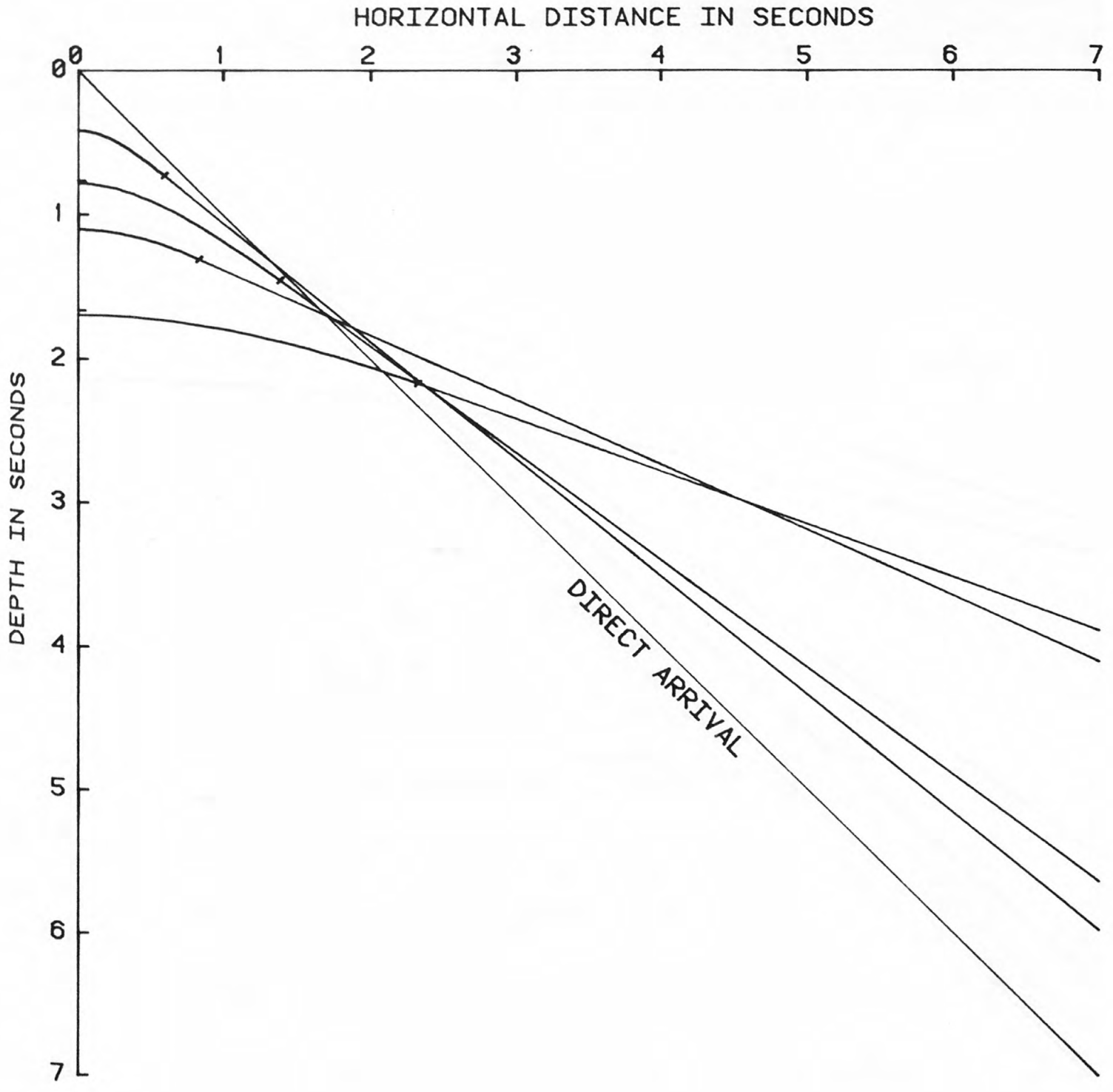
LINFT
10/ 6/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.313	1.490	0.420	0.000
LAYER 2	0.240	0.628	1.816	0.767	0.898
LAYER 3	0.425	0.964	1.999	1.103	2.067
LAYER 4	0.930	1.880	3.284	1.661	1.253
LAYER 5	1.320		4.053		3.476

CRUISE : L7-77-WG
DATE/TIME : JD 190,1830
LINE : 712
SONOBUOY : 19
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

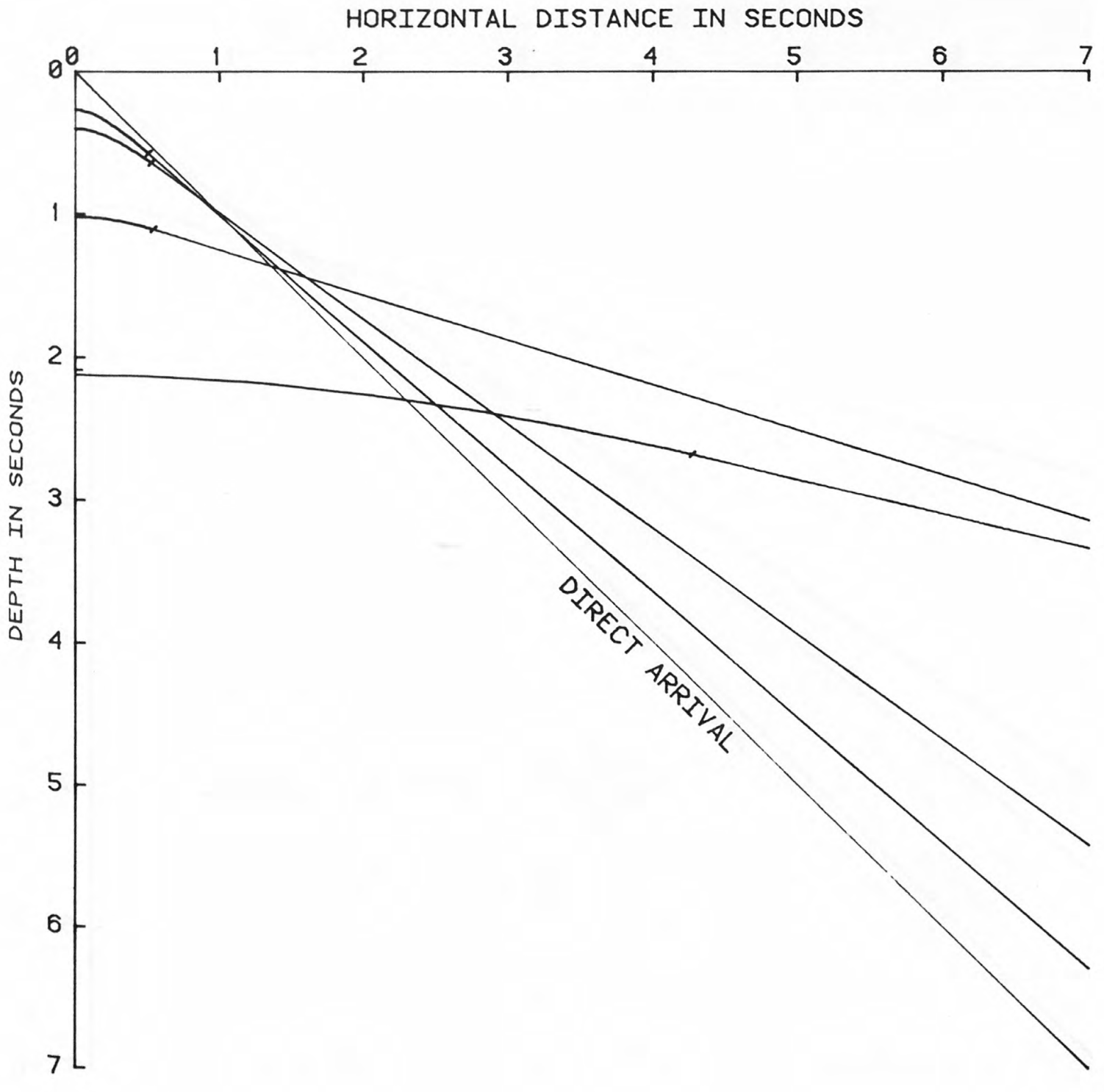
LINFT
10/ 6/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.204	1.490	0.274	0.000
LAYER 2	0.130	0.313	1.693	0.403	0.756
LAYER 3	0.255	0.936	2.018	1.020	0.784
LAYER 4	0.938	3.455	4.719	2.088	0.809
LAYER 5	1.675		6.255		6.377

CRUISE : L7-77-WG
DATE/TIME : JD 191,1220
LINE : 701
SONOBUOY : 22
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

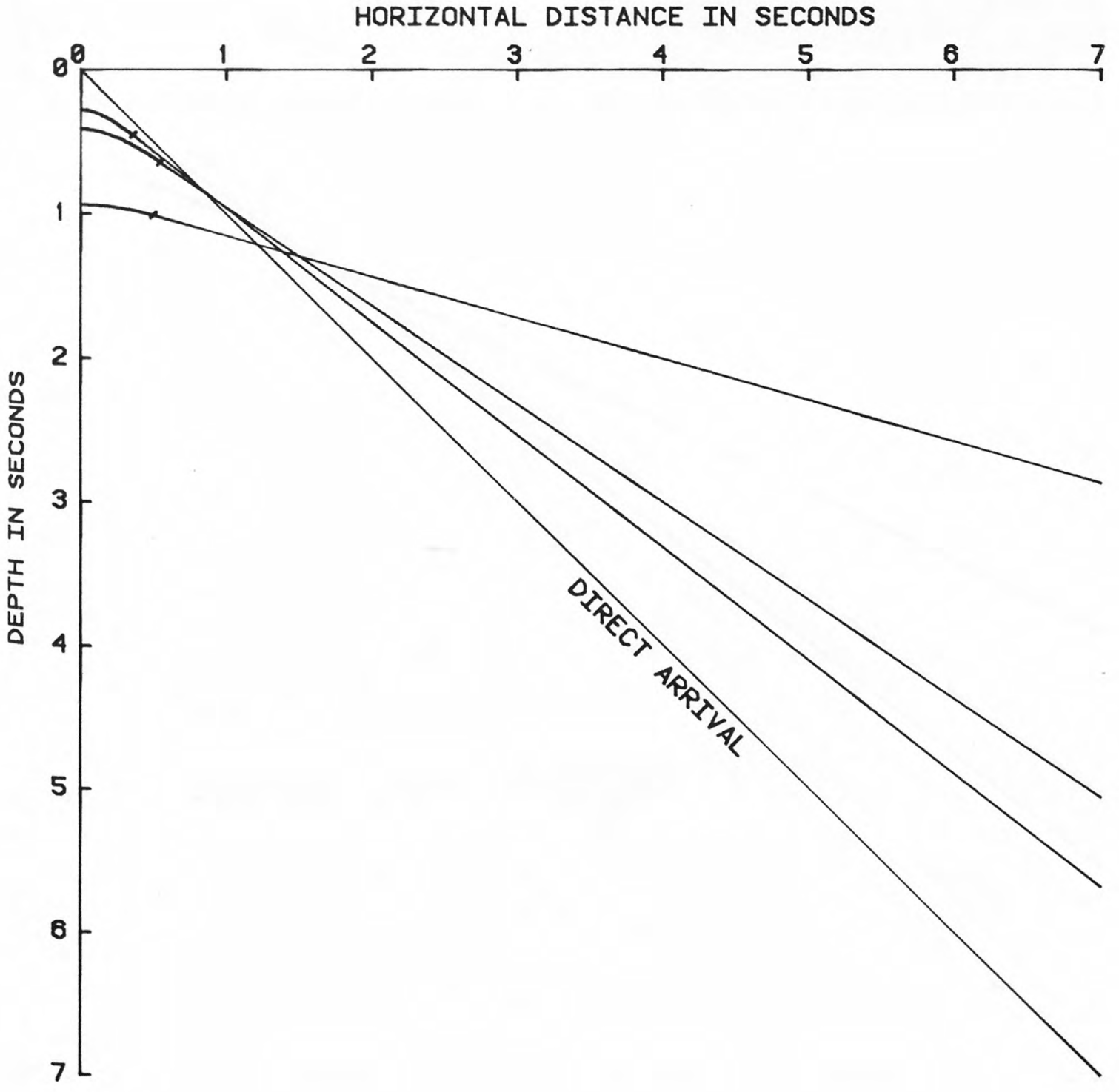
LINFT
10/ 5/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.211	1.490	0.284	0.000
LAYER 2	0.175	0.332	1.893	0.411	0.539
LAYER 3	0.270	0.907	2.179	0.939	0.819
LAYER 4	0.870		5.207		0.750

CRUISE : L7-77-WG
DATE/TIME : 192 JD,0938
LINE : 772
SONOBUOY : 23
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

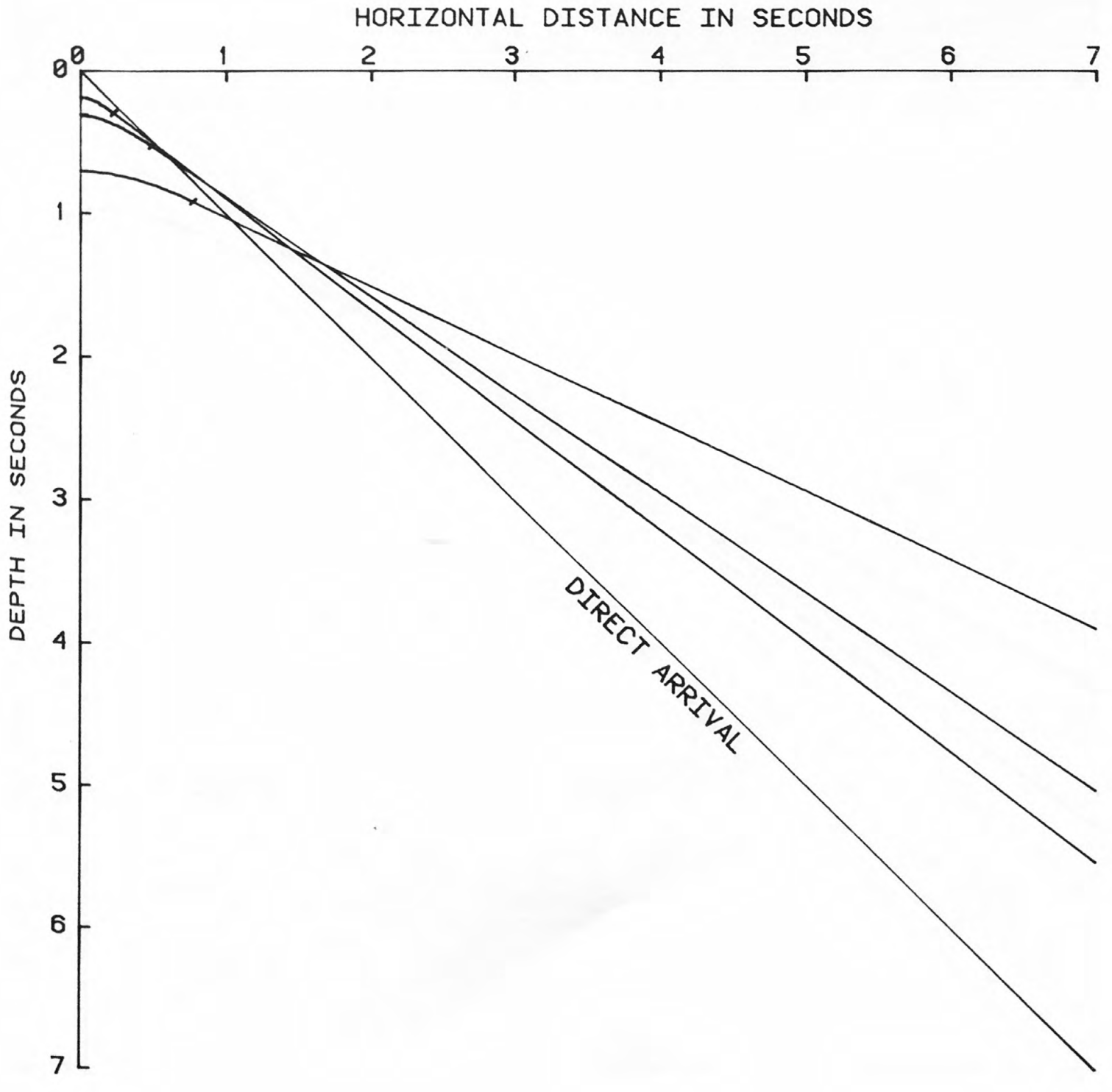
LINFT
9/ 2/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.141	1.490	0.190	0.000
LAYER 2	0.120	0.255	1.925	0.308	0.346
LAYER 3	0.190	0.681	2.154	0.704	0.724
LAYER 4	0.545		3.111		1.152

CRUISE : L7-77-WG
DATE/TIME : JD 192,2125
LINE : 773
SONOBUOY : 25
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

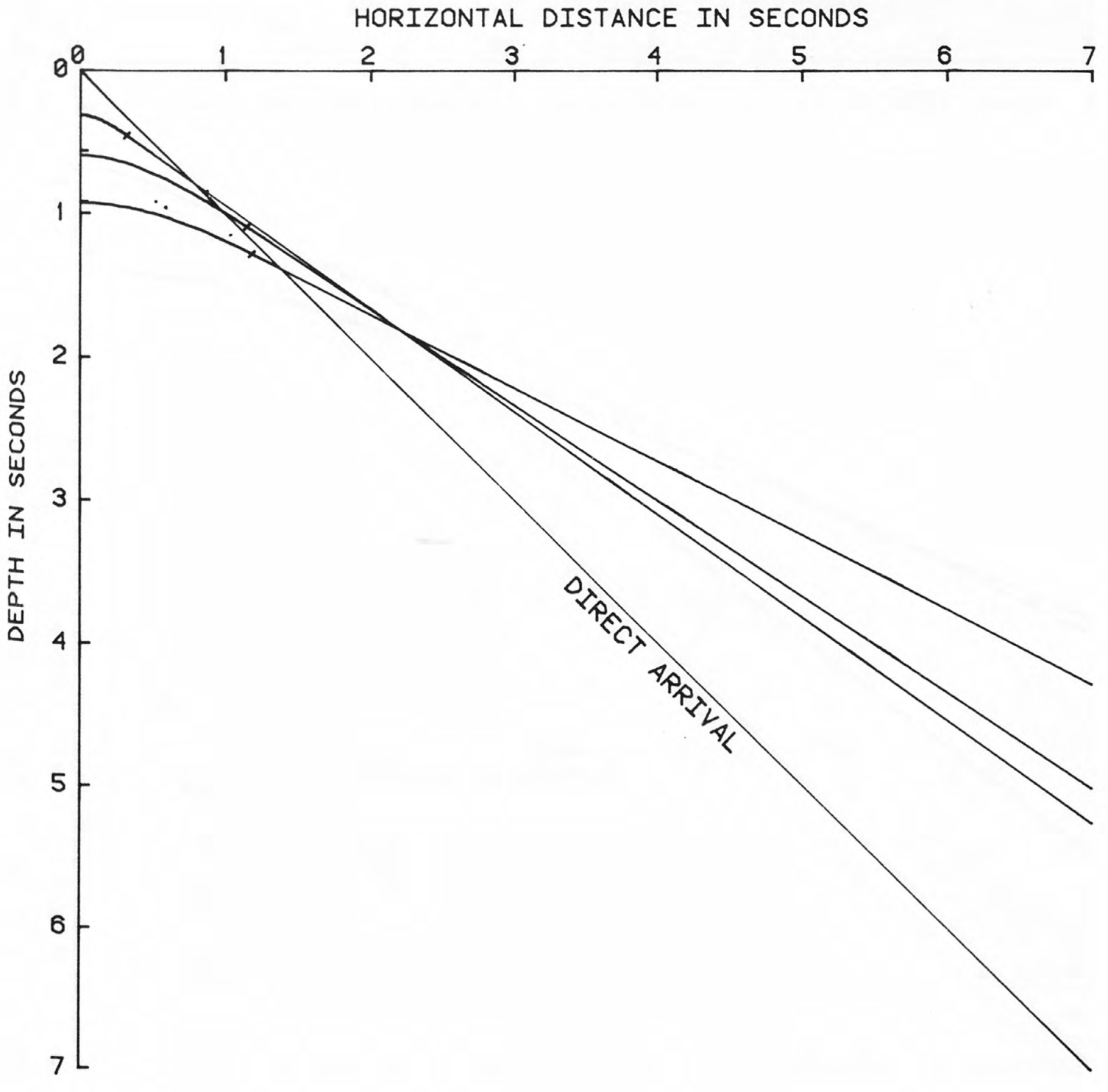
LINFT
10/ 7/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.236	1.490	0.317	0.000
LAYER 2	0.220	0.489	2.068	0.561	0.491
LAYER 3	0.325	0.886	2.222	0.918	1.710
LAYER 4	0.670		2.885		1.763

CRUISE : L7-77-WG
DATE/TIME : JD 192,2315
LINE : 773
SONOBUOY : 26
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

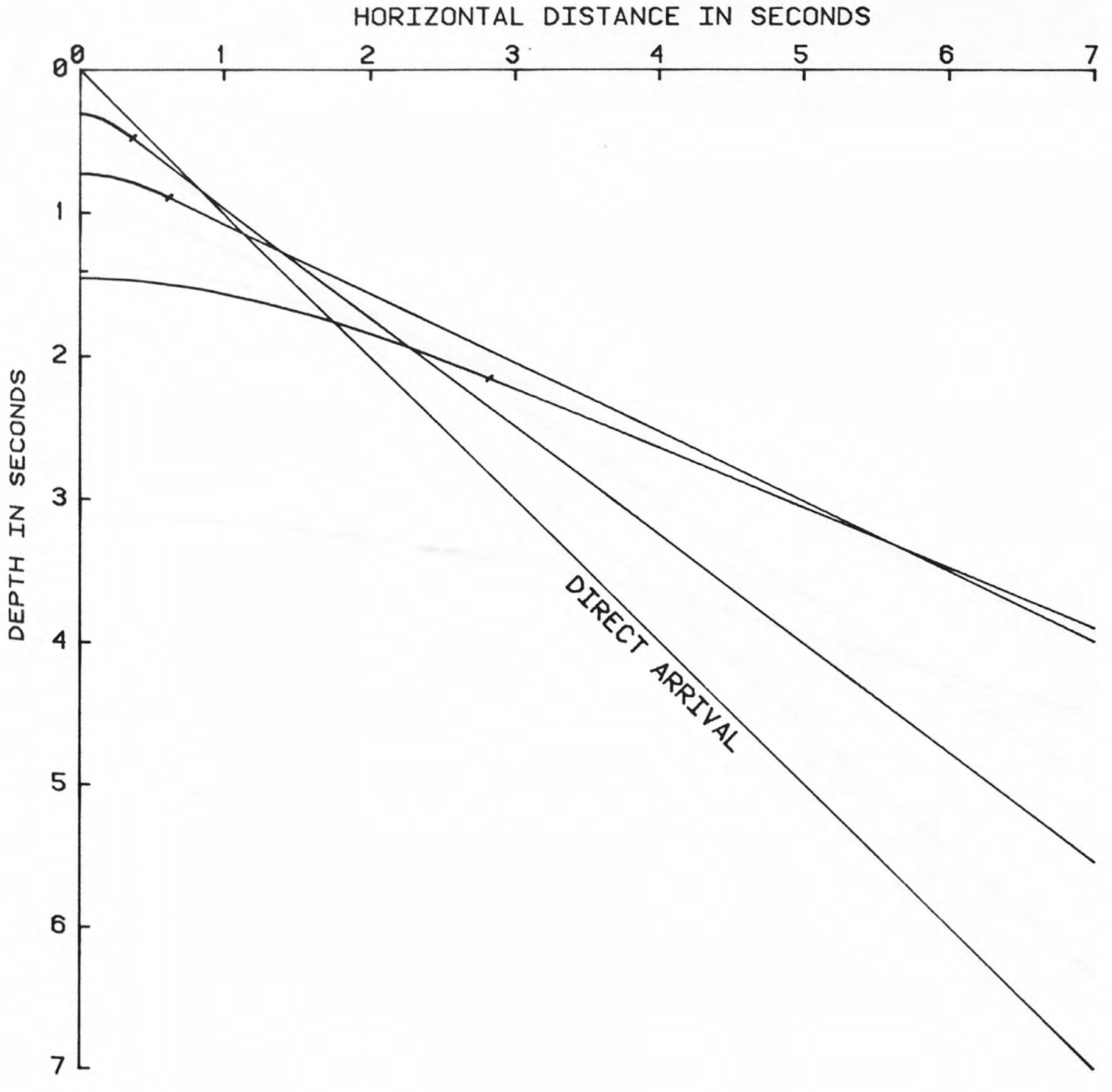
LINFT
12/ 5/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.231	1.490	0.310	0.000
LAYER 2	0.200	0.635	1.952	0.725	0.545
LAYER 3	0.590	1.681	3.062	1.408	0.926
LAYER 4	0.980		3.571		4.224

CRUISE : L7-77-WG
DATE/TIME : 193 JD,0959
LINE : 773
SONOBUOY : 28
SOURCE : 1132 CU IN AIRGUNS
BUOY TYPE : NAVY

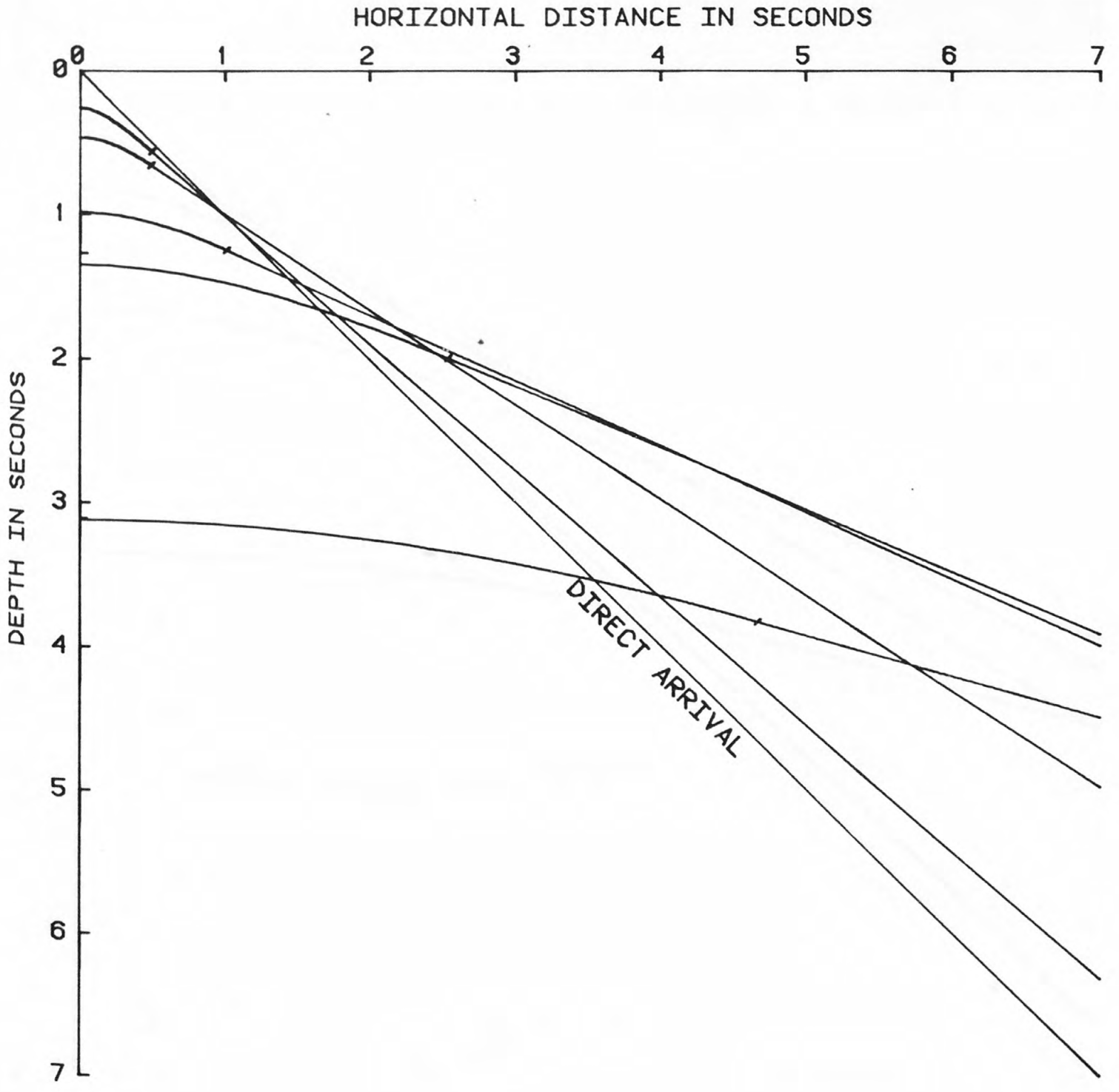
LINFT
9/ 2/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.195	1.490	0.262	0.000
LAYER 2	0.122	0.366	1.683	0.465	0.743
LAYER 3	0.330	0.946	2.244	0.982	0.734
LAYER 4	0.780	1.409	3.247	1.267	1.518
LAYER 5	0.910	4.603	3.473	3.106	3.793
LAYER 6	2.535		5.332		6.959

CRUISE : L7-77-WG
DATE/TIME : 193 JD,1537
LINE : 773
SONOBUOY : 29
SOURCE : 1132 CU IN
BUOY TYPE : NAVY

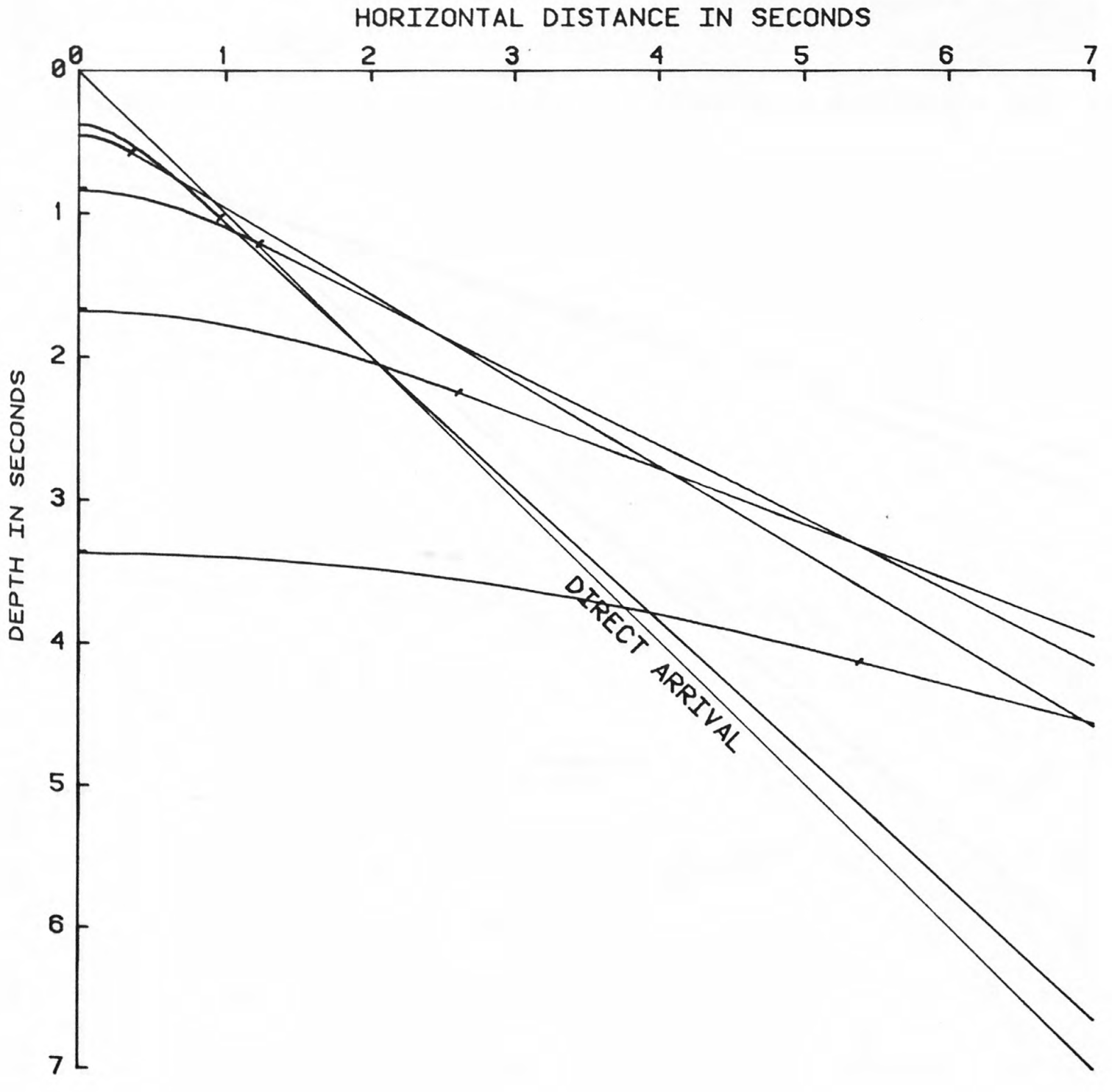
LINFT
9/ 7/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.283	1.490	0.380	0.000
LAYER 2	0.140	0.343	1.602	0.455	1.432
LAYER 3	0.360	0.793	2.466	0.820	0.533
LAYER 4	0.585	2.023	2.919	1.663	1.836
LAYER 5	1.250	5.286	3.855	3.356	3.892
LAYER 6	2.745		5.724		8.021

CRUISE : L7-77-WG
DATE/TIME : 193 JD,2051
LINE : 774
SONOBUOY : 30
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

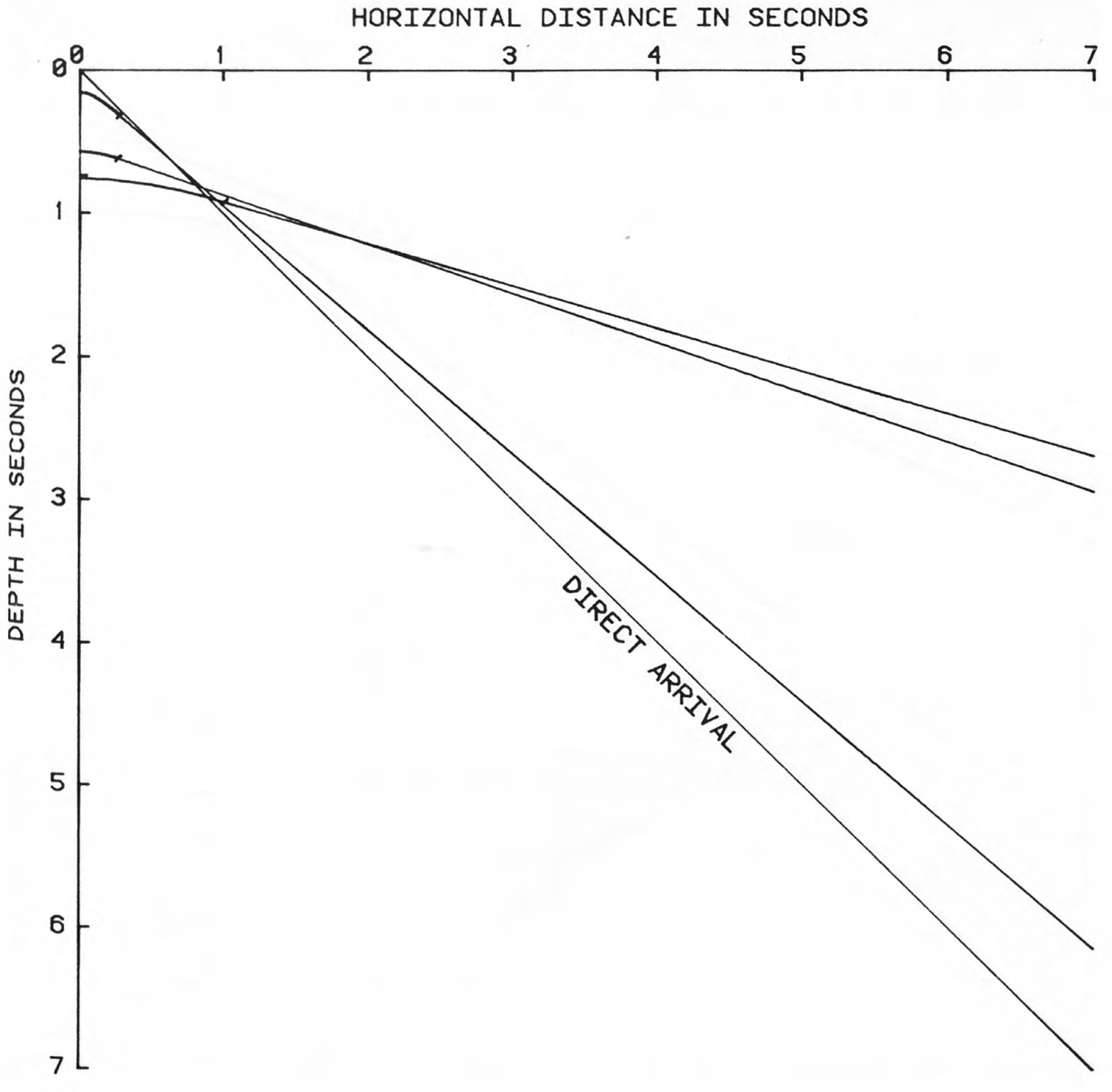
LINFT
9/ 7/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.119	1.490	0.160	0.000
LAYER 2	0.080	0.475	1.719	0.574	0.415
LAYER 3	0.530	0.830	4.314	0.739	0.397
LAYER 4	0.627		5.036		1.512

CRUISE : L7-77-WG
DATE/TIME : 194 JD,0212
LINE : 775
SONOBUOY : 31
SOURCE : 1326 CU IN AIRGUNS
BUOY TYPE : NAVY

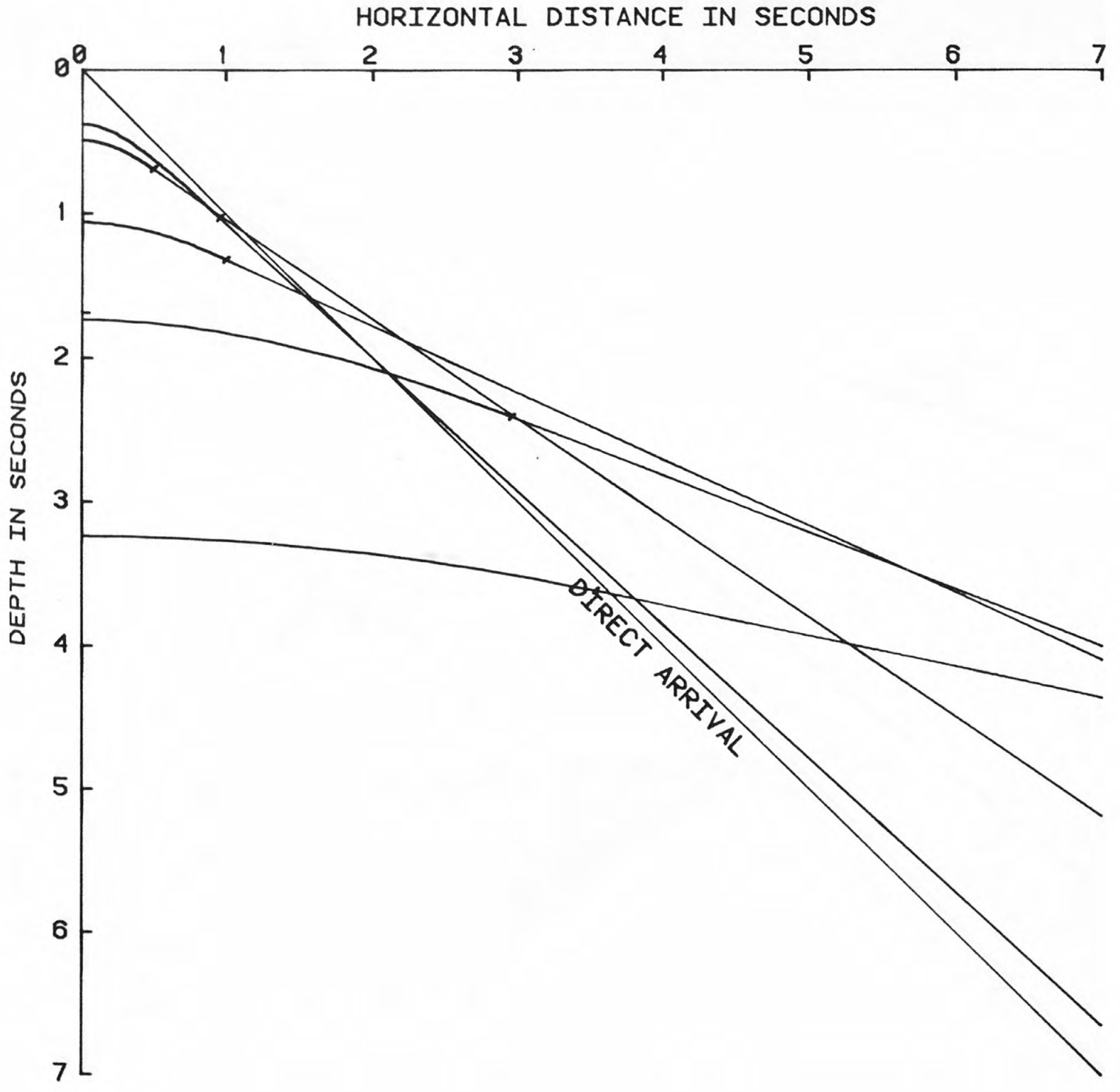
LINFT
9/ 2/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.283	1.490	0.380	0.000
LAYER 2	0.140	0.373	1.602	0.492	1.432
LAYER 3	0.350	0.984	2.156	1.059	0.742
LAYER 4	0.855	1.996	3.216	1.688	1.504
LAYER 5	1.250	4.926	3.788	3.235	4.425
LAYER 6	2.890		7.094		5.284

CRUISE : L7-77-WG
DATE/TIME : 194 JD,1235
LINE : 776
SONOBUOY : 33
SOURCE : 1326 CU IN
BUOY TYPE : SELECT

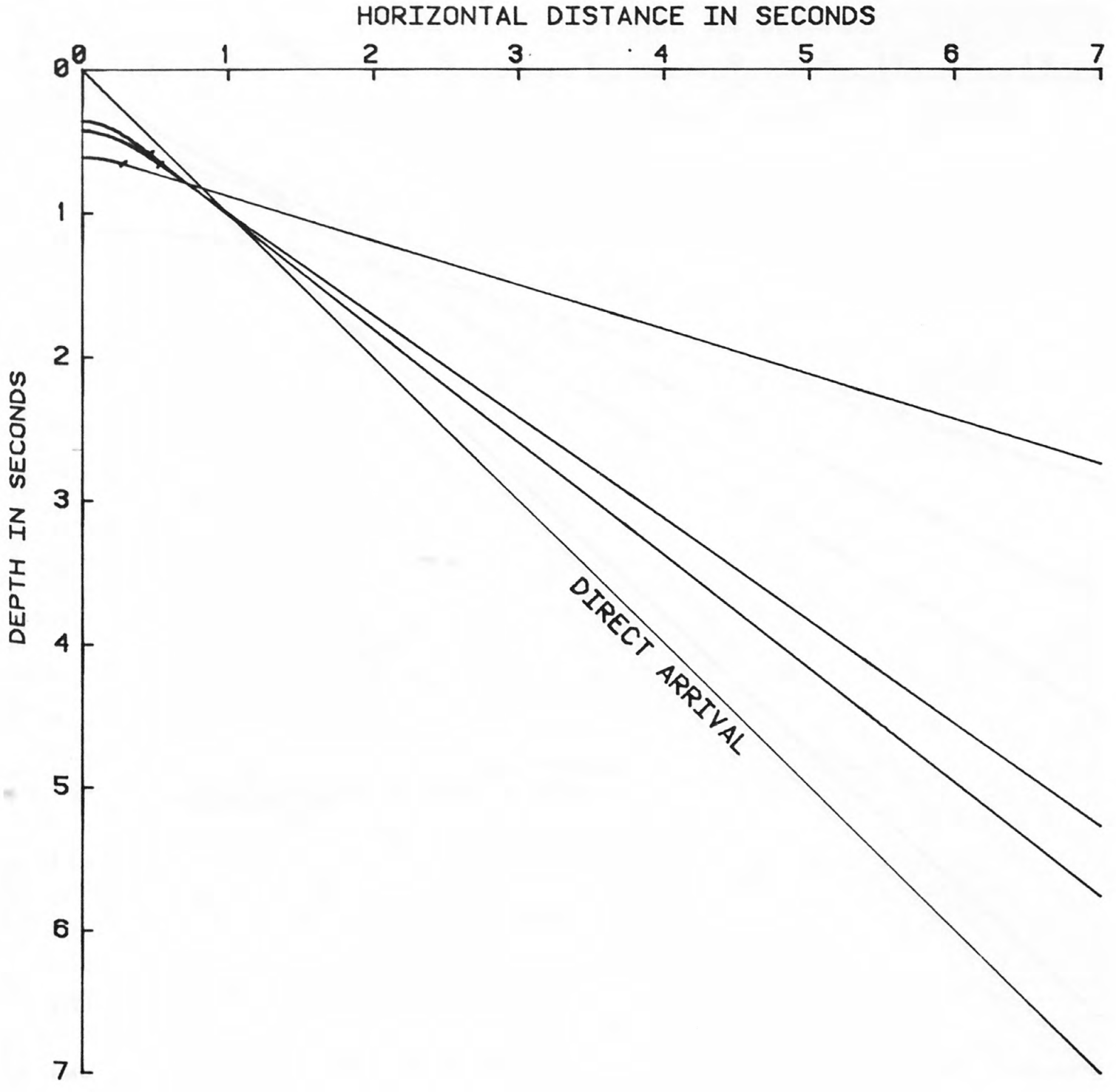
LINFT
9/ 7/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.268	1.490	0.360	0.000
LAYER 2	0.220	0.328	1.882	0.424	0.695
LAYER 3	0.280	0.525	2.089	0.612	0.794
LAYER 4	0.570		4.788		0.418

CRUISE : L7-77-WG
DATE/TIME : 194 JD,1620
LINE : 776
SONOBUOY : 34
SOURCE : 1326 CU IN
BUOY TYPE : SELECT

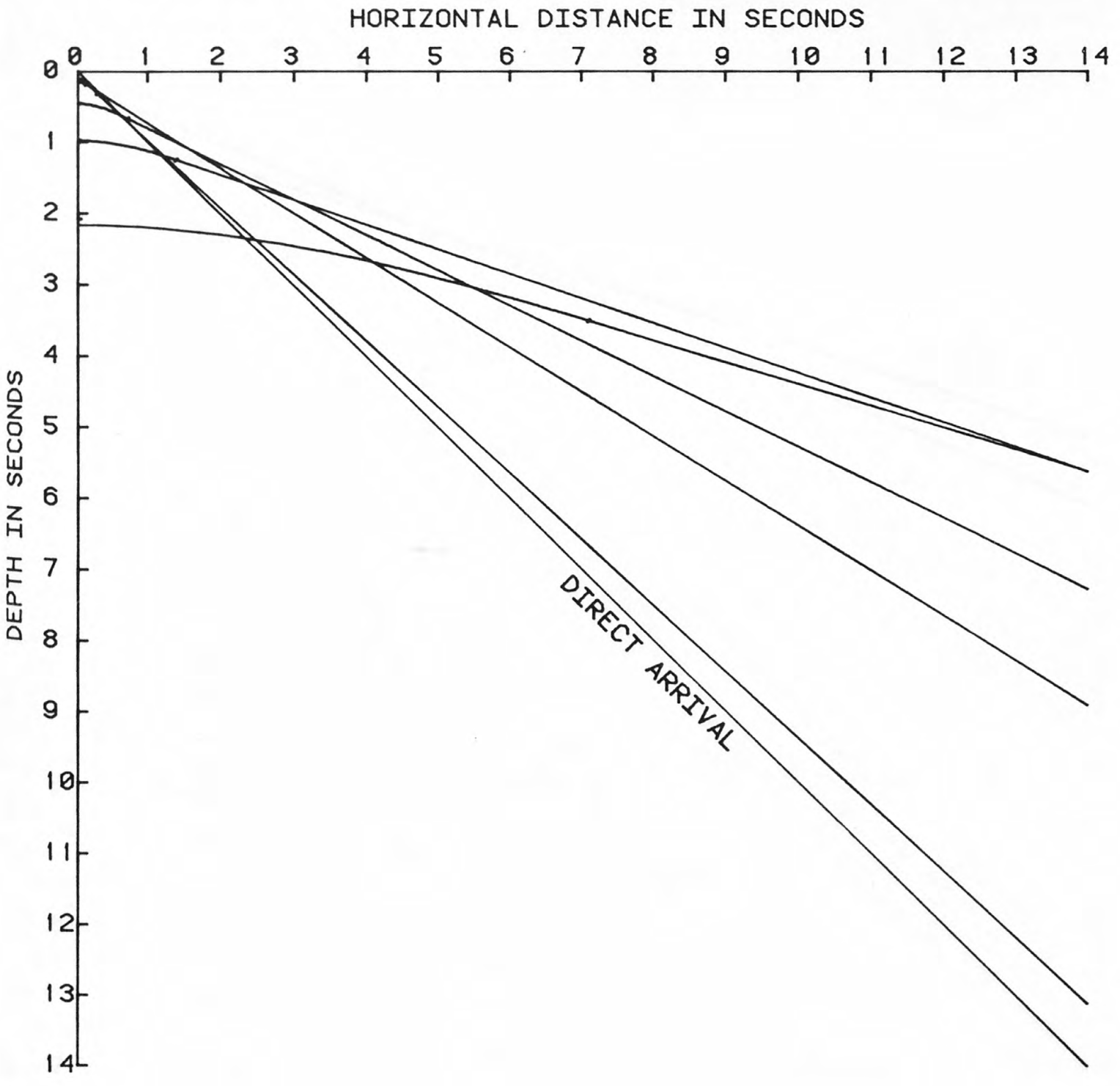
LINFT
9/ 7/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	0.083	1.490	0.111	0.000
LAYER 2	0.040	0.108	1.596	0.143	0.432
LAYER 3	0.110	0.470	2.372	0.448	0.180
LAYER 4	0.310	1.249	2.997	0.968	1.065
LAYER 5	0.760	3.617	4.288	2.072	2.085
LAYER 6	1.330		4.857		10.599

CRUISE : L7-77-WG
DATE/TIME : 195 JD,0753
LINE : 714
SONOBUOY : 38
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

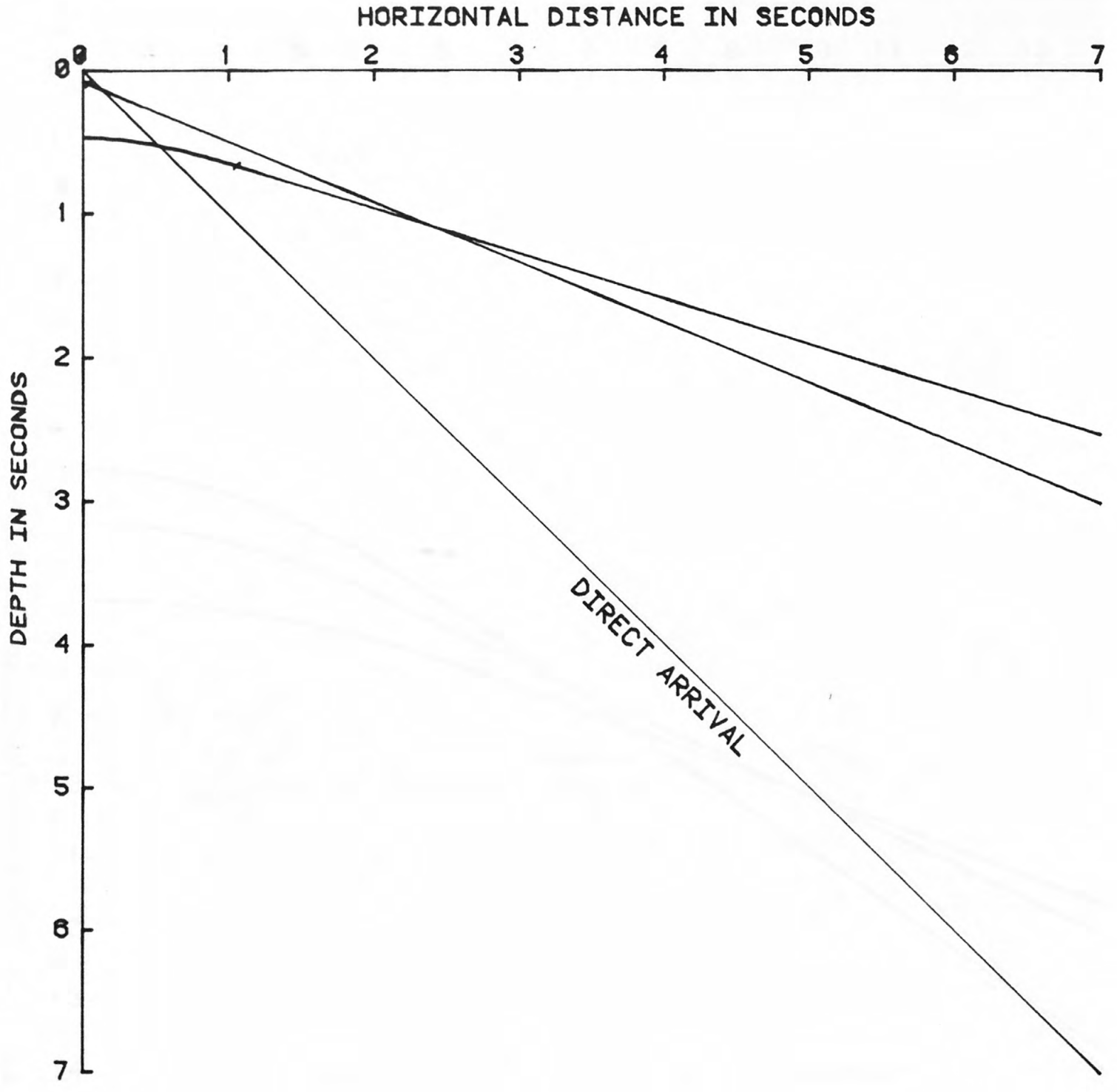
LINFT
9/ 7/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.066	1.490	0.088	0.000
LAYER 2	0.080	0.738	3.553	0.466	0.061
LAYER 3	0.333		4.726		1.576

CRUISE : L7-77-WG
DATE/TIME : JD 195,1934
LINE : 714
SONOBUOY : 41
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

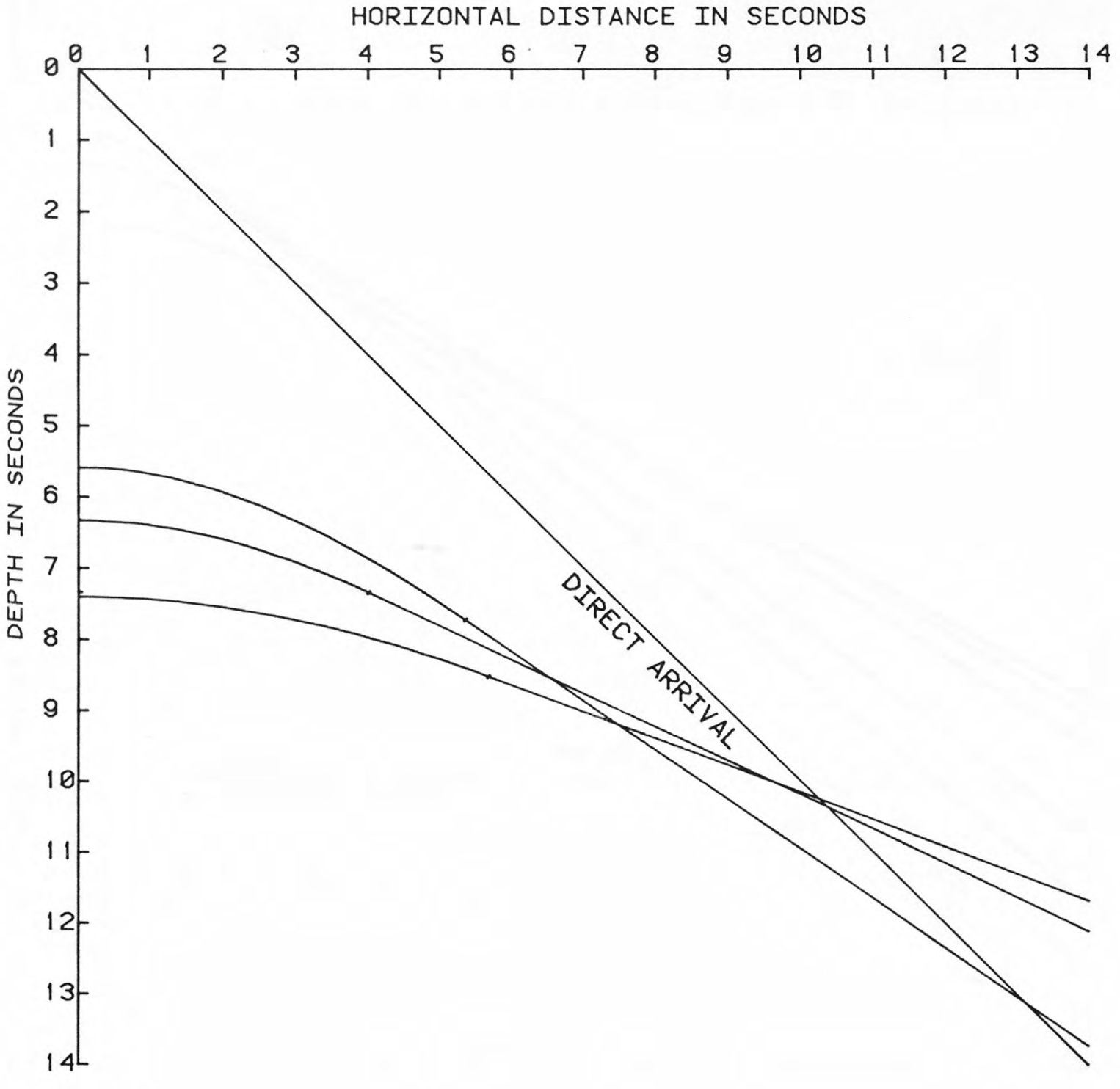
LINFT
9/12/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	4.186	1.497	5.592	0.000
LAYER 2	4.030	4.976	2.159	6.324	8.052
LAYER 3	5.450	6.559	3.145	7.331	6.022
LAYER 4	6.410		3.975		8.524

CRUISE : L7-77-WG
DATE/TIME : JD 196,1241
LINE : 109
SONOBUOY : 43
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

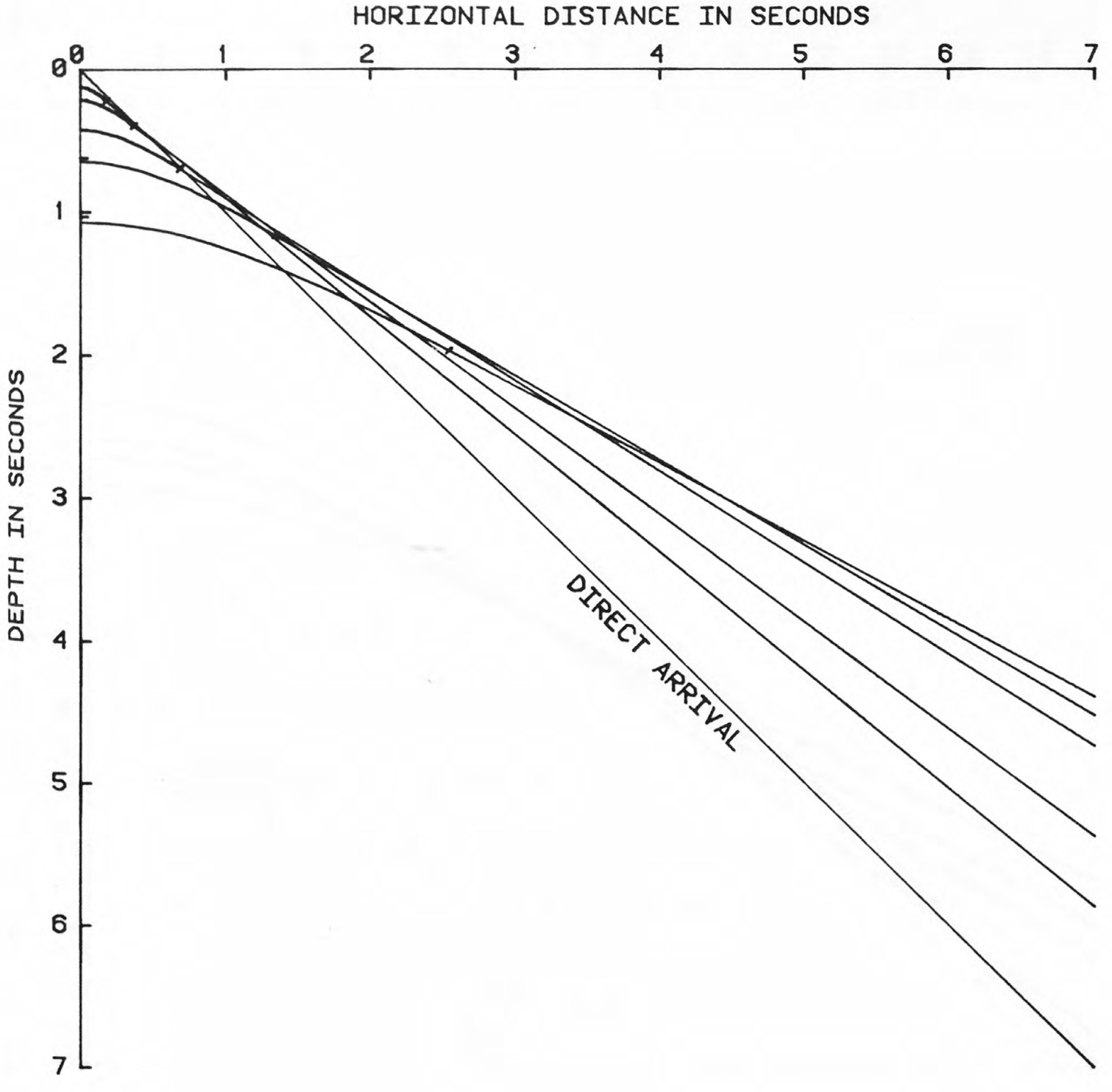
LINFT
10/ 4/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	0.094	1.500	0.125	0.000
LAYER 2	0.070	0.174	1.811	0.213	0.277
LAYER 3	0.120	0.380	2.000	0.420	0.554
LAYER 4	0.260	0.615	2.346	0.621	1.024
LAYER 5	0.362	1.136	2.524	1.033	2.023
LAYER 6	0.585		2.758		3.823

CRUISE : L7-77-WG
DATE/TIME : JD 199,2020
LINE : 70
SONOBUOY : 44
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

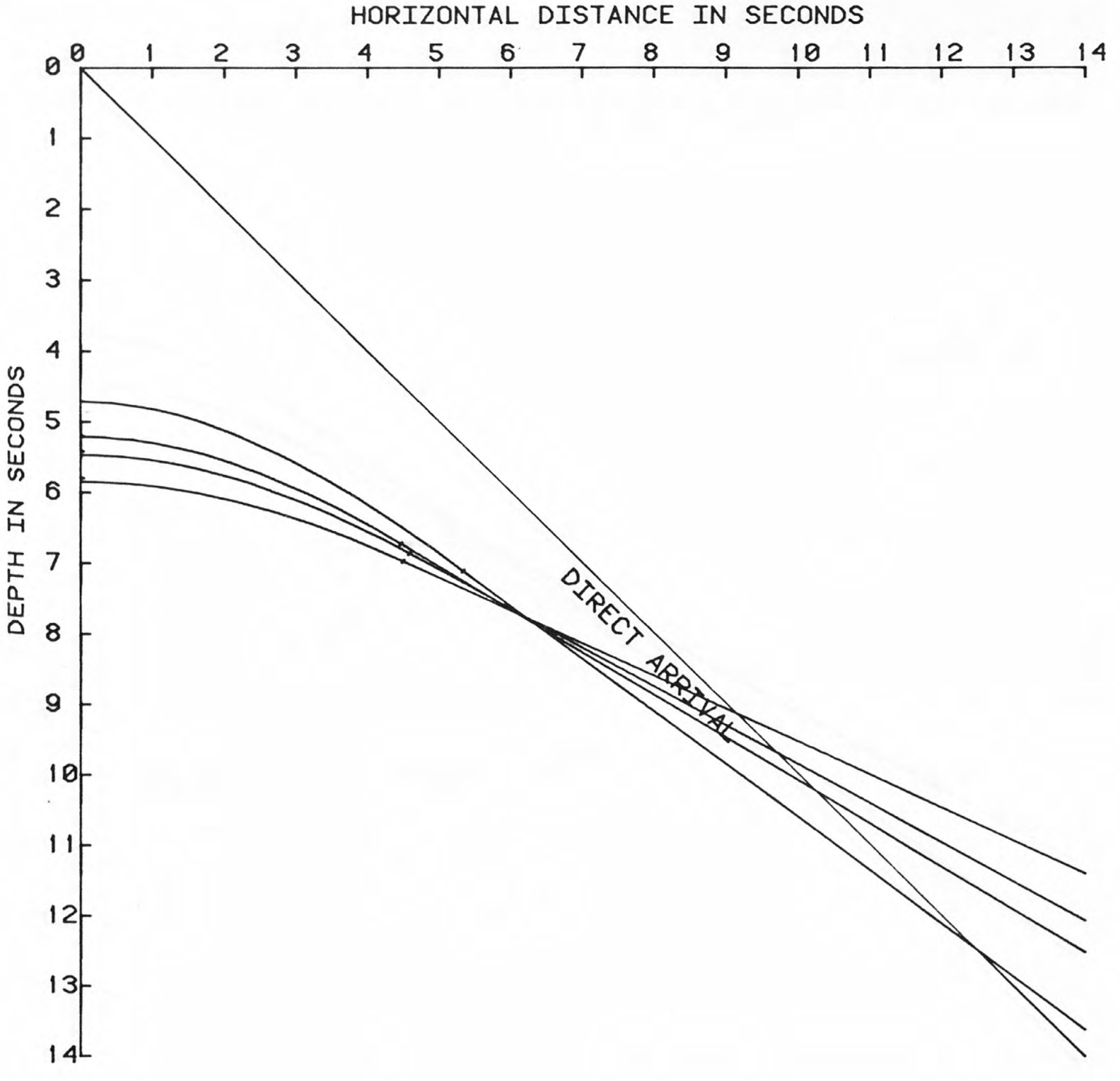
LINFT
9/12/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	3.538	1.500	4.717	0.000
LAYER 2	3.120	4.016	2.000	5.195	8.023
LAYER 3	4.030	4.287	2.472	5.414	6.719
LAYER 4	4.350	4.810	2.719	5.799	6.898
LAYER 5	4.900		3.227		6.753

CRUISE : L7-77-WG
DATE/TIME : JD 200,1132
LINE : 81
SONOBUOY : 45
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

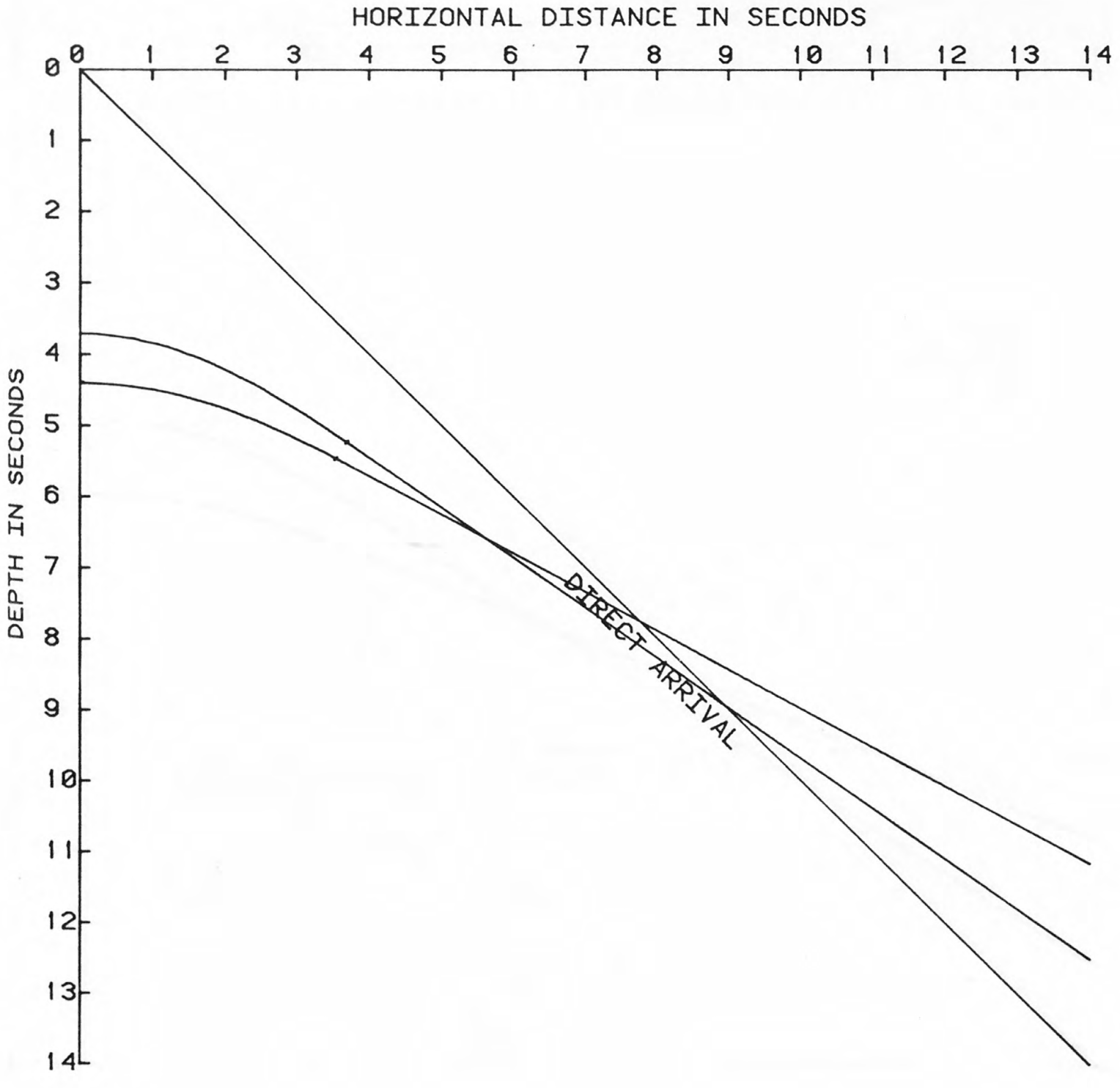
LINFT
10/ 5/77



	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	2.787	1.500	3.715	0.000
LAYER 2	2.630	3.494	2.124	4.381	5.561
LAYER 3	3.540		2.754		5.332

CRUISE : L7-77-WG
DATE/TIME : JD 200,1345
LINE : 81
SONOBUOY : 46
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

LINFT
10/ 4/77



	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	3.684	1.500	4.912	0.000
LAYER 2	3.830	4.927	2.396	5.950	5.915
LAYER 3	5.325		3.819		5.149

CRUISE : L7-77-WG
DATE/TIME : JD 200,1547
LINE : 81
SONOBUOY : 47
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

LINFT
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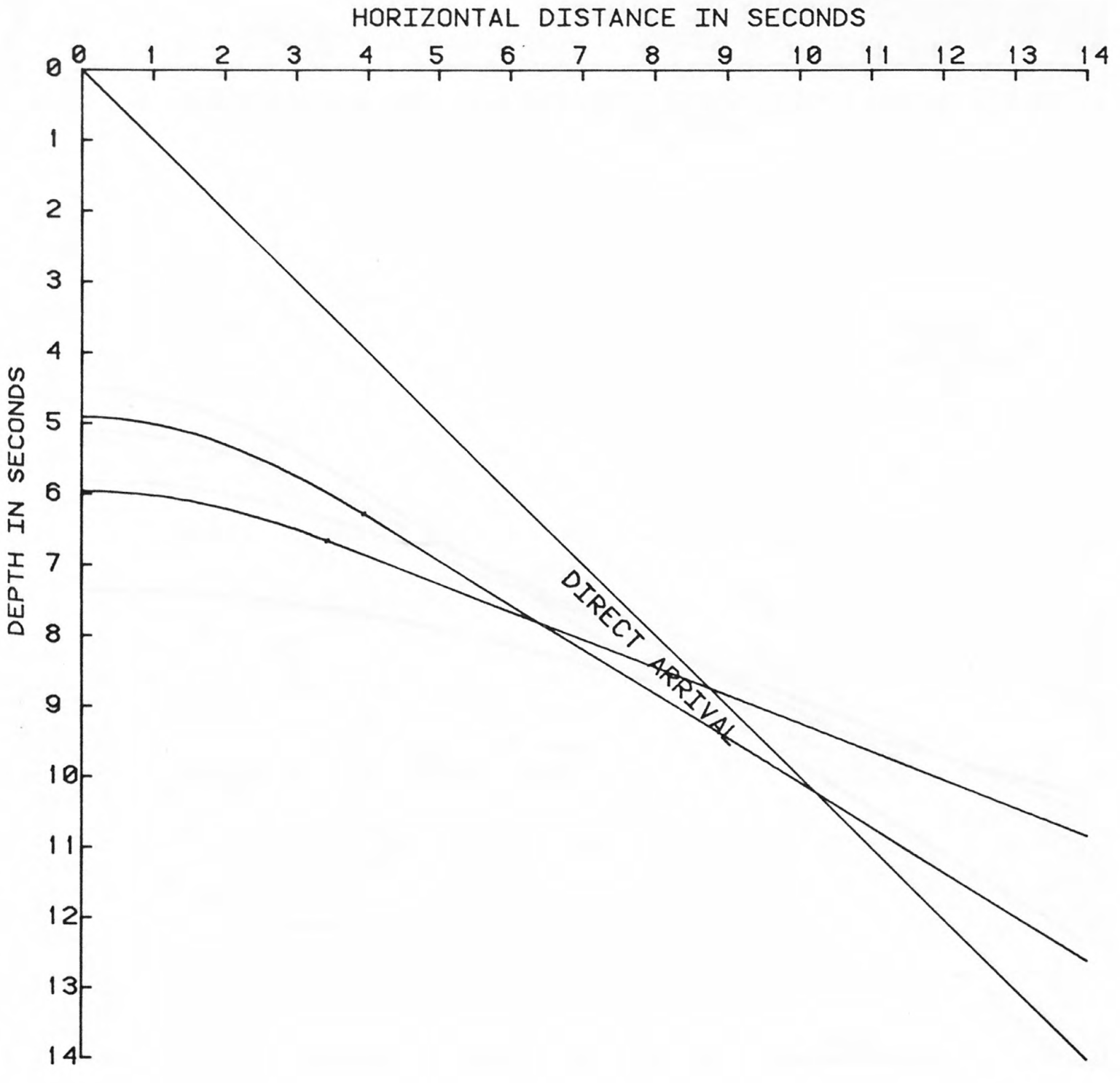

	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	3.399	1.500	4.533	0.000
LAYER 2	3.500	4.095	2.361	5.122	5.595
LAYER 3	4.375	5.104	3.149	5.763	5.258
LAYER 4	4.960	8.075	3.750	7.348	7.216
LAYER 5	6.630		5.676		9.076

CRUISE : L7-77-WG
DATE/TIME : JD 200,1955
LINE : 82
SONOBUOY : 48
SOURCE : 1326 CU IN
BUOY TYPE : SELECT

LINFT
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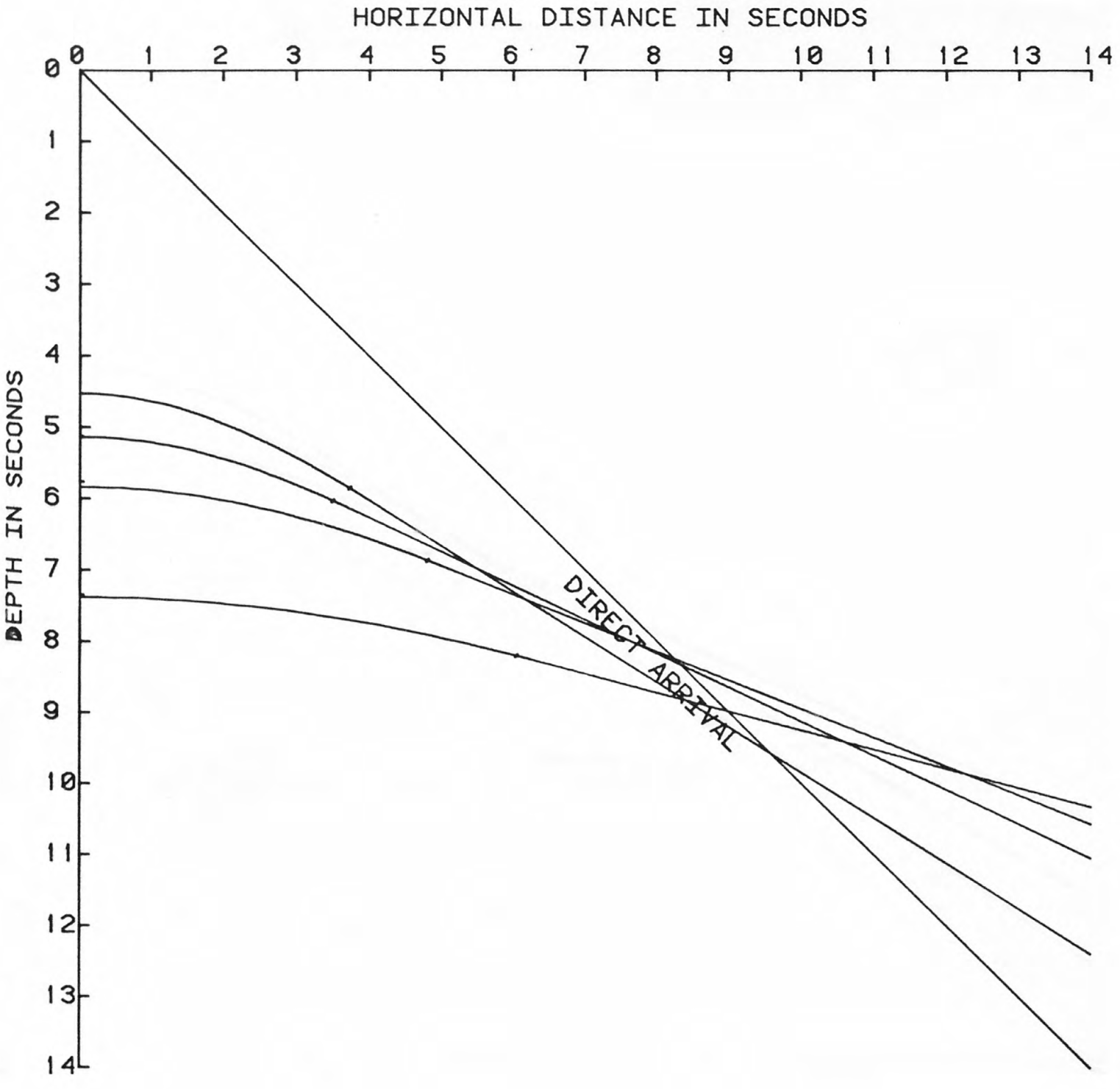

	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	3.113	1.500	4.150	0.000
LAYER 2	3.060	3.471	2.220	4.472	5.705
LAYER 3	3.575	4.241	2.621	5.060	5.484
LAYER 4	4.350		3.415		5.503

CRUISE : L7-77-WG
DATE/TIME : JD 201,0335
LINE : 82
SONOBUOY : 50
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

LINFT
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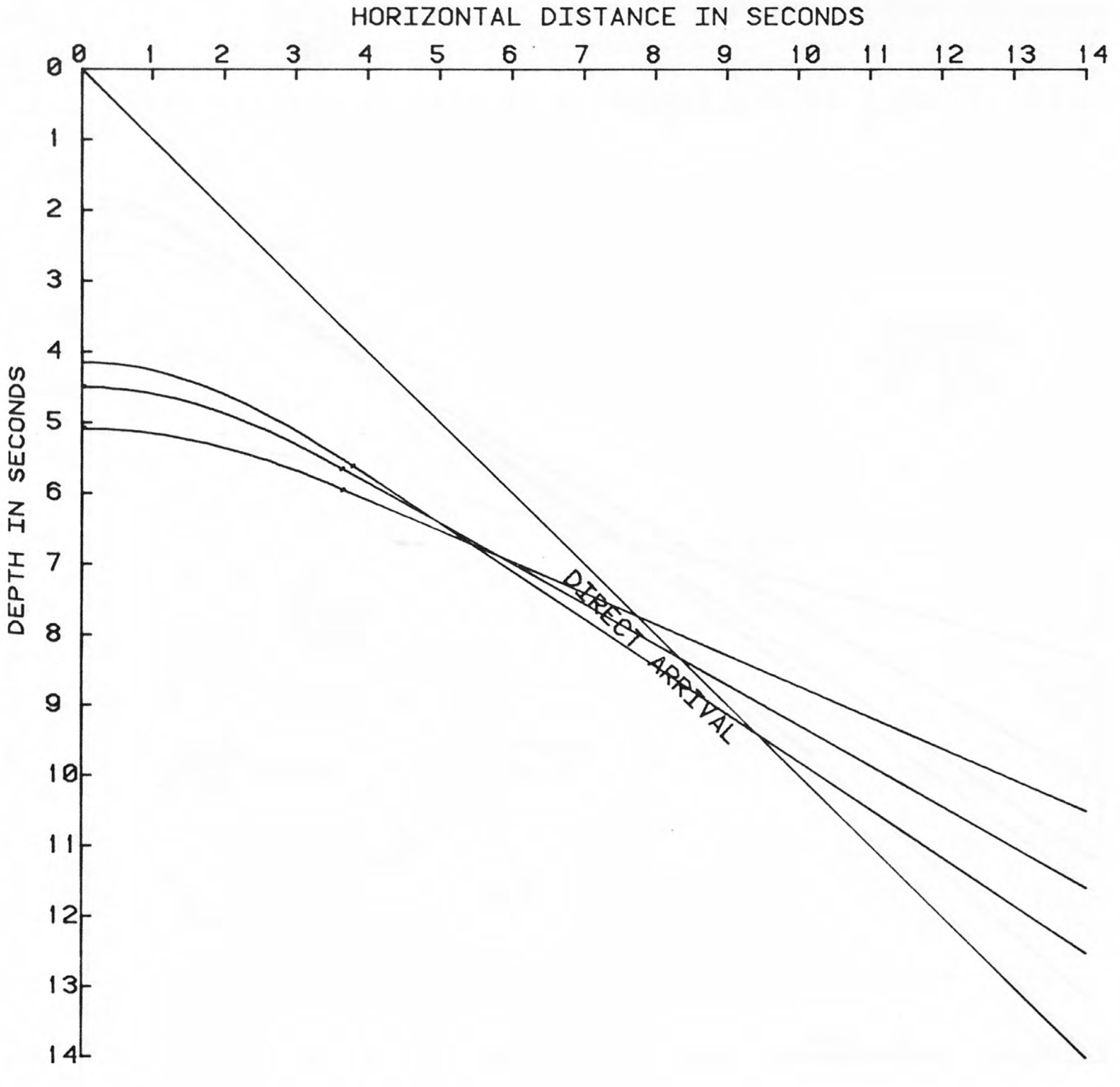

	INTCPT	DEPTH	VEL	TT INC CR	DIST KM
LAYER 1	0.000	1.405	1.500	1.874	0.000
LAYER 2	0.890	1.511	1.705	1.998	5.207
LAYER 3	1.340	1.843	2.042	2.323	3.363
LAYER 4	1.550	2.166	2.179	2.620	4.712
LAYER 5	1.980	5.500	2.588	5.196	4.048
LAYER 6	4.840		6.000		4.468

CRUISE : L7-77-WG
DATE/TIME : JD 201,1403
LINE : 86
SONOBUOY : 51
SOURCE : 1326 CU IN
BUOY TYPE : SELECT

LINFT
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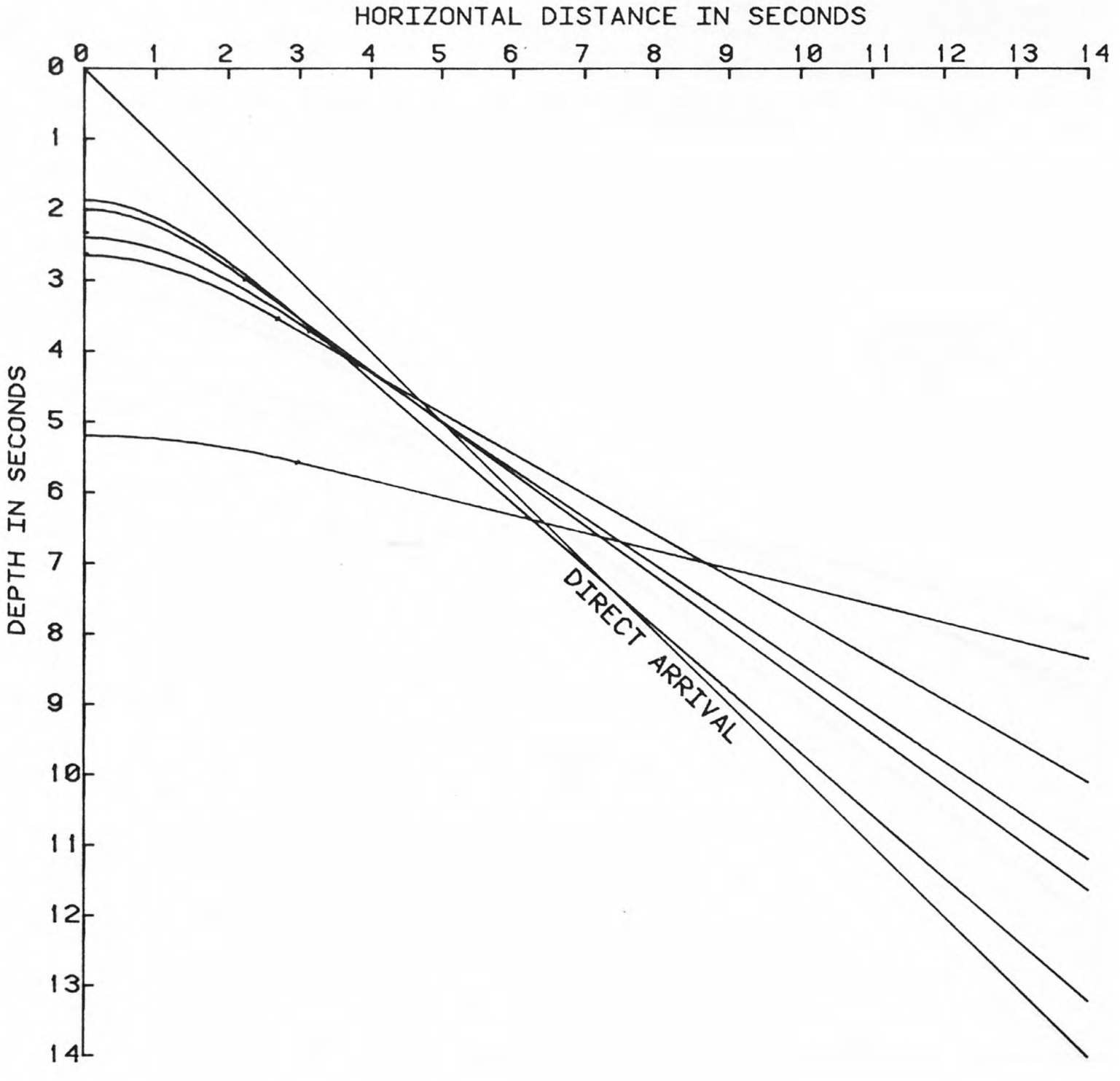

	INTCPT	DEPTH	VEL	TT INC CR DIST KM	
LAYER 1	0.000	1.655	1.500	2.207	0.000
LAYER 2	1.460	2.118	2.000	2.669	3.754
LAYER 3	2.140	2.741	2.687	3.133	3.258
LAYER 4	2.630	4.567	3.373	4.215	3.968
LAYER 5	3.300	5.325	3.878	4.606	9.582
LAYER 6	4.080		5.446		6.439

CRUISE : L7-77-WG
DATE/TIME : JD 201,2018
LINE : 86
SONOBUOY : 52
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

LINFT
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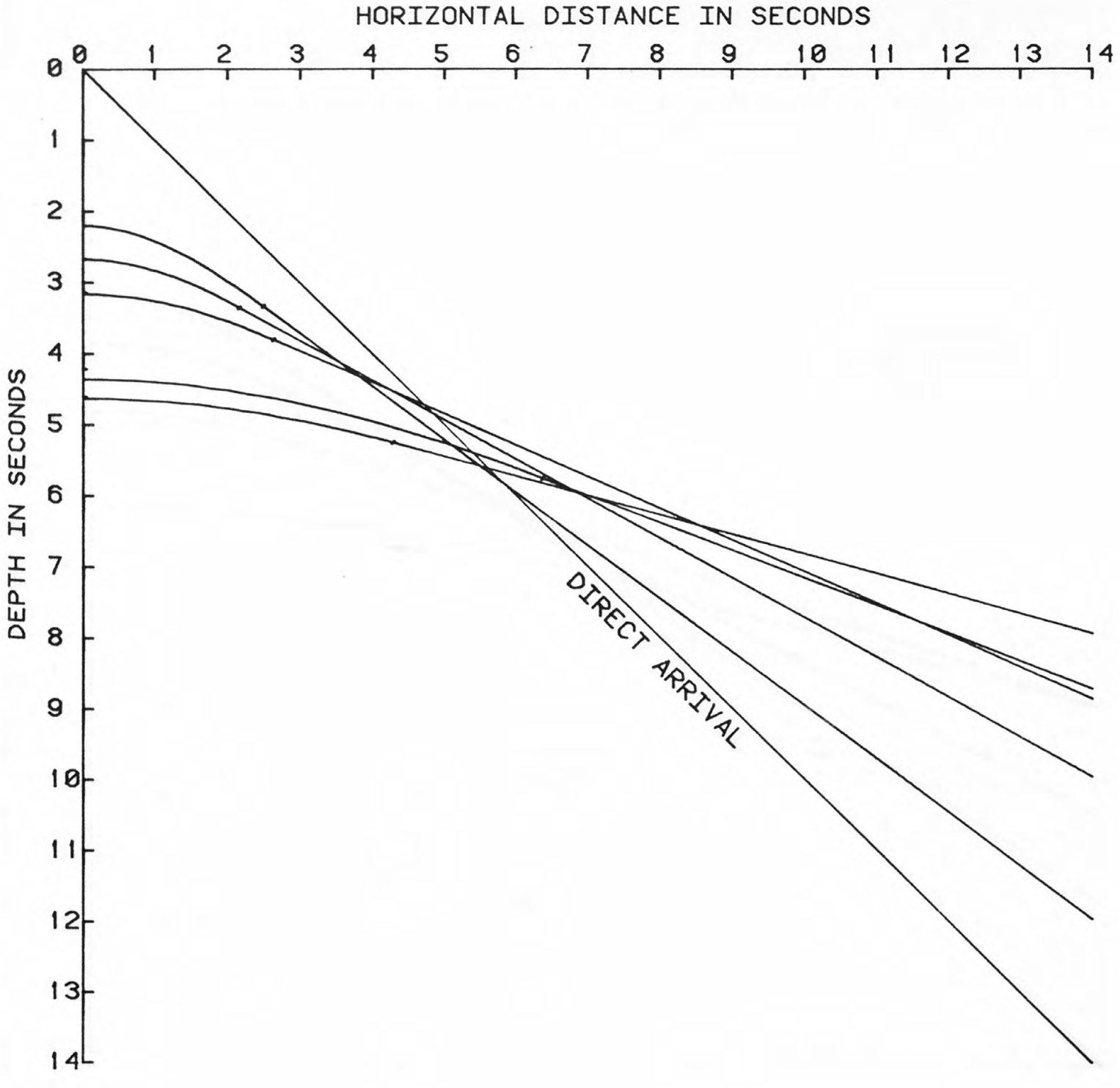

	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	2.355	1.500	3.140	0.000
LAYER 2	2.330	3.078	2.238	3.786	4.253
LAYER 3	3.050	4.444	2.817	4.756	4.855
LAYER 4	4.275	7.268	4.490	6.014	4.702
LAYER 5	5.208		5.602		11.101

CRUISE : L7-77-WG
DATE/TIME : JD 202,0517
LINE : 85
SONOBUOY : 53
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

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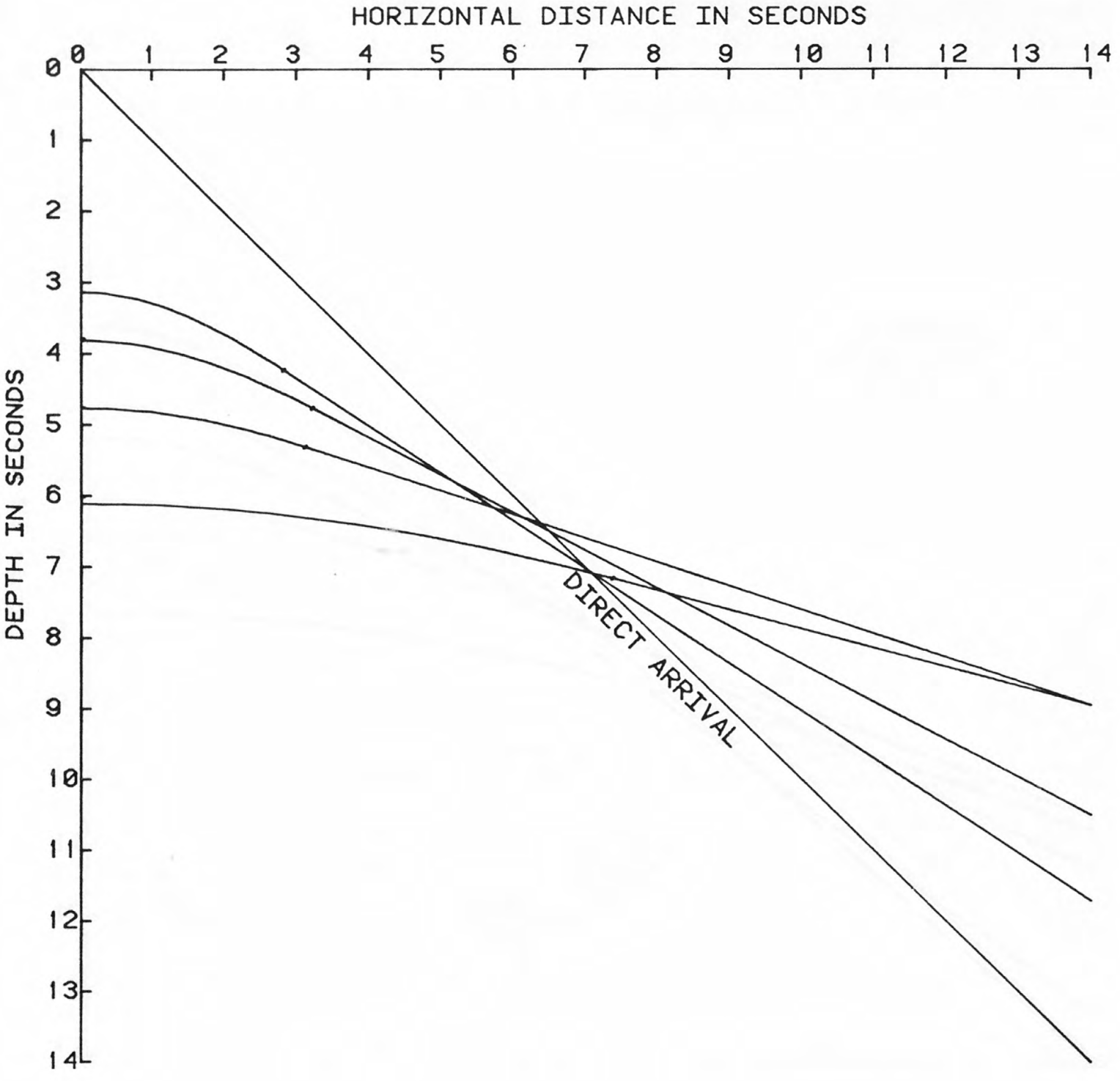

	INTCPT	DEPTH	VEL	TT INC	CR DIST KM
LAYER 1	0.000	2.779	1.500	3.705	0.000
LAYER 2	1.760	3.695	1.705	4.780	10.298
LAYER 3	3.105	4.196	2.042	5.271	8.799
LAYER 4	4.490	5.448	3.063	6.088	5.244
LAYER 5	5.355	7.883	4.000	7.305	6.688
LAYER 6	5.920		4.308		18.093

CRUISE : L7-77-WG
DATE/TIME : JD 202,1137
LINE : 84
SONOBUOY : 55
SOURCE : 1326 CU IN
BUOY TYPE : NAVY

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