NEUTRALLY BUOYANT FLOATS

Serial Nos. 78 - 98

February - June 1960

TABLES AND DIAGRAMS

by

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WORMLEY, GODALMING, SURREY

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Tables of times and positions.
Diagrams showing trajectories
and components of displacement.

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C O N T E N T S

Introduction

This is the third volume of data from neutrally buoyant floats tracked during the "Aries" project. The preceding ones are described in Refs. 1 and 2. During February and March 1960, offshore work was limited by frequent bad weather, and the R.V. "Aries" was engaged in finding whether a rotating mass of 18°C water would accumulate around the Bermuda islands in the winter months. The first eight floats of this volume (serial nos. 78-85) were tracekd during that period, and the last three of those show some signs of clockwise circulation at 400m depth.

Work was resumed in the neighbourhood of $31\frac{1}{2}$°N, $67\frac{1}{2}$°W in April 1960 and continued in May, (floats 86-94).

The last four floats of this volume, 95-98, were tracked in an area to the NNE of Bermuda at the same time as part of the "Gulf Stream '60" cruises (Ref.3).

Navigation was based on land fixes, both visual and radar, near Bermuda. Offshore, Loran-C (Ref.4) supplemented by Loran-A was used.

Those floats with original designations prefixed by "V" were built at Woods Hole by G.H. Volkmann, the rest were built by J.C. Swallow

The trajectories obtained from them have been re-numbered in chronological order, as in previous volumes.

LIST OF FLOATS

| Serial No	Original Designation	Date and time laid
78	S8	1050/16.II.60
79	V17	1101/17.II.60
80	V16	0905/25.II.60
81	V14	0925/25.II.60
82	S9	0955/25.II.60
83	V15	1438/28.III.60
84	S11	1122/29.III.60
85	V20	1129/4.IV.60
86	S12	1345/13.IV.60
87	S6	0852/14.IV.60
88	V21	1102/14.IV.60
89	S10	2004/16.IV.60
90	S13	1037/2.V.60
91	S14	1735/2.V.60
92	S15	1435/14.V.60
93	V19	0915/15.V.60
94	S16	1632/15.V.60
95	V35	0709/27.V.60
96	J	1029/28.V.60
97	V32	1545/29.V.60
98	V34	1315/2.VI.60

REFERENCES

1. Caston, G.F. and J.C. Swallow, 1970   Neutrally Buoyant Floats, Serial Nos 40-58, June-October 1959.   Tables and Diagrams. NIO Internal Report No. D4.

2. Caston, G.F. and J.C. Swallow, 1970.   Neutrally Buoyant Floats, Serial Nos 59-77, November-December 1959.   Tables and Diagrams. NIO Internal Report No. D5.

3. Fuglister, F.C.   1963.   Gulf Stream '60.   Progress in Oceanography, Vol. 1,   pp. 265-273.

4. Walden, R.G.   1961.   An Interim Loran-C Receiving System. WHOI Technical Report No. 61-22 (unpublished manuscript).

FLOAT DESIGNATIONS:
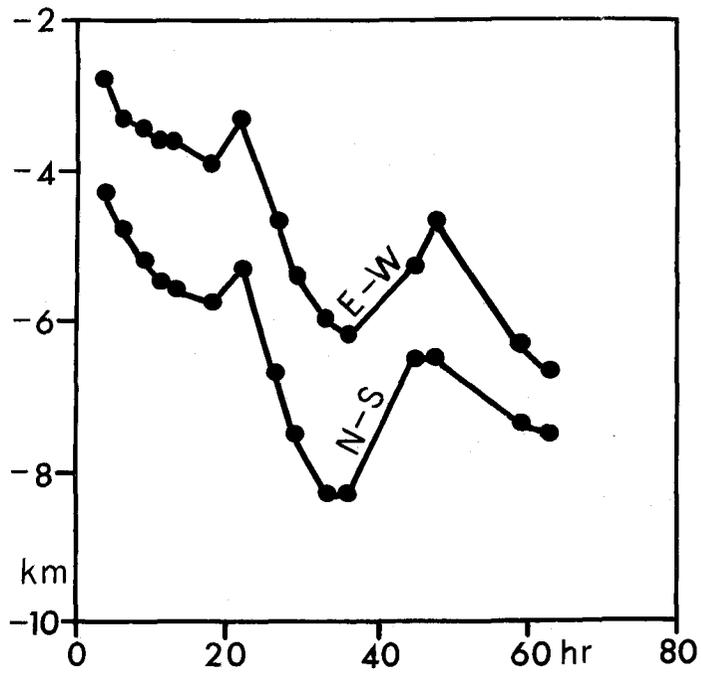
S8 (laid 1050/16.II.60),	V17 (laid 1101/17.II.60),
V16 (laid 0905/25.II.60),	V14 (laid 0925/25.II.60),
S9 (laid 0955/25.II.60),	V15 (laid 1438/28.III.60),
S11 (laid 1122/29.III.60),	V20 (laid 1129/4.IV.60).
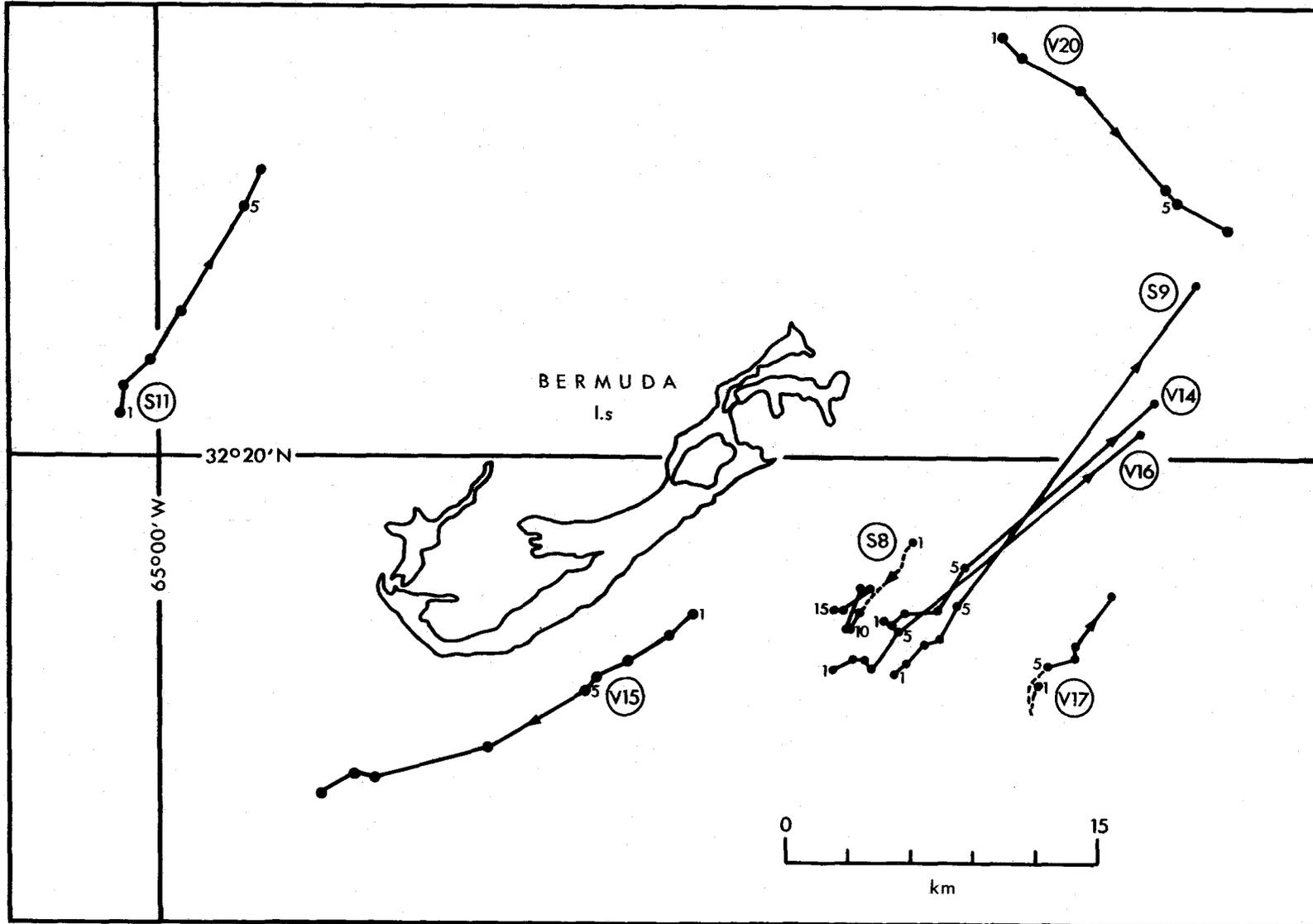
FLOAT DESIGNATION: S8   Date and time laid: 1050/16.II.60
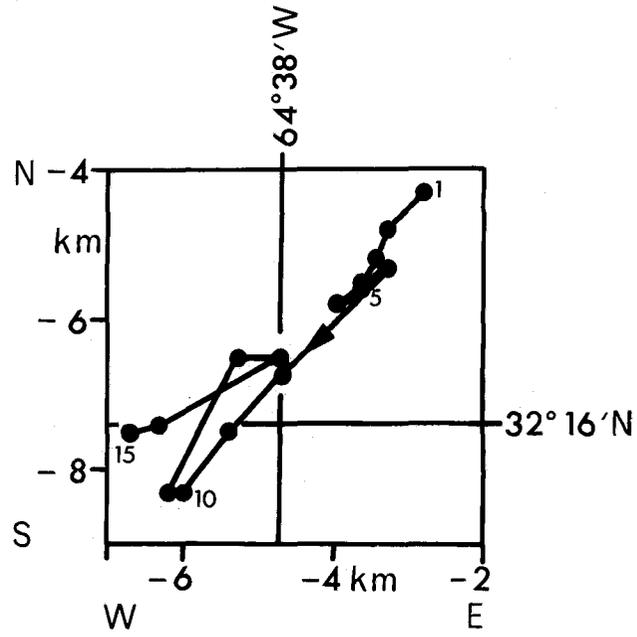
FLOAT DESIGNATION S 8

Date and time laid: 1050/16.II.60

Position laid: 32° 18'·1N
               64° 36'·3W

Displacement origin: 32° 20' N
                    64° 35' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3 km (relative)

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	400	570	±135	± 37 (bearings)
		525		± 20 (reflection)

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	16.II	1400	32°17'·7	64°36'·8	3·2	-2·8	-4·3	+0·4	+0·7
2	16.II	1640	32°17'·4	64°37'·1	5·9	-3·3	-4·8	0·0	+0·4
3	16.II	1942	32°17'·2	64°37'·2	8·9	-3·4	-5·2	0·0	+0·2
4	16.II	2153	32°17'·1	64°37'·3	11·1	-3·6	-5·5	0·0	0·0
5	16.II	2352	32°17'·0	64°37'·3	13·1	-3·6	-5·6	+0·2	0·0
6	17.II	0434	32°16'·9	64°37'·5	17·8	-3·9	-5·8	+0·2	0·0
7	17.II	0834	32°17'·2	64°37'·1	21·8	-3·3	-5·3	+0·9	+0·7
8	17.II	1319	32°16'·4	64°38'·0	26·5	-4·7	-6·7	-0·2	-0·4
9	17.II	1548	32°16'·0	64°38'·5	29·0	-5·4	-7·5	-0·7	-1·1
10	17.II	1946	32°15'·5	64°38'·8	33·0	-6·0	-8·3	-1·1	-1·7
11	17.II	2300	32°15'·5	64°38'·9	36·2	-6·2	-8·3	-1·1	-1·5
12	18.II	0747	32°16'·5	64°38'·4	45·0	-5·3	-6·5	+0·4	+0·7
13	18.II	1025	32°16'·5	64°38'·0	47·6	-4·7	-6·5	+1·1	+0·7
14	18.II	2146	32°16'·0	64°39'·0	59·0	-6·3	-7·4	+0·2	+0·6
15	19.II	0146	32°16'·0	64°39'·3	63·0	-6·7	-7·5	0·0	+0·6

Fitted lines: x = -0·060t - 2·9

                y = -0·049t - 5·0

Mean velocity = 2·2(±0·3)cm/sec, 231(±6)°T

FLOAT DESIGNATION: V17   Date and time laid: 1101/17.II.60

FLOAT DESIGNATION: V 17

Position laid: 32° 14'·1 N
                64° 32'·95 W

Date and time laid: 1101/17.II.60

Displacement origin: 32° 15' N
                      64° 30' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3 km (relative)

Depth(m):

	Nominal	Observed	S.D.	S.D.(mean)
	400	805	±450	±200

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1*	17.II	1214	32°14'·0	64°33'·0	1·2	-4·8	-1·9	0·0	0·0
2	17.II	1626	32°13'·8	64°33'·2	5·4	-5·0	-2·3	0·0	+0·2
3	17.II	1858	32°13'·4	64°33'·2	8·0	-4·9	-3·0	0·0 / +0·4	-0·2 / 0·0
4	18.II	0057	32°13'·9	64°33'·2	14·0	-4·9	-2·0	-0·4	0·0
5	18.II	0615	32°14'·6	64°32'·7	19·3	-4·2	-0·8	-0·2	+0·4
6	18.II	1155	32°14'·8	64°31'·9	24·9	-2·9	-0·4	+0·4	0·0
7	18.II	2028	32°15'·1	64°31'·9	33·5	-2·9	+0·2	-0·6	-0·7
8	19.II	0336	32°16'·4	64°30'·7	40·6	-1·1	+2·5	+0·4	+0·6

Fitted lines: $x = -0\cdot018t - 4\cdot8$)
               $y = -0\cdot155t - 1\cdot6$) Fixes 1 - 3

Mean velocity = 4·3(±1·3)cm/sec, 187(±8)°T

               $x = +0\cdot116t - 6\cdot2$)
               $y = +0\cdot152t - 4\cdot1$) Fixes 3 - 8

Mean velocity = 5·3(±0·5)cm/sec, 037(±3)°T

* Poor fix (±0·5km).

FLOAT DESIGNATION: V16   Date and time laid: 0905/25.II.60
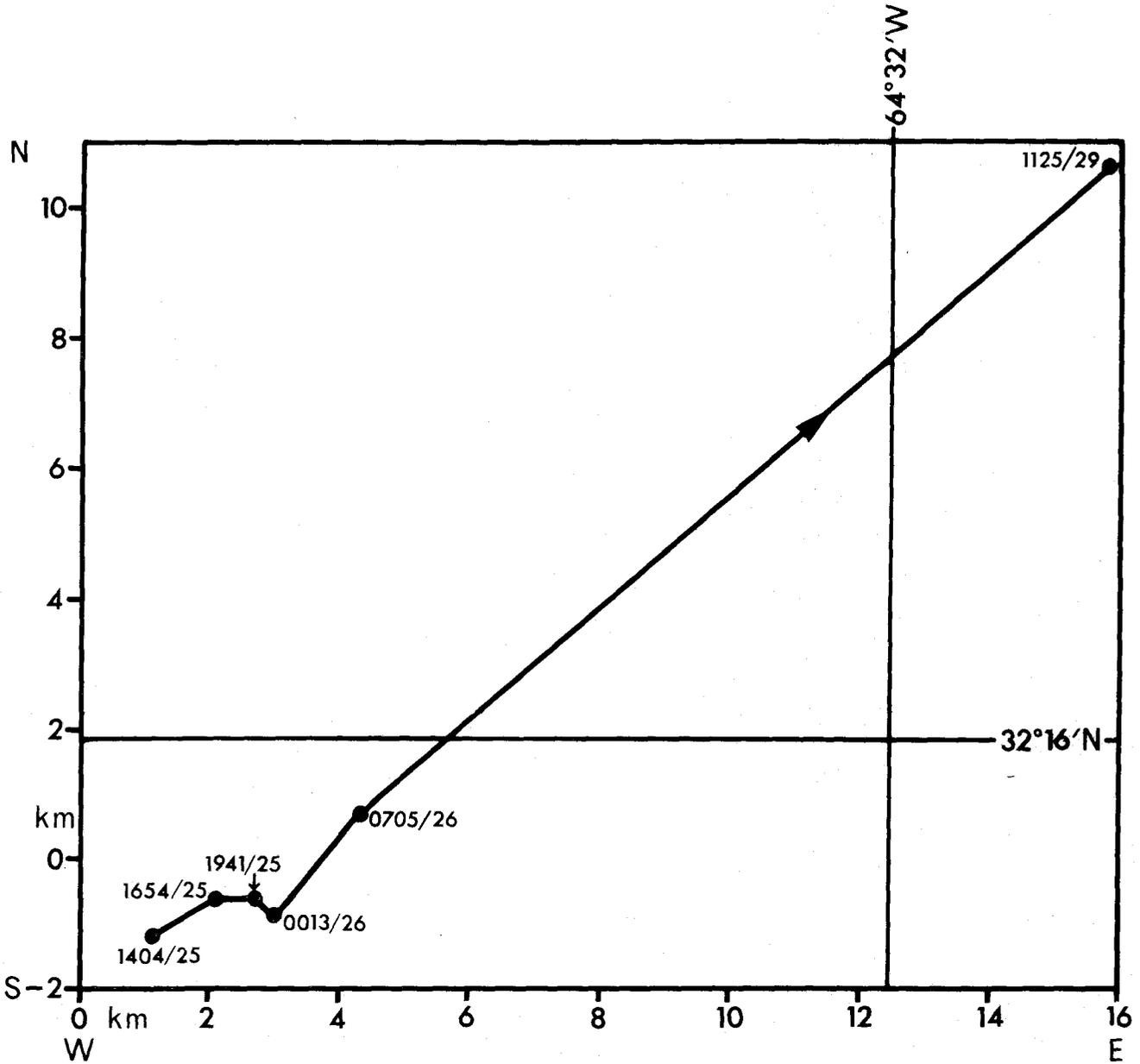
FLOAT DESIGNATION: V16   Date and time laid: 0905/25.II.60

Position laid: 32° 14'·1N   Displacement origin: 32° 15' N
              64° 39'·7W   64° 40' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3km (relative)

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	1200	1200	±210	±60

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t) *	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	25.II	1404	32°14'·4	64°39'·3	5·1	+1·1	−1·2	−0·4	0·0
2	25.II	1654	32°14'·7	64°38'·7	7·9	+2·1	−0·6	+0·2	+0·4
3	25.II	1941	32°14'·7	64°38'·3	10·7	+2·7	−0·6	+0·4	0·0
4	26.II	0013	32°14'·5	64°38'·1	15·2	+3·0	−0·9	−0·2	−0·7
5	26.II	0705	32°15'·4	64°37'·3	22·1	+4·3	+0·7	0·0	+0·4
6	29.II	1125	32°20'·7	64°29'·8	98·4	+15·8	+10·6	omitted	

Fitted lines: x = + 0·153t + 0·8   )
                  y = + 0·128t − 2·1   )   Fixes 1 − 6

Mean velocity = 5·5(±0·1)cm/sec, 050(±1·1)°T

                  x = + 0·172t + 0·5   )
                  y = + 0·091t − 1·6   )   Fixes 1 − 5
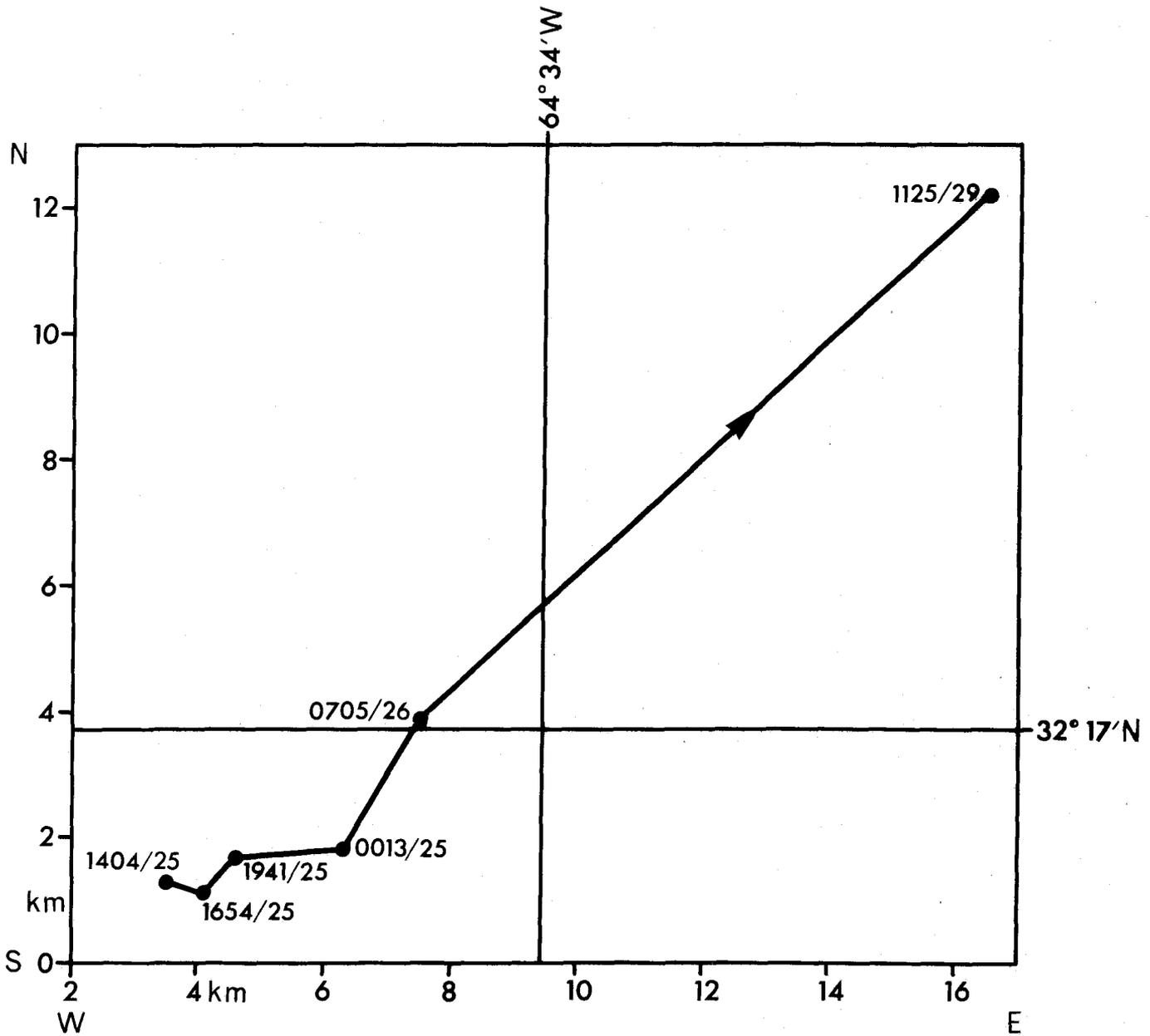
Mean velocity = 5·4(±0·7)cm/sec,062(±8)°T

* Hours since 0900/25.II.60
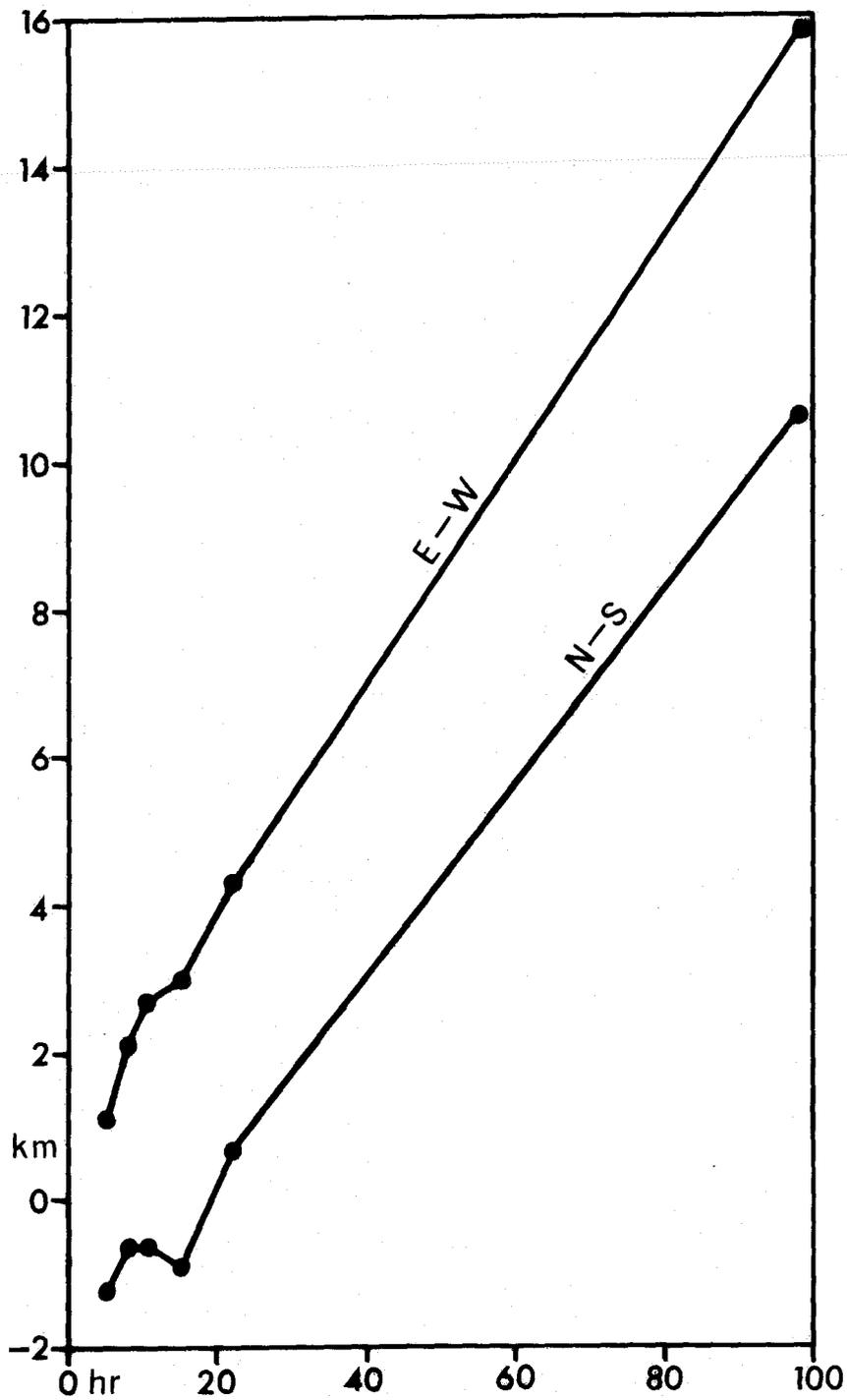
FLOAT DESIGNATION: V16   Date and time laid: 0905/25.II.60

FLOAT DESIGNATION: V14   Date and time laid: 0925/25.II.60

FLOAT DESIGNATION: V14

Position laid: 32° 15'·1 N
64° 38'·4 W

Date and time laid: 0925/25.II.60

Displacement origin: 32° 15' N
64° 40' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3 km (relative)

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	1200	1310	±230	±80

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t) *	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	25.II	1404	32°15'·7	64°37'·7	5·1	+3·5	+1·3	0·0	+0·4
2	25.II	1654	32°15'·6	64°37'·4	7·9	+4·1	+1·1	0·0	-0·2
3	25.II	1941	32°15'·9	64°37'·0	10·7	+4·6	+1·7	-0·2	0·0
4	25.II	0013	32°16'·0	64°36'·0	15·2	+6·3	+1·8	+0·4	-0·6
5	26.II	0705	32°17'·1	64°35'·2	22·1	+7·5	+3·9	-0·2	+0·4
6	29.II	1125	32°21'·5	64°29'·4	98·4	+16·5	+12·2	omitted	

Fitted lines: $x = + 0·134t + 3·5$)
$y = + 0·120t + 0·5$) Fixes 1 - 6

Mean velocity $= 5·0(±0·2)$ cm/sec, $048(±1·5)°$T

$x = + 0·246t + 2·2$)
$y = + 0·154t + 0·1$) Fixes 1 - 5

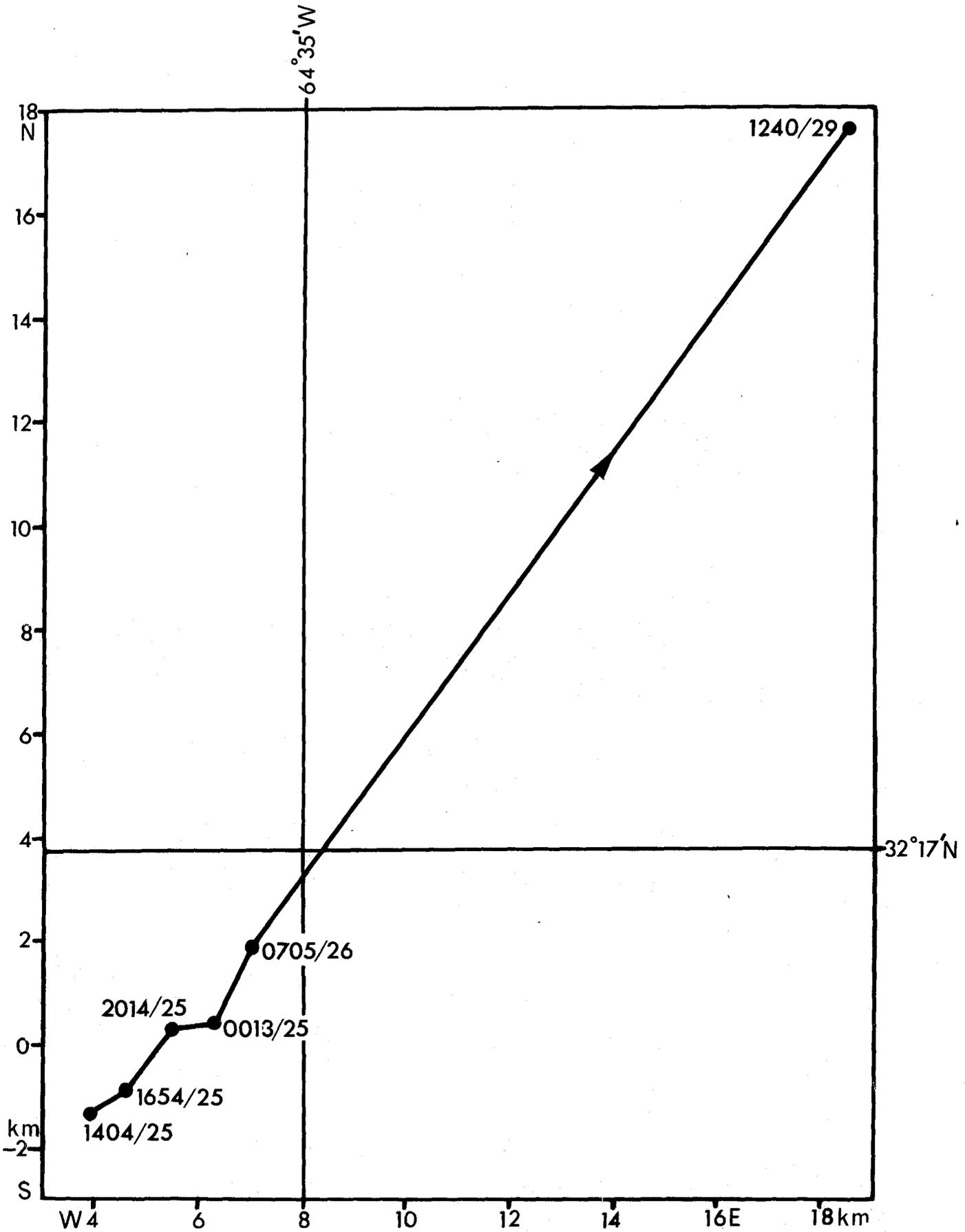Mean velocity $= 8·1(±0·7)$ cm/sec, $058(±6)°$T

* Hours since 0900/25.II.60
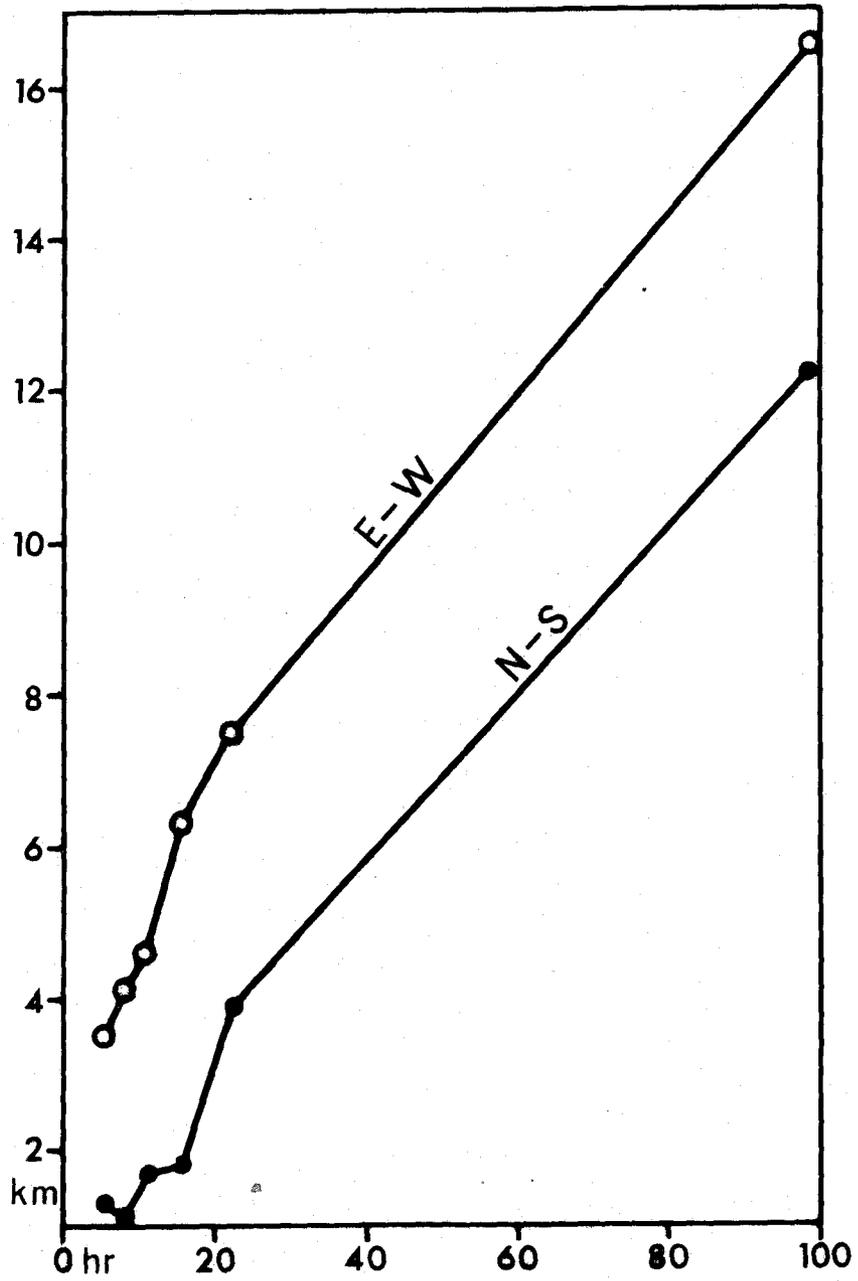
FLOAT DESIGNATION: V14   Date and time laid: 0925/25.II.60

FLOAT DESIGNATION: S9   Date and time laid: 0955/25.II.60

FLOAT DESIGNATION: S 9   Date and time laid: 0955/25.II.60

Position laid: 32° 13'·8 N   Displacement origin: 32° 15' N
             64° 38'·0 W   64° 40' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3 km (relative)

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
                  1200   1290   ±210   ±60

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)*	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	25.II	1404	32°14'·3	64°37'·5	5·1	+3·9	−1·3	−0·2	0·0
2	25.II	1654	32°14'·6	64°37'·0	7·9	+4·6	−0·9	0·0	−0·2
3	25.II	2014	32°15'·2	64°36'·5	11·2	+5·5	+0·3	+0·2	+0·4
4	25.II	0013	32°15'·2	64°36'·0	15·2	+6·3	+0·4	+0·4	−0·2
5	26.II	0705	32°16'·1	64°35'·5	22·1	+7·0	+1·9	−0·2	0·0
6	29.II	1240	32°24'·5	64°28'·1	99·7	+18·5	+17·6	omitted	

Fitted lines: $x = + 0·150t + 3·6$)
                  $y = + 0·200t − 2·4$)   Fixes 1 − 6
)

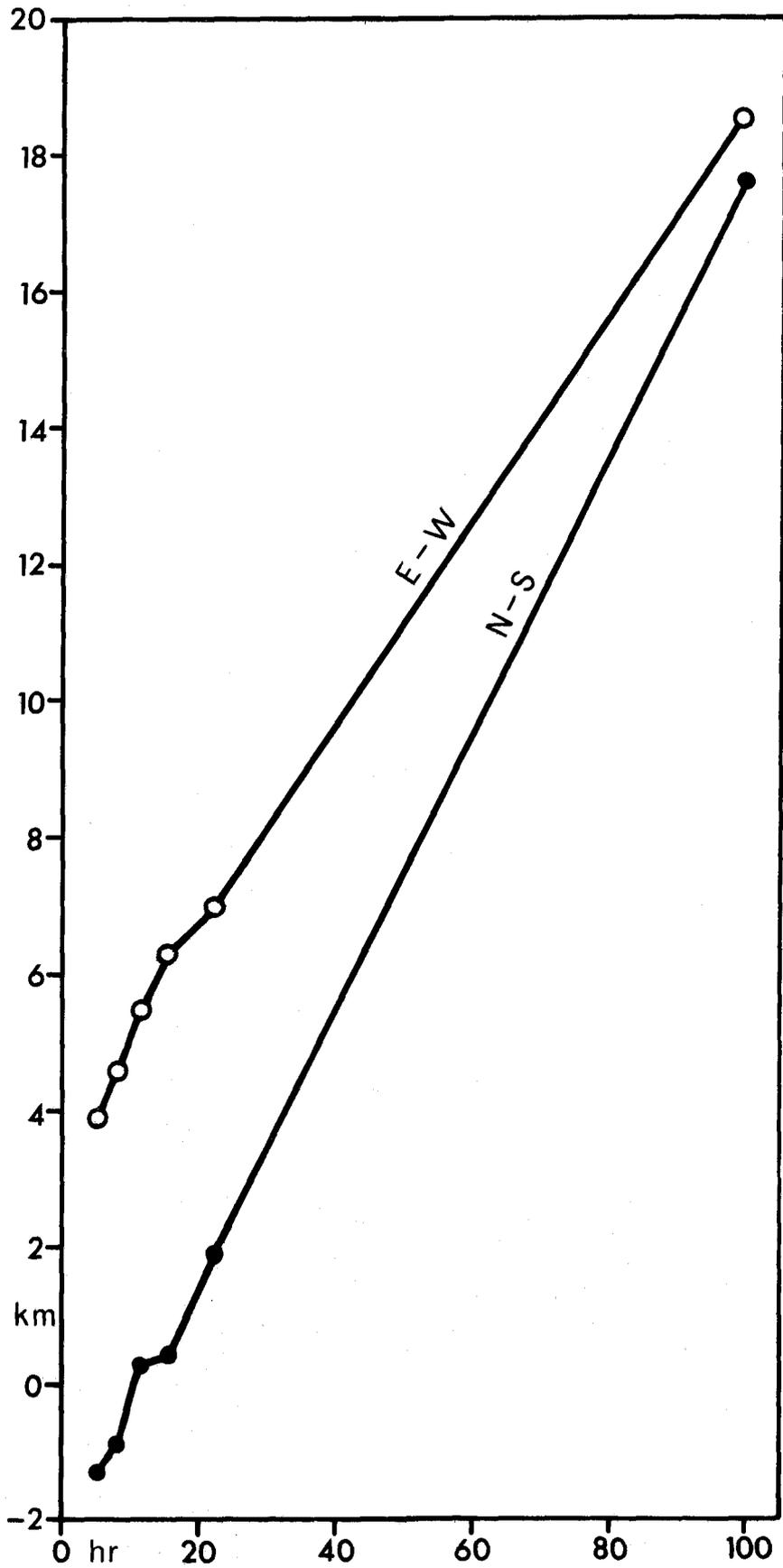Mean velocity = 6·9(±0·1)cm/sec, 037(±0·6)°T

                  $x = + 0·184t + 3·2$)
                  $y = + 0·185t − 2·2$)   Fixes 1 − 5
)
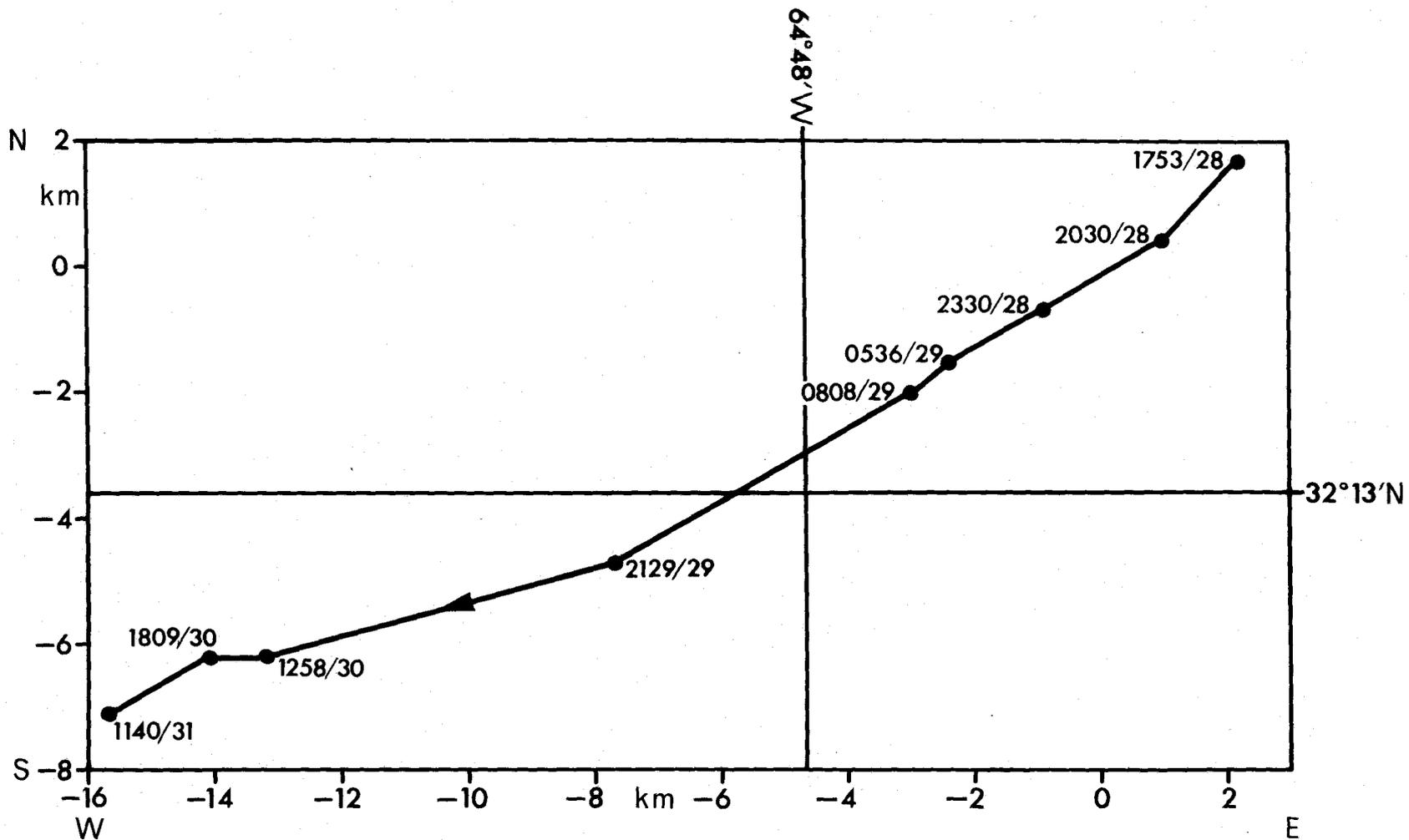
Mean velocity = 7·2(±0·6)cm/sec, 045(±11)°T

* Hours since 0900/25.II.60

FLOAT DESIGNATION: S9   Date and time laid: 0955/25.II.60

FLOAT DESIGNATION: V15

Position laid: 32° 16'·2 N
64° 42'·9 W

Date and time laid: 1438/28.III.60

Displacement origin: 32° 15' N
64° 45' W

Navigation based on: Land fixes

Estimated accuracy of positions: ± ●·3 km (relative)
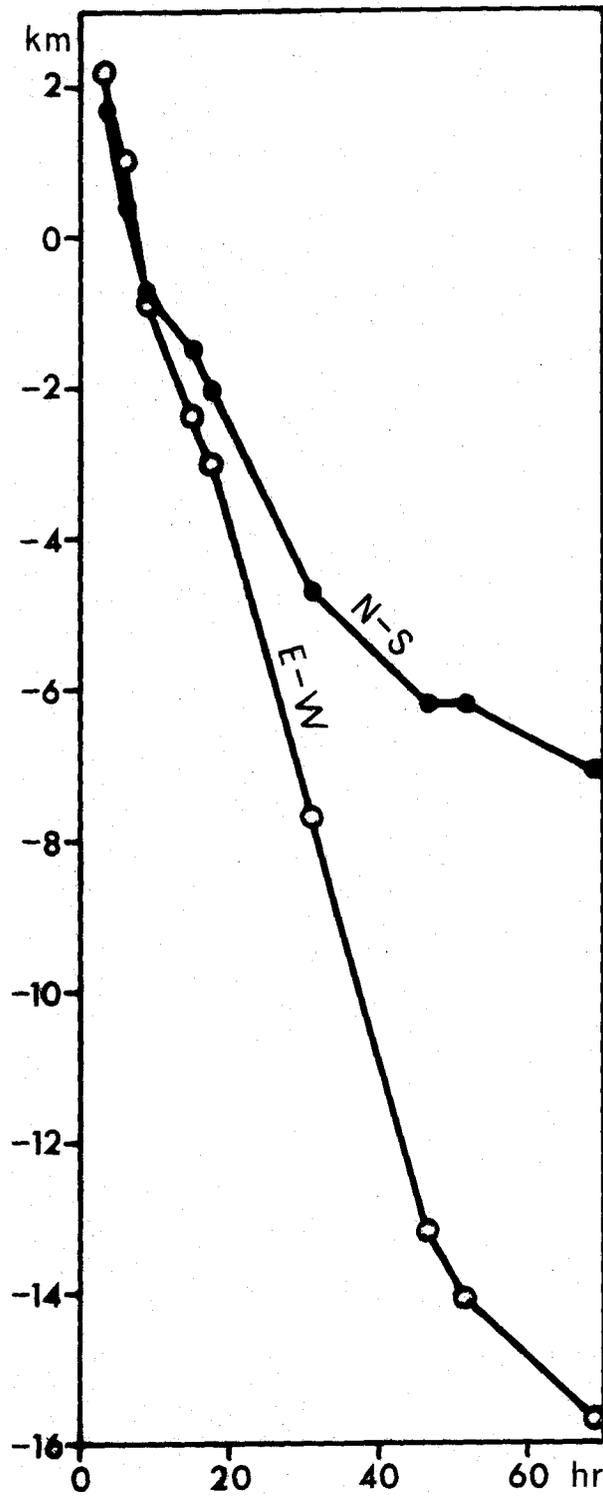
Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	400	310	±50	±22

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	28.III	1753	32°15'·9	64°43'·6	3·3	+2·2	+1·7	+1·1	+1·5
2	28.III	2030	32°15'·2	64°44'·4	5·9	+1·0	+0·43	+0·7	+0·4
3	28.III	2330	32°14'·6	64°45'·6	8·9	-0·9	-0·7	-0·4	-0·2
4	29.III	●536	32°14'·2	64°46'·6	15·0	-2·4	-1·5	-0·0	-0·2
5	29.III	0808	32°13'·9	64°46'·9	17·5	-3·0	-2·0	0·0	-0·4
6	29.III	2129	32°12'·4	64°49'·9	30·9	-7·7	-4·7	-●·7	-1·3
7	30.III	1258	32°11'·6	64°53'·4	46·4	-13·2	-6·2	-1·9	-0·7
8	30.III	1809	32°11'·6	64°54'·0	51·6	-14·1	-6·2	-1·1	-0·2
9	31.III	1140	32°11'·2	64°55'·0	69·1	-15·7	-7·1	+2·4	+1·3

Fitted lines: $x = -0·291t + 2·1$

$y = -0·132t + ●·7$

Mean velocity $= 8·9(±0·5)$ cm/sec, $246(±1·9)$ °T

FLOAT DESIGNATION: V15   Date and time laid: 1438/28.III.60

FLOAT DESIGNATION: S11   Date and time laid: 1122/29.III.60
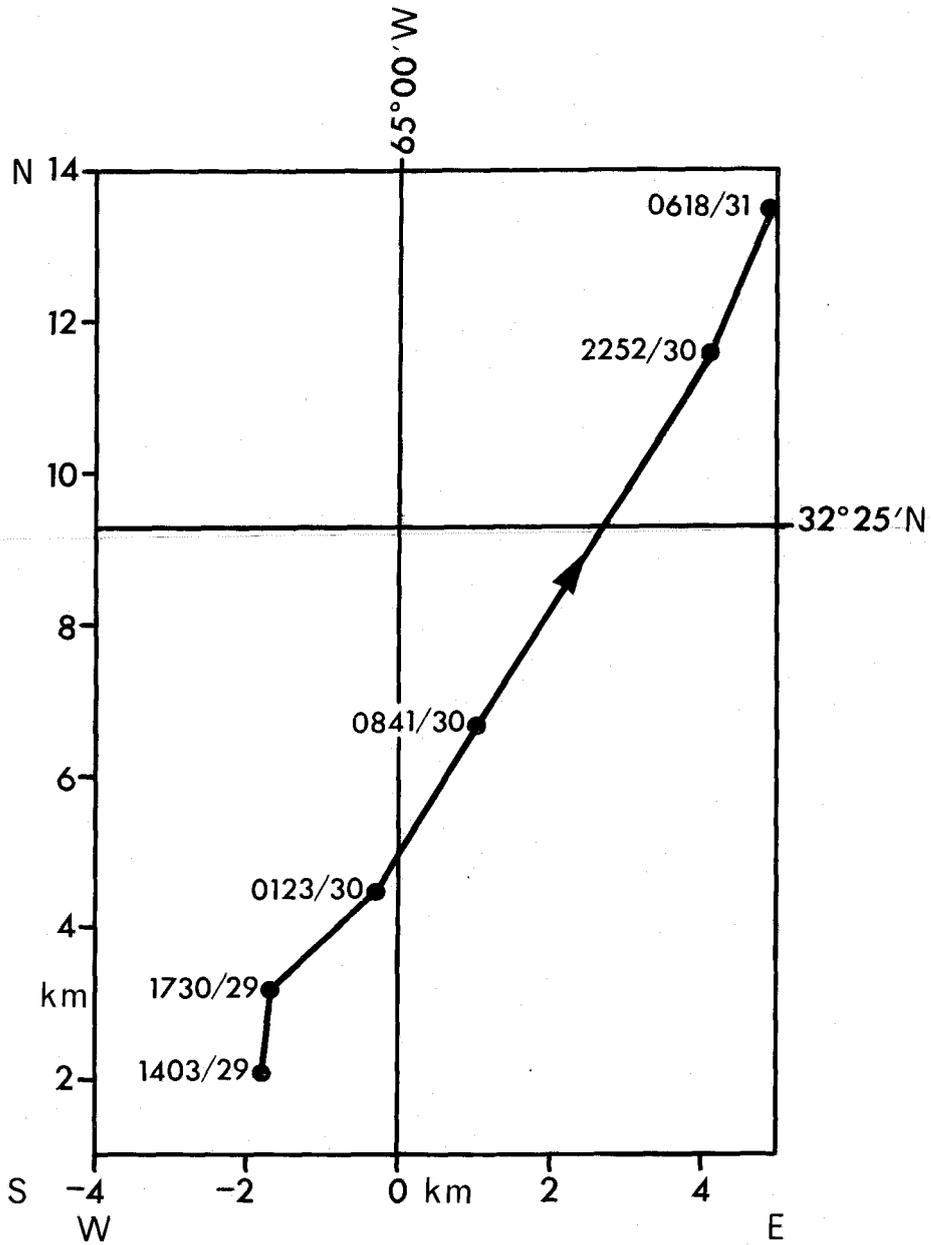
FLOAT DESIGNATION: S 11

Position laid: 32° 20'N
                 65° 02'W

Date and time laid: 1122/29.III.60

Displacement origin: 32° 20'N
                       65° 00'W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3km (relative)

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
   400   440   ±170   ±60

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	29.III	1403	32°21'·1	65°01'·2	2·7	−1·8	+2·1	+0·4	+0·2
2	29.III	1730	32°21'·8	65°01'·1	6·1	−1·7	+3·2	−0·2	+0·4
3	30.III	0123	32°22'·4	65°00'·2	14·0	−0·3	+4·5	−0·2	−0·6
4	30.III	0841	32°23'·6	64°59'·3	21·3	+1·0	+6·7	−0·2	−0·6
5	30.III	2252	32°26'·2	64°57'·4	35·5	+4·1	+11·6	+0·4	+0·4
6	31.III	0618	32°27'·3	64°56'·9	42·9	+4·9	+13·5	−0·2	+0·2

Fitted lines: $x = + 0·179t - 2·6$

$y = + 0·288t + 1·1$

Mean velocity $= 9·4(±0·3)$ cm/sec, $032(±0·3)°T$

FLOAT DESIGNATION: S11   Date and time laid: 1122/29.III.60
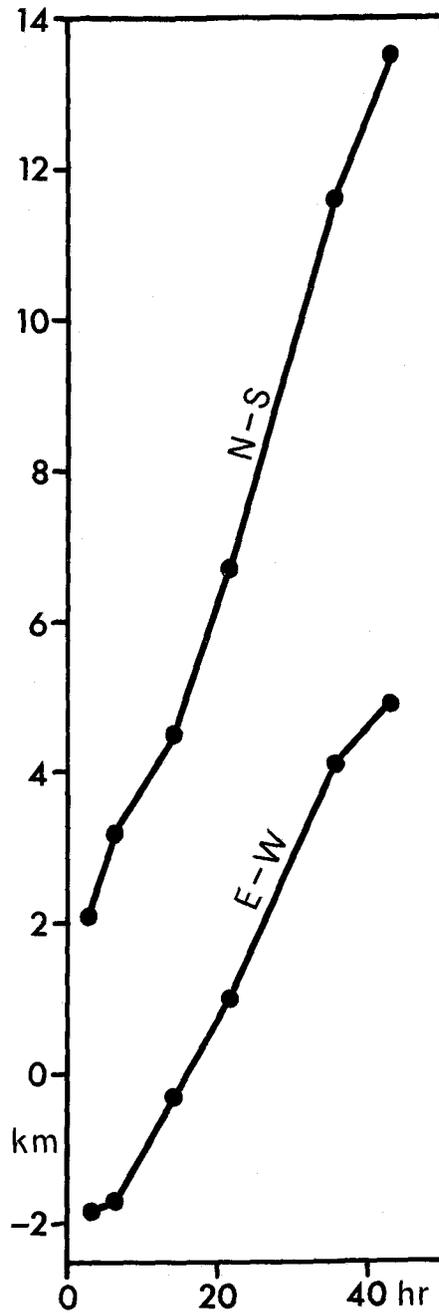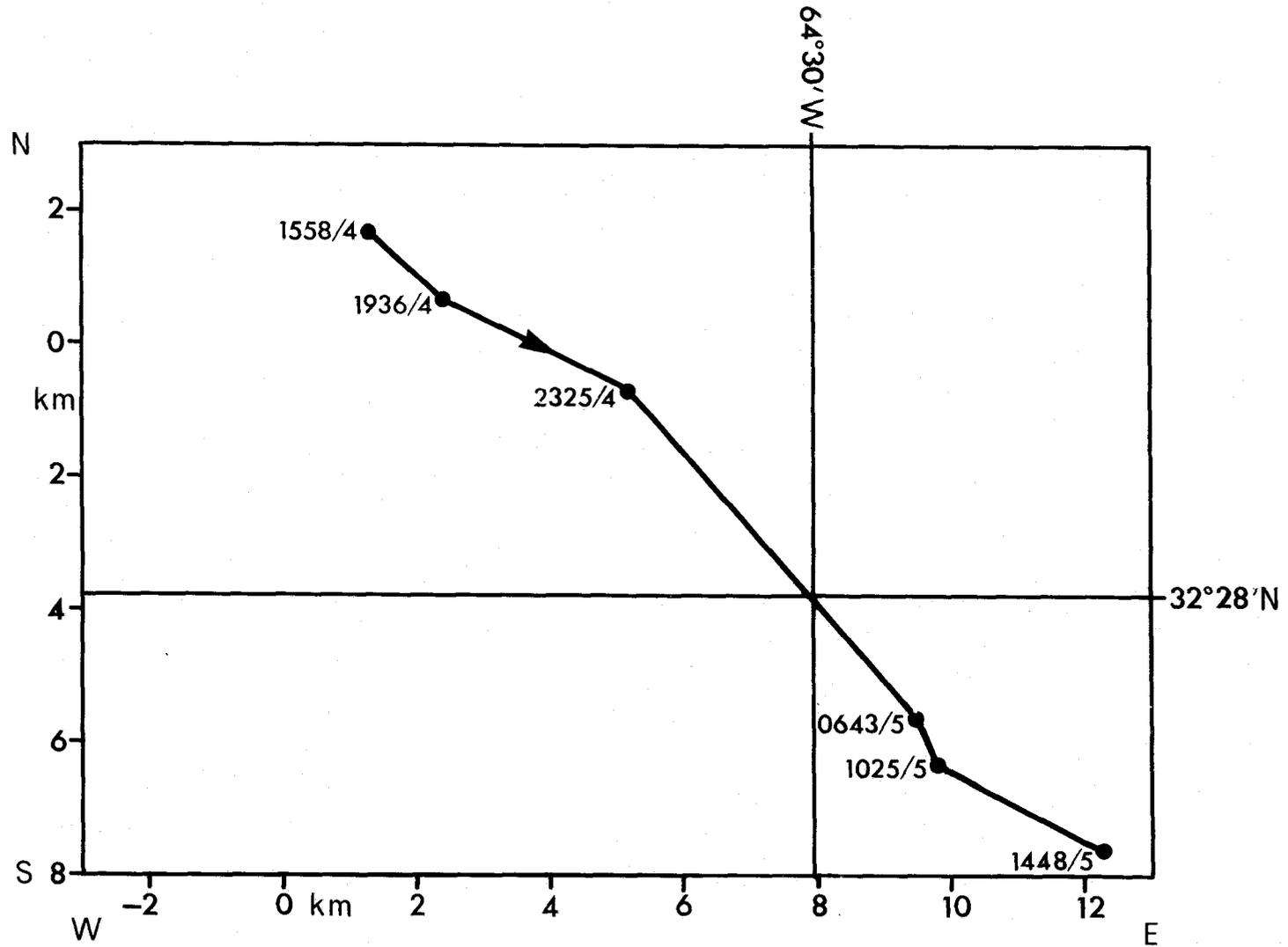
FLOAT DESIGNATION: V20   Date and time laid: 1129/4.IV.60

FLOAT DESIGNATION: V 20

Position laid: 32° 31'·9N
64° 36'·4W

Date and time laid: 1129/4.IV.60

Displacement origin: 32° 30'N
64° 35'W

Navigation based on: Land fixes

Estimated accuracy of positions: ± 0·3km (relative)
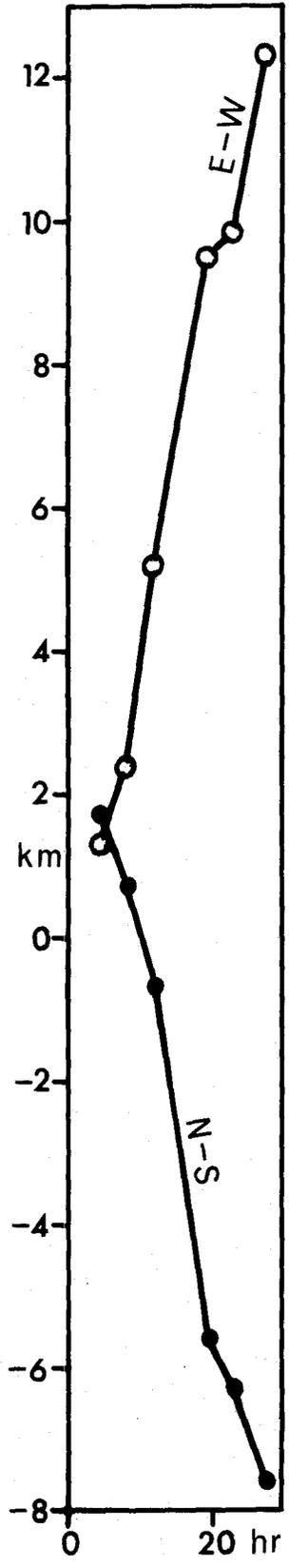
Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	400	630	±250	±110

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	4.IV	1558	32°30'·9	64°34'·1	4·5	+1·3	+1·7	0·0	−0·2
2	4.IV	1936	32°30'·4	64°33'·5	8·1	+2·4	+0·7	−0·6	+0·4
3	4.IV	2325	32°29'·6	64°31'·7	11·9	+5·2	−0·7	+0·4	+0·6
4	5.IV	0643	32°27'·0	64°29'·0	19·2	+9·5	−5·6	+0·9	−1·1
5	5.IV	1025	32°26'·6	64°28'·8	22·9	+9·8	−6·3	−0·6	−0·2
6	5.IV	1448	32°25'·9	64°27'·2	27·3	+12·3	−7·6	−0·2	+0·6

Fitted lines: $x = +0·494t - 1·0$

$y = -0·443t + 4·0$

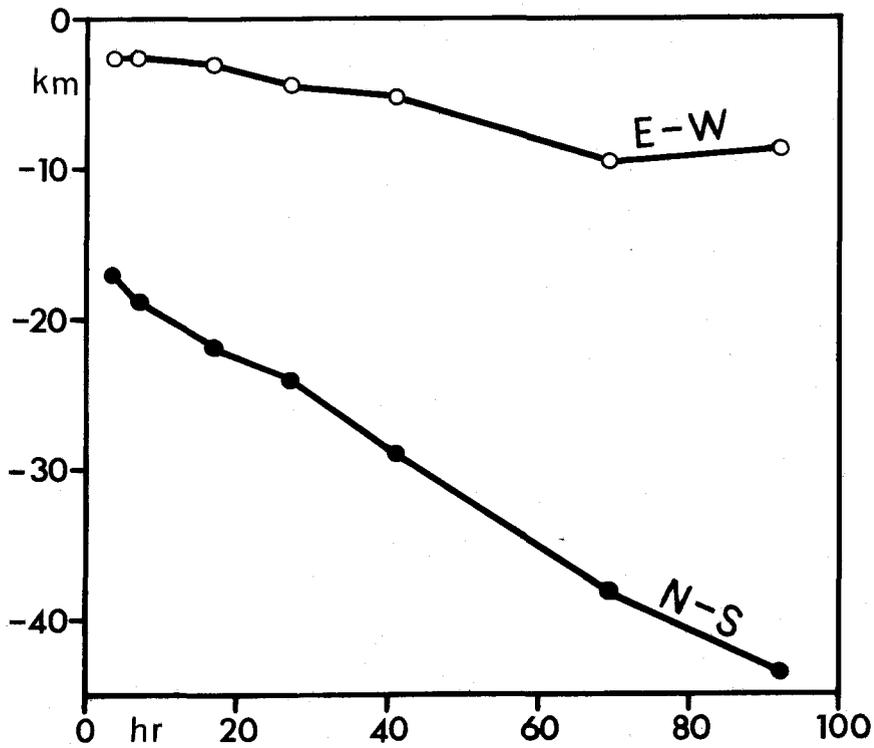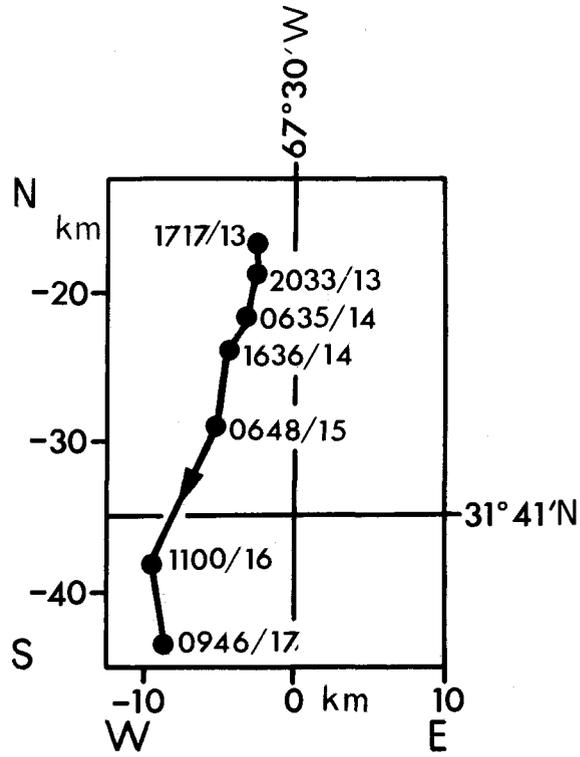Mean velocity $= 18·4(±1·0)$ cm/sec, $132(±1·1)°T$

FLOAT DESIGNATION: V20   Date and time laid: 1129/4.IV.60

FLOAT DESIGNATIONS: S12(laid 1345/13.IV.60), S6(laid 0852/ 14.IV.60), V21(laid 1102/14.IV.60), S10(laid 2004/16.IV.60).
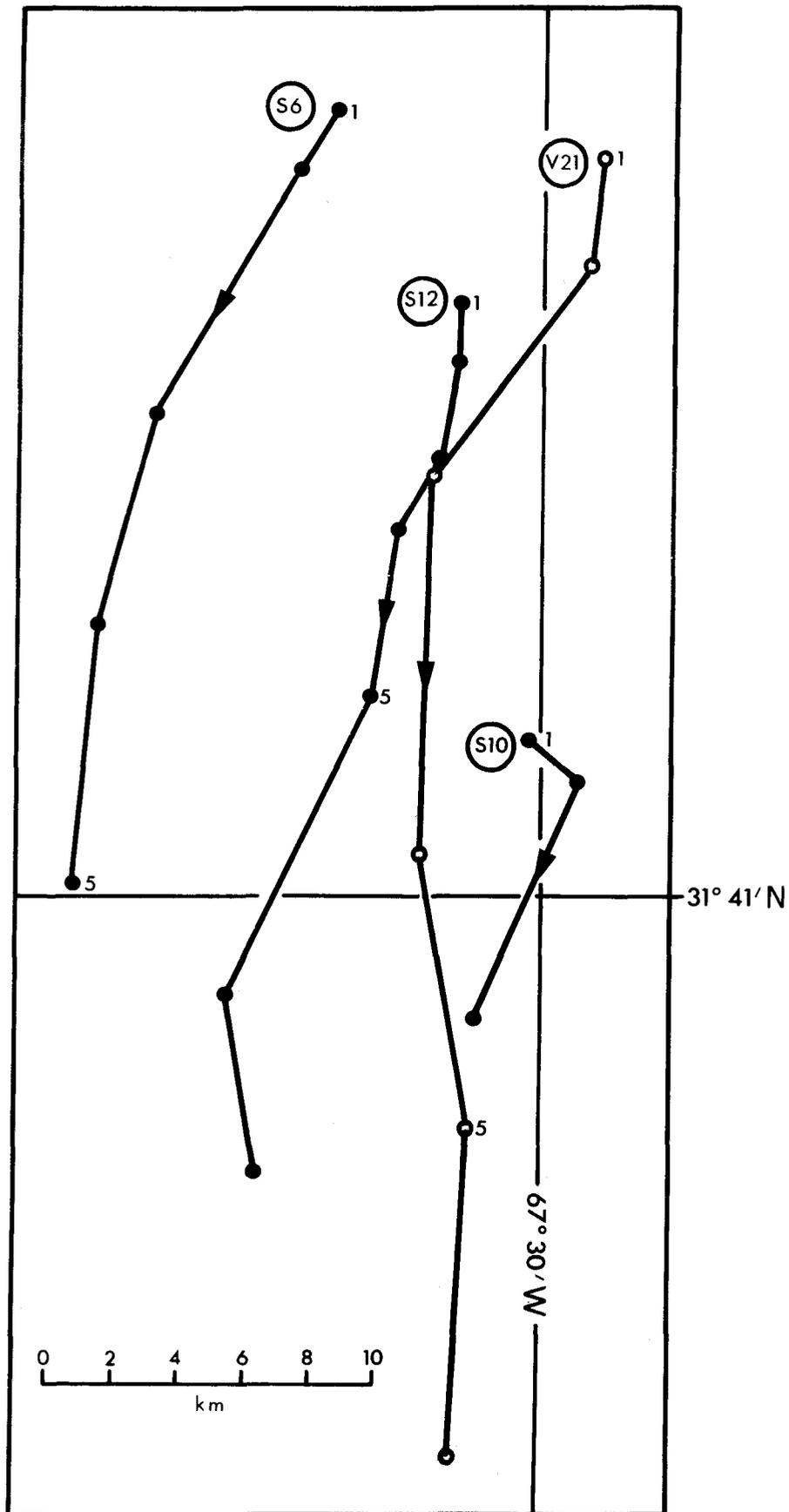
FLOAT DESIGNATION: S12   Date and time laid: 1345/13.IV.60.

FLOAT DESIGNATION: S 12   Date and time laid: 1345/13.IV.60

Position laid: 31° 51'·06N, 67°31'·25W Displacement origin: 32° 00'N
              (2·0km W, 16·5km S)   67° 30'W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·2 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
   2000   1782   ±420   ±100

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	13.IV	1717	31°50'·78	67°31'·66	3·5	−2·6	−17·0	−0·2	+0·5
2	13.IV	2033	31°49'·82	67°31'·64	6·8	−2·6	−18·8	+0·1	−0·3
3	14.IV	0635	31°48'·19	67°32'·00	16·8	−3·1	−21·8	+0·4	−0·3
4	14.IV	1636	31°47'·08	67°32'·80	26·8	−4·4	−23·9	0·0	+0·6
5	15.IV	0648	31°44'·31	67°33'·32	41·0	−5·2	−29·0	+0·3	−0·2
6	16.IV	1100	31°39'·36	67°36'·07	69·2	−9·6	−38·1	−1·7	−0·8
7	17.IV	0946	31°36'·48	67°35'·51	92·0	−8·7	−43·5	+1·1	+0·6

Fitted lines: $x = -0·083t - 2·1$

$y = -0·301t - 16·4$

Mean velocity = 8·7(±0·2)cm/sec, 195(±2)°T

FLOAT DESIGNATION: S6   Date and time laid: 0852/14.IV.60.
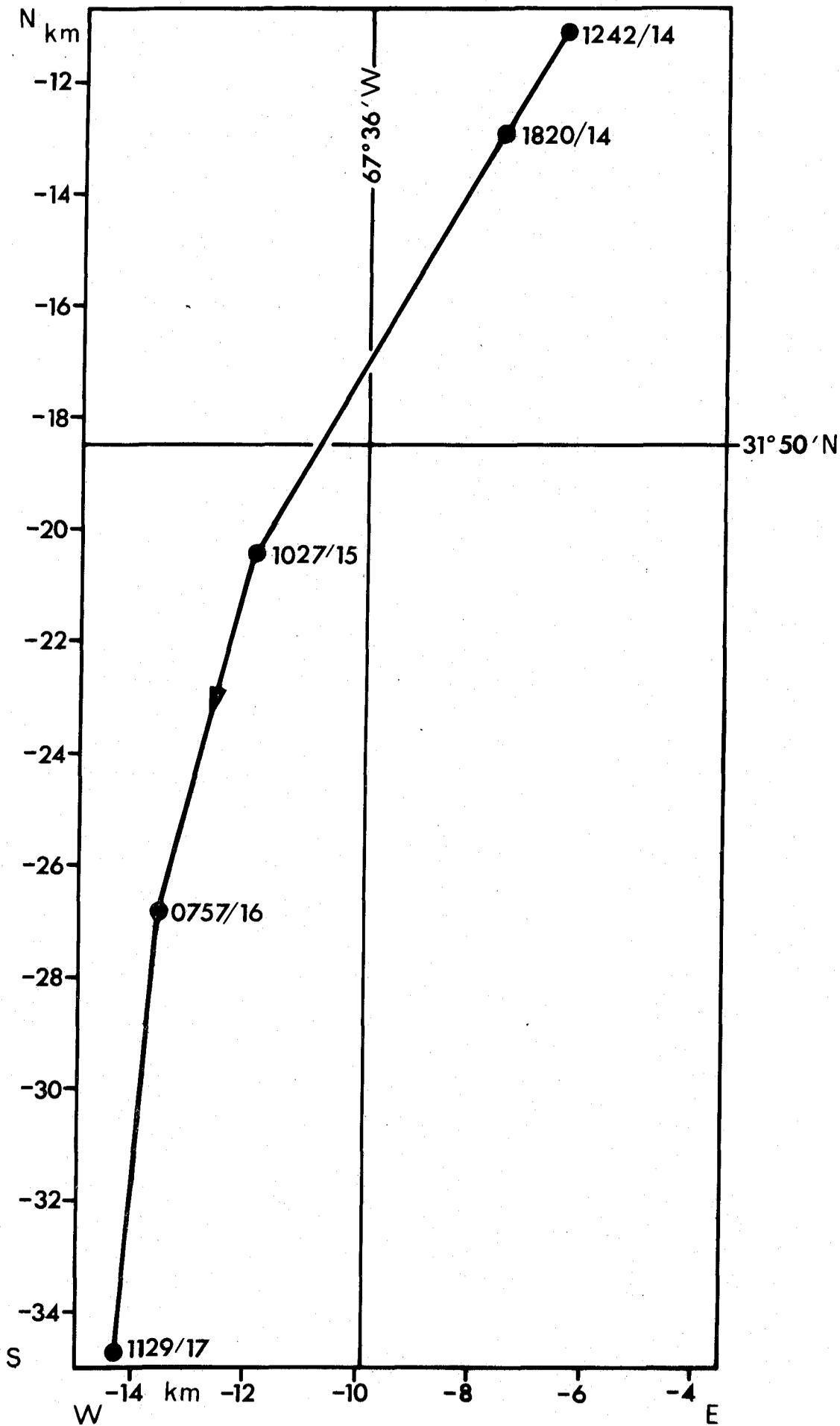
FLOAT DESIGNATION: S 6   Date and time laid: 0852/14.IV.60

Position laid: 31° 54'·59N, 67° 33'·62 W Displacement origin: 32° 00'N
                (5·7km W, 10·0km S)   67° 30'W

Navigation based on: Loran C, except fix 3 (Radar on anchored buoy)

Estimated accuracy of positions: ± 0·2km, except fix 3 (± 0·3km approx)

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
   3000   3270   ±950   ±350

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	14.IV	1242	31°53'·99	67°34'·07	3·8	−6·4	−11·1	+1·1	+0·6
2	14.IV	1820	31°53'·04	67°34'·75	9·5	−7·5	−12·9	+0·7	+0·7
3	15.IV	1027	31°48'·94	67°37'·55	25·6	−11·9	−20·4	−1·9	−1·4
4	16.IV	0757	31°45'·48	67°38'·63	47·1	−13·6	−26·8	−1·2	−0·6
5	17.IV	1129	31°41'·21	67°39'·10	74·6	−14·3	−34·7	+1·2	+0·7

Fitted lines: $x = -0·113t - 7·1$

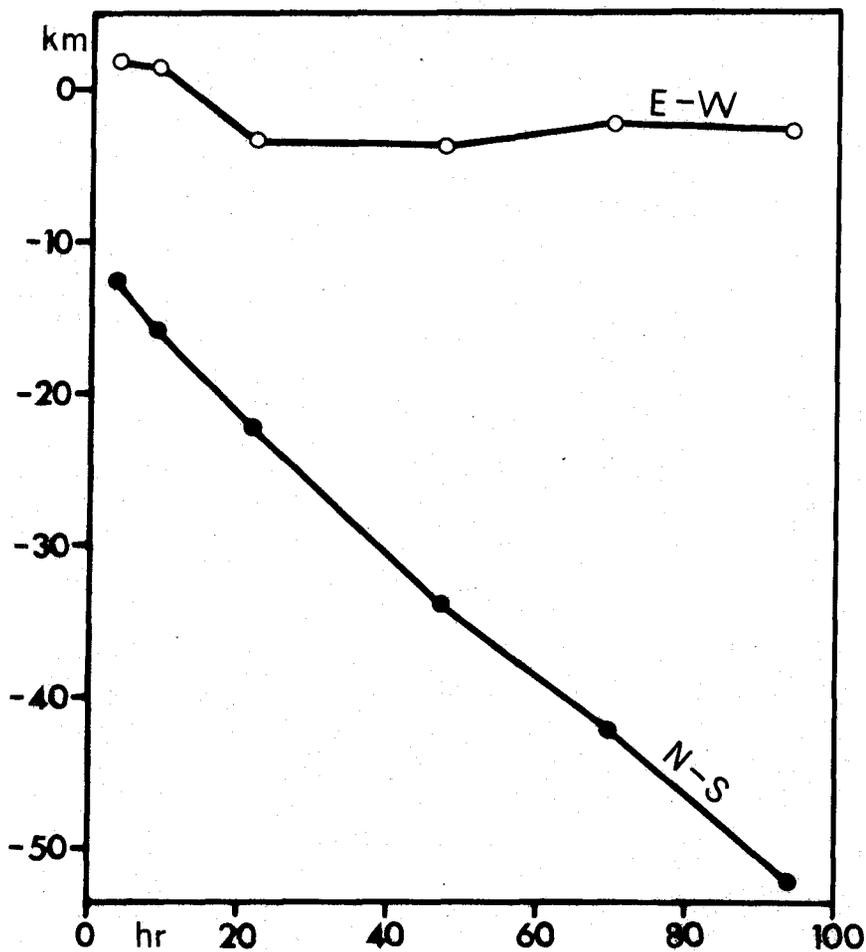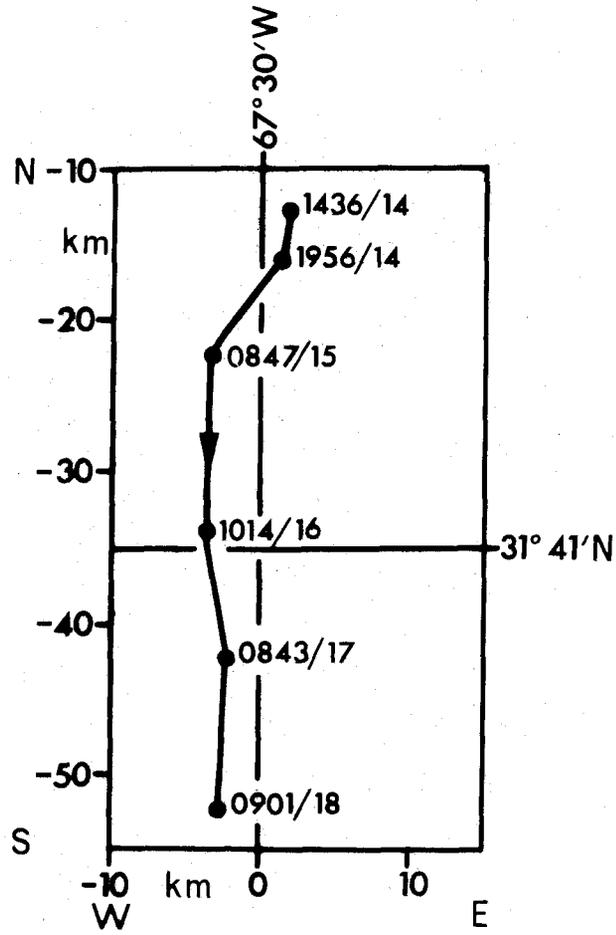 $y = -0·336t - 10·4$

Mean velocity $= 9·8(±0·6)$ cm/sec, $198(±4)$°T

FLOAT DESIGNATION: S6   Date and time laid: 0852/14.IV.60.
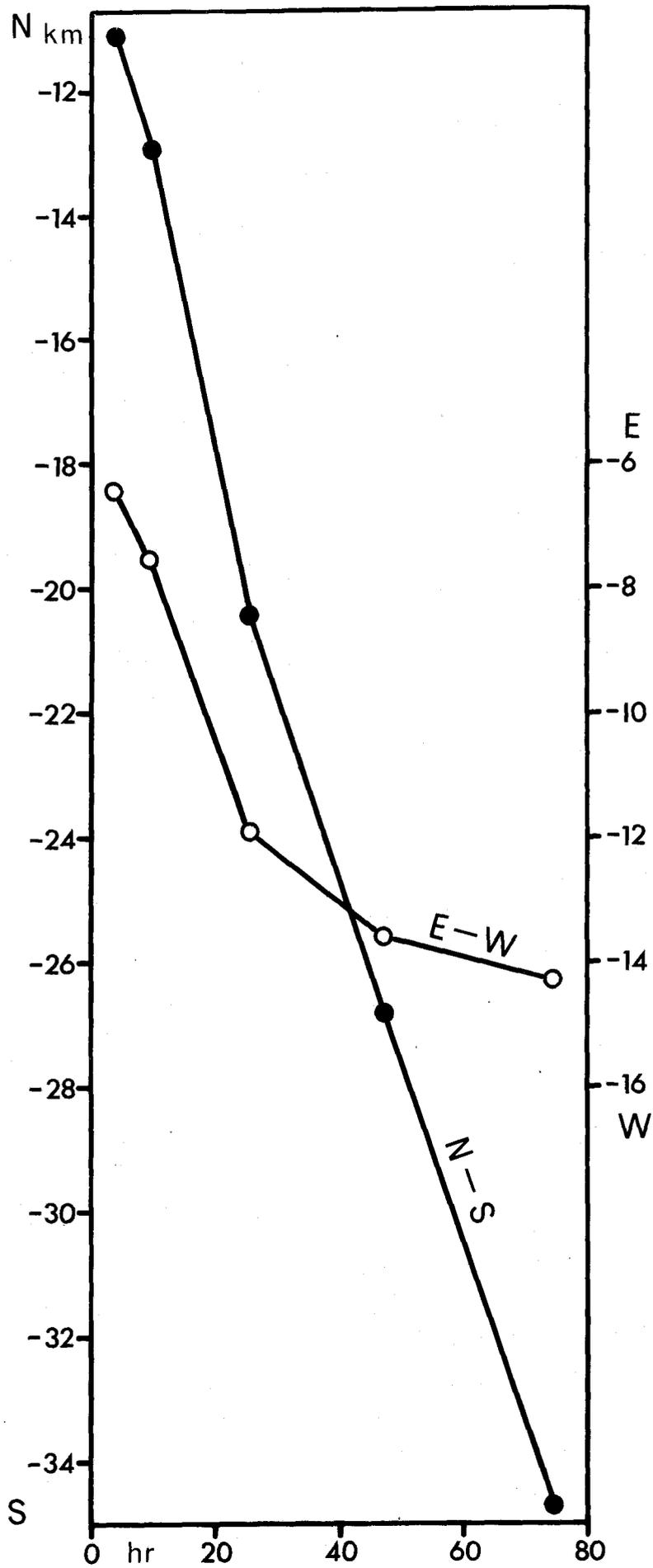
FLOAT DESIGNATION: V21   Date and time laid: 1102/14.IV.60.

FLOAT DESIGNATION: V 21   Date and time laid: 1102/14.IV.60

Position laid: 31°53'·68N, 67°28'·97W   Displacement origin: 32°00'N
                (1·6kmE, 11·7kmS)   67°30'W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·3km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
   4000   3940   ±870   ±260

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	14.IV	1436	31°53'·16	67°28'·87	3·6	+1·8	−12·6	+1·7	+1·1
2	14.IV	1956	31°51'·38	67°29'·13	8·9	+1·4	−15·9	+1·5	+0·1
3	15.IV	0847	31°47'·93	67°32'·13	21·8	−3·4	−22·3	−2·8	−0·7
4	16.IV	1014	31°41'·71	67°32'·33	47·2	−3·7	−33·8	−2·0	−1·2
5	17.IV	0843	31°37'·18	67°31'·42	69·7	−2·2	−42·2	+0·5	+0·1
6	18.IV	0901	31°31'·75	67°31'·71	94·0	−2·7	−52·2	+1·0	+0·6

Fitted lines: $x = -0·043t + 0·3$

                $y = -0·433t - 12·1$

Mean velocity = 12·1(±0·3)cm/sec, 186(±3)°T

FLOAT DESIGNATION: S10   Date and time laid: 2004/16.IV.60.
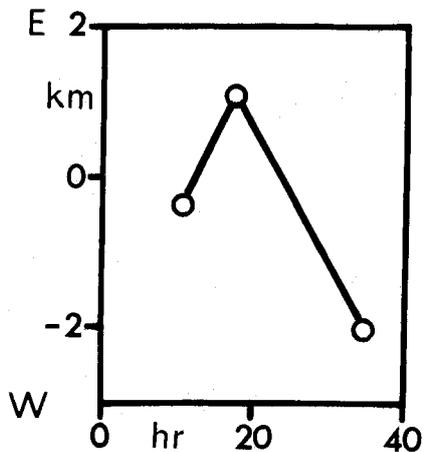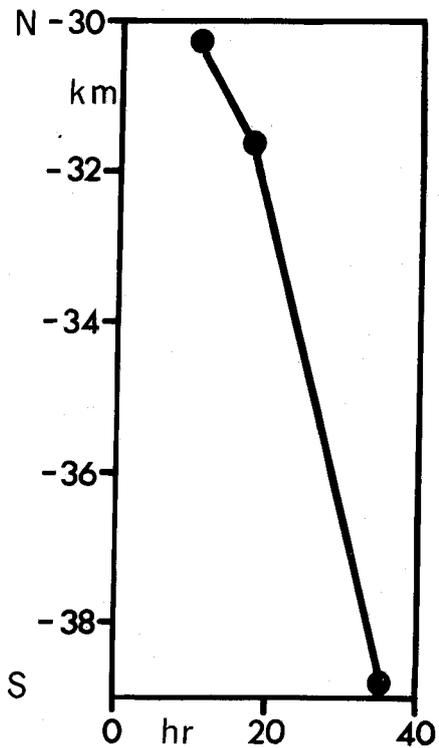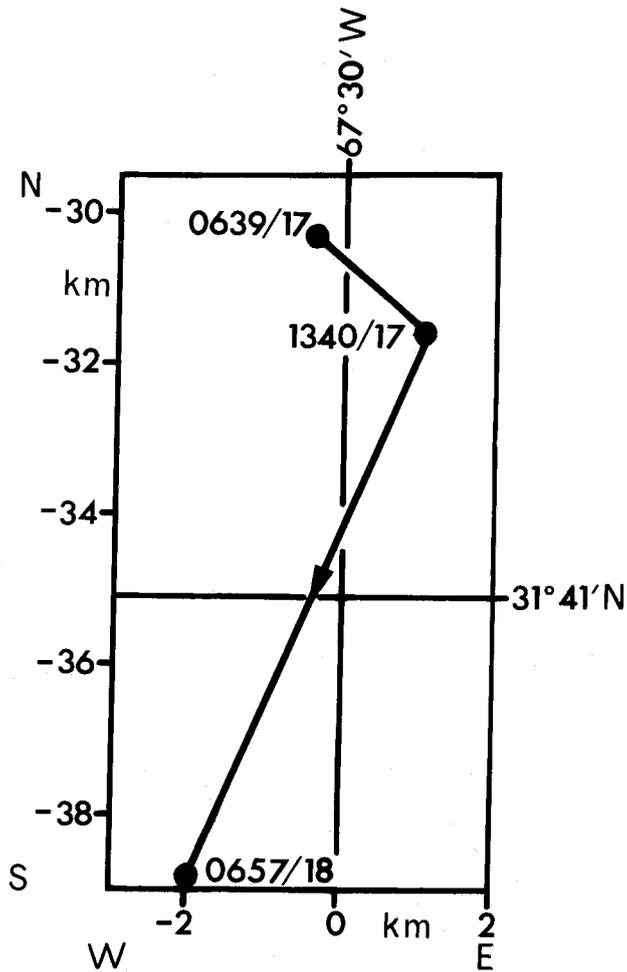
FLOAT DESIGNATION: S 10   Date and time laid: 2004/16.IV.60

Position laid: 31°45'·69N, 67°30'·24W Displacement origin: 32° 00'N
                (0·4kmW, 26·4kmS)   67° 30'W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·2 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
   5000   4710   ±540   ±240

| Fix No.	Date	Time GMT -4	Fic Position Lat.N.	Fic Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	17.IV	0639	31°43'·59	67°30'·22	10·6	−0·4	−30·3	−0·9	−0·5
2	17.IV	1340	31°42'·88	67°29'·30	17·6	+1·1	−31·6	+1·2	+0·7
3	18.IV	0657	31°38'·98	67°31'·27	34·9	−2·0	−38·8	−0·4	−0·2

Fitted lines: x = − 0·087t + 1·4

               y = − 0·362t − 25·9

Mean velocity = 10·4(±1·5)cm/sec, 194(±13)°T

FLOAT DESIGNATIONS: S13(laid 1037/2.V.60), S14(laid 1735/2.V.60), S15 (laid 1435/14.V.60), V19(laid 0915/15.V.60), S16(laid 1632/15.V.60).
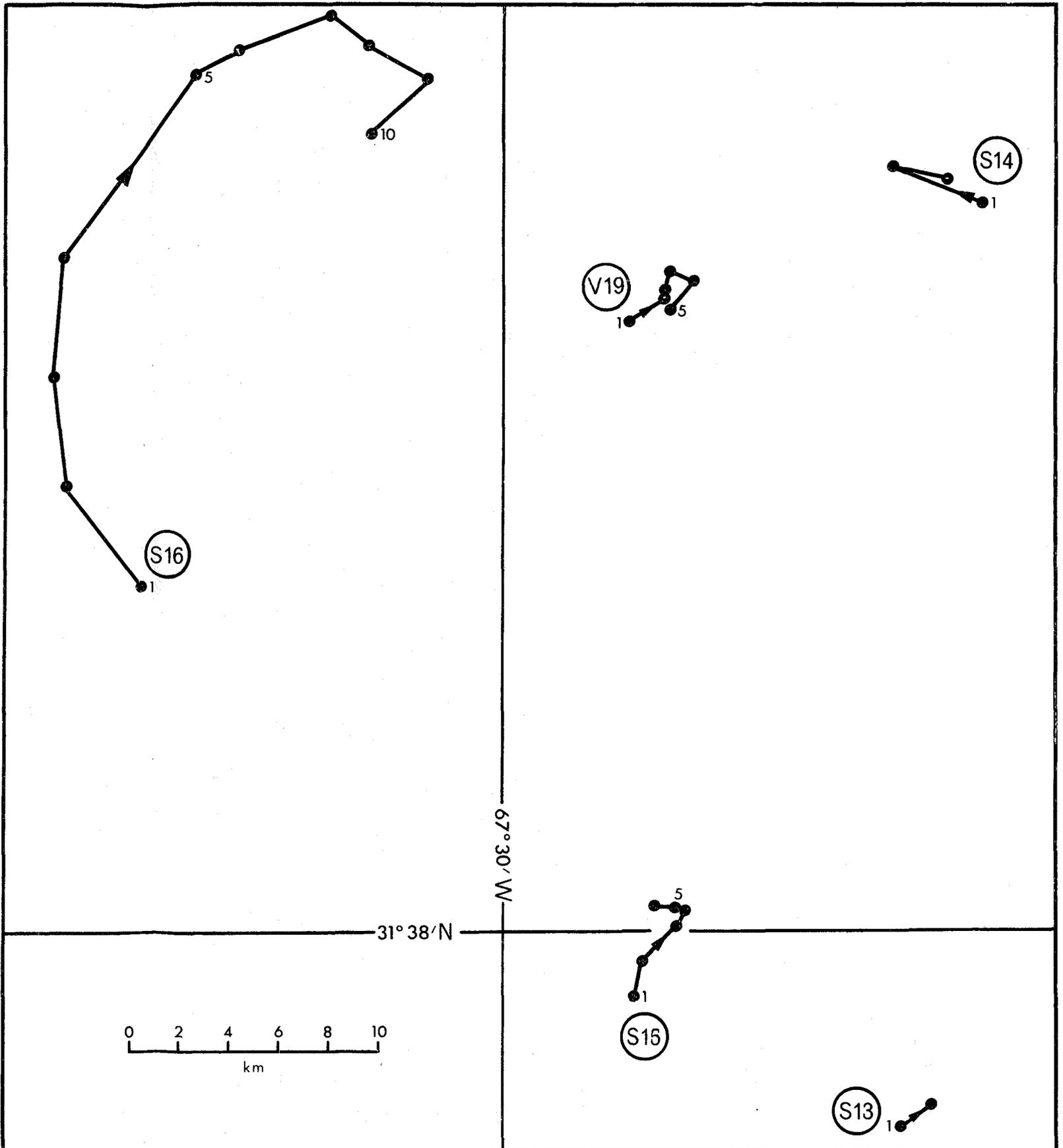
FLOAT DESIGNATION: S13   Date and time laid: 1037/2.V.60.
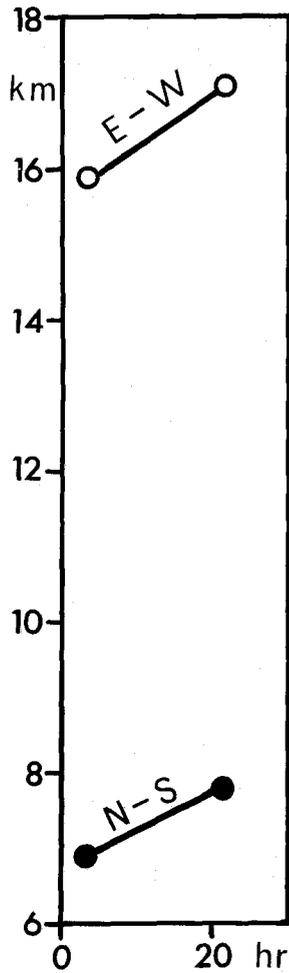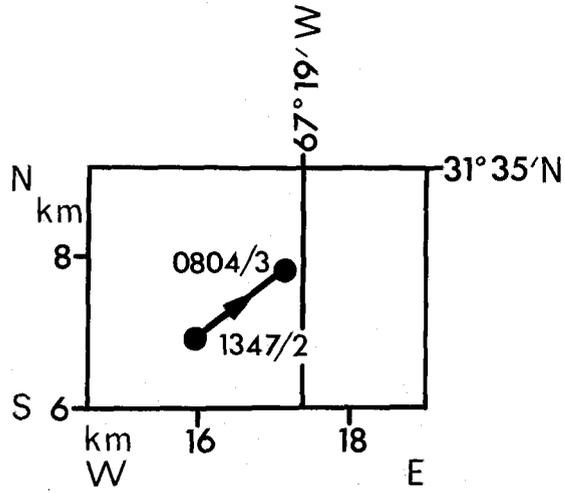
FLOAT DESIGNATION: S 13   Date and time laid: 1037/2.V.60

Position laid: 31°35'·54N, 67°16'·85W   Displacement origin: 31°30'N
               (20·8kmE, 10·2kmN)   67°30'W

Navigation based on: Loran C

Estimated accuracy of positions: ±0·3km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	2000 *	-	-	-

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y
1	2.V	1347	31°33'·73	67°19'·94	3·2	+15·9	+6·9
2	3.V	0804	31°34'·25	67°19'·20	21·4	+17·1	+7·8

Mean velocity, Fix 1-Fix 2 = 2·3 cm/sec,053°T

* Not enough fixes for useful depth estimate

FLOAT DESIGNATION: S14   Date and time laid: 1735/2.V.60.

FLOAT DESIGNATION: S 14   Date and time laid: 1735/2.V.60

Position laid: 31°53'·55N, 67°18'·10W   Displacement origin: 31° 30'N
             (18·7km E, 43·5km N)   67° 30'W

Navigation based on: Loran C except fix 2 (DR + Loran A[*])

Estimated accuracy of positions: ± 0·3km, except fix 2 (± 1km approx).

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
              2000   1960   ±550   ±220

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	2.V	2010	31°53'·82	67°17'·84	2·6	+19·1	+44·0	+0·4	−0·1
2	3.V	1317	31°54'·60	67°20'·10	19·7	+15·5	+45·5	−1·6	+0·5
3	3.V	1930	31°54'·35	67°18'·76	25·9	+17·7	+45·0	+1·2	−0·3

Fitted lines: $x = -0·092t + 18·9$

               $y = +0·052t + 44·0$

Mean velocity = 2·9(±2·9)cm/sec, 300(±27) °T

[*] adj. for mean systematic difference from Loran C

FLOAT DESIGNATION: S15   Date and time laid: 1435/14.V.60.

FLOAT DESIGNATION: S 15   Date and time laid: 1435/14.V.60

Position laid: 31°36'·35N, 67°26'·84W   Displacement origin: 31° 30'N
(5·0 km E, 11·7 kmN)   67° 30'W

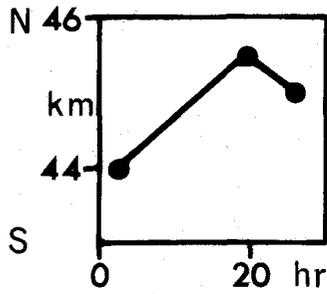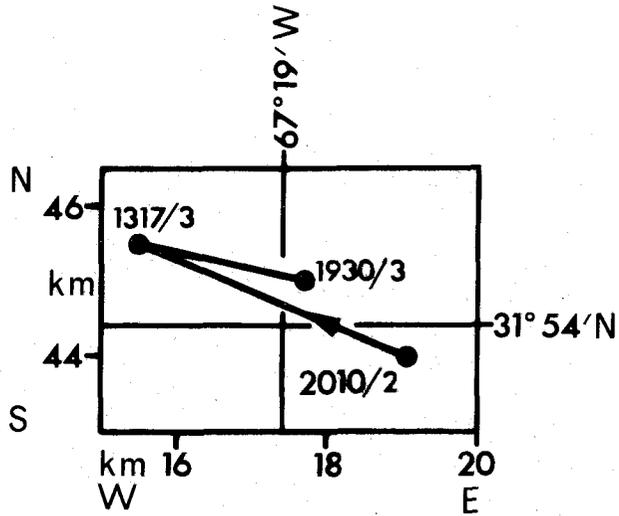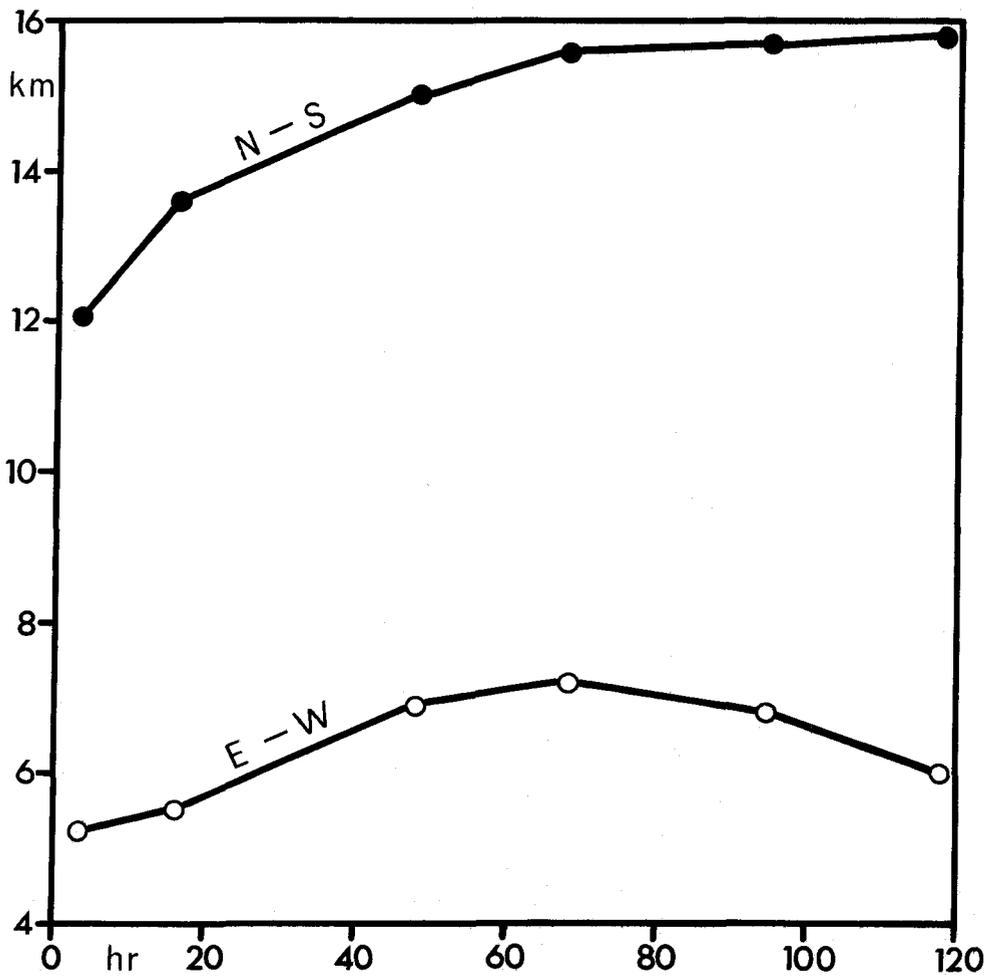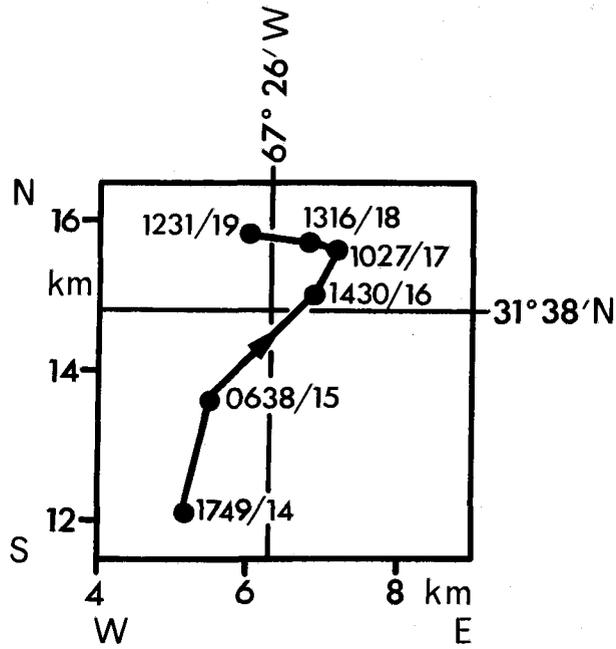Navigation based on: Loran C

Estimated accuracy of positions: ± 0·2 km
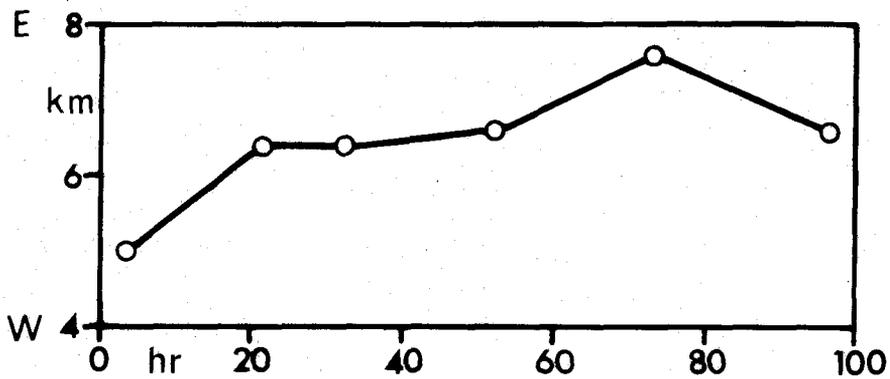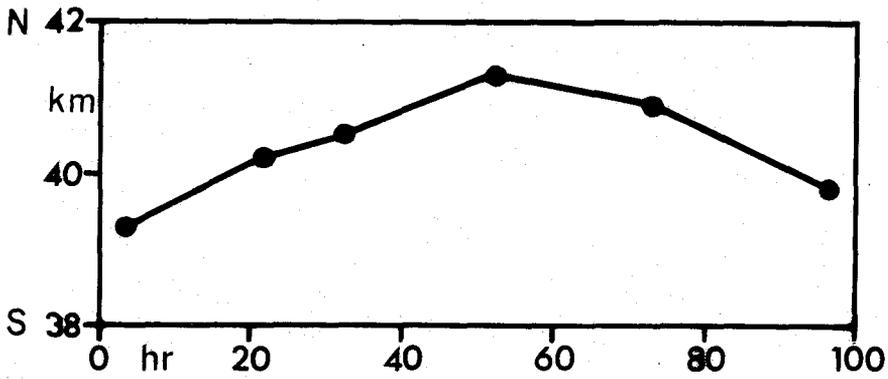
Depth(m):

	Nominal	Observed	S.D.	S.D.(mean)
	2000	1880	±330	±80

Fix No.	Date	Time GMT 54	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E–W x	Displacement(km) +N–S y	Residuals– x	Residuals– y
1	14.V	1749	31°36'·54	67°26'·68	3·2	+5·2	+12·1	−0·5	−0·9
2	15.V	0638	31°37'·35	67°26'·55	16·0	+5·5	+13·6	−0·4	+0·2
3	16.V	1430	31°38'·11	67°25'·62	47·9	+6·9	+15·0	+0·7	+0·7
4	17.V	1027	31°38'·46	67°25'·48	67·9	+7·2	+15·6	+0·8	+0·7
5	18.V	1316	31°38'·50	67°25'·73	94·7	+6·8	+15·7	+0·2	0·0
6	19.V	1231	31°38'·53	67°26'·22	117·9	+6·0	+15·8	−0·9	−0·6

Fitted lines: $x = +0.010t + 5.7$

$y = +0.030t + 12.9$

Mean velocity $= 0.9(\pm0.2)$ cm/sec, $018(\pm13)$ °T

FLOAT DESIGNATION: V19   Date and time laid: 0915/15.V.60.

FLOAT DESIGNATION: V 19

Position laid: 31°50'·86N, 67°26'·83W
(5·0kmE, 38·5kmN)

Date and time laid: 0915/15.V.60

Displacement origin: 31° 30'N
67° 30'W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·2km
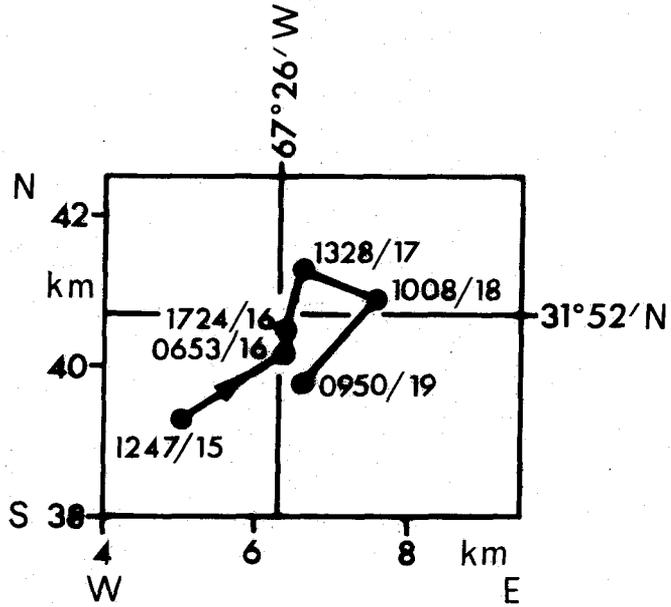
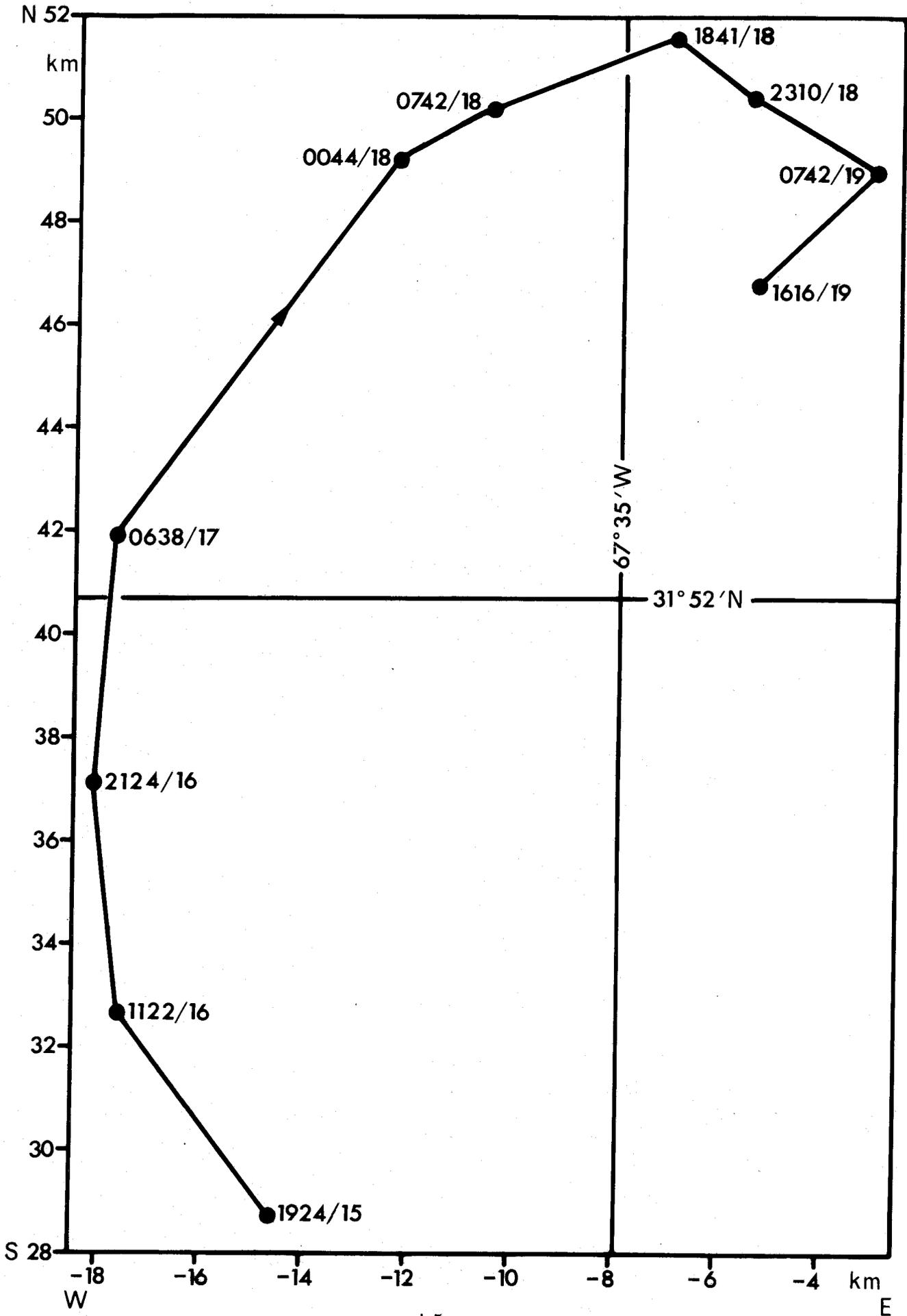| Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	2000	1890	±400	±100

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	15.V	1247	31°51'·25	67°26'·85	3·5	+5·0	+39·3	-0·7	-0·7
2	16.V	0653	31°51'·74	67°25'·90	21·6	+6·4	+40·2	+0·4	0·0
3	16.V	1724	31°51'·92	67°25'·91	32·2	+6·4	+40·5	+0·2	+0·3
4	17.V	1328	31°52'·37	67°25'·82	52·2	+6·6	+41·3	+0·1	+0·9
5	18.V	1008	31°52'·14	67°25'·18	72·9	+7·6	+40·9	+0·7	+0·4
6	19.V	0950	31°51'·54	67°25'·79	96·6	+6·6	+39·8	-0·7	-0·9

Fitted lines: $x = + 0\cdot017t + 5\cdot6$

$y = + 0\cdot007t + 40\cdot0$

Mean velocity $= 0\cdot5(\pm0\cdot2)$ cm/sec, $069(\pm27)$ °T

FLOAT DESIGNATION: S16   Date and time laid: 1632/15.V.60.

FLOAT DESIGNATION: S 16   Date and time laid: 1632/15.V.60

Position laid: 31°45'·19N, 67°38'·93W   Displacement origin: 31° 30'N
         (14·1 kmW, 28·1 km N)   67° 30'W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·2 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	2000	1780	±280	±63

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	15.V	1924	31°45'·52	67°39'·28	2·9	−14·6	+28·7	+0·6	+0·8
2	16.V	1122	31°47'·70	67°41'·17	18·8	−17·6	+32·7	−0·9	−1·1
3	16.V	2124	31°50'·10	67°41'·50	28·9	−18·1	+37·1	−0·5	−0·5
4	17.V	0638	31°52'·66	67°41'·25	38·1	−17·7	+41·9	+0·8 / 0·0	+0·9 / −0·9
5	18.V	0044	31°56'·60	67°37'·80	56·2	−12·3	+49·2	+0·1	+1·4
6	18.V	0742	31°57'·16	67°36'·67	63·2	−10·5	+50·2	−0·2	+0·5
7	18.V	1841	31°57'·90	67°34'·38	74·2	−6·9	+51·6	+0·1 / −0·9	−1·1 / +0·1
8	18.V	2310	31°57'·30	67°33'·40	78·6	−5·4	+50·4	+0·2	−0·2
9	19.V	0742	31°56'·50	67°31'·88	87·2	−3·0	+49·0	+1·9	+0·3
10	19.V	1616	31°55'·34	67°33'·38	95·7	−5·3	+46·8	−1·2	−0·1

Fitted lines: x = − 0·092t − 15·0)
               y = + 0·371t + 26·9 } Fixes 1 − 4

Mean velocity = 10·6(±1·3)cm/sec, 346(±5)°T

               x = + 0·297t − 29·0)
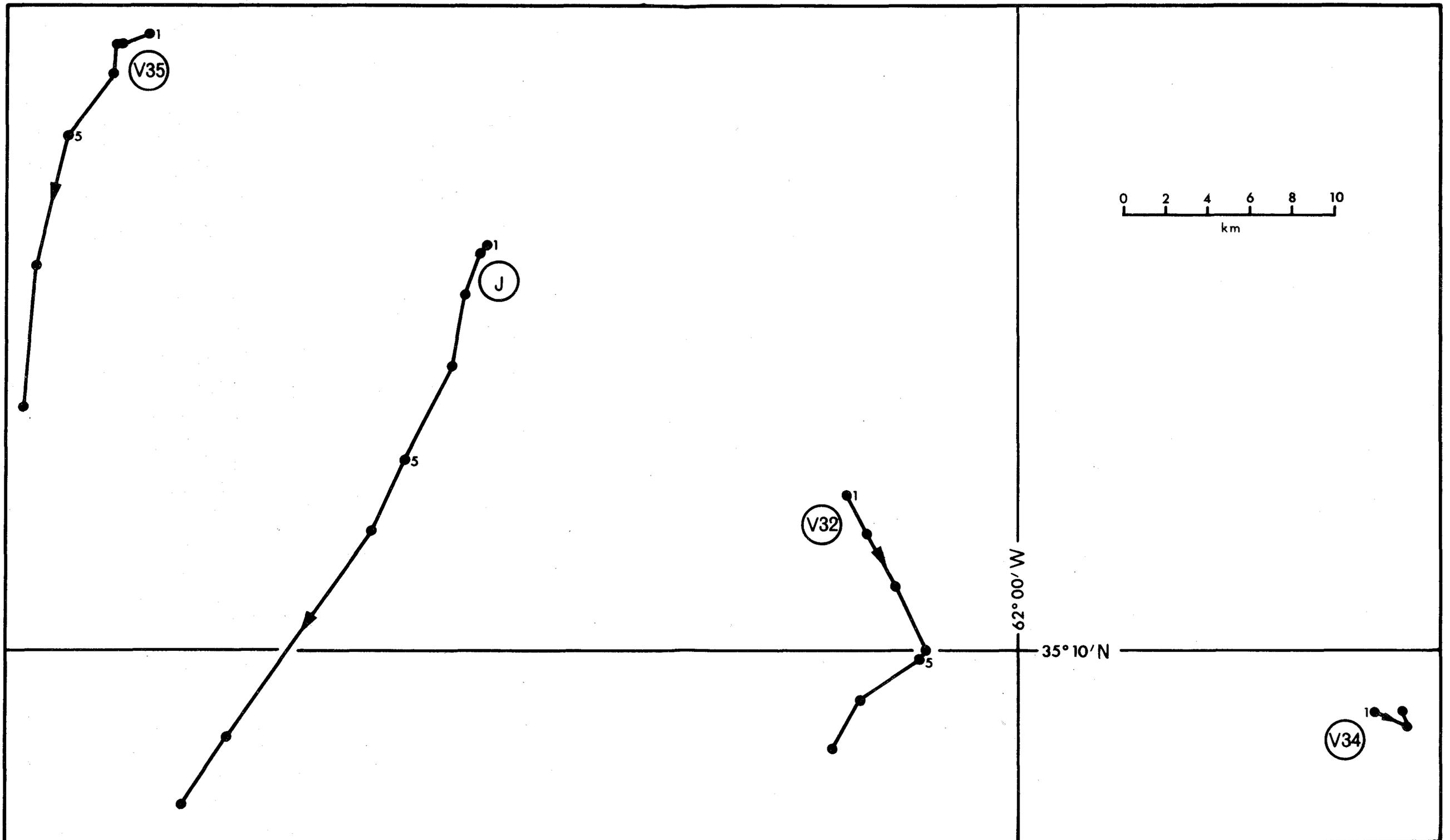   y = +0·274t + 32·3 } Fixes 4 − 7

Mean velocity = 11·2(±1·1)cm/sec, 047(±6)°T

               x = + 0·087t − 12·4)
               y = − 0·215t + 67·5 } Fixes 7 − 10

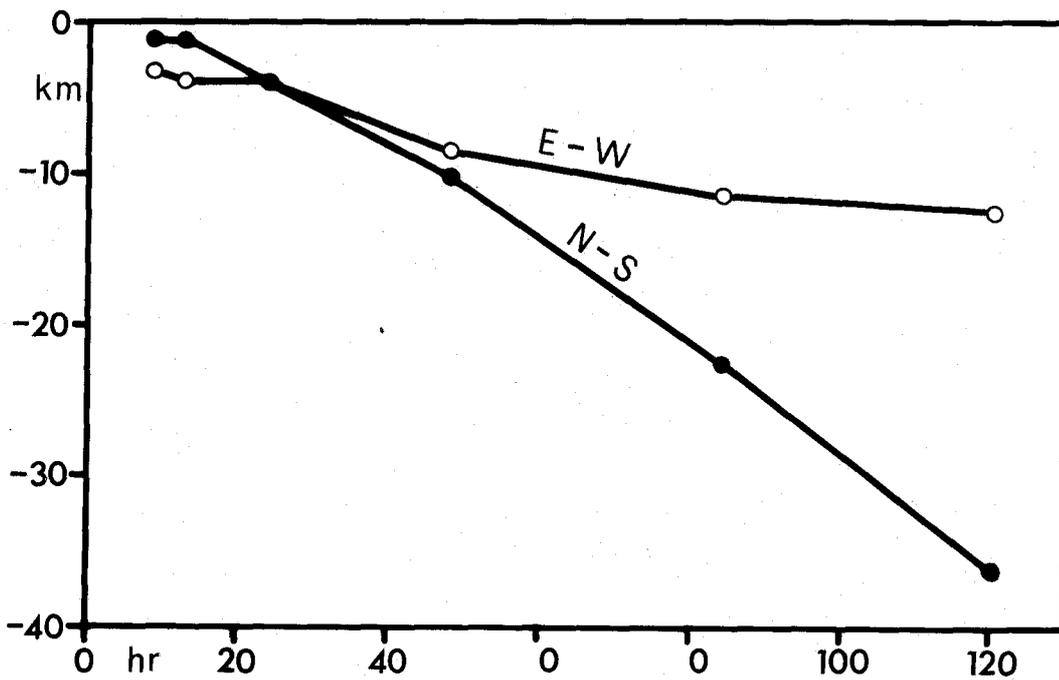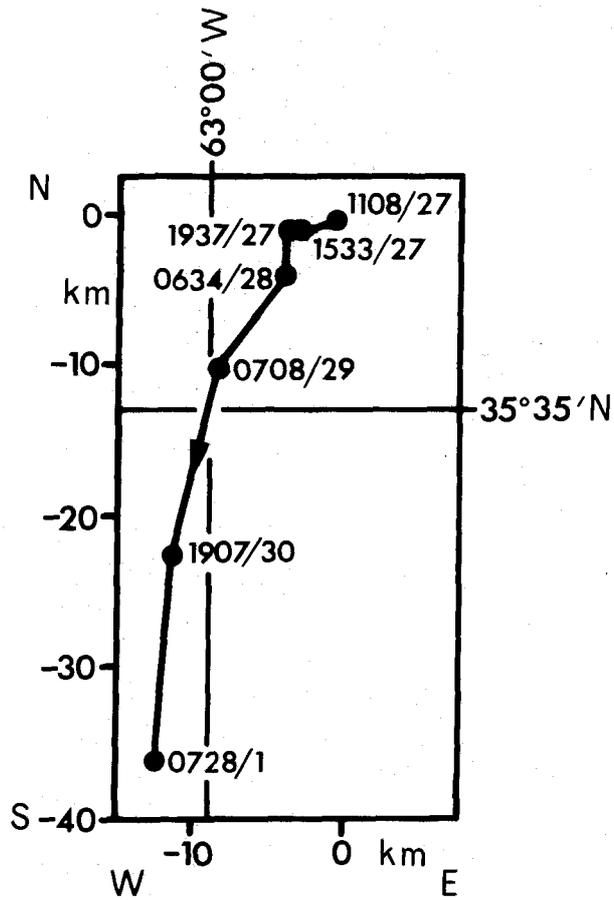Mean velocity = 6·5(±1·1)cm/sec, 158(±23)°T

FLOAT DESIGNATION: S16   Date and time laid: 1632/15.V.60.
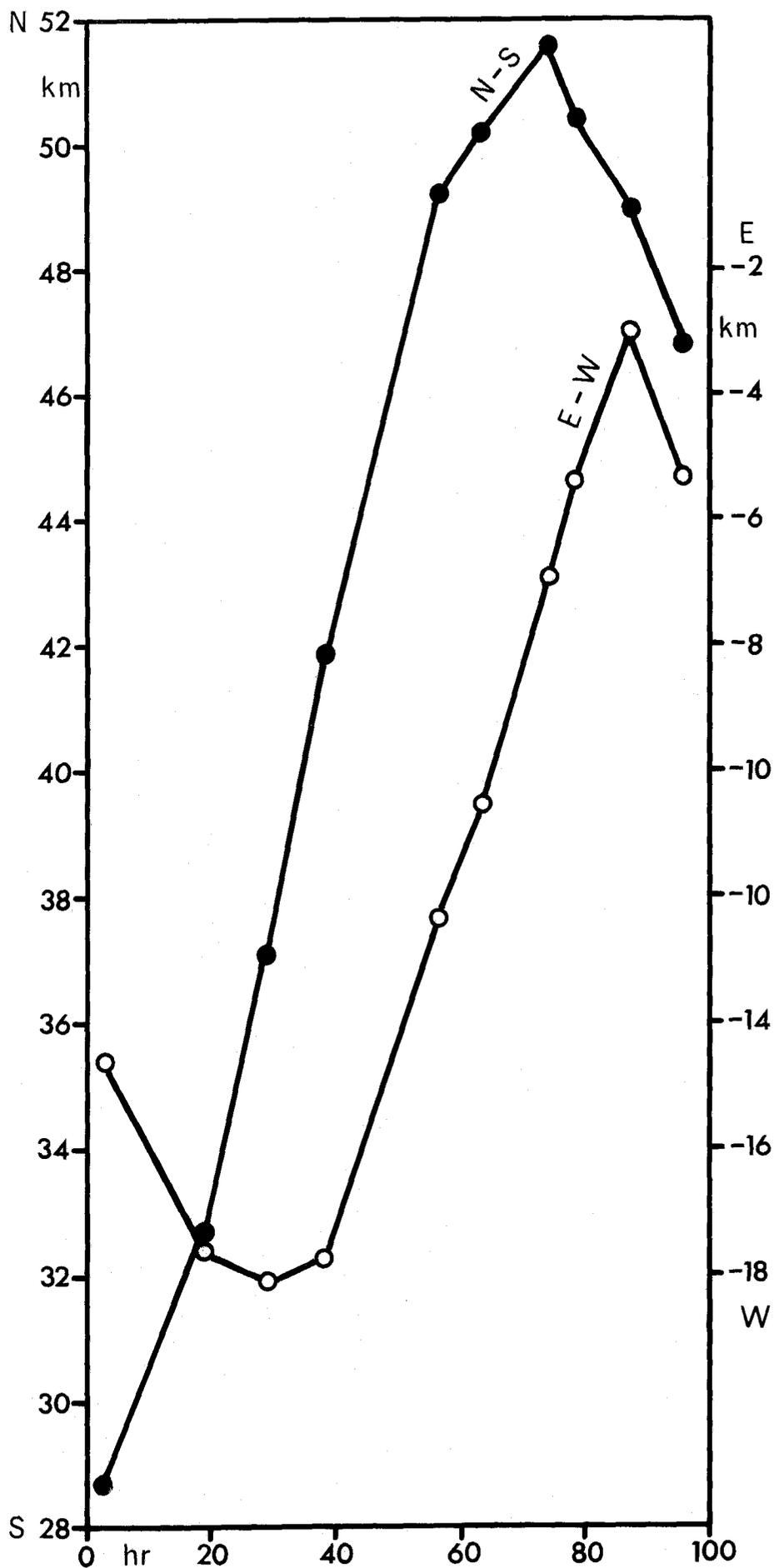
FLOAT DESIGNATIONS: V35(laid 0709/27.V.60), J(laid 1029/28.V.60), V32(laid 1545/29.V.60), V34(laid 1315/2.VI.60).

FLOAT DESIGNATION: V35   Date and time laid: 0709/27.V.60.

FLOAT DESIGNATION: V 35

Date and time laid: 0709/27.V.60

Position laid: 35°42'·0 N, 62°54'·0W
(approx)

Displacement origin: 35° 42' N
62° 54' W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·3 km
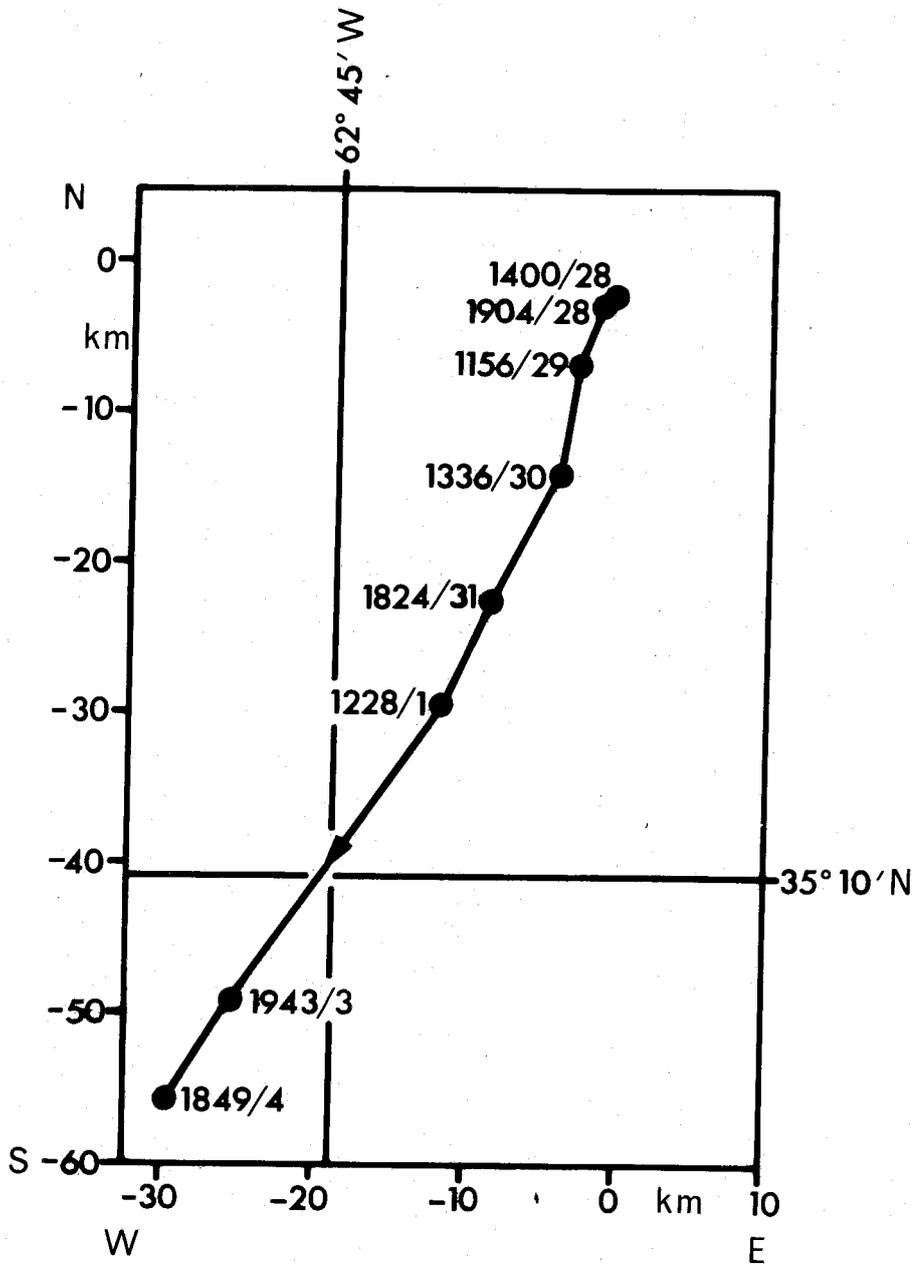
Depth(m):

	Nominal	Observed	S.D.	S.D.(mean)
	3000	2950	±850	±300

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	27.V	1108	35°41'·8	62°54'·5	4·0	−0·7	−0·4	+1·8	−1·5
2	27.V	1533	35°41'·3	62°56'·2	8·4	−3·3	−1·3	−0·3	−1·0
3	27.V	1937	35°41'·3	62°56'·6	12·5	−3·9	−1·3	−0·5	+0·2
4	28.V	0634	35°39'·8	62°56'·7	23·4	−4·1	−4·1	+0·4	+0·8
5	29.V	0708	35°36'·5	62°59'·6	48·0	−8·5	−10·2	−1·6	+2·2
6	30.V	1907	35°29'·8	63°01'·6	84·0	−11·5	−22·6	−1·1	+0·9
7	1.VI	0728	35°22'·4	63°02'·3	120·3	−12·6	−36·2	+1·4	−1·6

Fitted lines: $x = -0·098t - 2·2$

$y = -0·307t + 2·3$

Mean velocity $= 9·0(±0·4)$ cm/sec, $198(±2)$ °T

FLOAT DESIGNATION: J   Date and time laid: 1029/28.V.60.

FLOAT DESIGNATION: J

Date and time laid: 1029/28.V.60

Position laid: 35°32'·0N, 62°32'·7W

Displacement origin: 35° 32'·0 N
62° 32'·7 W

Navigation based on: Loran G

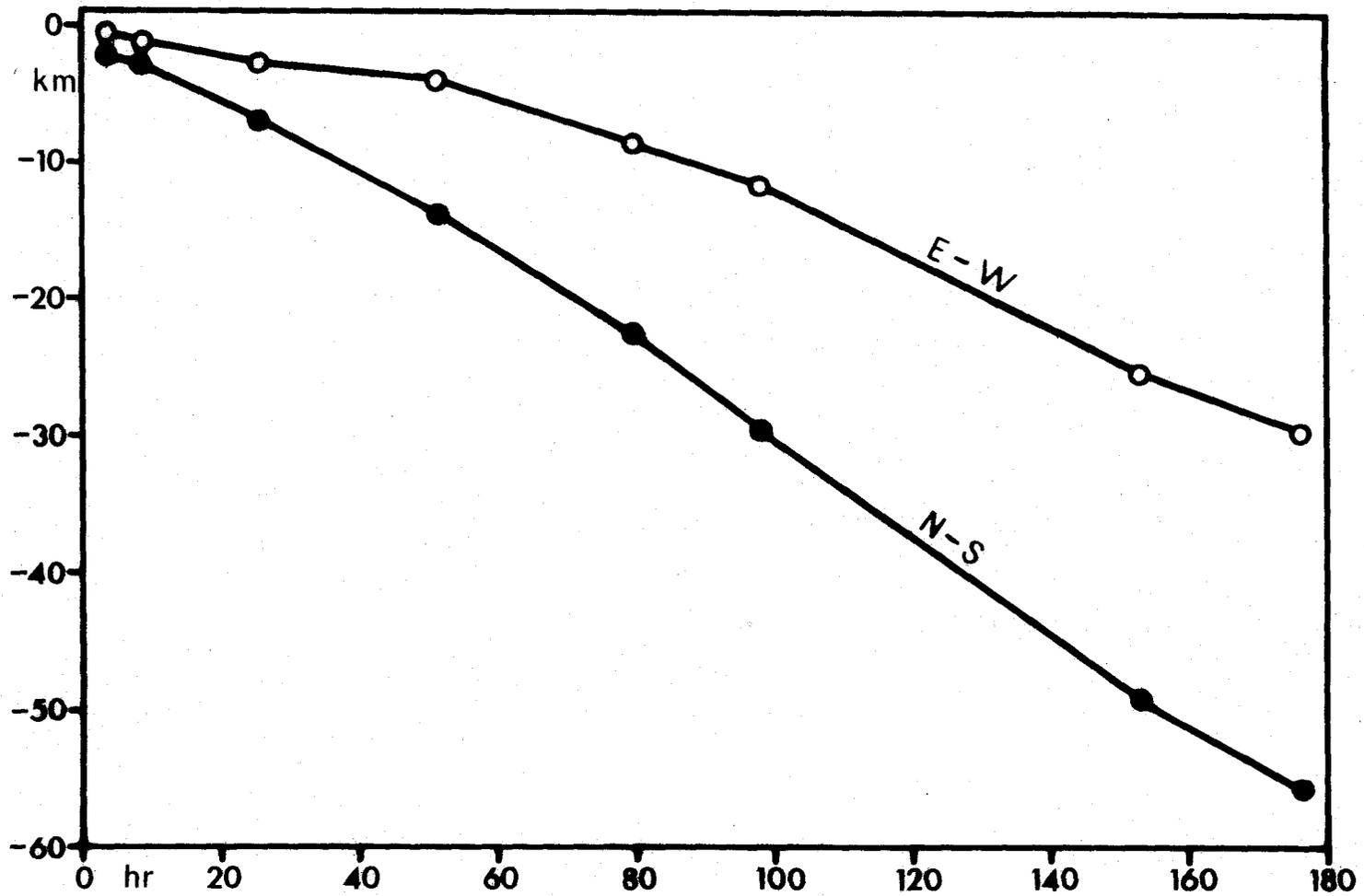Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	3000	2600	±440	±110

| Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	28.V	1400	35°30'·8	62°33'·1	3·5	−0·6	−2·2	−2·1	−1·9
2	28.V	1904	35°30'·5	62°33'·6	8·6	−1·3	−2·8	−2·0	−0·9
3	29.V	1156	35°28'·3	62°34'·5	25·4	−2·8	−6·8	−0·6	+0·4
4	30.V	1336	35°24'·6	62°35'·3	51·1	−3·9	−13·7	+2·6	+1·7
5	31.V	1824	35°19'·8	62°38'·3	79·9	−8·5	−22·6	+2·9	+1·9
6	I.VI	1228	35°16'·1	62°40'·4	98·0	−11·6	−29·4	+2·8	+0·8
7	3.VI	1943	35°05'·5	62°49'·4	153·2	−25·3	−49·0	−1·6	−1·3
8	4.VI	1849	35°01'·9	62°52'·1	176·3	−29·6	−55·6	−2·0	−0·6

Fitted lines: $x = -0·168t + 2·1$

$y = -0·317t + 0·8$

Mean velocity $= 10·0(±0·3)$ cm/sec, $208(±2)$ °T

FLOAT DESIGNATION: J   Date and time laid: 1029/28.V.60.

FLOAT DESIGNATION: V32   Date and time laid: 1545/29.V.60.
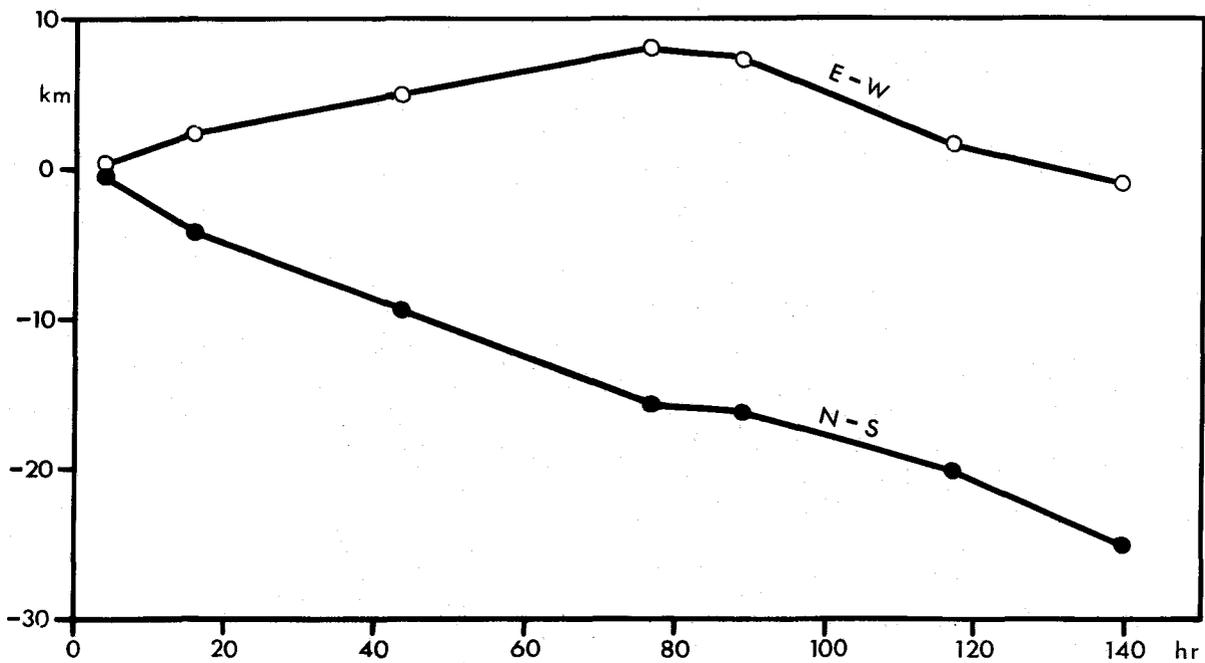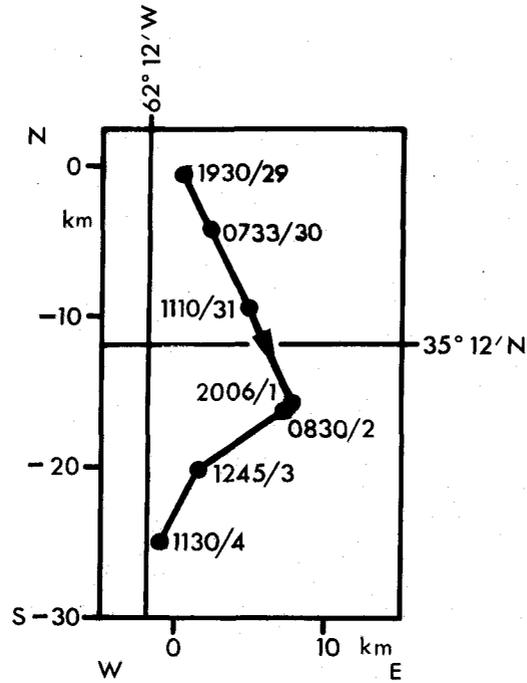
FLOAT DESIGNATION: V 32   Date and time laid: 1545/29.V.60

Position laid: 35°18'·4N, 62°10'·8W   Displacement origin: 35° 18'·4 N
                                             67° 10'·8 W

Navigation based on: Loran C

Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	3000	2640*	±900	±300

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Residuals x	y
1	29.V	1930	35°18'·1	62°10'·7	3·8	+0·2	−0·6	−0·4	+0·6
2	30.V	0733	35°16'·1	62°09'·4	15·8	+2·2	−4·3	+0·4	−0·7
3	31.V	1110	35°13'·3	62°07'·6	43·4	+4·8	−9·4	+0·2	−0·2
4	1.VI	2006	35°09'·9	62°05'·7	76·4	+7·8	−15·7	−0·2 / −0·4	+0·2 / −0·7
5	2.VI	0830	35°09'·6	62°06'·1	88·8	+7·2	−16·3	+0·8	+0·5
6	3.VI	1245	35°07'·5	62°09'·8	117·0	+1·5	−20·2	−0·6	+0·9
7	4.VI	1130	35°04'·9	62°11'·5	139·8	−1·1	−25·0	+0·2	−0·7

Fitted lines: x = + 0·101t + 0·2)
                 y = − 0·202t − 0·4)   Fixes 1 − 4

Mean velocity   =   6·3(±0·3)cm/sec, 153(±1)°T

                x = − 0·151t + 19·8)
                y = − 0·147t − 3·7)   Fixes 4 − 7

Mean velocity   =   5·9(±0·5)cm/sec, 226(±3)°T

* Omitting one reading.

FLOAT DESIGNATION: V34   Date and time laid: 1315/2.VI.60.
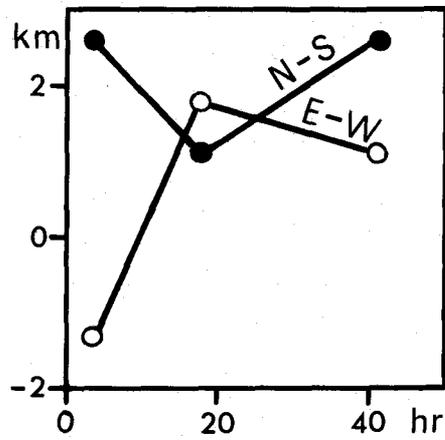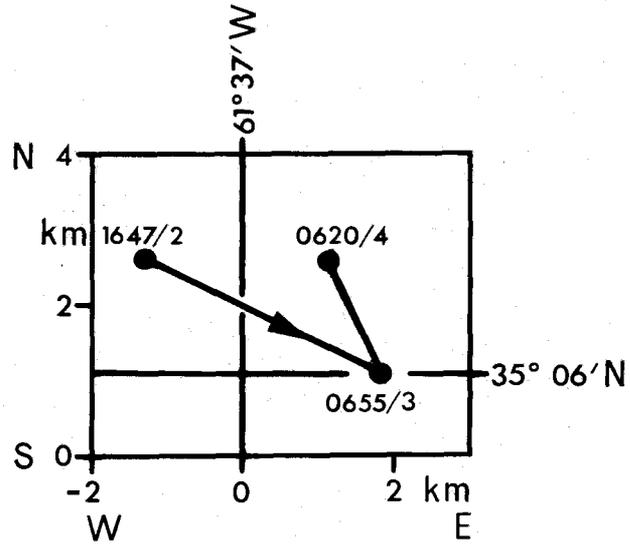
FLOAT DESIGNATION: V 34
Date and time laid: 1315/2.VI.60

Position laid: 35°05'·4N, 61°36'·9W
Displacement origin: 35° 05'·4 N
                     61° 36'·9 W

Navigation based on: Loran A *

Estimated accuracy of positions: ± 1 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	3000	3040	±330	±150

Fix No.	Date	Time GMT -4	Fix Position Lat.N.	Fix Position Long.W.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Residuals x	Residuals y
1	2.VI	1647	35°06'·8	61°37'·8	3·5	−1·3	+2·6	−0·9	+0·6
2	3.VI	0655	35°06'·0	61°35'·7	17·7	+1·8	+1·1	+1·4	−1·0
3	4.VI	0620	35°06'·8	61°36'·2	41·1	+1·1	+2·6	−0·5	+0·4

Fitted lines: $x = + 0·054t - 0·6$

$y = + 0·006t + 2·0$

Mean velocity $= 1·5(±1·8)$ cm/sec, $083(±46)°T$

* Loran C OK for relative pos. on fixes 1 and 3 but absolute values doubtful