NATIONAL INSTITUTE OF OCEANOGRAPHY

WORMLEY, GODALMING, SURREY

NEUTRALLY BUOYANT FLOATS

Serial Nos. 209 - 227

February - March 1969

TABLES AND DIAGRAMS

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and

J. C. SWALLOW

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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 report describes the results of work with neutrally buoyant floats undertaken during cruise 25 of the RRS "Discovery", in the N.W. Mediterranean in February and March 1969, as part of the "MEDOC 1969" cooperative investigations. It contains tables of data and diagrams showing trajectories and components of displacement for each float.

The floats were basically similar in design to those described in Ref.1, with some simplification in the mechanical sealing arrangements, and considerable improvement in the circuits used for energising the nickel scroll transducers (in part described in Ref.2). The method of tracking was an elaboration of that described in Ref.3, using two pairs of towed hydrophones. By this means, the ship could be manoeuvred to pass directly over the float position with an accuracy well within the other uncertainties of navigation.

In the tables, "Nominal depth" is the depth for which the float was loaded; "Observed depth" is that calculated by the method given below the table. Three methods of calculating depths were used; (1) triangulation using the angle between the received sound ray and the horizontal (derived from the time difference observed on a fore-and-aft pair of hydrophones) combined with a horizontal range derived from the observed rate of approach (2) from the time difference between the direct sound and the bottom reflection, and the known depth of water, at the instant of passing over the float (3) from the time difference between the bottom reflection and a ray reflected first at the surface and then at the bottom. These three methods are given in increasing order of accuracy but the latter two could not always be applied because reflections were not always observable. "S.D." and "S.D.mean" are the standard deviation of a single depth observation and the standard deviation of the mean, given in cases where the number of depth estimates seemed sufficient.

North-south and east-west components of displacement are tabulated and plotted as functions of time. These lists of times and positions are sufficiently detailed to allow the trajectories to be reconstructed with as much accuracy as the navigation allows.

Velocities between fixes are given as well as mean speeds and velocities along each trajectory. No attempt has been made to fit straight lines or oscillations to the tabulated displacements.

The floats were part of a batch of 28 numbered originally in sequence when their densities and payloads were determined; they have

subsequently been re-numbered in chronological order of use in the sea. These new serial numbers and the original designations are listed below.

LIST OF FLOATS

Serial No	Original Designation	Date and Time Laid
209	18	0710A/8.II.69
210	22	2316A/21.II.69
211	10	0645A/22.II.69
212	26	1810A/22.II.69
213	6	1856A/22.II.69
214	16	1538A/23.II.69
215	28	1637A/23.II.69
216	1	1759A/28.II.69
217	27	1851A/28.II.69
218	13	1934A/28.II.69
219	5	2024A/28.II.69
220	11	1855A/8.III.69
221	23	1939A/8.III.69
222	3	2025A/8.III.69
223	14	2108A/8.III.69
224	25	1229A/9.III.69
225	17	1315A/9.III.69
226	4	0450A/14.III.69
227	20	0527A/14.III.69

REFERENCES

1. SWALLOW, J.C. and B.V. HAMON, 1960 Some measurements of deep currents in the Eastern North Atlantic. Deep-Sea Research, Vol.6, pp.155-168.

2. TUCKER, M.J. and C.A. HUNTER, 1969. A stable very low-frequency multivibrator. Electronic Engineering, Vol.41, No. 499, pp.37-39.

3. TUCKER, M.J. 1969. The potentialities of sonar as a research and commercial tool. Journal of Sound and Vibration, Vol.9, No.2, pp.173-180.

FLOAT DESIGNATION: 18   Date and time laid: 0710A/8.II.69.
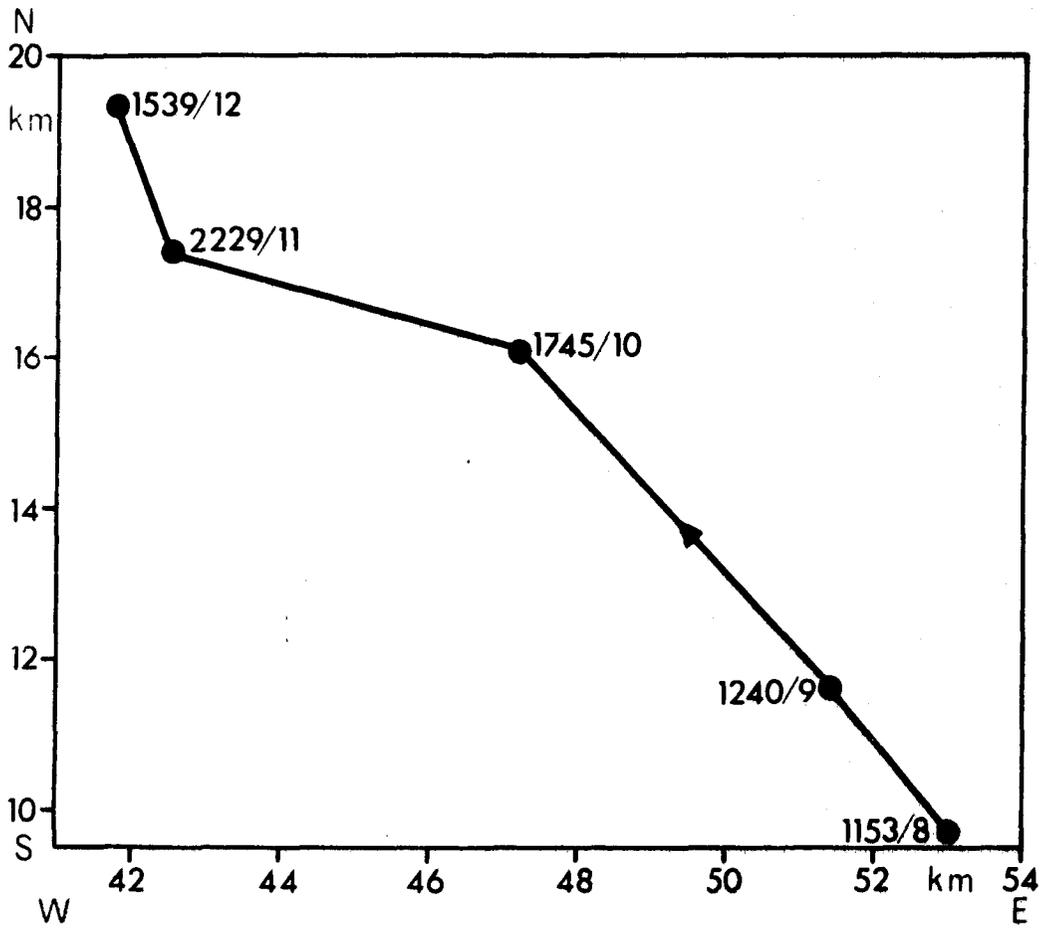
FLOAT DESIGNATION: 18   Date and time laid 0710A/8.II.69

Position laid: 41° 42'·0N, 5° 03'·9E   Displacement origin: 41° 37'·0N
         (53·5km.E, 9·2km.N)   4° 25'·●E

Navigation based on: Radar on anchored buoy + Satellite Fixes

Estimated accuracy of positions: ± 0·5km

Depth (m):

	Nominal	Observed	S.D.	S.D.(mean)
	800	760*	-	-

Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocities between fixes cm/sec	Velocities between fixes °T
1	8.II	1153	41°42'·2	5°03'·5	4·7	53·0	9·7		
								2·9	318
2	9.II	1240	41°43'·3	5°02'·4	29·5	51·4	11·6		
								5·7	318
3	10.II	1745	41°45'·7	4°59'·3	58·6	47·2	16·1		
								4·6	286
4	11.II	2229	41°46'·4	4°56'·0	87·3	42·5	17·4		
								3·4	339
5	12.II	1539	41°47'·5	4°55'·4	104·5	41·8	19·3		

Mean speed along trajectory = 4·3cm/sec
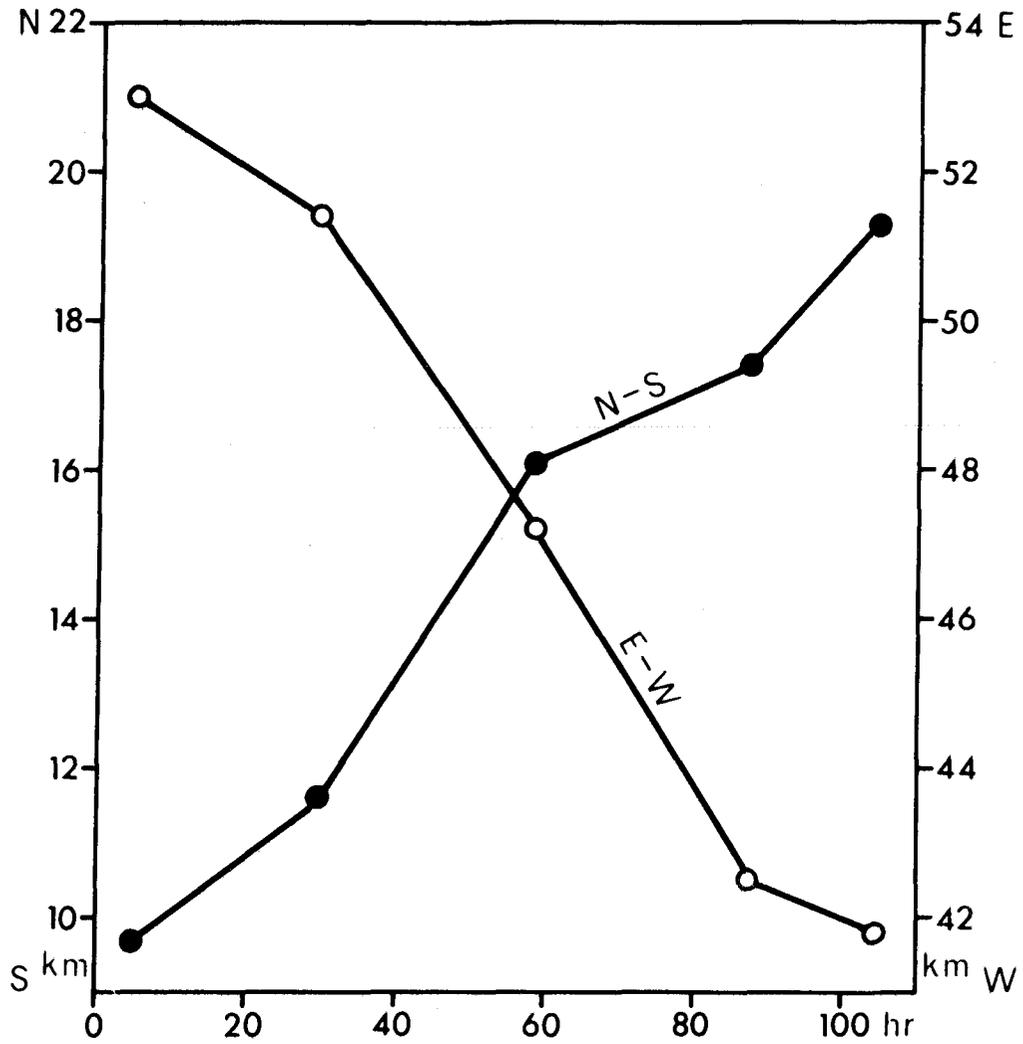
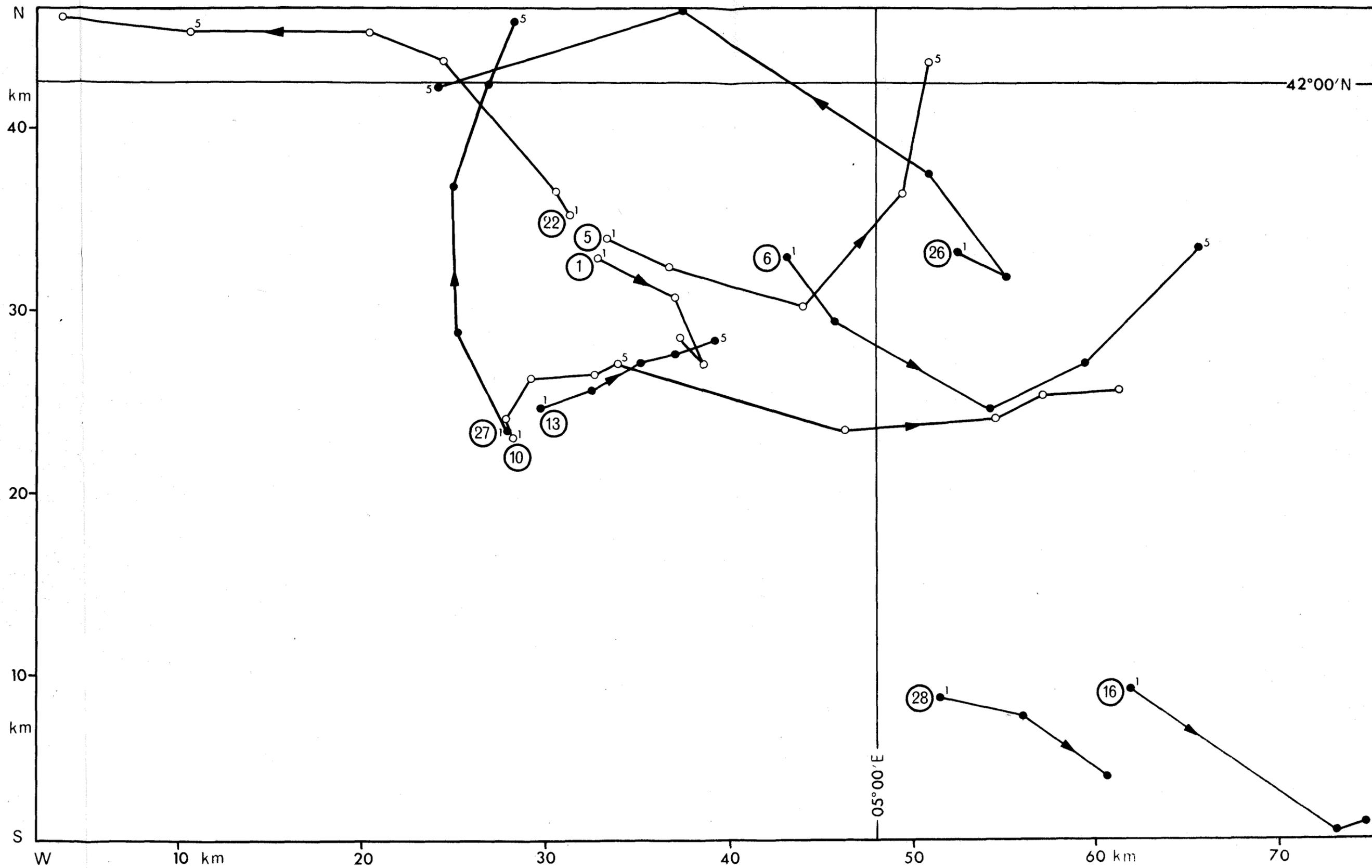Mean velocity, fixes 1-5, = 4·1cm/sec, 311°T

* By bottom reflections (2 observations)

FLOAT DESIGNATION: 18   Date and time laid: 0710A/8.II.69.

FLOAT DESIGNATIONS: 10(laid 0645/22.II.69), 26(laid 1810/22.II.69), 6(laid 1856/22.II.69), 16(laid 1538/23.II.69), 28(laid 1637/23.II.69), 1(laid 1759/28.II.69), 27(laid 1851/28.II.69), 13(laid 1934/28.II.69), 5(laid 2024/28.II.69).

FLOAT DESIGNATION: 22   Date and time laid 2316A/21.II.69

Position laid: 41° 55'·2N, 4°48'·1E   Displacement origin: 41° 37'·0N
            (31·8km.E, 33·8km.N)   4°25'·0E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	500	514[*]	±20	-

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	22.II	0320	41°56'·0	4°47·7	4·1	31·2	35·2		
								9·2	329
2	22.II	0754	41°56'·7	4°47'·2	8·6	30·4	36·5		
								14·9	319
3	23.II	0118	42°00'·5	4°42'·7	26·0	24·3	43·6		
								11·0	292
4	23.II	1210	42°01'·4	4°39'·7	36·9	20·2	45·2		
								15·1	270
5	24.II	0614	42°01'·4	4°32'·6	55·0	10·3	45·2		
								13·9	277
6	24.II	2040	42°01'·9	4°27'·4	69·4	3·2	46·1		

Mean speed along trajectory = 13·7 cm/sec

Mean velocity, fixes 1-6, = 12·8 cm/sec, 292°T

[*]   By bottom reflections and triangulation

FLOAT DESIGNATION: 22   Date and time laid: 2316A/21.II.69.
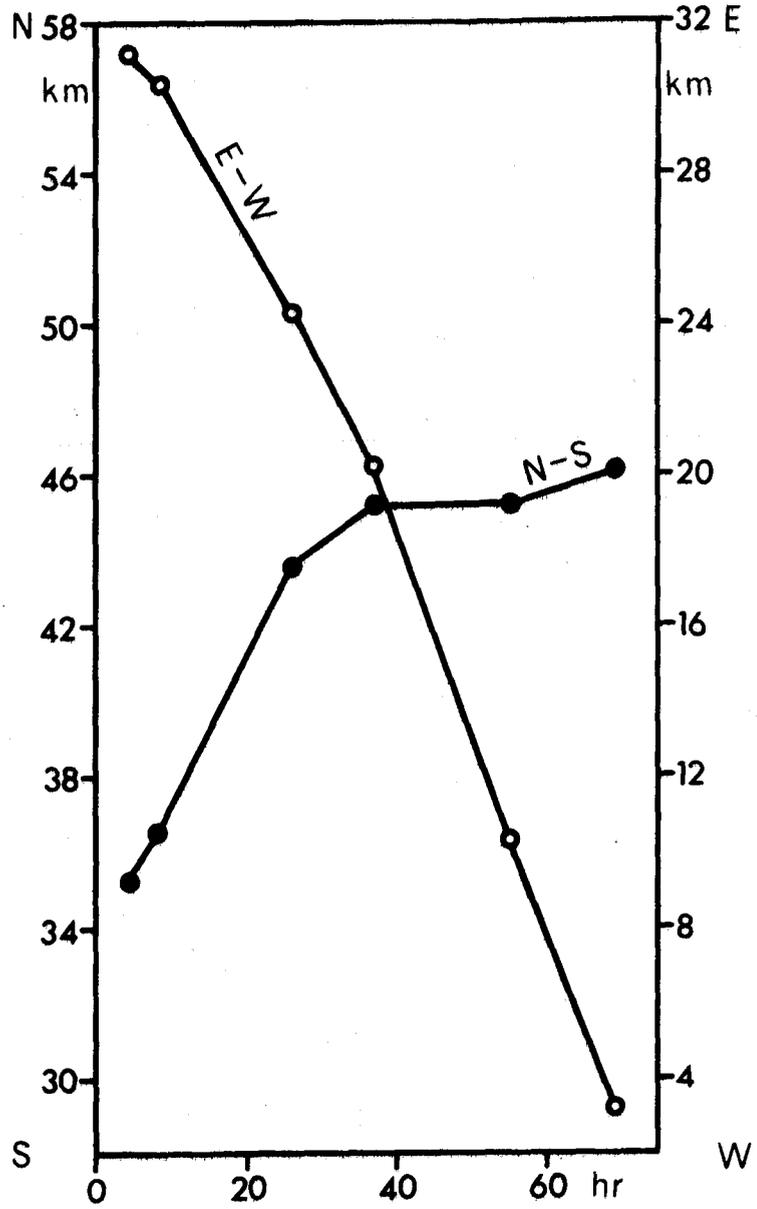
FLOAT DESIGNATION: 10   Date and time laid 0645A/22.II.69

Position laid: 41° 48'·9N, 4° 44'·4E   Displacement origin: 41° 37'·ON
           (26·6km E, 22·1km N)   4° 25'·0E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	500	496*	±20	–

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E–W x	+N–S y	Velocity between fixes cm/sec	°T
1	22.II	0920	41°49'·4	4°45'·5	2·6	28·1	23·0	12·6	337
2	22.II	1200	41°50'·0	4°45'·2	5·3	27·7	24·0	3·2	032
3	23.II	0348	41°50'·8	4°45'·8	21·1	28·6	25·5	2·5	035
4	23.II	1349	41°51'·2	4°46'·2	31·1	29·0	26·2	5·4	087
5	24.II	0817	41°51'·3	4°48'·8	49·5	32·6	26·4	2·5	064
6	24.II	2251	41°51'·6	4°49'·7	64·1	33·9	27·1	8·1	106
7	26.II	1936	41°49'·6	4°58'·7	108·8	46·3	23·4	16·3	085
8	27.II	0936	41°50'·0	5°04'·7	122·8	54·5	24·0	8·9	063
9	27.II	1842	41°50'·7	5°06'·5	132·0	57·2	25·4	5·9	086
10	28.II	1332	41°50'·8	5°09'·5	150·8	61·2	25·6		

Mean speed along trajectory = 6·9cm/sec

Mean velocity, fixes 1–10, = 6·2cm/sec, 085°T

* By bottom reflections and triangulation

FLOAT DESIGNATION: 10   Date and time laid: 0645A/22.II.69.
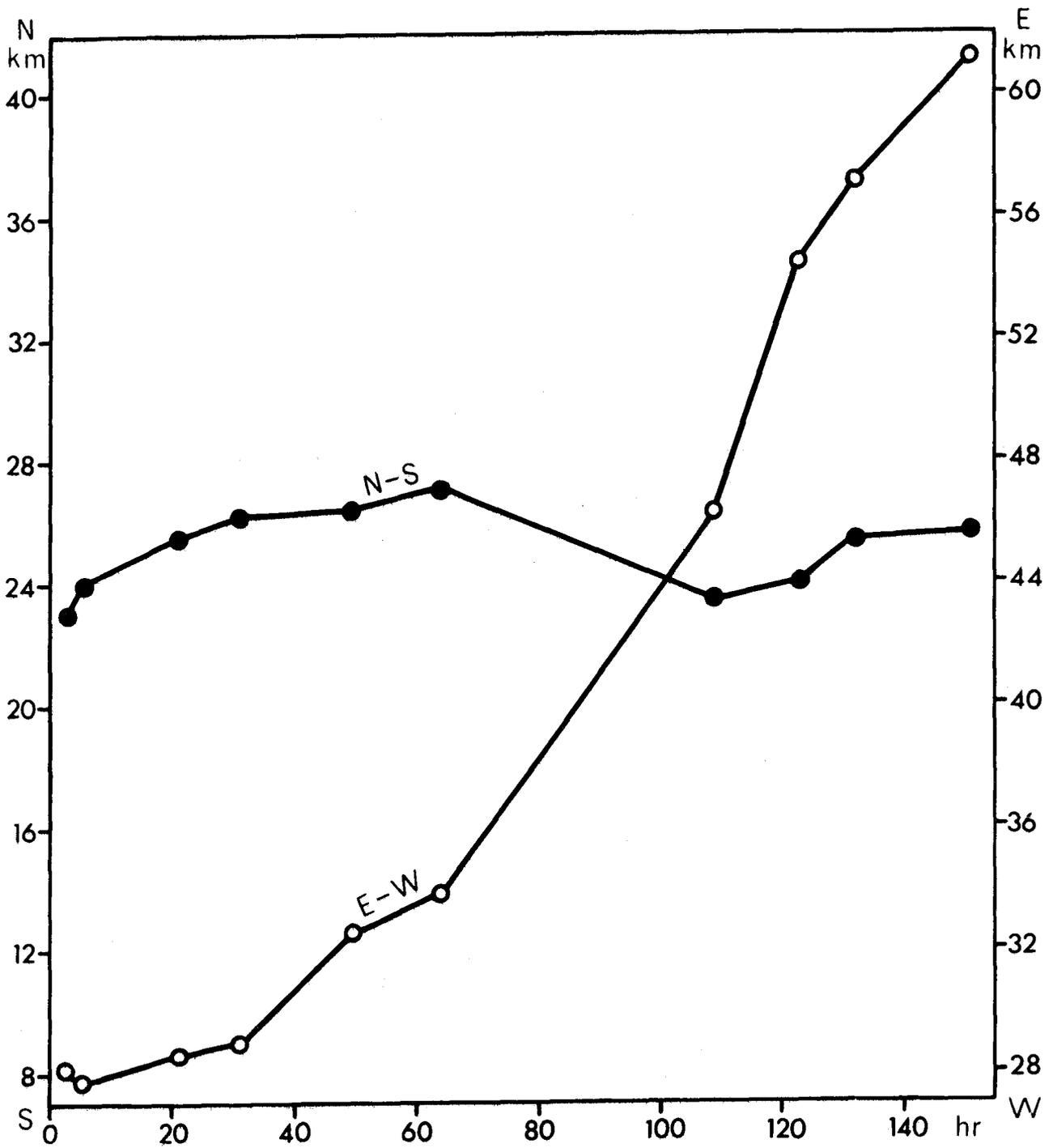
FLOAT DESIGNATION: 26   Date and time laid 1810A/22.II.69

Position laid: 41° 56'·0N, 5°03'·2E   Displacement origin: 41° 37'·0N,
                (52·7km.E, 35·3km.N)   4°25'·0E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	500	558*	±80	—

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	22.II	2205	41°54'·9	5°03'·1	3·9	52·5	33·2		
								7·6	117
2	23.II	0907	41°54'·2	5°05'·2	15·0	55·2	31·8		
								12·3	324
3	24.II	0047	41°57'·2	5°02'·1	30·6	51·0	37·4		
								26·5	303
4	24.II	1754	42°02'·1	4°52'·2	47·7	36·5	46·5		
								20·1	252
5	25.II	1318	41°59'·8	4°42'·4	67·1	24·0	42·2		

Mean speed along trajectory = 17·7 cm/sec

Mean velocity, fixes 1-5, = 13·1cm/sec, 287°T

* By reflections (2 observations only).

FLOAT DESIGNATION: 26   Date and time laid: 1810A/22.II.69.
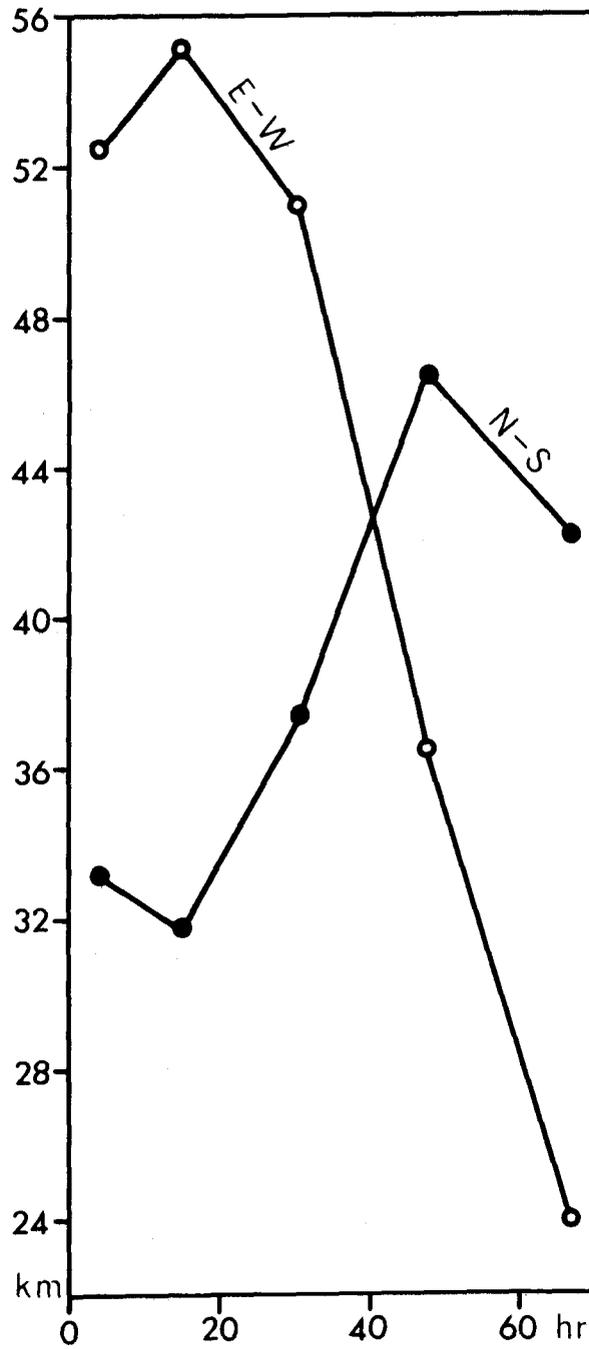
FLOAT DESIGNATION: 6   Date and time laid 1856A/22.II.69

Position laid: 41° 56'·0N, 4° 56'·8E   Displacement origin: 41° 37'·0N
(43·8km.E, 35·2km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
             500   518*   ±20   –

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	22.II	2310	41°54'·8	4°56'·4	4·2	43·1	33·0		
2	23.II	1008	41°52'·8	4°58'·3	15·2	45·7	29·3	11·4	144
3	24.II	0223	41°50'·3	5°04'·4	31·5	54·2	24·6	16·6	119
4	24.II	1438	41°51'·6	5°08'·2	43·7	59·3	27·0	12·9	064
5	25.II	0823	41°55'·0	5°12'·6	61·5	65·4	33·4	13·8	043

Mean speed along trajectory = 14·0 cm/sec

Mean velocity, fixes 1-5, = 10·9 cm/sec, 089°T

* By reflections and triangulation

FLOAT DESIGNATION: 6   Date and time laid: 1856A/22.II.69.

15
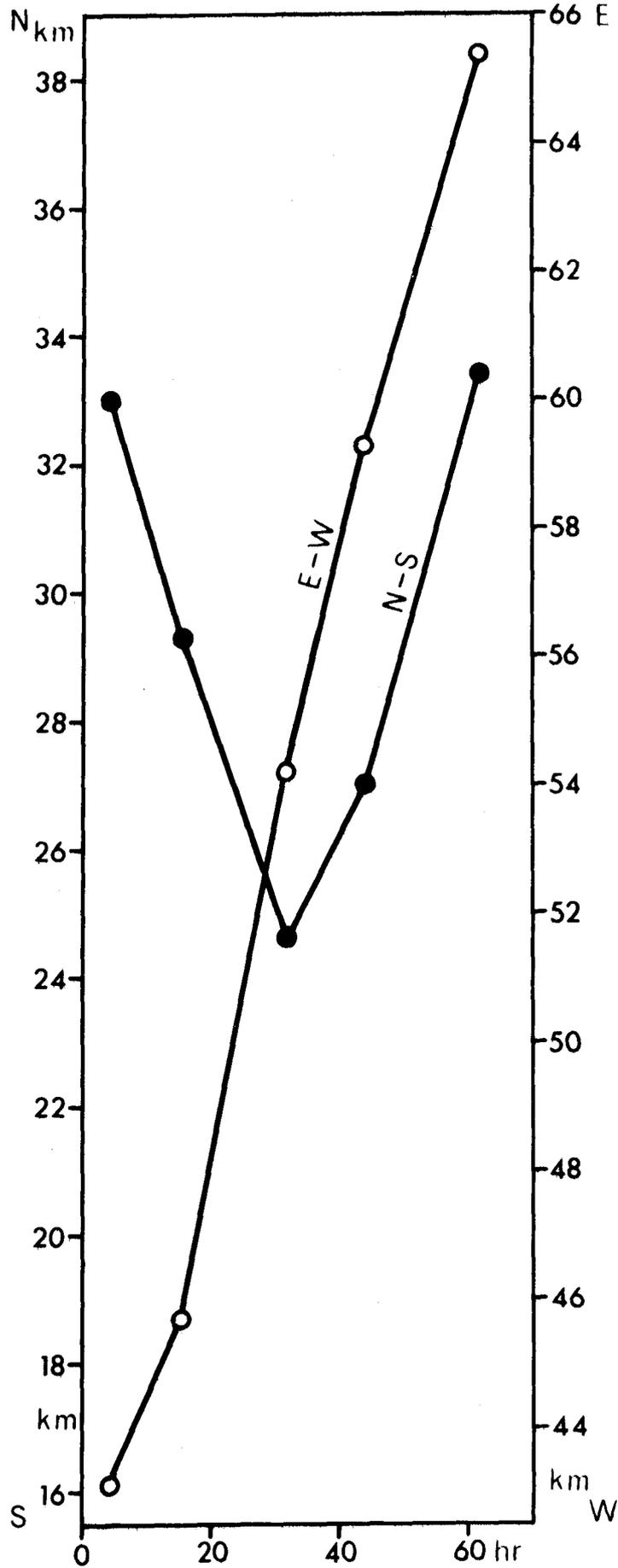
FLOAT DESIGNATION: 16   Date and time laid 1538A/23.II.69

Position laid: 41° 42'·7N, 5° 07'·7E Displacement origin: 41° 37'·0N
               (58·7km.E, 10·6km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0·5km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
              500   504*   ±4   -

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	23.II	2028	41°42'·0	5°10'·0	4·8	61·8	9·3	23·8	125
2	24.II	1227	41°37'·8	5°18'·2	20·8	73·2	1·6	3·2	072
3	25.II	0223	41°38'·1	5°19'·3	34·8	74·7	2·0		

Mean speed along trajectory = 14·2 cm/sec

Mean velocity, Fixes 1-3, = 13·7 cm/sec, 120°T

* From surface-bottom reflections (2 observations only).

FLOAT DESIGNATION: 16   Date and time laid: 1538A/23.II.69.
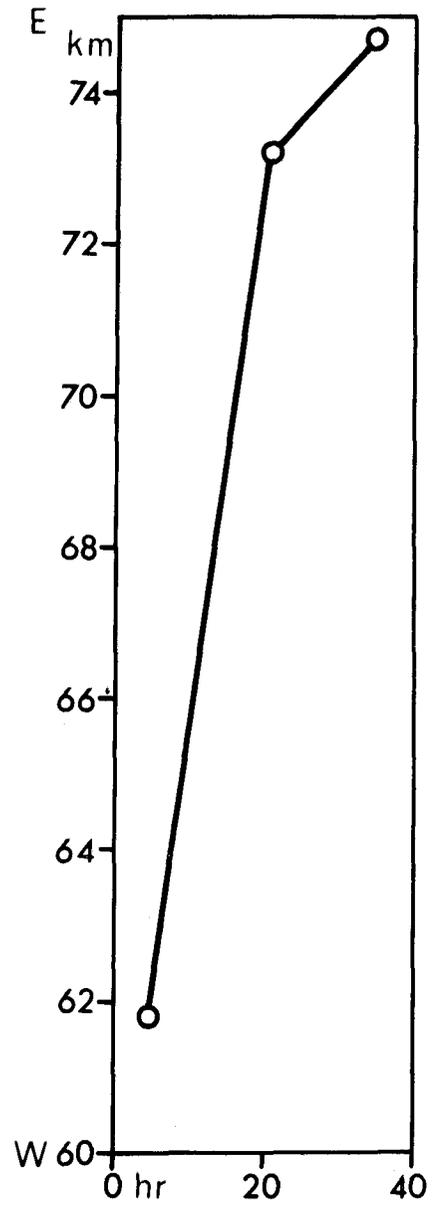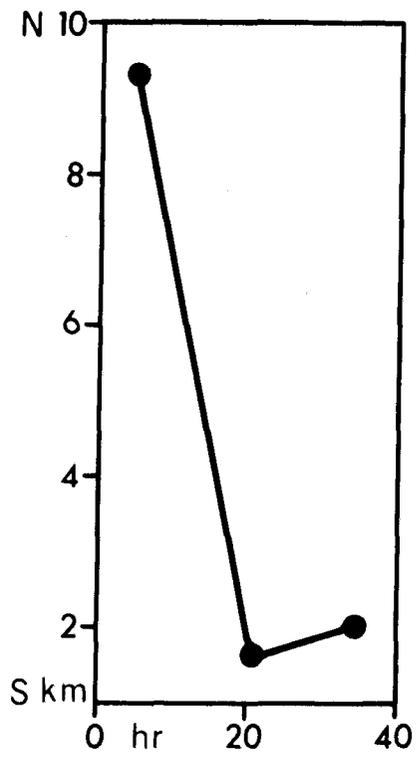
FLOAT DESIGNATION: 28   Date and time laid 1637A/23.II.69

Position laid: 41°42'•1N, 5°00'•9E   Displacement origin: 41°37'•0N
            (49•4km.E, 9•5km.N)   4°25'•0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0•5 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
              500   481*   —   —

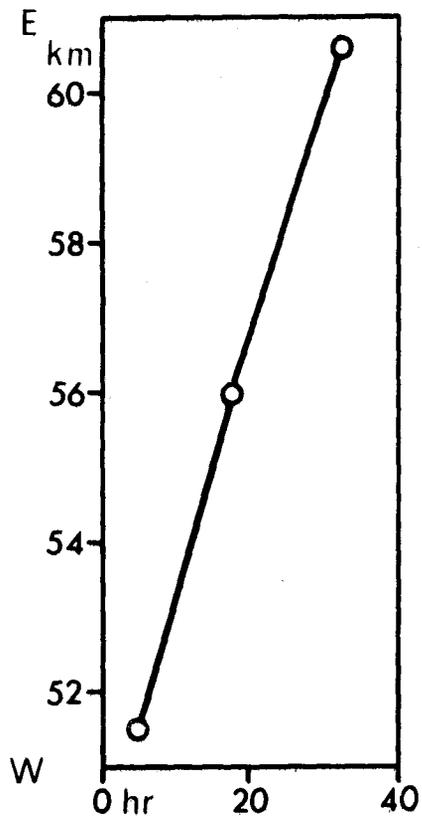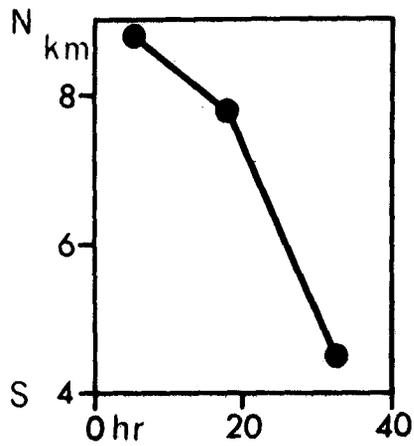| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	23.II	2137	41°41'•7	5°02'•4	5•0	51•5	8•8		
								10•1	103
2	24.II	1012	41°41'•2	5°05'•7	17•6	56•0	7•8		
								10•6	126
3	25.II	0053	41°39'•4	5°09'•0	32•3	60•6	4•5		

Mean speed along trajectory = 10•4 cm/sec

Mean velocity, fixes 1-3, = 10•2 cm/sec, 115°T

*   Surface-bottom reflection (1 observation only)

FLOAT DESIGNATION: 28   Date and time laid: 1637A/23.II.69.

FLOAT DESIGNATION: 1   Date and time laid 1759A/28.II.69

Position laid: 41° 55'·1N, 4°48'·4E   Displacement origin: 41°37'·0N
(32·2 km.E,33·5 km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	1500	1307[*]	±16	±6

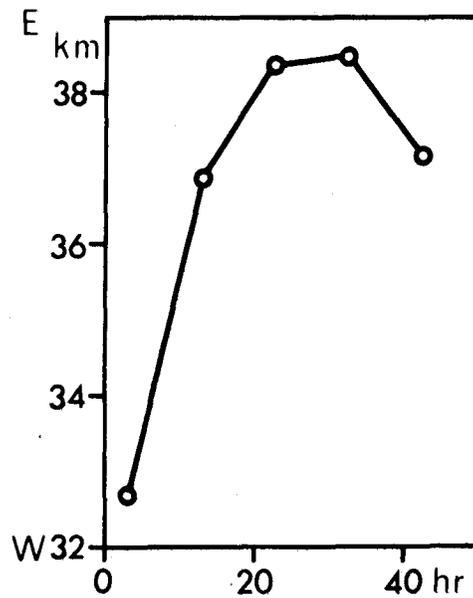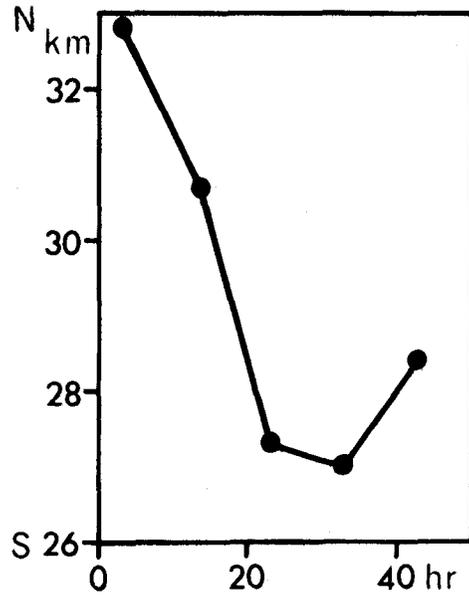| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocity between fixes cm/sec	Velocity between fixes °T
1	28.II	2105	41°54'·7	4°46'·8	3·1	32·7	32·8		
2	1.III	0716	41°53'·6	4°51'·8	13·3	36·9	30·7	12·8	117
3	1.III	1702	41°51'·8	4°53'·0	23·1	38·4	27·3	10·6	155
4	2.III	0249	41°51'·6	4°53'·0	32·8	38·5	27·0	1·1	170
5	2.III	1249	41°52'·3	4°52'·1	42·8	37·2	28·4	5·3	318

Mean speed along trajectory = 7·5 cm/sec

Mean velocity, fixes 1-5, = 4·3 cm/sec, 135°T

[*] By reflection (7 observations)

FLOAT DESIGNATION: 1   Date and time laid: 1759A/28.II.69.

FLOAT DESIGNATION: 27   Date and time laid 1851A/28.II.69

Position laid: 41° 49'·6N, 4° 45'·5E   Displacement origin: 41° 37'·0N
               (28·3km.E, 23·4km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± ●·5 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
               1500   1388*   ±5   –

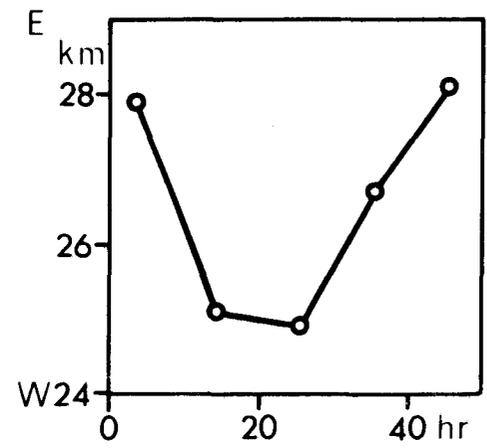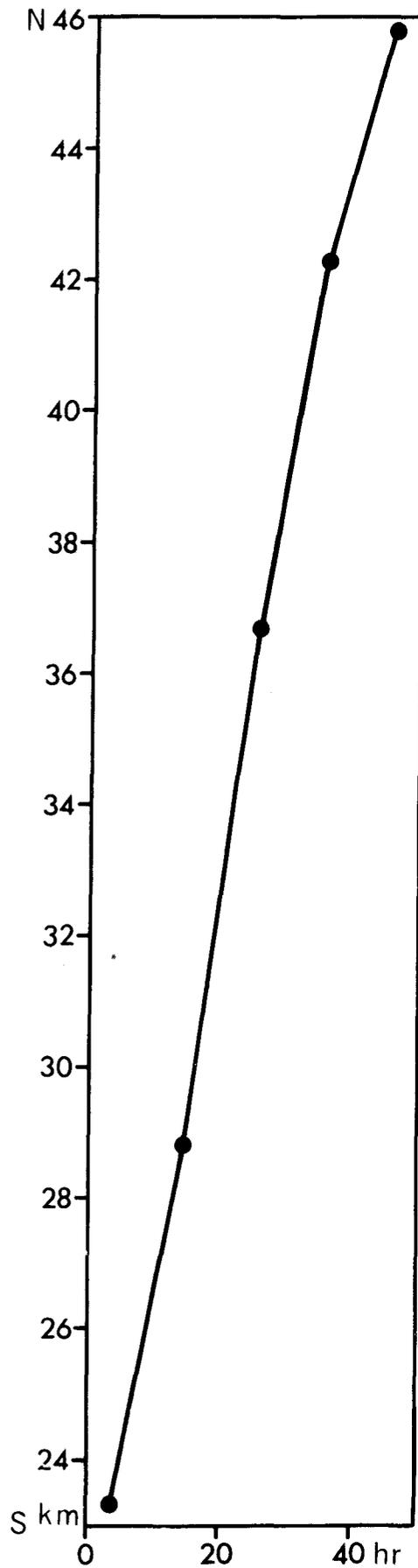| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E	Hours Since Laid (t)	Displacement(km) +E–W x	Displacement(km) +N–S y	Velocity between fixes cm/sec	Velocity between fixes °T
1	28.II	2215	41°49'·6	4°45'·3	3·4	27·9	23·3		
								15·6	333
2	1.III	0905	41°52'·5	4°43'·3	14·2	25·1	28·8		
								19·2	358
3	1.III	2032	41°56'·8	4°43'·1	25·7	24·9	36·7		
								16·4	019
4	2.III	0622	41°59'·8	4°44'·4	35·5	26·7	42·3		
								10·7	022
5	2.III	1614	42°01'·7	4°45'·4	45·4	28·1	45·8		

Mean speed along trajectory = 15·6 cm/sec

Mean velocity, fixes 1-5, = 14·9 cm/sec, 001°T

* Surface-bottom reflections (2 observations only)

FLOAT DESIGNATION: 27   Date and time laid: 1851A/28.II.69.

FLOAT DESIGNATION: 13   Date and time laid 1934A/28.II.69

Position laid: 41° 49'·7N, 4° 45'·6E   Displacement origin: 41° 37'·0N
             (28·3 km,E, 23·6 km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):	Nominal	Observed	S.D.	S.D.(mean)
	500	5●3*	±2	–

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	28.II	2241	41°50'·3	4°46'·5	3·1	29·5	24·6		
								8·9	071
2	1.III	0805	41°50'·8	4°48'·6	12·5	32·4	25·6		
								7·9	060
3	1.III	1900	41°51'·6	4°50'·5	23·4	35·1	27·1		
								6·8	076
4	2.III	0311	41°51'·9	4°51'·9	31·6	37·0	27·6		
								6·5	071
5	2.III	1238	41°52'·3	4°53'·4	41·1	39·0	28·3		

Mean speed along trajectory = 7·5 cm/sec

Mean velocity, fixes 1-5, = 7·5 cm/sec, 069°T

* Surface-bottom reflections (5 observations)

FLOAT DESIGNATION: 13   Date and time laid: 1934A/28.II.69.
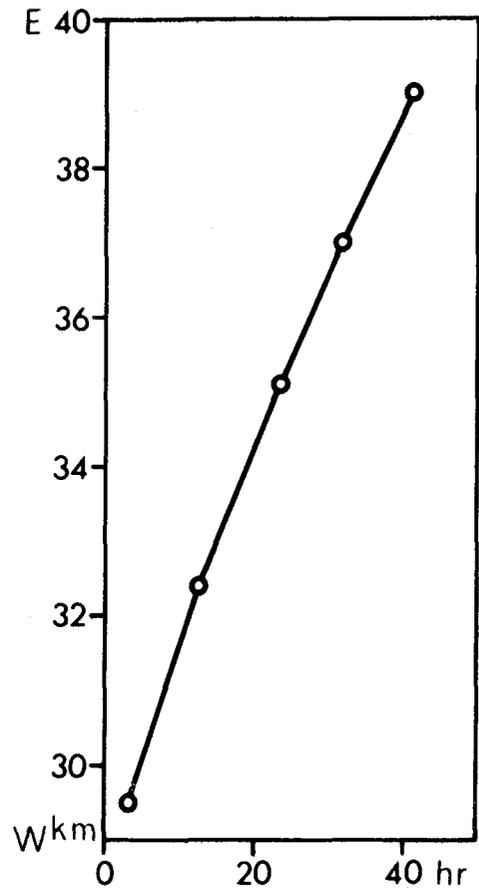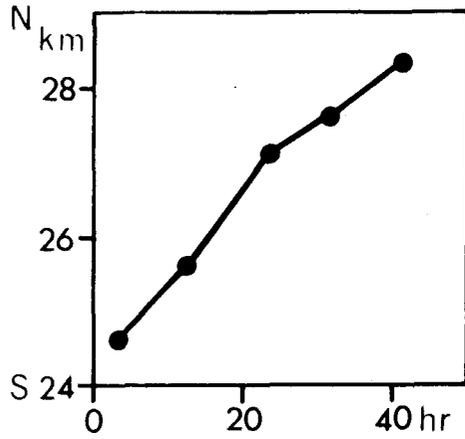
FLOAT DESIGNATION: 5   Date and time laid 2024A/28.II.69

Position laid: 41° 55'·2N 4° 48'·7E.   Displacement origin: 41° 37'·0N
                 (32·6 km.E, 33·7 km.N)   4° 25'·0E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):   Nominal   Observed*   S.D.   S.D.(mean)
               500   248*   ±13   ±6

Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E	Hours Since Laid (t)	Displacement (km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	28.II	2339	41°55'·3	4°49'·2	3·3	33·2	34·0		
								15·3	116
2	1.III	0632	41°54'·4	4°51'·6	10·1	36·6	32·3		
								18·5	106
3	1.III	1756	41°53'·2	4°57'·0	21·5	44·0	30·2		
								21·4	041
4	2.III	0450	41°56'·7	5°01'·0	32·4	49·5	36·5		
								21·1	011
5	2.III	1419	42°00'·5	5°02'·0	41·9	51·0	43·5		

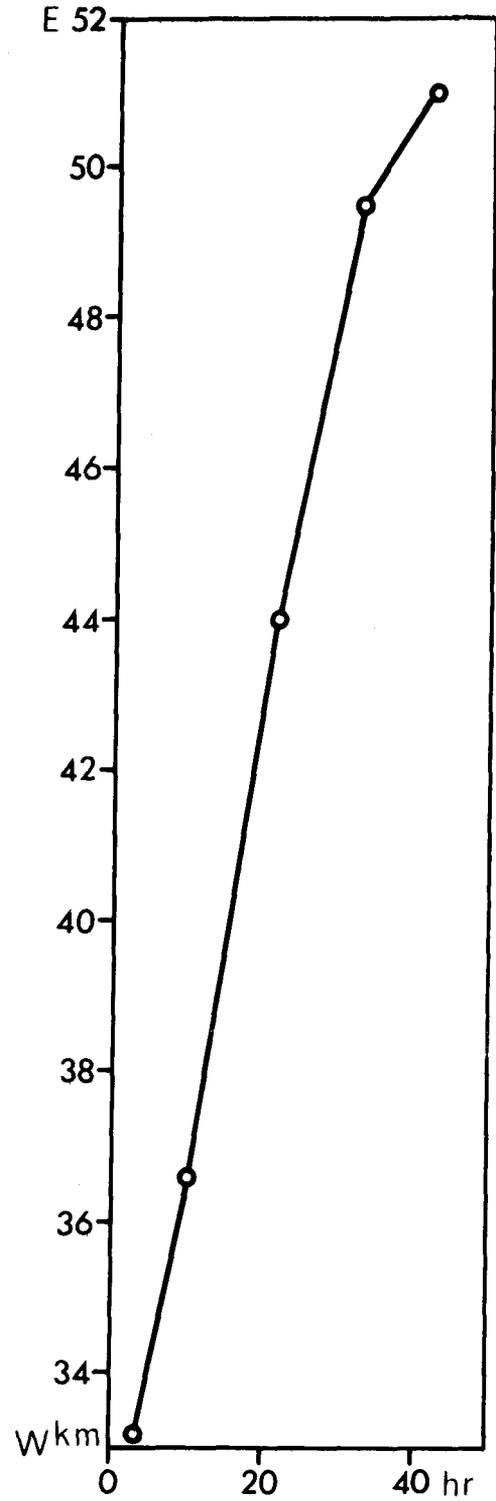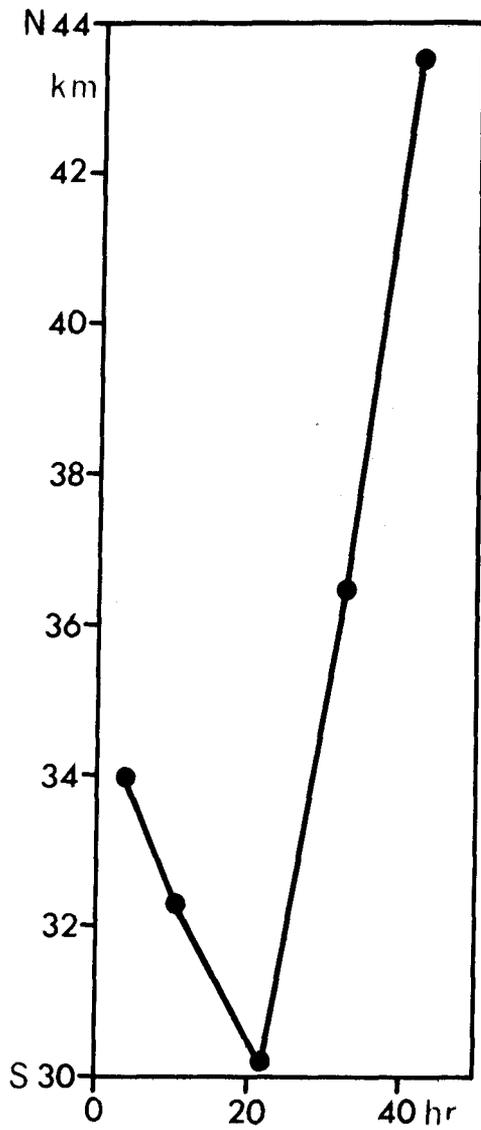Mean speed along trajectory = 19·4 cm/sec

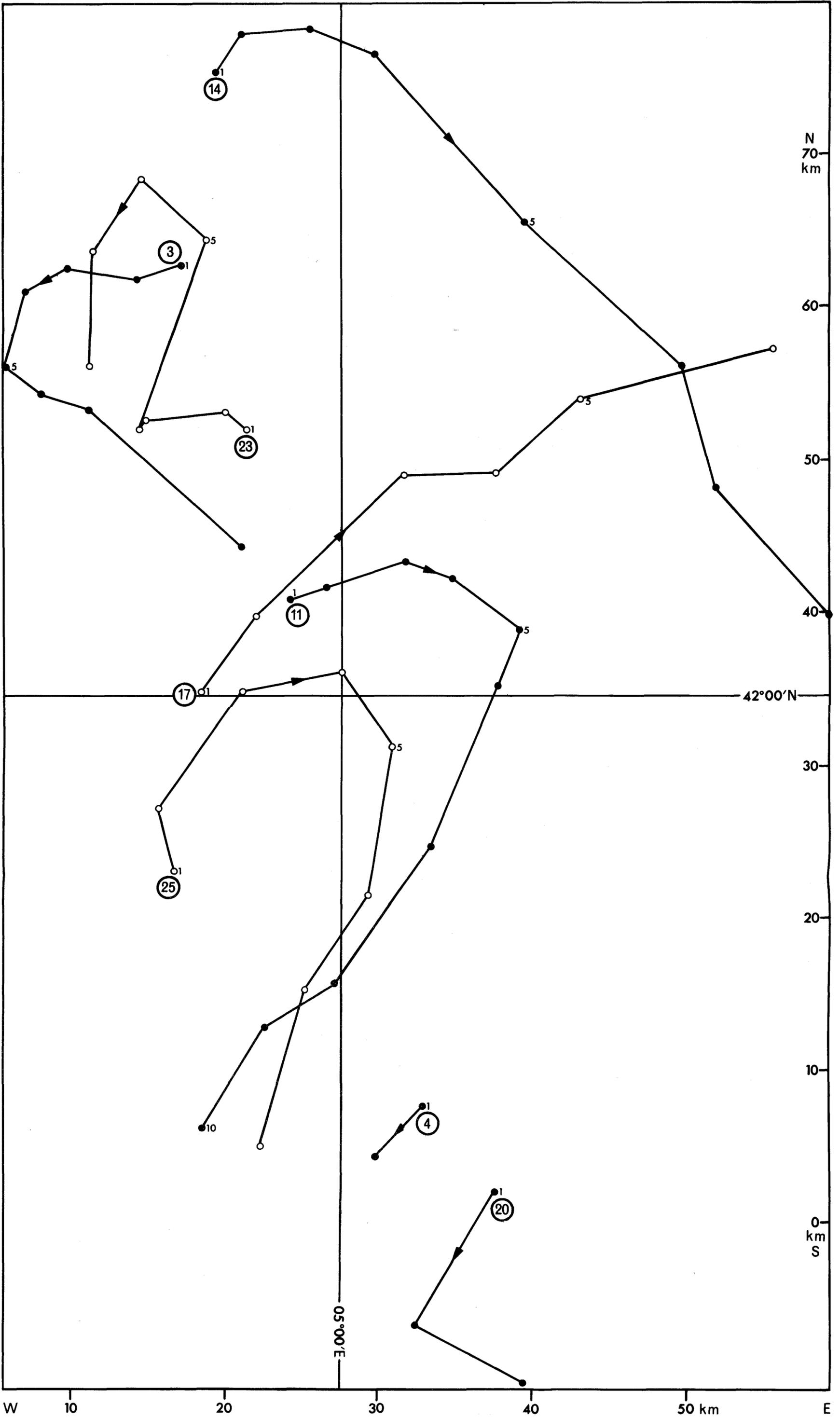Mean velocity, fixes 1-5, = 14·4 cm/sec, 061°T

* Surface-bottom reflections (5 observations)

FLOAT DESIGNATION: 5   Date and time laid: 2024A/28.II.69.

FLOAT DESIGNATIONS: 11(laid 1855/8.III.69), 23(laid 1939/8.III.69), 3(laid 2025/8.III.69), 14 (laid 2108/8.III.69), 25(laid 1229/9.III.69), 17(laid 1315/9.III.69), 4(laid 0450/14.III.69), 20 (laid 0527/14.III.69).

FLOAT DESIGNATION: 11   Date and time laid 1855A/8.III.69

Position laid: 42° 02'·8N, 4°56'·2E   Displacement origin: 41° 36'·N,
(22·3 km.E, 49·7 km.N.)   4° 40'E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
              500   470*   ±11   ±6

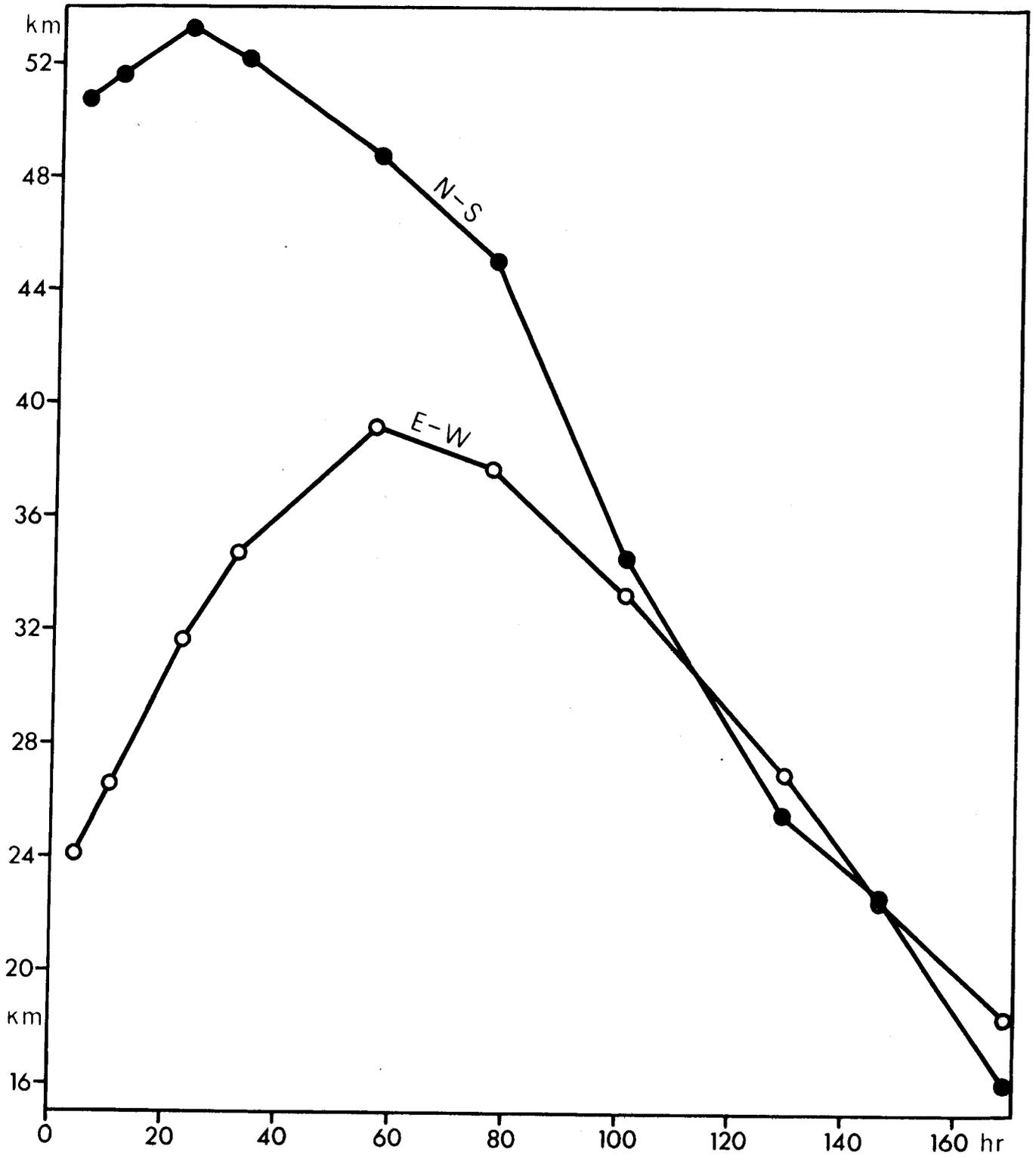| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocity between fixes cm/sec	Velocity between fixes °T
1	8.III	2305	42°03'·4	4°57'·5	4·2	24·1	50·7		
								11·9	071
2	9.III	0507	42°03'·8	4°59'·3	10·2	26·6	51·6		
								12·0	071
3	9.III	1737	42°04'·8	5°03'·0	22·7	31·7	53·3		
								9·5	110
4	10.III	0318	42°04'·2	5°05'·3	32·4	34·8	52·2		
								6·5	127
5	11.III	0250	42°02'·4	5°08'·4	55·9	39·2	48·8		
								5·3	202
6	11.III	2340	42°00'·4	5°07'·3	76·8	37·7	45·1		
								13·2	203
7	12.III	2326	41°54'·7	5°04'·2	100·5	33·3	34·6		
								10·8	215
8	14.III	0359	41°49'·8	4°59'·6	129·1	27·0	25·5		
								8·8	237
9	14.III	2106	41°48'·2	4°56'·4	146·2	22·5	22·6		
								9·5	212
10	15.III	1934	41°44'·6	4°53'·3	168·7	18·4	16·0		

Mean speed along trajectory = 9·5 cm/sec

Mean velocity, fixes 1-10, = 5·9 cm/sec, 190°T

* Surface-bottom reflections

FLOAT DESIGNATION: 11 Date and time laid: 1855A/8.III.69.

FLOAT DESIGNATION: 23   Date and time laid 1939A/8.III.69

Position laid: 42° 08'·7N, 4° 56'·1E   Displacement origin: 41° 36'·N,
              (22·2 km.E, 60·6 km.N)   4° 40'E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
                 500   532*   ±5   -

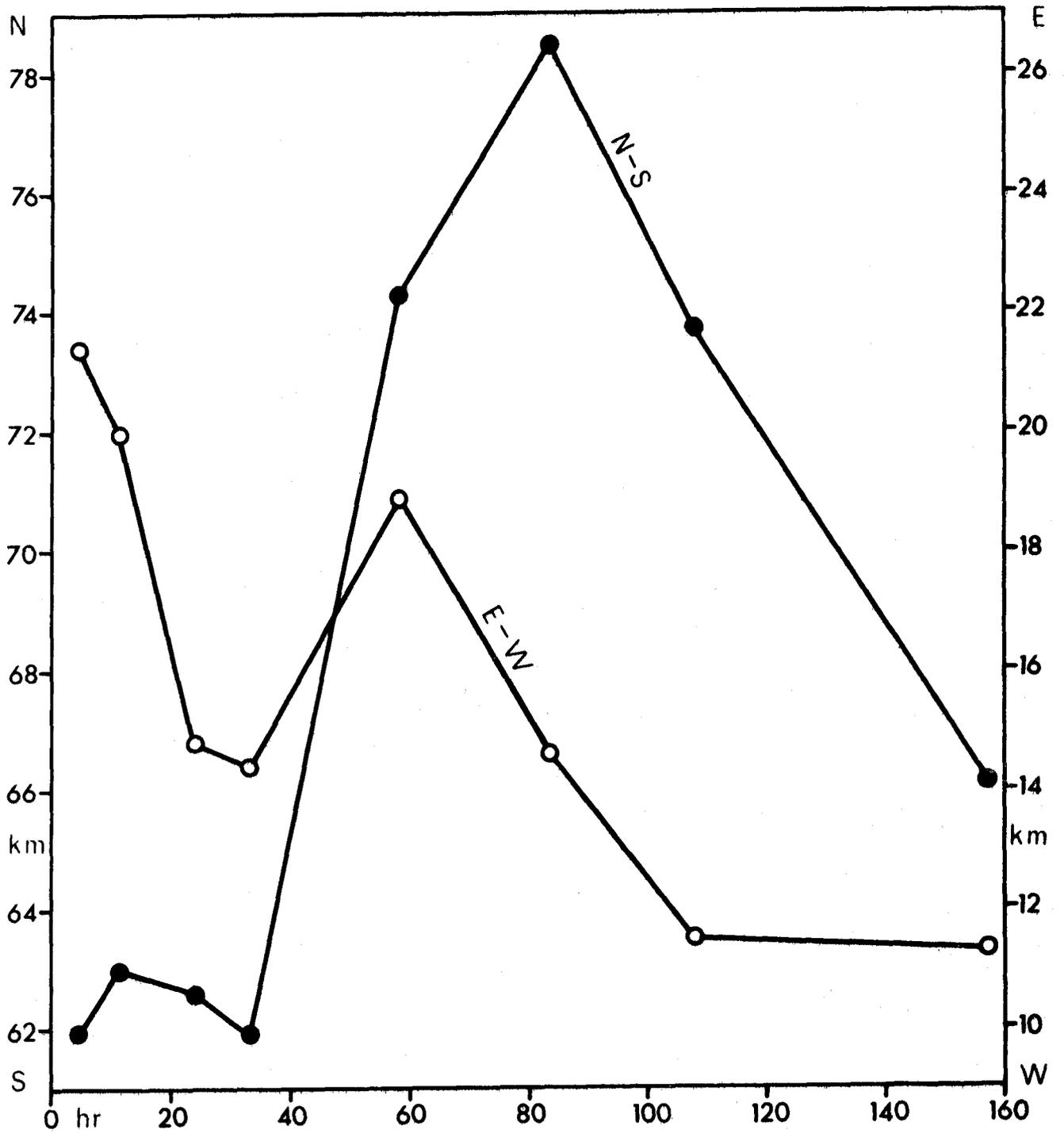| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocity between fixes cm/sec °T	
1	9.III	0015	42°09'·4	4°55'·5	4·6	21·4	61·9	7·6	310
2	9.III	0649	42°10'·0	4°54'·5	11·2	20·0	63·●	11·4	265
3	9.III	1930	42°09'·8	4°50'·7	23·9	14·8	62·6	2·4	209
4	10.III	0448	42°09'·4	4°50'·4	33·2	14·4	61·9	14·6	020
5	11.III	0556	42°16'·2	4°53'·7	58·3	18·9	74·3	6·5	313
6	12.III	0715	42°18'·4	4°50'·6	83·6	14·6	78·5	6·7	213
7	13.III	0725	42°15'·8	4°48'·3	107·8	11·5	73·7	4·2	182
8	15.III	0856	42°11'·7	4°48'·2	157·3	11·3	66·1		

Mean speed along trajectory = 7·3 cm/sec

Mean velocity, fixes 1-8, = 2·0 cm/sec 293°T

* Surface-bottom reflections (3 observations only)

FLOAT DESIGNATION: 23   Date and time laid: 1939A/8.III.69.

FLOAT DESIGNATION: 3   Date and time laid 2025A/8.III.69

Position laid: 42°15'·1N, 4° 54'·9E   Displacement origin: 41° 36'N
           (20·6 km.E, 72·5 km.N)   4° 40'E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km.

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
           500   464*   ±9   ±4

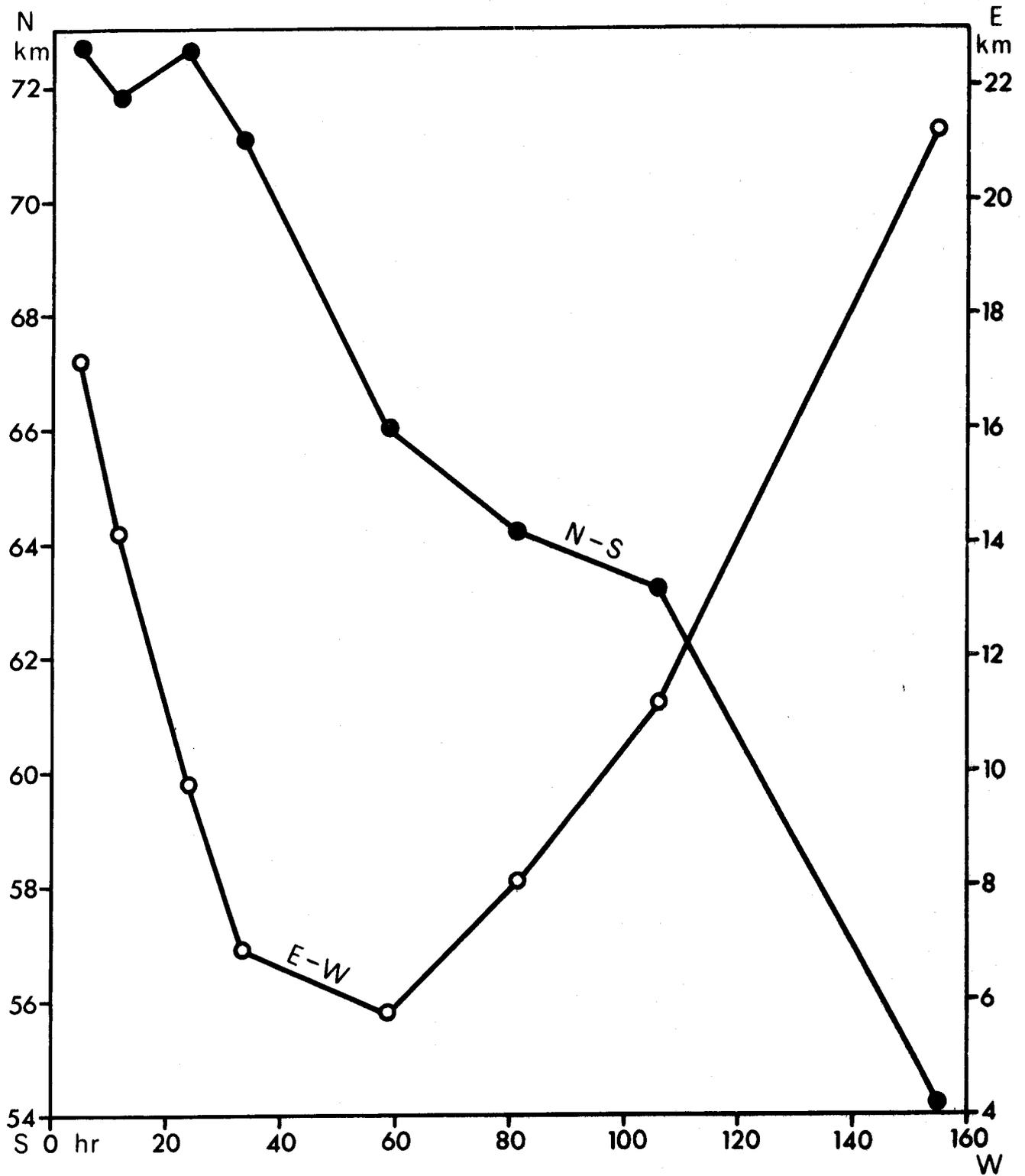| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	9.III	0113	42°15'·2	4°52'·5	4·8	17·2	72·7		
								13·2	252
2	9.III	0747	42°14'·8	4°50'·3	11·4	14·2	71·8		
								10·0	279
3	9.III	2020	42°15'·2	4°47'·1	23·9	9·8	72·6		
								9·5	242
4	10.III	0544	42°14'·4	4°45'·0	33·3	6·9	71·1		
								5·7	194
5	11.III	0706	42°11'·7	4°44'·2	58·7	5·8	66·0		
								3·6	127
6	12.III	0534	42°10'·7	4°45'·8	81·2	8·1	64·2		
								3·7	108
7	13.III	0622	42°10'·1	4°48'·1	106·0	11·2	63·2		
								7·6	132
8	15.III	0732	42°05'·2	4°55'·3	155·1	21·2	54·2		

Mean speed along trajectory = 6·6 cm/sec

Mean velocity, fixes 1-8, = 3·5 cm/sec 168°T

* Surface-bottom reflections

FLOAT DESIGNATION: 3   Date and time laid: 2025A/8.III.69.

FLOAT DESIGNATION: 14   Date and time laid 2108A/8.III.69

Position laid: 42° 21'·1N, 4° 55'·0E   Displacement origin: 41° 36'N,
          (20·7 km.E, 83·6 km.N)   4° 40'E

Navigation based on: Radar on anchored buoys + Satellite fixes + D.R.

Estimated accuracy of positions: ± 0·5 km (Fixes 6-8 ± 1 km)

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
                 50C   512*   ±2   –

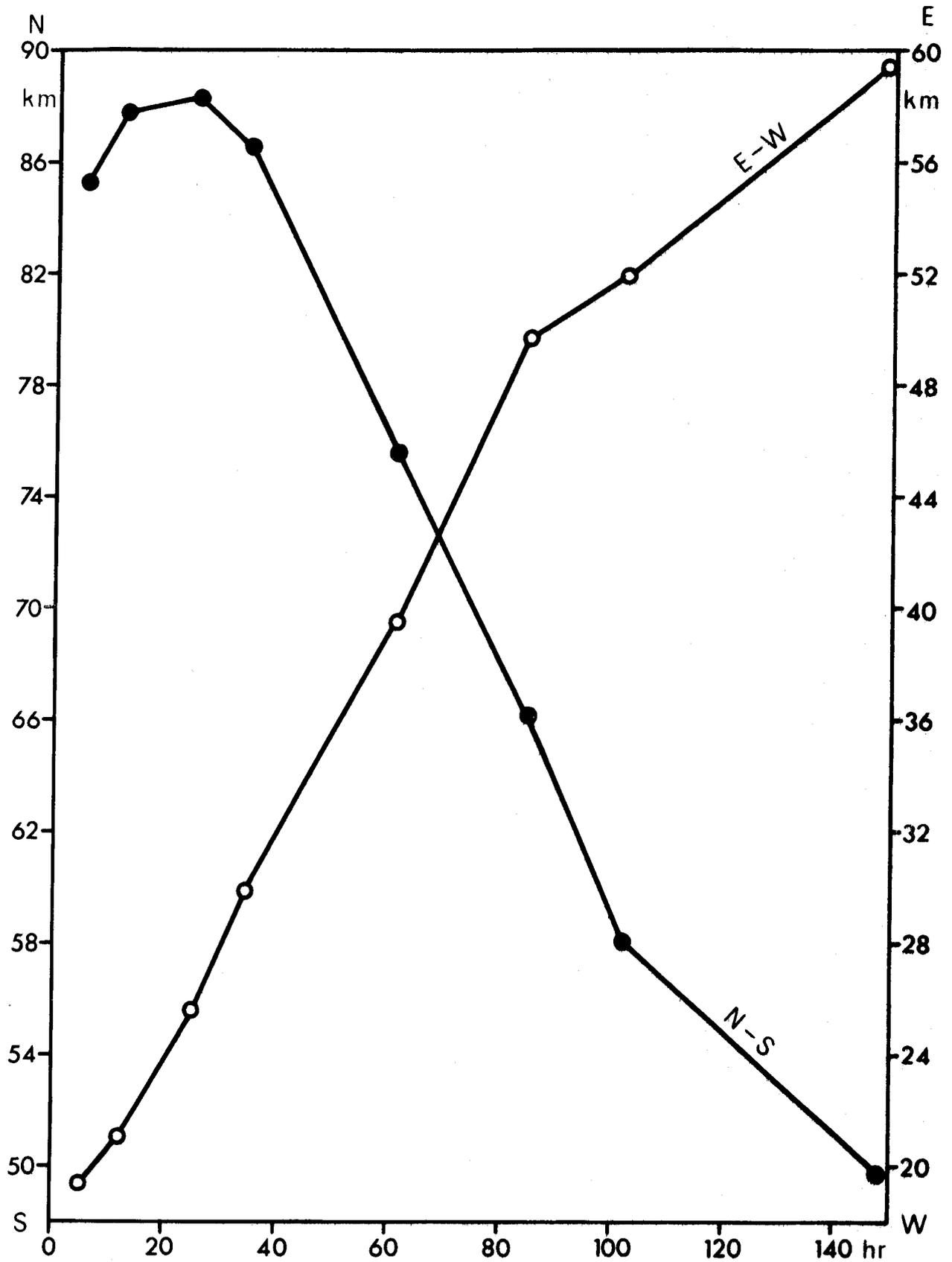| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocity between fixes cm/sec	Velocity between fixes °T
1	9.III	0219	42°22'·1	4°54'·1	5·2	19·4	85·3		
								11·8	033
2	9.III	0922	42°23'·4	4°55'·2	12·2	21·1	87·8		
								9·9	084
3	9.III	2203	42°23'·7	4°58'·5	24·9	25·6	88·3		
								13·6	113
4	10.III	0728	42°22'·8	5°01'·7	34·3	29·9	86·6		
								15·2	139
5	11.III	1010	42°16'·8	5°08'·6	61·0	39·5	75·6		
								16·4	133
6	12.III	0943	42°11'·7	5°16'·1	84·6	49·7	66·1		
								13·3	165
7	13.III	0303	42°07'·4	5°17'·7	101·9	51·9	58·1		
								6·7	138
8	15.III	0130	42°02'·9	5°23'·1	148·4	59·4	49·8		

Mean speed along trajectory = 11·7 cm/sec

Mean velocity, Fix 1- Fix 8, = 10·4 cm/sec, 132°T

*   Surface-bottom reflections (3 observations only)

FLOAT DESIGNATION: 14   Date and time laid: 2108A/8.III.69.

FLOAT DESIGNATION: 25

Date and time laid 1229A/9.III.69

Position laid: 41° 52'·9N, 4° 52'·8E
(17·6km. E, 31·4km.N)

Displacement origin: 41° 36'·N,
4° 40'E

Navigation based on: Radar on anchored buoys + Satellite fixes

Estimated accuracy of positions: ± 0·5 km.

Depth(m): Nominal   Observed   S.D.   S.D.(mean)
500   529*   ±9   -

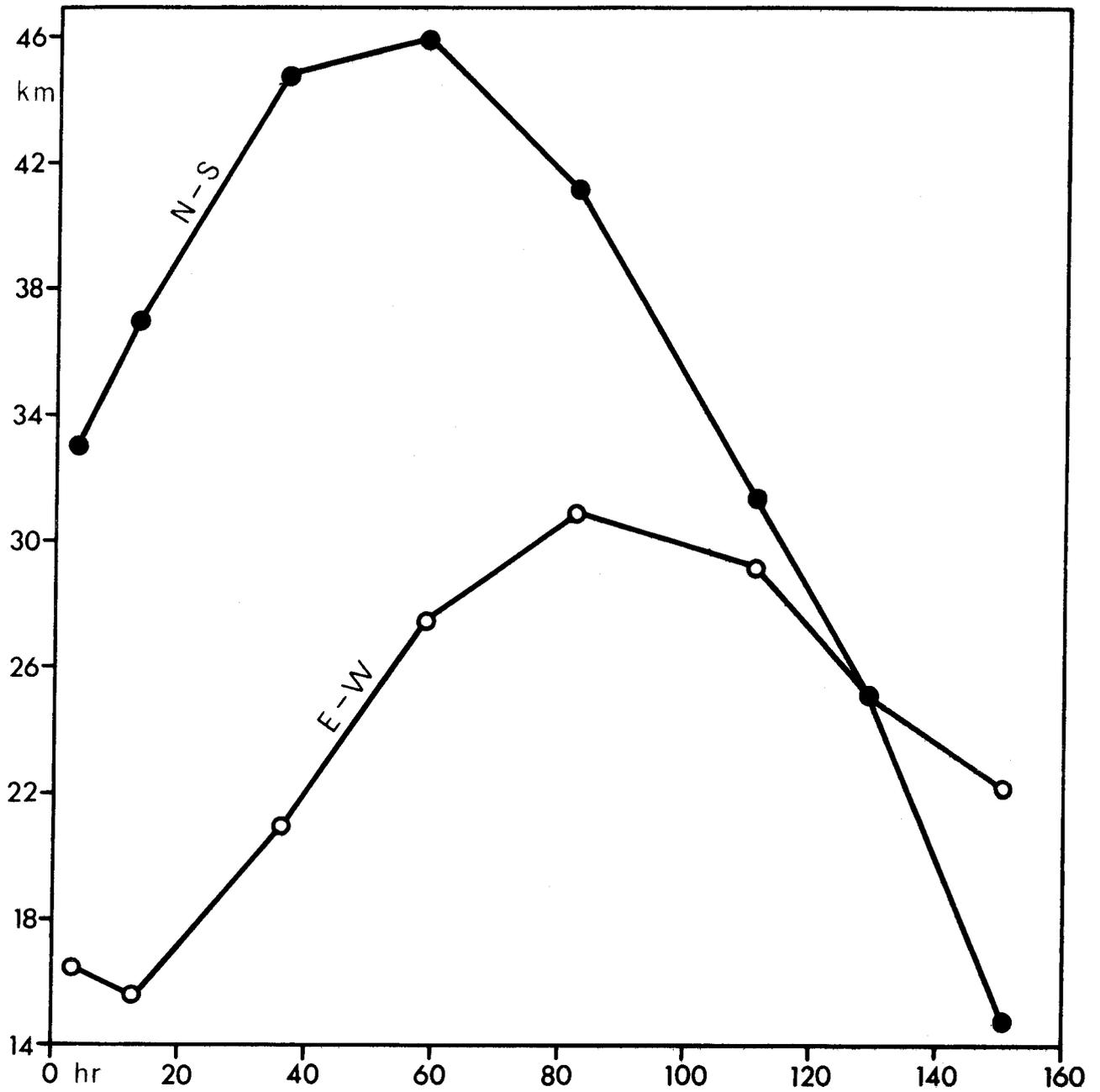| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Fix Position Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	Displacement(km) +N-S y	Velocity between fixes cm/sec	Velocity between fixes °T
1	9.III	1535	41°53'·8	4°52'·0	3·1	16·5	33·0		
								12·2	347
2	10.III	0108	41°56'·0	4°51'·3	12·7	15·6	37·0		
								11·4	034
3	11.III	0020	42°00'·2	4°55'·2	35·9	21·0	44·8		
								8·3	079
4	11.III	2252	42°00'·8	5°00'·0	58·4	27·5	46·0		
								6·9	145
5	12.III	2232	41°58'·2	5°02'·4	82·1	30·9	41·2		
								9·6	189
6	14.III	0329	41°52'·9	5°01'·3	111·0	29·2	31·4		
								11·5	213
7	14.III	2134	41°49'·5	4°58'·2	129·1	25·1	25·1		
								13·9	196
8	15.III	1859	41°44'·0	4°56'·1	150·5	22·2	14·8		

Mean speed along trajectory = 10·3 cm/sec

Mean velocity, Fix 1 - Fix 8 = 3·6 cm/sec, 163°T

* Surface-bottom reflections (3 observations only)

FLOAT DESIGNATION: 25   Date and time laid: 1229A/9.III.69.

FLOAT DESIGNATION: 17   Date and time laid 1315A/9.III.69

Position laid: 41° 59'·0N, 4° 53'·2E   Displacement origin: 41° 36'N,
(18·2km. E, 42·6 km.N.)   4°40'E

Navigation based on: Radar on anchored buoys + Satellite fixes + DR

Estimated accuracy of positions: ± 0·5 km (Fix 6 ± 1 km).

Depth (m):   Nominal   Observed   S.D.   S.D.(mean)
              500   435*   ±21   -

| Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	9.III	1630	42°00'·1	4°53'·3	3·3	18·3	44·7	17·3	036
2	10.III	0219	42°02'·8	4°55'·9	13·1	21·9	49·7	15·8	046
3	11.III	0144	42°07'·8	5°03'·0	36·5	31·6	58·9	7·0	089
4	12.III	0105	42°07'·9	5°07'·3	59·8	37·5	59·0	8·3	049
5	13.III	0155	42°10'·5	5°11'·3	84·7	43·1	63·9	7·2	076
6	15.III	0352	42°12'·3	5°20'·4	134·6	55·7	67·1		

Mean speed along trajectory = 9·7 cm/sec

Mean velocity, Fix 1 - Fix 6 = 9·2 cm/sec, 059°T

* Surface-bottom reflections (2 observations only)

FLOAT DESIGNATION: 17   Date and time laid: 1315A/9.III.69.
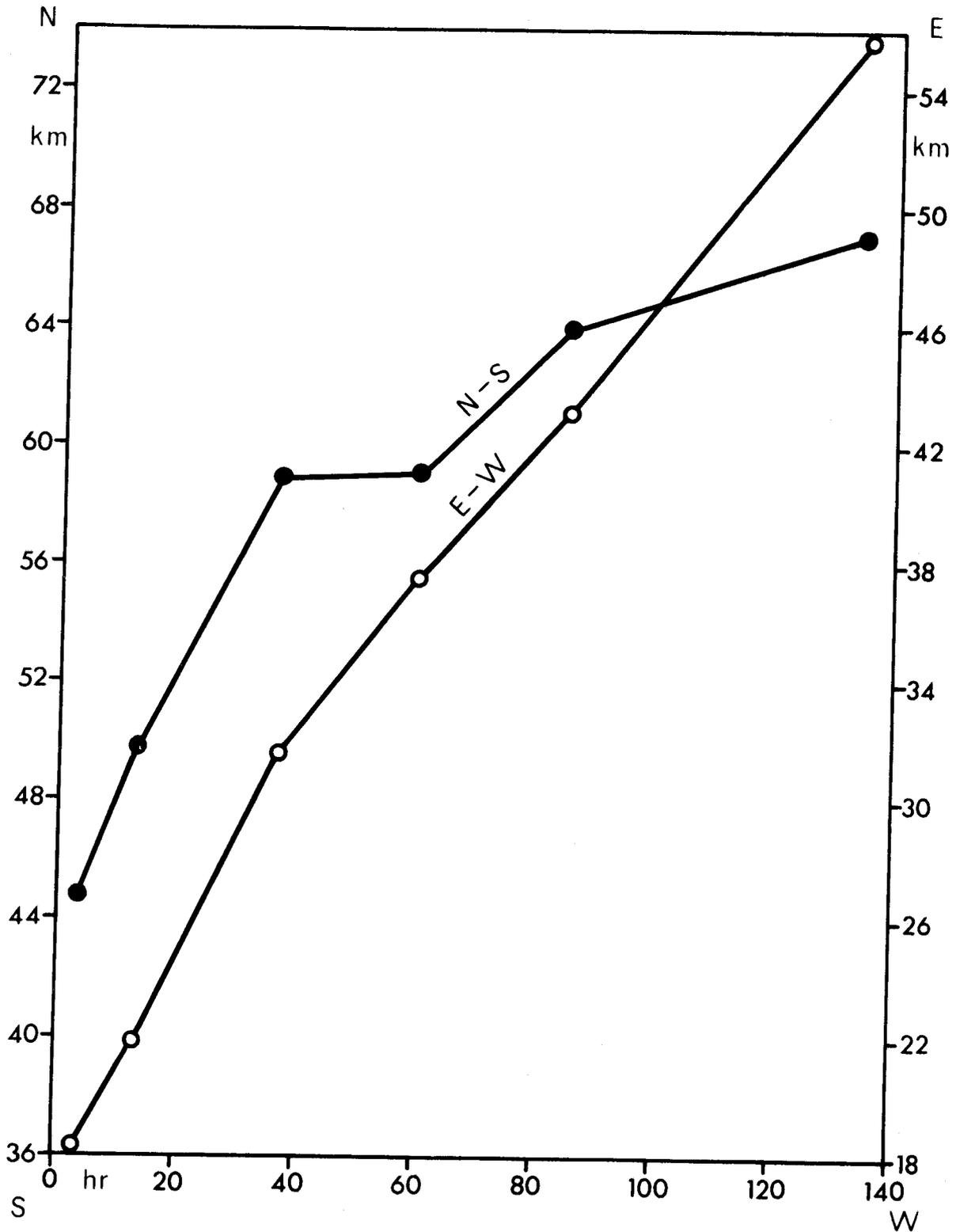
FLOAT DESIGNATION: 4   Date and time laid 0450A/14.III.69

Position laid: 41° 46'·1N, 5° 04'·5E   Displacement origin: 41° 36'N,
                (33·8km.E, 18·7 km.N.)   4°40'E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ±0·5 km

Depth(m):   Nominal   Observed   S.D.   S.D.(mean)
              500   514*   ±50m   -
                                       approx

Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E-W x	+N-S y	Velocity between fixes cm/sec	°T
1	14.III	0930	41°45'·4	5°03'·8	4·7	32·8	17·5	11·9	223
2	14.III	2002	41°43'·7	5°01'·6	15·2	29·7	14·2		

* By reflection (1 observation only)

FLOAT DESIGNATION: 4   Date and time laid: 0450A/14.III.69.

FLOAT DESIGNATION: 20   Date and time laid 0527A/14.III.69

Position laid: 41° 42'·8N, 5°08'·5E   Displacement origin: 41°36'N,
              (39·2 km.E, 12·7 km.N.)   4° 40'E

Navigation based on: Radar on anchored buoy + Satellite fixes

Estimated accuracy of positions: ± 0·5 km
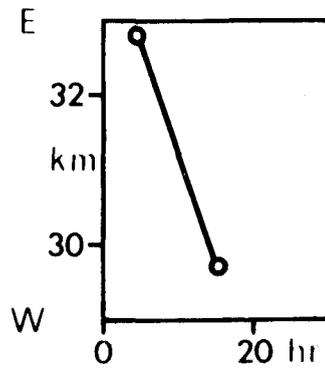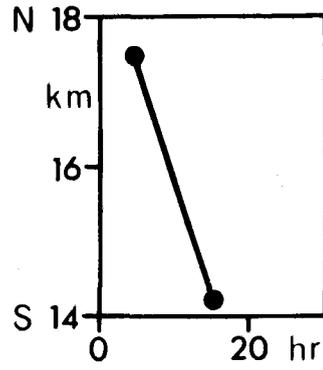
Depth(m):   Nominal   Observed   S.D.   S.D.(mean)

              500   482*   ±20m   -

                                      approx

Fix No.	Date	Time GMT +1	Fix Position Lat.N.	Long.E.	Hours Since Laid (t)	Displacement(km) +E–W x	+N–S y	Velocity between fixes cm/sec	°T
1	14.III	0824	41°42'·4	5°07'·2	3·0	37·3	11·9		
								27·1	211
2	14.III	1845	41°37'·7	5°03'·4	13·3	32·2	3·3		
								10·3	119
3	15.III	1639	41°35'·6	5°08'·6	35·2	39·3	–0·6		

Mean speed along trajectory = 15·7 cm/sec

Mean velocity, Fix 1 - Fix 3 = 10·9cm/sec, 171°T

*   Surface-bottom reflection (1 observation only)

FLOAT DESIGNATION: 20   Date and time laid: 0527A/14.III.69.