International Council for the
Exploration of the Sea

C.M. 1959
Special IGY Meeting
No. 47

Preliminary report on current measurements 1958 on the Galicia Bank west of Cape Finisterre.

By
Odd H. Sælen
Geofysisk institutt, Bergen.

In the summer of 1958, the research ship "Helland-Hansen" took part in a cooperative program in the sea west of Portugal. The work done by our ship is indicated in Fig. 1. Stations in two sections along latitude circles are indicated by crosses. In the location denoted by A, current measurements from an anchored ship were attempted on the continental slope. The ship drifted, however, and the measurements had to be discontinued rather soon. In the area C, the "Discovery II" conducted experiments with Swallow's deep sea float, while "Helland-Hansen" made numerous hydrographic stations in the same area. These observations will be analyzed in a paper by Swallow, and will therefore not be reported on by me. The present report will be concerned only with the current measurements made on the anchor station indicated by B in Fig. 1. The station is located at 42°42' N, 11°47' W on the top of the Galicia Bank with a bottom depth of 760 metres. The ship was anchored for nearly four days, and the following series were obtained: With the usual Ekman current meter: a series of 69 hours at 10 metres, a series of 69 hours at 25 metres, a series of 90 hours at 100 metres. With the Ekman repeating current meter: a series of 67 hours at 600 metres. With the Sverdrup-Dahl electric current meter: a series of 42 hours at 75 metres. With Mosby's bottom current meter: a series of 22 hours 1,5 m. above bottom.

The weather was fine during the measurements, with winds from 0-3 in the Beaufort scale.

The results given below are not to be considered as the final analysis, it is a rough draft based on a preliminary inspection of the data.

In Fig. 2, the results of the current measurements at the depths 10, 100 and 600 metres are presented as progressive vector diagrams. The residual currents, taken roughly as the rate of total displacement during the observation period, are as follows: at 10 m. of the order 10 cm/sec., at 100 m. 6 cm/sec. and at 600 m. 3 cm/sec. The directions also differ: at 10 m. the average flow is toward the west, at 100 m. toward SW and at 600 toward NNW. In these diagrams, the tidal influence is most clearly seen in the loops occurring in the curves for 100 and 600 metres. There is obviously a cum sole rotation of the velocity vector. Because of the higher residual velocity at 10 m., such loops are not found in the curve for that depth. In Fig. 3, we have therefore reproduced the N and E components (smoothed) for that depth. A period of about 12 hours is clearly seen, especially in the curve for the N component. The more irregular course of the E component may be due to the fact that the residual current, which is directed toward the W, is more exposed to irregular variations than is the tidal part of the current. The tidal current at 10 m. seems to be nearly alternating, there is any case not such a clear indication of rotation as in 100 and 600 m. At 25 m. (not reproduced here), conditions are much the same as at 10 m. At 75 m. (not reproduced here), there even seems to be an indication that the tidal current has a rotation contra solem. The strength of the tidal current does not decrease with depth. In fact, it seems to be at least as strong at 100 and 600 m. as at 10 m. As the residual current decreases with depth, the tidal part of the current becomes increasingly prominent with increasing depth. Thus, with a residual current of 3 cm/sec. at 600 m., the strength of the tidal current is about 20 cm/sec. This development is clearly seen from Fig. 2. The bottom current measurements were not made so frequently that they can be represented in a diagram comparable to those in Fig. 2. In one part of the series, the velocity vector rotates cum sole, with an irregular rate, once in about 12 hours, with velocities between 10 and 20 cm/sec.

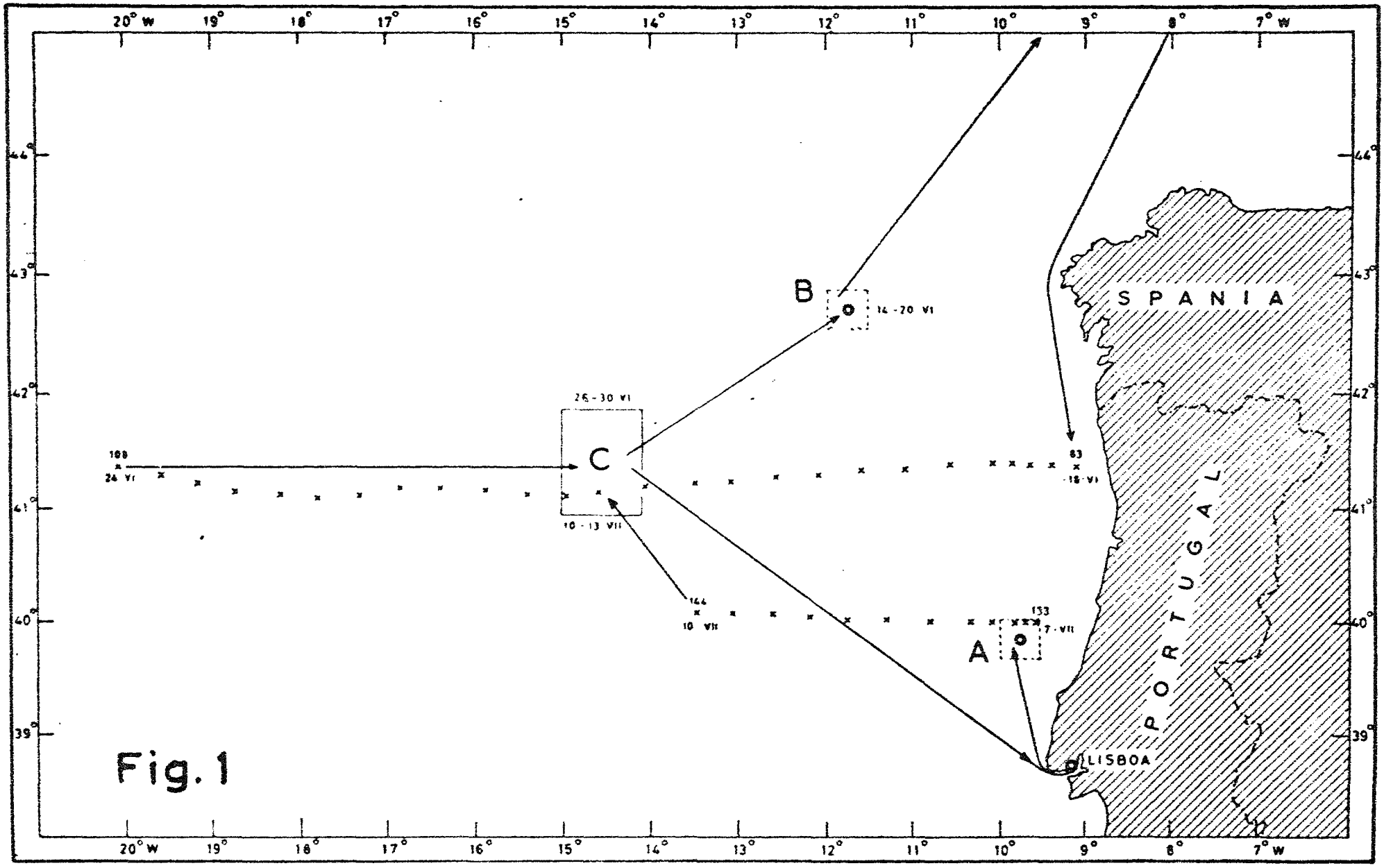
20° W
19°
18°
17°
16°
15°
14°
13°
12°
11°
10°
9°
8°
7° W
44°
43°
42°
41°
40°
39°
B
14 - 20 VI
26 - 30 VI
C
168
24 VI
10 - 13 VII
83
18 VI
144
10 VII
153
7 VII
A
SPANIA
PORTUGAL
LISBOA

Fig. 1

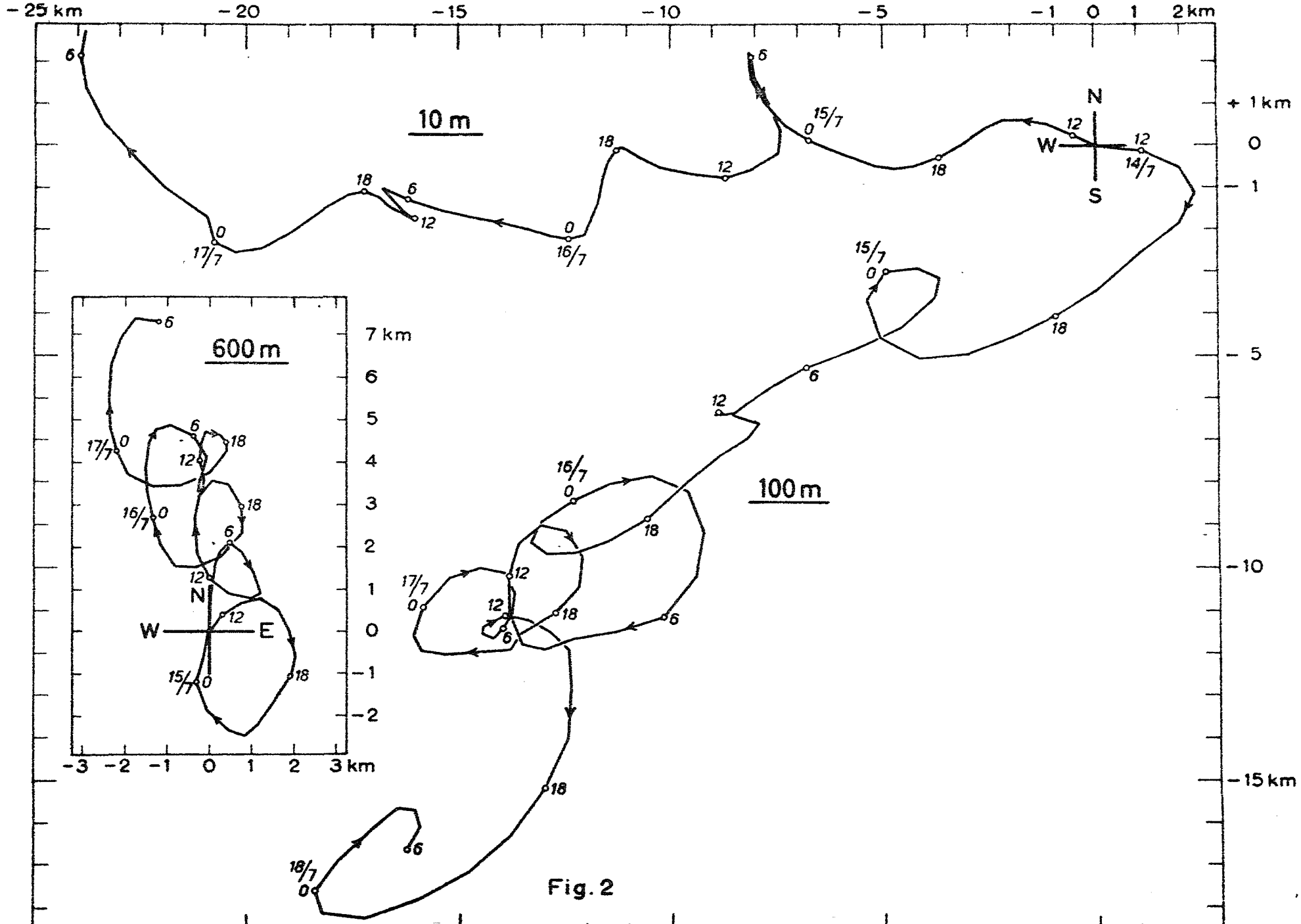
10 m
100 m
600 m
N
S
W
E
+ 1 km
0
– 1
– 5
– 10
– 15 km
7 km
– 25 km
– 20
– 15
– 10
– 5
– 1
0
1
2 km
– 3
– 2
– 1
0
1
2
3 km

Fig. 2

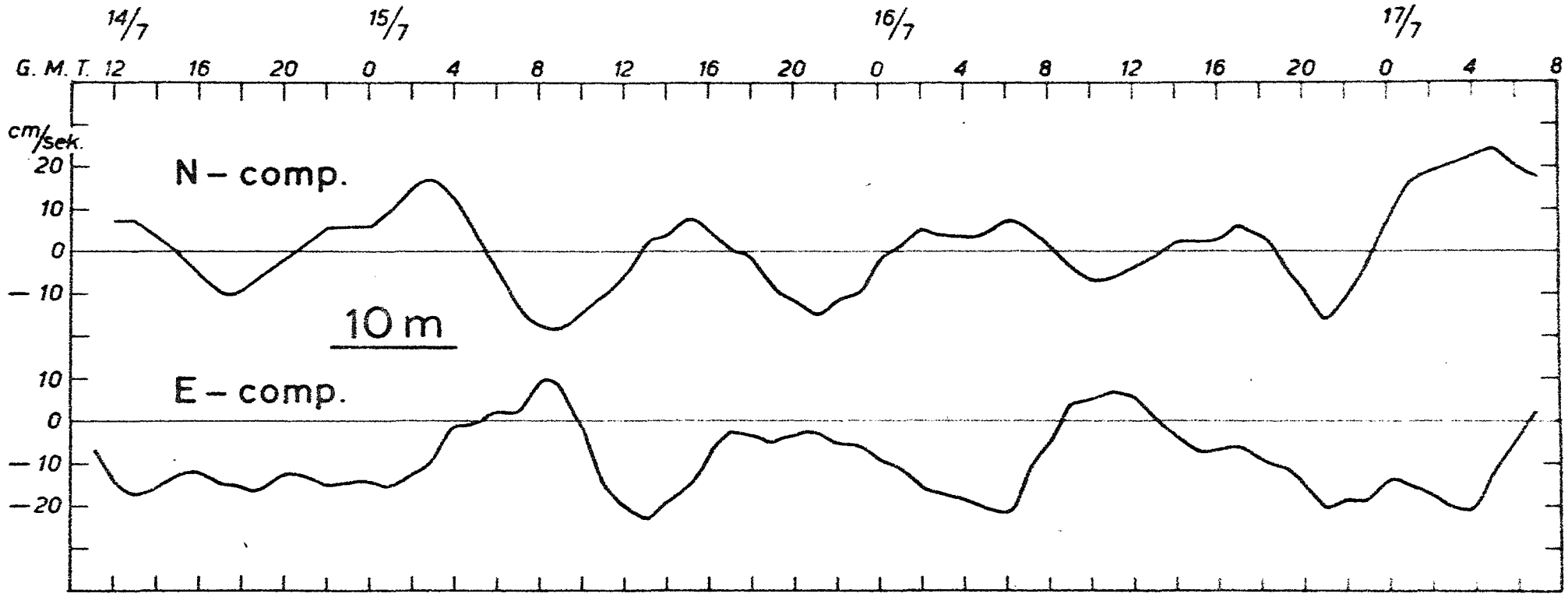
14/7
15/7
16/7
17/7
G. M. T. 12 16 20 0 4 8 12 16 20 0 4 8 12 16 20 0 4 8
cm/sek.
20
10
0
— 10
N – comp.
10 m
10
0
— 10
—20
E – comp.

Fig. 3