SOME NEW METHODS FOR THE RAPID PROCESSING OF OCEANOGRAPHIC DATA

by Commander P. MOREIRA DA SILVA,
of the Directorate of Hydrography and Navigation, Brazil.

Rapid processing of oceanographic data, if highly desirable in any campaign, becomes essential indeed when the purpose is a broad preliminary survey, searching for points of special interest connected with the general circulation. Aboard our oceanographic ship, the *Almirante Saldanha,* we were able, during our last two cruises between Rio de Janeiro and Baia, to develop two kinds of diagrams which proved very helpful. Both will be described in this paper.

A NEW T-S DIAGRAM

The purpose was to have a T-S diagram giving immediately σ_t accurately to two decimals, which we thought would be sufficient for most dynamical calculations.

The diagram was based on Mr. Knudsen's *Hydrographical Tables* (1901). Given Cl, or S, of a sample, Mr Knudsen's Tables give immediately σ_0 and, to every temperature, a correction, D, to be subtracted from σ_0 to obtain σ_t. If salinities are plotted according to σ_0 and temperatures are plotted according to D (1) a T-S diagram like Fig. 1 is obtained; of course the decimal part of σ_t is the horizontal distance, in millimeters, from the nearest « equal σ_t » line to the sample.

A NEW DYNAMIC ANOMALY COMPUTER

We now have t, σ_t and p (depth) of every sample; they are plotted on another diagram (Fig. 2).

Mathew's *Tables for calculating the specific volume of sea-water under pressure* (1938) give the specific volume anomaly of a sample as :

$$A = \delta\sigma_t + \delta_t$$

$\delta\sigma_t$ is a function of σ_t and depth ; δ_t is a function of temperature and depth.

The diagram is drawn in such a manner that, when plotting a sample by its σ_t and depth, we automatically plot it at a distance from the vertical axis $\sigma_t = 28.00$ proportional to $\delta\sigma_t$; and the representative point is then displaced to the right by a distance proportional to δ_t as taken from the triangular diagram at the left corner. In Fig. 2, it can be seen that sample A, from 550 metres, is first plotted at A (by its σ_t) and then displaced to A', OA' being the total anomaly 0.001039, as read on the scale 1.

(1) Scales most adequate are : for σ_0, 100 mm = 1 unit.
for D, 100 mm = 1 unit.

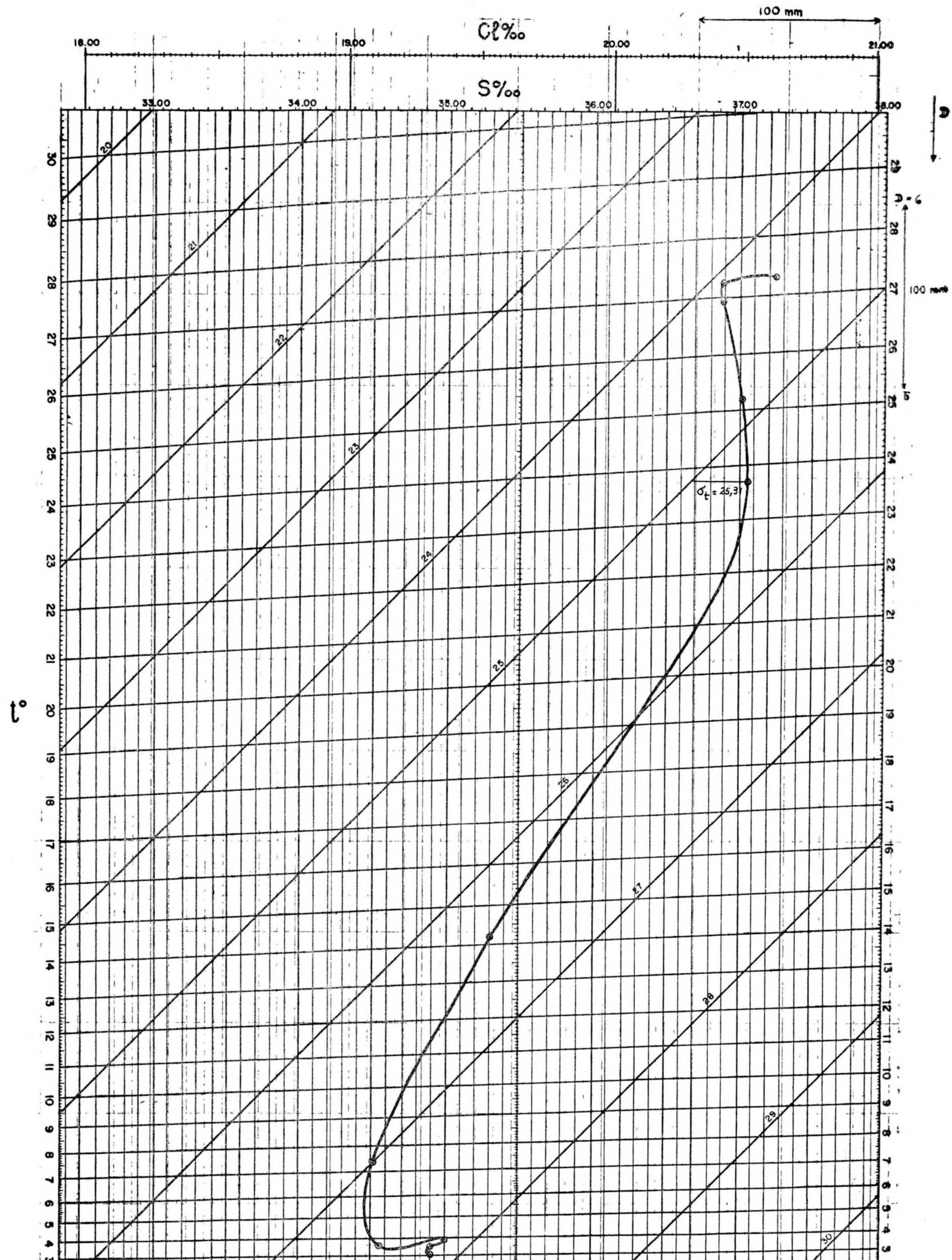
Cl‰
100 mm
18.00
19.00
20.00
21.00
S‰
33.00
34.00
35.00
36.00
37.00
38.00
t°
20
21
22
23
24
25
26
27
28
29
30
σ_t = 25,31
100 mm
σ_t

FIG. 1

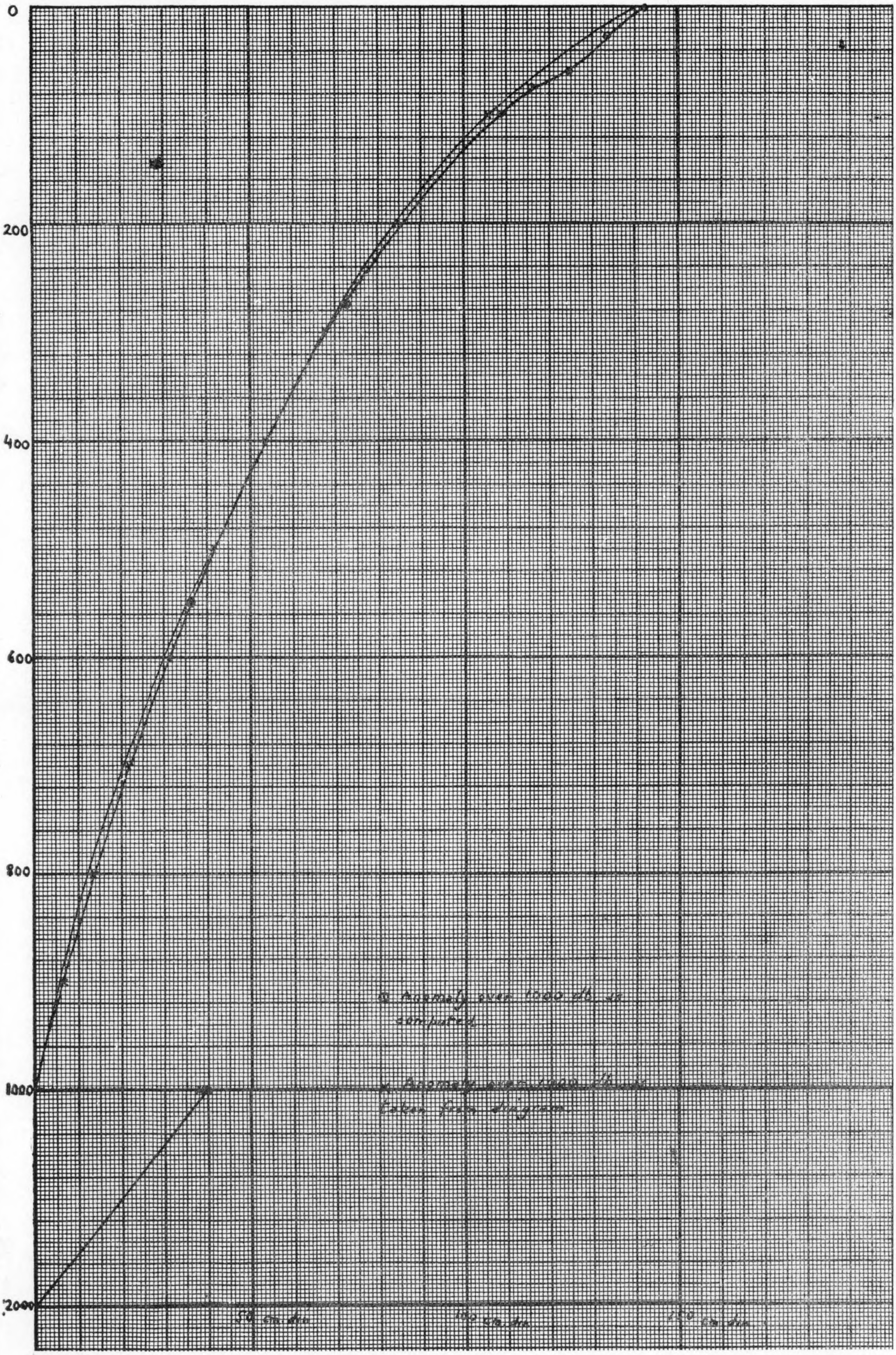
0
200
400
600
800
1000
2000
50 cm
100 cm
150 cm
Anomaly over 1000 db. as computed
taken from diagram

Fig. 3.

Let E and F be samples (real, or interpolated) taken at 900 and 1000 metres. Of course OE is the total anomaly of sample E, O'F the total anomaly of sample F.

Dynamic anomaly of any layer = $\Delta p \times$ mean anomaly $= \Delta p \times \frac{OE + O'F}{2}$
This corresponds to the area of trapezium OEFO'.
In our diagram:
1 sq. mm corresponds to 5 metres $\times$ 0.000020 = 0.0001 dyn. metre.
10 sq. mm correspond to 1 dyn. mm. (dynamic).
Area of trapezium in sq. mm $= \frac{OE + O'F}{2}$ mm $\times$ 20 = 10 (OE+O'F)

So, the number which gives OE+O'F in millimetres gives also the dynamical anomaly of our layer in dynamic millimetres.

All that need be done is to measure distances from $\sigma_t = 28.00$, every hundred metres, to the curve which represents the sounding, to obtain dynamic anomalies.

From 1000 to 5000 metres another scale was adopted ; the number giving the sum of bases separated by 1000 metres, in millimeters, is the same as dynamic anomaly in centimetres.

Figs. 1 and 2 represent an oceanographic station made by the *Almirante Saldanha* near Baia. In Fig. 3 results are compared, as taken from Table I, Fig. 4. The small differences seem acceptable; it is even possible that the graphical method proves more accurate, since the area of each trapezium can be more accurately measured by the known method of equal areas, as illustrated between depths 0 and 100 metres in Fig. 2.

STATION 218, 2000/26 March 1957, 18°00' South,
32°24' West.

Depth (met.)	T	S	σ_t (1)	σ_t (2)	$\delta\sigma_t$	δ_t	A	Mean of layer	D cm
0	27.30	37.25	24.337	24.34	3476	0	0.003476		
25	27.22	36.89	24.091	24.09	3712	12	0.003724	0.003600	9
50	26.93	36.89	24.185	24.19	3624	25	0.003649	0.003686	9.2
75	25.19	37.01	24.822	24.83	3014	35	0.003049	0.003349	8.4
100	23.70	37.05	25.302	25.31	2557	46	0.002603	0.002826	7.1
275	14.18	35.30	26.398	26.40	1508	86	0.001594	0.002098	36.7
550	7.36	34.51	27.004	27.00	938	101	0.001039	0.001316	36.2
1042	3.57	34.56	27.502	27.51	465	97	0.000562	0.000800	39.4
1558	3.91	34.99	27.811	27.82	175	153	0.000328	0.000445	23.0
2000	3.43	34.90	27.786	27.79	191	170	0.000361	0.000344	15.2
2600	3.04	34.90	27.822	27.82	162	192	0.000354	0.000357	21.4

Fig. 4.

(1) As calculated by Table H.O. 615.
(2) As taken from diagram.