Circulation and Intermediate Water Formation in the Northern Levantine Sea Inferred from MArch 1989 Observations

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Objectively analyzed maps of geopotential anomaly obtained from a March 1989 survey at selected depth levels show a series of mesoscale eddies and a meandering current field. The picture of circulation emerging from the data is consistent with the general picture identified earlier (The POEM Group, 1989). The circulation is dominated by mesoscale eddies with a wide variety of spatial scales and strengths. The region to the west of Cyprus is occupied by two adjacent large scale cyclonic gyres. The Rhodes gyre is oriented in the NE-SW direction, extends up to the Turkish coast, and covers approximately the area to the west of 30° E. The second cyclonic gyre occupies the eastern part of the Antalya basin and has an elongated structure extending between 35° N and 36° N. The westerly flowing Asia Minor Current (AMS) along the Turkish coast is fed partially by the Mid-Mediterranean jet proceeding in the northward direction around the periphery of the Rhodes gyre. Another branch of the jet flows around the anticyclonic eddy and, although the details are not shown by this data, emerges as a northwesterly flow to the southwest of Cyprus. The jet then contributes partially to the AMC by penetrating further north. The main branch continues eastwards to form a part of the anticyclonic Shikmona gyre located to the south of Cyprus.

The hydrographic characteristics show considerable variability in the vertical structure depending on the regional circulation. There are distinct regions characterized by homogeneous properties down to depths of 300-400 m (Fig. 1). The typical values of the temperature, salinity and oxygen imply that the vertical uniformity of conditions observed is associated with the formation of the new LIW prior to the survey (Fig. 2). The data indicate that the formation takes place within the anticyclonic regions through the process of convective overturning. The profiles reveal a two-layer structure in which the upper layer, having depths greater than 300 m, attains approximately 39.0-39.1 ppt salinity, 15.5 – 16.0° C temperature, and 28.95-29.0 sigma-theta values. The surface layer is separated from the deeper levels by a well-defined interfacial transition zone having a thickness of about 100-200 m. A confirmation of the LIW formation within the anticyclonic eddies, as opposed to the general existing view of its formation within the Rhodes cyclonic gyre (Ovchinnikov, 1984), is provided by a one-dimensional diffusion/convection model.

Fig. 1

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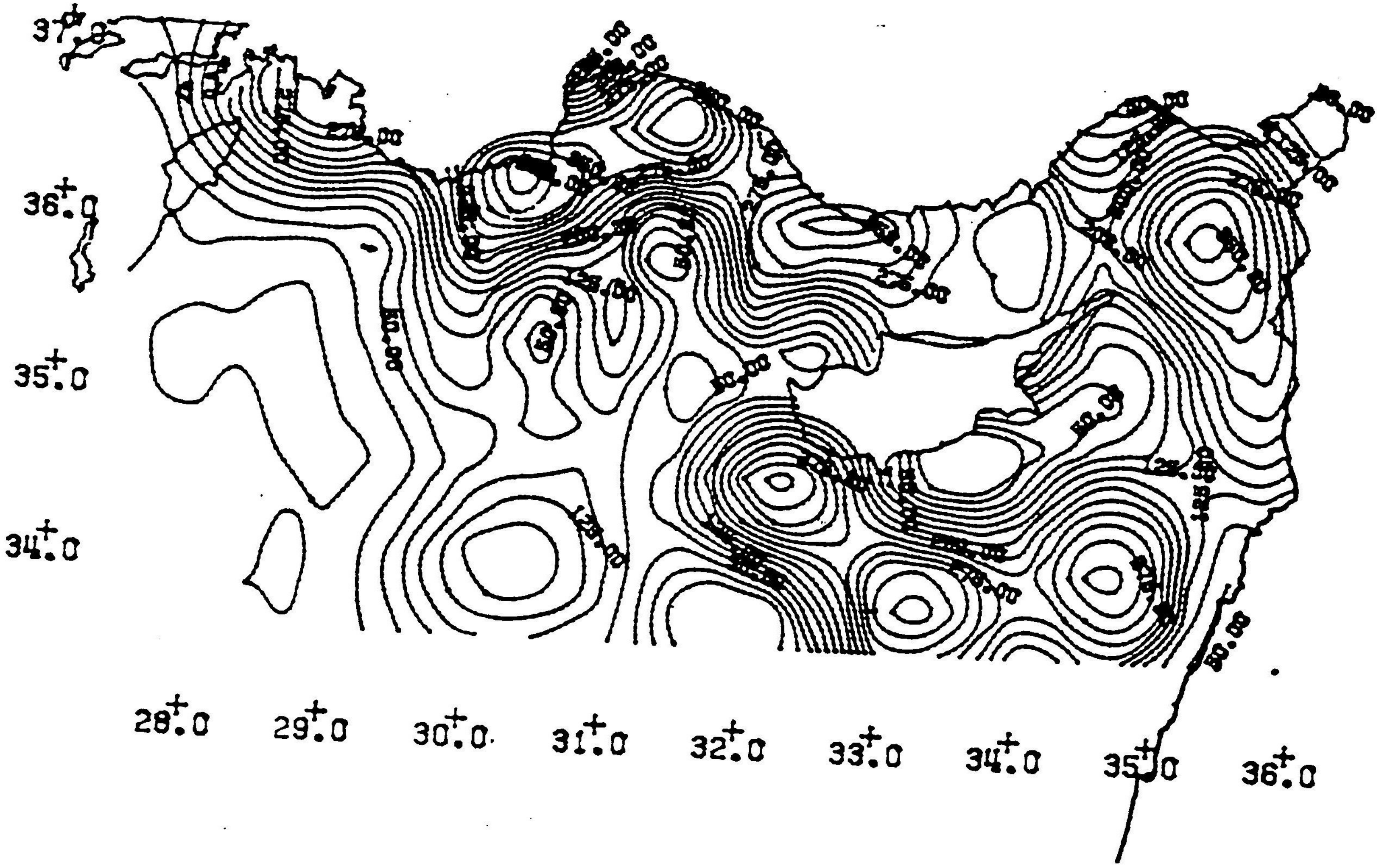
DEPTH OF 39 ppt ISOHALINE
MIN: 0.00   MAX: 425.00 CI: 25.00



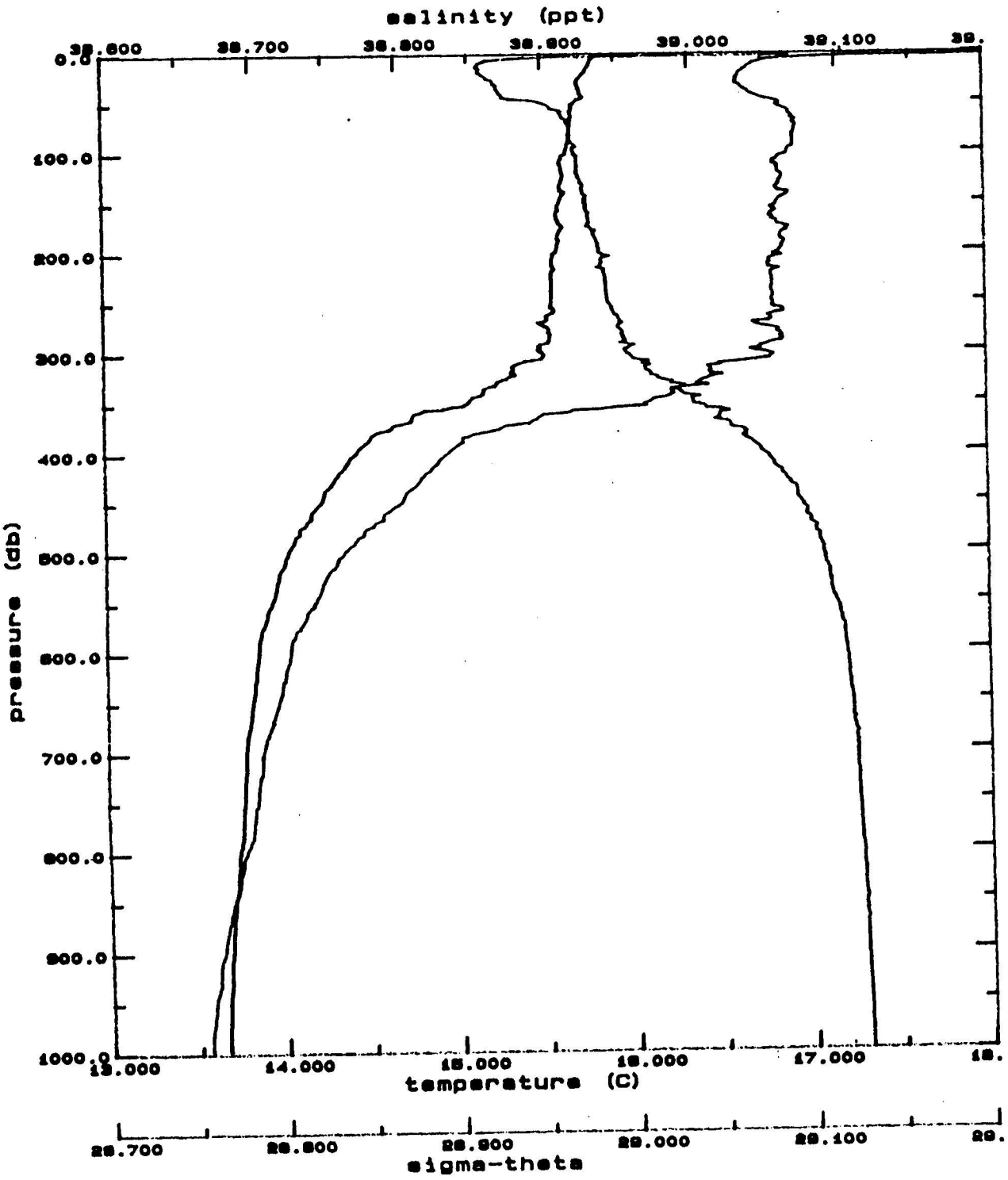
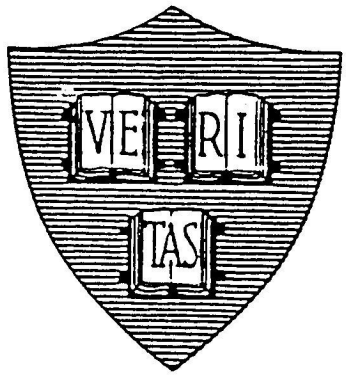

salinity (ppt)
38.600
38.700
38.800
38.900
39.000
39.100
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
1000.0
pressure (db)
15.000
14.000
13.000
12.000
11.000
temperature (C)
28.700
28.800
28.900
29.000
29.100
sigma-theta
b: tk022703.dat: STA: G15N30 (11.3.89)

Fig. 2



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