**Salt fingering processes and the distribution of the density ratio in the Southeastern off the Egyptian Coast**

M.A. SAID

National Institute of Oceanography & Fisheries, Kayet Bey, ALEXANDRIA **(Egypt)**

Temperature and salinity (T-S) finestructure on vertical scales of 10 db and larger is examined in a 215 km by 110 km grid located southeastern Mediterranean off the Egyptian coast. The convergence of several water masses within the grid dominated by the Levantine Intermediate Water leads to a variety of T-S finestructure which unstable to double diffusive processes. The data used in this study were collected during the joint Soviet-Egyptian expedition on the Russian RV Akademic Levrentyev which took place from 20 to 26 December 1988.

Vertical profiles of temperature, salinity, density and density ratio Rp for a number of stations in the experimental area are selected to identify the salt fingering regions. Vertical profiles from a selected station located at the western boundary of the area are shown in Fig.1. A profile of the stability angle Tù taken from Washburn and Käse (1987) defined as :

$$Tù = \tan^{-1} \frac{\alpha Tz - \beta Sz}{\alpha Tz - \beta Sz}$$

where $\alpha$ is the coefficient of thermal expansion ($\alpha$ >O), $\beta$ the coefficient of haline contraction, and Tz and Sz the vertical in situ temperature and salinity gradients. The vertical distribution of Tù allows portions of the profile to be grouped into four stability regimes : S denotes a stable region of the profile, U a region with density inversions, SF a region diffusively unstable to salt fingering, and DL a region unstable to double diffusive layering.

To quantify the frequency of occurrence of Tù in the various stability regimes, all Tù estimate from all stations were sorted into a histogram which is shown in Fig.2. By forming histograms of the density ratio Rp, a fundamental parameter in controlling double diffusive processes, it is found that 66 % of the volume is unstable to salt fingering while the unstable gradients are found in the 11 % of the profiles. In about 23 % of the volume, Rp is less than 2 in the salt fingering sense and at these low values salt fingers grow rapidly. SCHMITT (1979) has developed a similarity theory which describes the initial growth rates for salt fingers and found that for Rp ≤ 2, salt fingers grow rapidly.

One primary salt fingering region is found from about 300 to 1000 db with a modal Rp of 2.0. A horizontal map of Rp in the salt fingering region showed that the strong horizontal Rp gradients underlie relatively high salinity regions and vica versa.

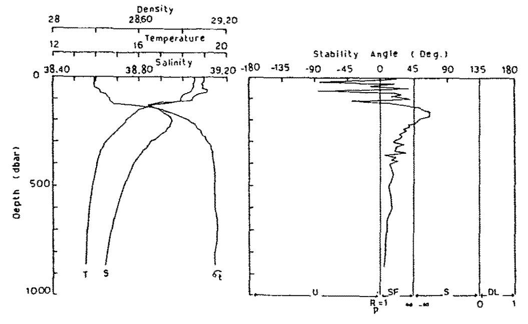


Fig .1.- Profiles of water temperature, salinity and density for station 2056. Profile of the stability angle is shown in panel at right

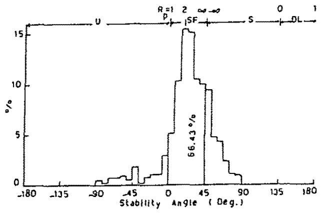


Fig. 2.- Histogram of stability angle from all stations. Stability regions and Rp scale are shown at top of figure.

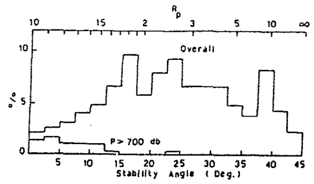


Fig. 3.- Higher resolution histogram of stability angle for salt fingering portion of the histogram of Fig 2.

## REFERENCES

SCHMITT R.W., 1979.- The growth rate of super-critical salt fingers. *Deep-Sea Res.*, 26A : 23-40.

WASHBURN L. and KASE R.H., 1987.- Double diffusion and the distribution of the density ratio in the Mediterranean waterfront southeast the Azores. *J. Phys. Oceanogr.*, 17 : 12-25.