# A quantitative Analysis of Southeastern Mediterranean water masses

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The Southeastern Mediterranean was one of the least investigated areas until the last two decades. To date, no one has been determined the volumes of water represented by the various θ-S types on the Egyptian coast. The present study deals with an attempt to identify the important water masses and their limits in the Southeastern Mediterranean off the Egyptian coast using the volumetric analysis technique during winter and summer seasons.

The oceanographic data used were selected from several expeditions carried out by Egypt and different countries during the last 27 years (1959-1986). Water temperature and salinity data have been taken from 162 stations in winter and from 152 stations in summer. The average values of temperature and salinity of these collected data were computed for stations distributed in a grid for winter and summer seasons. The volume and the mean depth of the waters in each bivariate class with potential temperature range 0.2 or 0.5 °C and salinity range of 0.1 ‰ have been estimated during winter and summer. The resulting statistics were presented on a pair of characteristic diagrams, each having potential temperature as ordinate and salinity as abscissa.

On a bivariate distribution, a boundary has been drawn to enclose all classes of a certain frequency (volume) and greater frequencies. Each standard boundary encloses the smallest area that contains at least the standard proportion of occurrences. The 50-per-cent and 75-per cent boundaries were established by the cumulative addition of frequencies in descending order of magnitude (Fig.1).

In winter, the three largest classes at potential temperature range 13.3o-13.8o °C and salinity range 38.70-38.80 ‰ contain nearly 50% of the total geometric volume and comprise the core of the deep water of the Eastern Mediterranean off the Egyptian coast. In summer, as in winter, a primary and big mode appears at a potential temperature 13.40 °C and salinity 38.75 ‰. It occupies the deeper classes below 1000m depth and is called the deep water mass. The 50-per-cent boundary, encloses three classes from the total of 93. This boundary lies between the potential temperature range 13.30-14.00 °C and salinity range 38.70-38.90 ‰. The 75-per-cent boundary encloses six classes in one group. Outside the 75-per-cent boundary, a secondary mode with high salinity (38.95 ‰) and potential temperature (15.25 °C) is observed. This water mass is called the intermediate water mass which is characterized by a secondary maximum of salinity (38.80-39.10 ‰). Its volume is about 18059. 54 km3 and represents about 8. 03% of the total volume of the Egyptian Mediterranean waters. A third mode in bivariate distribution appears at temperature 18.75 °C and salinity 38.75 ‰. This mode forms the subsurface layer of minimum salinity which is of the Atlantic origin.

For the univariate distribution, it was remarkable that the mean potential temperatures and salinities were 14.141 °C and 38.818 ‰ in winter and 14.407 °C and 38.807 ‰ in summer. Temperature and salinity of half of the water volume were below the mean values. The characteristics of temperature and salinity at 5, 25, 50 and 75 % were identical during the two seasons.

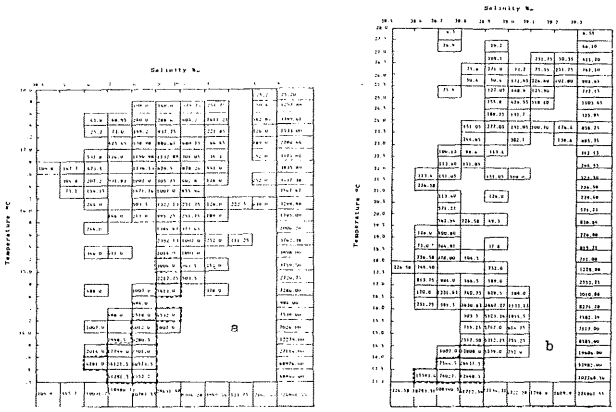


Fig. 1.- Potential temperature-salinity diagram of the Southeastern Mediterranean waters during a- winter and b- summer. Heavy boundary encloses 50 percent of the total and the dotted boundary encloses 75 percent. Volume in km3.