A REVIEW OF THE CIRCULATION IN THE CYPRUS BASIN, EASTERN MEDITERRANEAN LEVANTINE BASIN

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Abstract

The circulation of the Levantine Basin is reviewed on the basis of new oceanographic CTD data obtained during the last four cruises of the CYBO (Cyprus Basin Oceanography) project, between 1995-1997. The data analysis reveals the existence of some new, permanent as well as semi-permanent, mesoscale dynamic features in the Cyprus Basin, part of Levantine Basin in the Eastern Mediterranean, that can modify the flow pattern of the mid-Mediterranean jet in the region. Moreover, the Cyprus Basin is identified as an area of LIW formation. The interaction between the two Cyprus eddies, an anticyclonic eddy and another cyclonic one, contributes to the deeping of the newly formed LIW.

Key-words: mesoscale phenomena, currents, water transport, open sea, Levantine Sea

Introduction

The general circulation pattern derived from the flow investigations of the Eastern Mediterranean Sea during the late 1980s and the early 1990s, shows the existence of a meandering flow associated with several mesoscale eddies. The latter play an important role in the establishement of the general circulation and the hydrological structure of the water masses (1, 2). The circulation pattern of the Eastern Mediterranean Sea is dominated by the mid-Mediterranean jet, the cyclonic flow activity of the Rhodos gyre in the northwestern part of the region, and the two anticyclonic gyres: the Mersa Matruch and the Shikmona, to the south and southeast respectively. The latter two gyres encampass the Cyprus anticyclonic eddy (3). Generally, the mid-Mediterranean jet is meandering eastward between these three dominant flow features. To the southwest of Cyprus this flow jet bifurcates to the north. Moreover, the knowledge of smaller mesoscale eddies, as for instance, the cyclonic eddy in the Lattakia Basin (4), is crucial to the understanding of the regional circulation at the easternmost physiographic boundary of the Mediterranean, especially regarding the flow path of the mid-Mediterranean jet.

Nevertheless, until recently there were areas influenced by the mid-Mediterranean jet, like the Cyprus Basin and the Hecataeus Ridge, which were very poorly investigated. In order to fill the gaps in the oceanographic knowledge of the sea area south of Cyprus the CYBO- (Cyprus Basin Oceanography) project, a several year Cyprus National Oceanographic Programme, based on Physical Oceanographic studies, has been implemented by the Laboratory of Physical Oceanography, Fisheries Department (Center for Marine Research in Cyprus).

Results and discussion

Within the framework of the CYBO project four seasonal hydrographic cruises were carried out in the Levantine Basin between: 22 September-15 October 1995, 6-13 May 1996, 21-30 October 1996 and 6-13 May 1997. The cruises were aimed at obtaining reliable CTD measurements from a grid of more than 80 CTD stations in the deep waters of the open and the near coastal sea areas of the Cyprus Basin, an area of about 150x100 nm (Fig. 1).

The review of the circulation in the Cyprus Basin provides valuable information for the open and near coastal flow paths and their significant seasonal variabilities (Fig.2). The circulation of the water masses in the area is characterized by some well known oceanographic flow features such as the mid-Mediterranean jet and the Cyprus anticyclonic eddy.

In addition, new flow features have emerged in the Cyprus Basin from the recent CYBO's data set analysis. The definition of the circulation reveals in detail, the existence of the permanent Cyprus Basin Cyclonic eddy. This eddy with horizontal dimensions between 25 and 50 km undergoes significant seasonal changes in shape, size and intensity under the strong dynamic influence of the neighbouring flow features. The centre of the eddy was defined as an area of a well developed thermohaline dome owing to the winter mixing processes (Fig. 3). The latter contribute to the sinking along isopycnals of dense (saline) surface water initially down to 200m, thereby forming a water with a LIW singnature. Furthermore, the neighbouring strong hydrophysical depression of the Cyprus anticyclonic eddy contributes to the deepening of this saline waters down to 450 m depth.

The CTD data analysis from the four CYBO surveys, showed that the mid-Mediterranean jet during its eastward flow bifurcates twice to the south of Cyprus. At first, this current to the southwest of Cyprus bifur-

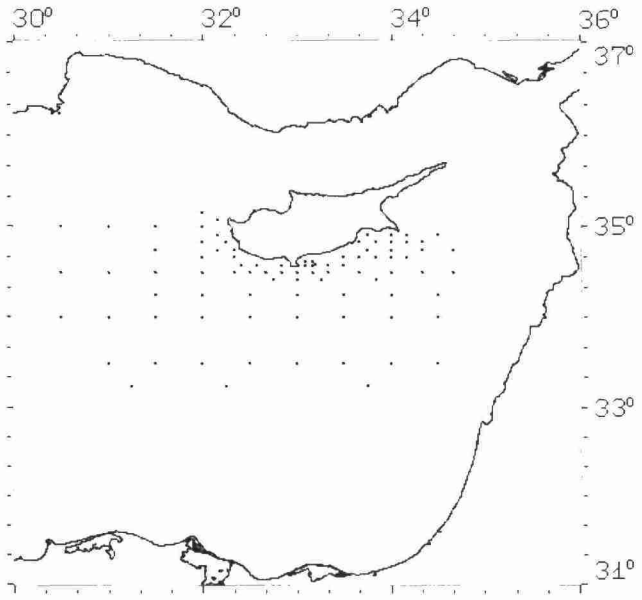

Figure 1 : CTD stations for CYBO project (1995-1997).

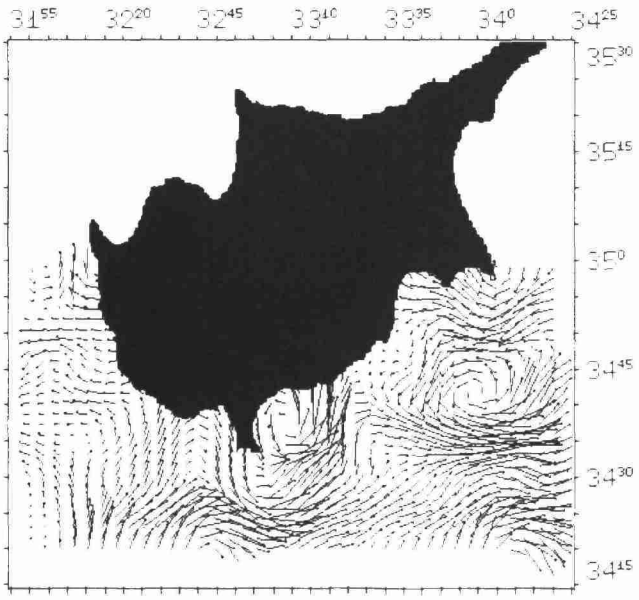

Figure 2a : Surface density currents, CYBO-1.