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ON UPWELLING OFF THE PENG-HU ISLANDS[1]

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ABSTRACT

Two cruises through Taiwan Strait were carried out by the R/V CHIU LIEN in late October 1977 and late June 1978. Totally, there are 22 stations off the western coast of Taiwan. STD measurement was made at each station for both cruises. Studying the horizontal temperature distribution, we observe very clear upwelling existing in the south of the Peng-hu Islands in October, but not in June. The seasonal variation of upwelling and the reasons for this phenomenon are stated in this paper. The wind and the current patterns for different seasons in Taiwan Strait are also discussed.

INTRODUCTION

Upwelling means an ascending motion, of some minimum duration and extent, by which water from subsurface layers is brought into the surface layer. In general, upwelling is the result of horizontal divergence in the surface layer, and usually the water comes from depths not exceeding a few hundred meters.

Upwelling may occur anywhere, but it usually happens along the western coasts of the continents where prevailing winds carry the surface water away from the coast.

According to E. C. LaFond (1966), localized upwelling develops in the following areas:

(i) The lees of islands.
(ii) The lees of major land promontories projecting into a current.
(iii) Over shoals or sea-mounts.
(iv) In counterclockwise (clockwise) eddies in the northern (southern) hemisphere.
(v) At water mass boundaries.
(vi) In thermal domes or ridges in the open sea.

Because the water is upwelled from the subsurface leyers to the surface layer the surface water temperature in the upwelling areas is considerably lower than that in surrounding surface waters. This difference often amounts to 7°C (Schumacher, 1933) off the north-western coast of Africa.

Generally speaking, the upwelling velocity is estimated to be from 10^{-5} to 10^{-2} cm/sec, and it is so small that in the past no instrument was sensitive enough to be able to measure this ascending velocity directly. Thus the speed of upwelling is calculated from the equations of motion, continuity, advection, and so forth.

In the last two decades interest in upwelling, the process and the effects, has increased. There are two obvious and immediate practical concerns whose solutions may lie in a better understanding of upwelling: food from the sea and waste disposal. Upwelling is very important from the biological point of view, as it brings the nutrients from the deeper layers, where consumption is small, into the surface layer which results in the establishment of rich fishing grounds. A map showing the areas of upwelling in the world ocean may also serve as a map of the areas of high organic productivity.

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