# VARIABILITY OF PHYSICAL PARAMETERS IN SABAH AND SARAWAK WATERS DUE TO THE SOUTHWEST MONSOON

LIM PHAIK KIN

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
TERENGGANU
1999

# VARIABILITY OF PHYSICAL PARAMETERS IN SABAH AND SARAWAK WATERS DUE TO THE SOUTHWEST MONSOON

BY

LIM PHAIK KIN

This project is submitted in partial fulfillment of the requirements for the Degree of Bachelor of Marine Science

Faculty of Applied Science and Technology
UNIVERSITI PUTRA MALAYSIA TERENGGANU

1999

## ACKNOWLEDGEMENT

I extend many thanks to my supervisor, Dr. Mohd. Nasir Saadon, for his guidance, valuable suggestions and utmost important contribution to this research. Most of all, for providing me the golden opportunities to present this study during the Malaysian Technology and Science Conference '98 and Technical Seminar of MV SEAFDEC Survey Area II. I owe very special thanks to the crew on board the 3rd and 4th cruises of MV SEAFDEC research vessel, without whose help, enthusiasm and coordinated efforts in obtaining the raw data, this research could not have been accomplished.

I would also like to acknowledge Dr. Alex Camerlengo, for his concern and valuable advises. I also appreciate advises and comments given by Mr. Liew Hock Chark, regarding statistical analysis in this study. Gratitude is also expressed to my family, especially my mom, for her love, sacrifices and support. I am also very indebted to Chee Heng, my fiancé, for his understanding, constant support, encouragement and forbearance.

Appreciation is also due to the following persons for their motivation and support; Lilian Kek, Pei Thing, Yii Siang and Travis. Not forgetting my course mates; Morgan and the others, who have been through all the good and bad times with me for these past three years. Lastly, to those who pray for my success...

Jillian Lim Phaik Kin

## ABSTRACT

This study provides new information on the physical characteristics of water masses in Sabah and Sarawak waters. The aim is to determine the effect of Southwest monsoon on the variability of water masses, in Sabah and Sarawak waters. Data were obtained using an iCTD System, during the third (July 1996) and fourth (May 1997) cruises of MV SEAFDEC research vessel, under SEAFDEC collaborative research program in the South China Sea between Malaysia and Thailand.

Temperature, salinity and density values from various selected standard depths and bottom waters, as well as along five selected transects, were analyzed and its distributions are presented as contour maps. Lastly, from each sampling station, temperature, salinity and density profiles have been acquired.

Basically, temperature decreased with increasing depth while both salinity and density increased as pressure increases. From the graphs of mean temperature/depth, mean salinity/depth and mean density/depth (with standard error bars), it is concluded that there were no variations of temperature, salinity and density values in the study area during both cruises. The results also show that different periods of Southwest monsoon did not cause variability of physical parameters in Sabah and Sarawak waters. However, variations of temperature, salinity and density values were observed between coastal and offshore waters, as well as shallow and deep waters.

Based on their vertical and horizontal distributions obtained during the two cruises, lower salinity and consequently, lower density values were detected in coastal

waters, in view of the influx of freshwater from Sabah and Sarawak waters during this monsoon season. Water properties in shallow waters were found to vary slightly from deeper ones as surface waves induced pronounce mixing effects of shallow waters. As a result, in the southern tip of the study area, where the water is shallow, its water properties differed from the rest of the study area.

Three layers of water had been ascertained in deep water stations off Sabah and Sarawak waters. They were the mixed, thermocline/halocline/pycnocline and deep layers. The depths of these layers remained more or less identical in both cruises, as there were no significant variations of physical parameters between the two cruises.

# ABSTRAK

Kajian ini menyumbangkan informasi terbaru mengenai ciri-ciri fizikal air laut di perairan Sabah and Sarawak. Tujuannya adalah untuk menentukan kesan Monsun Barat Daya ke atas variasi air laut di perairan Sabah and Sarawak. Data telah dikumpul dengan menggunakan satu alat yang dipanggil Sistem iCTD, semasa pelayaran kapal kajian MV SEAFDEC yang ketiga (Julai 1996) and keempat (Mei 1997), di bawah program kajian usahasama di antara Malaysia and Thailand.

Nilai suhu, kemasinan dan ketumpatan pada kedalaman yang tertentu serta dasar, dan juga taburannya secara menegak and mendatar sepanjang lima transek yang dipilih telah dianalisa and ditunjukkan sebagai peta kontor. Akhirnya, profil suhu, kemasinan dan ketumpatan juga diperolehi dari setiap stesen penyampelan.

Secara amnya, suhu menurun mengikut kedalaman manakala kemasinan dan ketumpatan bertambah mengikut kedalaman. Dari graf min suhu/kedalaman, min kemasinan/kedalaman and min ketumpatan/kedalaman, adalah disimpulkan bahawa ketiga-tiga parameter tersebut tidak menunjukkan variasi semasa kedua-dua pelayaran. Keputusan tersebut juga menunjukkan bahawa Monsun Barat Daya yang berlainan tidak membawa variasi ke atas parameter fizikal di perairan Sabah dan Sarawak. Tetapi, variasi suhu, kemasinan dan ketumpatan telah didapati di antara air persisiran pantai dengan air luar persisiran pantai, serta di antara air cetek dengan air dalam.

Berdasarkan kepada taburan menegak and mendatar yang diperolehi, nilai kemasinan dan ketumpatan yang lebih rendah telah dikesan di dalam air persisiran pantai. Ini disebabkan oleh kemasukan air tawar dari sungai Sabah and Sarawak semasa musim monsun tersebut.

Ciri-ciri air cetek telah didapati berbeza sedikit dari air dalam, disebabkan oleh kesan percampuran arus permukaan. Maka, di bahagian selatan kawasan kajian, di mana air di sini agak cetek, ciri-ciri airnya berbeza sedikit jika dibandingkan dengan kawasan kajian yang lain.

Tiga lapisan air yang berbeza telah didapati di dalam stesen air dalam di perairan Sabah and Sarawak. Mereka adalah lapisan permukaan, lapisan termoklin/haloklin/pycnoklin and lapisan dalam. Kedalaman lapisan-lapisan tersebut hampir tidak berubah dalam kedua-dua pelayaran, memandangkan ketiga-tiga parameter fizikal tersebut tidak menunjukkan variasi dalam kedua-dua pelayaran.