THE PHOSPHORUS FLUX FROM SEDIMENT TO SEDIMENT-WATER INTERFACE AND OVERLYING WATER IN UNDISTURBED CORE

LIM PEIK LEE

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
TERENGGANU
2000

THE PHOSPHORUS FLUX FROM SEDIMENT TO SEDIMENT-WATER INTERFACE AND OVERLYING WATER IN UNDISTURBED CORE

BY

LIM PEIK LEE

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

Faculty of Applied Science and Technology
UNIVERSITI PUTRA MALAYSIA TERENGGANU

2000

ACKNOWLEGMENTS

I was being extremely fortunate in being able to finish my final year project on time. I wish to express my thanks to Professor Dr. Law Ah Theem who have allowed me free access to the Marine Science Laboratory and Marine Pollution Laboratory and for his invaluable editorial, administrative help and financial support. I would like to send special thanks to Mr. Liew Hock Chark for lend me the Laser Printer for printing my master thesis.

Furthermore, I would like to send my gratitude to Mr. Hii Yii Siang and Mr. Jong Khiam Jan for their invaluable advises, and an especially thanks to Mr. Kamari Sulong to help me to drill the holes on PVC pipe, Mr. Johari Md. Noor to help me to cut the Perspex. I would like to thanks also Mr. Ismail Nordin, Mr. Mohd. Sharol Ali and Mr. Sukiman Sengat for their helps and support during my laboratory works.

There is another person who give me spiritually and emotionally support throughout this project, and he is the only one accompanied me in the laboratory until midnight. He scarifies his holiday and time in order to help me to finish my works, it is no such words that can express my thanks to him deeply. Nevertheless I still need to say thank you very much **Mr. Tan Seng Ghee**.

I would like to apologize to anybody who felt inconvenient during my works in the laboratory, to whom which feel disturbed by my project and to anyone who felt that I really troubled him or her. Lastly, I would like to thank my housemate, coursemate, friends, and my family for their endless spiritual support.

To my fiancé

TAN SENG GHEE

ABSTRACT

This project report presents the result of a study on the phosphorus flux from sediment to sediment-water interface and overlying water in undisturbed core, which governed by various environmental parameters, i.e. temperature, pH and salinity. The phosphorus flux under optimum condition also had been studied.

Nutrient regeneration from the sediment floor of the ocean to the water column is essential. Thus, the sediment column and water column were designed in an undisturbed core in order to study the phosphorus flux.

The phosphorus flux showed different results between water column and sediment column that governed by different processes. Generally, the flux is higher for 40^0C in both the water column and sediment column. However the P flux is higher for 30ppt in water column and 0ppt in sediment column while for pH9 in water column and pH6 in sediment column. Under optimum condition, the flux tend to be higher compare to the 30ppt, pH9 and 30^0C cores. However the fluxes under optimum condition is lesser than the flux in 0ppt and 40^0C cores.

On the other hand, the phosphorus flux under freshwater environment is faster than marine environment in the sediment column. This may due to less dissolve solid in pore water eased the process of release phosphate to the pore water. Nevertheless the reversed is true for water column where the phosphate fluxes under optimum condition is faster than all cores had been set. Furthermore the phosphate flux in marine environment was faster than freshwater environment in water column.

Surface-adsorbed phosphate is released to the pore water as needed to replace the dissolve phosphate that escapes to the overlying water. In the region of constant concentration in the sediment column, phosphate is buffered by adsorption-desorption equilibrium with the sediment. The production rate of phosphate, the buffering capacity of the sediment, and the thickness of the diffusive boundary layer at the sediment-water interface control the shape of the pore water profile.

ABSTRAK

Laporan projek ini memaparkan keputusan analisis terhadap flux fosfat daripada sedimen ke interfasa sedimen-air and kolum air di atas sedimen dalam 'core' yang tidak diganggu. Di mana proses flux adalah dipengaruhi oleh pelbagai parameter alam sekitar seperti suhu, pH and saliniti. Flux fosfat dalam keadaaan optimum juga dikaji.

Penghasilan semula nutrien daripada dasar laut terbuka kepada kolum air adalah sangat penting. Oleh itu, kolum sedimen dan kolum air direkabentuk dalam 'core' yang tidak digganggu supaya flux fosfat dapat dikaji.

Flux fosfat menunjukkan keputusan yang berasingan kepada kolum air and kolum sedimen yang disebabkan oleh proses yang berlainan. Secara umumnya, flux adalah lebih tinggi pada 40^0C di dalam kedua-dua kolum air dan kolum sedimen. Malahan, flux fosfat adalah lebih tinggi untuk 30ppt dalam kolum air and 0ppt dalam kolum sedimen manakala untuk pH9 dalam kolum air dan pH6 dalam kolum sedimen. Dalam keadaan yang optimum, flux cenderung lebih tinggi daripada 'core' 30ppt, pH9 dan 30^0C. Walau bagimanapun flux dalam keadaan optimum adalah lebih kurang daripada flux untuk 'core' 0ppt dan 40^0C.

Selain daripada itu, flux fosfat dalam persekitaran air tawar adalah lebih cepat daripada flux daripada persekitaran marin dalam kolum sedimen. Hal yang demikian disebabkan oleh kurang pepejal terlarut dalam air liang memudahkan proses melepaskan fosfat ke dalam air liang. Selain daripada itu, keadaan yang terbalik wujud dalam kolum air di mana flux fosfat dalam keadaan optimum adalah lebih cepat daripada semua 'core' yang disediakan. Tambahan pula, flux fosfat dalam persekitaran marin adalah lebih cepat daripada persekitaran air tawar dalam kolum air.

Fosfat yang diserap oleh permukaan sedimen dilepaskan ke air liang untuk menggantikan fosfat terlarut yang hilang ke kolum air. Dalam kawasan kolum sedimen yang mempunyai kepekatan fosfat yang tetap, fosfat adalah ditampang oleh keseimbangan penyerapan – pelepasan dengan sedimen. Kadar penghasilan fosfat, kapasiti tampang sedimen dan ketebalan lapisan sempadan penyebaran pada interfasa sedimen-air mengawal bentuk profil air liang.