# BATHYMETRY MAPPING FROM FINE SPATIAL RESOLUTION SATELLITE IMAGERY AT LANG TENGAH ISLAND

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FACULTY OF MARITIME STUDIES AND MARINE SCIENCES
UNIVERSITI MALAYSIA TERENGGANU
2010

Bathymetry mapping from fine spatial resolution satellite sensor imagery at Lang Tengah Island / Chuah Siak Khoon.



Lihat Sebelah

# Bathymetry mapping from fine spatial resolution satellite sensor imagery at Lang Tengah Island

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**Research Proposal submitted in partial fulfilment of the requirements for the degree of Bachelor of Science (Marine science)**

**Department of Marine Science**
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**Appendix 7 : Final Research Project Report Declaration and Verification Form**

**DEPARTMENT OF MARINE SCIENCE**
**FACULTY OF MARITIME STUDIES AND MARINE SCIENCE**

## DECLARATION AND VERIFICATION REPORT

### FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:
Bathymetry mapping from fine spatial resolution satellite imagery at Lang Tengah Island by Chuah Siak Khoon, Matric No. UK15236 have been examined and all errors identified have been corrected. This report is submitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of Bachelor Science (Marine Science), Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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**Abstract**

Optical remote sensing offers an alternative to traditional hydrographic surveys for measuring water depth, with the advantage that data are collected synoptically over large area. Just one limitation of the remote sensing in the bathymetry field, this technique is only capable applied to the shallow water whereas for the deeper part of the water, remote sensing technique is not capable to map the bathymetry accurately. Bathymetry can only be derived from remote sensing to a maximum depth of 25m in the clearest water, and considerably less in turbid water. Different satellite had been used to derive bathymetry since 1970 such as Landsat and Ikonos. But the high spatial resolution of the satellite has limit the detection and analysis of bathymetry. QuickBird satellite imagery which it has 2.4m of spatial resolution for multispectral image was used in this study to acquire the bathymetry of Lang Tengah Island. The fine spatial resolution of the QuickBird satellite has improve the results of the bathymetry acquire as it can discern small object up to 2.4m. There are a lot of method develop to derive bathymetry, this study is only emphasize on two methods, which are linear method (Benny and Dawson method) and ratio method. Both methods require the same pre-processing, that is, geometric correction, atmospheric correction (Dark pixel subtraction method) and masking. But due to some problem encounter, geometric correction was not done in this project. Comparison was made to compare the accuracy of both methods above to map the bathymetry of various bottom types, which is bottom type with different albedo, at Lang Tengah Island. Accuracy was compare by the actual depth and the bathymetry depth acquire by both methods mention above. The results show that the highest accurate band for Benny and Dawson method was band 2 among the three band compare, which it's $R^2$

achieve 0.7036. But ratio method is much more robust than the linear method as its $R^2$ achieve 0.9825. Ratio method is better in mapping the water depth with different albedo than the linear method. It is more robust than the linear method as it is require only two tunable parameters whereas for the linear method, it is require more than 2 tunable parameters.

Abstrak

Penderiaan jauh optik menawarkan alternatif untuk menbuat survei mengenai kedalaman air selainkan daripada cara tradisional, dengan kelebihan bahawa data yang lebih luas dapat dikumpulkan. Hanya satu sekatan kepada penderiaan jauh di bidang batimetri, teknik ini hanya mampu mengukur kedalaman air cetek manakala untuk bahagian luat yang lebih dalam kedalaman, teknik penderiaan jarak jauh tidak mampu untuk mengukur batimetri dengan tepat. Batimetri hanya boleh diperolehi dengan mengunakan penderiaan jarak jauh ke kedalaman maksimum 25m di air jernih, dan kurang daripada 25m di air keruh. Satelit yang berbeza telah digunakan untuk mengukur batimetri sejak tahun 1970 seperti Landsat dan Ikonos. Tetapi resolusi spasial tinggi daripada satelit tersenut telah menyekat pengesanan dan analisis batimetri. Satelit Quickbird yang mempunyai resolusi spasial 2.4m digunakan dan gambar multispectral digunakan dalam kajian ini untuk mendapatkan batimetri Pulau Lang Tengah. Kehalusan spasial resolusi dari satelit Quickbird telah meningkatkan kejituan keputusan diperolehi kerana ia dapat membezakan benda-benda kecil sehingga 2.4m. Terdapat banyak cara untuk mengukur batimetri, kajian ini hanya menekankan pada dua kaedah, iaitu kaedah linear (Benny and Dawson) dan kaedah ratio. Kedua-dua kaedah ini juga memerlukan pra-pemprosesan, iaitu, pembetulan geometrik, pembetulan atmosfera (Dark pixel subtraction) dan masking. Namun, disebabkan oleh beberapa masalah yang dihadapi, pembetulan geometri tidak dilakukan dalam projek ini. Perbandingan dibuat untuk membandingkan ketepatan daripada kedua-dua kaedah di atas untuk mengukur batimetri dengan dasar laut yang menpunyai pelbagai jenis di Pulau Lang Tengah. Akurasi akan dibandingkan dengan kedalaman yang sebenar dan kedalaman yang diperolehi dengan kedua-dua kaedah di

atas. Keputusan kajian menunjukkan bahawa band yang tertepat untuk Benny and Dawson adalah band 2 di antara tiga band yang dibandingkan, yang itu R2nya mencapai 0,7036. Tetapi kaedah ratio jauh lebih kuat daripada kaedah linear dengan R2nya mencapai 0,9825. Kaedah ratio ini lebih baik dalam pemetaan kedalaman air dengan Albedo berbeza daripada kaedah linier. Ia lebih kuat daripada kaedah linear kerana hanya memerlukan dua parameter sedangkan untuk kaedah linear, itu memerlukan lebih daripada 2 parameter .