SHALLOW WATER DEPTH DETERMINATION BY USING REMOTE SENSING AT LANG TENGAH ISLAND, TERENGGANU

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FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
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2012

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SHALLOW WATER DEPTH DETERMINATION BY USING REMOTE SENSING AT LANG TENGAH ISLAND, TERENGGANU

By

Aw Pei Rui

Research Report submitted in partial fulfillment of

the requirement for the degree of

Bachelor of Science (Marine Science)

Department of Marine Science

Faculty of Maritime Studies and Marine Science

UNIVERSITI MALAYSIA TERENGGANU

2012

This project report should be cited as:

Aw, P. R. 2012. Shallow water depth determination by using remote sensing at Lang Tengah Island, Terengganu. Undergraduate thesis, Bachelor of Science in Marine Science, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu, Terengganu, 60p.

DEPARTMENT OF MARINE SCIENCE
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DECLARATION AND VERIFICATION FORM

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:

Shallow Water Depth Determination by Using Remote Sensing at Lang Tengah Island, Terengganu by **Aw Pei Rui**, Matric No. **UK 20363** has been examined and all errors identified have been corrected. This report issubmitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of **Bachelor of Science (Marine Science)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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ACKNOWLEDGEMENT

First and foremost I offer my sincerest gratitude to my first supervisor, Prof. Madya Dr. Aidy @ M. Shawal bin M. Muslim, for his supervision, advice, and guidance to my project with patience and knowledge. He had given me a lot of suggestion and opinion during the laboratory and thesis work. Without him, this thesis would not have been completed in time. I would also like to thanks Dr. Razak bin Zakariya, my co-supervisor, for his support and knowledge in my final year project.

I grateful acknowledge Mohd Kaharudin bin Mat Zin and Naieman bin Muhamad for their guiding during the laboratory session. They had sacrificed valuable time to teach me everything I know about remote sensing software. I would like to thanks my coordinator of final year report, Dr. Nor Antonina Abdullah, thanks for her help and care during the project. I would also like to thanks my faculty, Faculty of Maritime Studies and Marine Science for allow me do this final year project.

Special thanks also to all my course mates and friends, especially; Goh Wei Sin, Pek Yen Lee, Sim Eik Ee, and Teow Boon Shyan for sharing the literature and invaluable assistance. It would have been a lonely lab without them.

Last but not least, I would like to express my appreciation to my beloved family for their supporting and caring through the duration of my study.

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ABBREVIATIONS

1.	%	Percentage
2.	$\Delta\lambda_{Band}$	Effective bandwidth for a given band
3.	B_1	Band 1
4.	B_2	Band 2
5.	d_a	Actual depth
6.	d_p	Predicted depth
7.	D	Distance
8.	D	Depth
9.	*dc*	Draft correction
10.	*DN*	Digital Number
11.	E'	Sun elevation angle adjusted for refraction through seawater
12.	E_d	Down-welling irradiance entering the water
13.	*I*	Denote visible bands
14.	*IR*	Near-infrared band
15.	k	Attenuation coefficients
16.	k_1	Absolute radiometric calibration factor for Band 1
17.	k_2	Absolute radiometric calibration factor for Band 2
18.	k_3	Absolute radiometric calibration factor for Band 3
19.	K_{Band}	Absolute radiometric calibration factor for a given band
20.	L_d	Signal receive by sensor from deep water
21.	L_o	Signal receive by sensor from shallow water
22.	L_w	Water-leaving radiance
23.	L_x	Signal receive by sensor from water depth x
24.	$L_{\lambda\ Pixel,\ Band}$	Top-of-atmosphere spectral radiance image pixels
25.	*m*	Meter
26.	*m.s.l*	Mean sea level
27.	m_0	Offset for a depth of 0m

28. m_1 Tunable constant to scale the ratio depth

29. n Constant to assure the algorithm is positive under all circumstances

30. n Numbers of station

31. $q_{Pixel, Band}$ Radio metrically corrected image pixels

32. R^2 Correlation coefficient

33. RGB Red-Green-Blue

34. RMSE Root Mean Square Error

35. R_w Observed reflectance

36. SCS South China Sea

37. Y Constant to correct for spectral variation and depends on aerosol type

38. z Depth

39. λ Wavelength of the spectral band

40. Σ Sum

41. $\surd$ Square root

ABSTRACTS

The traditional hydrographical surveys are conducted via shipboard echo sounding. This traditional method is able to generate accurate water depth but it is high operating cost, labor-intensive, time-consuming and inefficiency. To overcome this problem, the application of remote sensing in bathymetry study has been extensively explored in recent years. Compared to the traditional method, satellite remote sensing technique is more cost-effective, easier and quicker. Besides, bathymetric measurement via remote sensing also has the advantage that the data are collected synoptically over large areas. This study is discusses the determination of bathymetry of a shallow water area applying remote sensing techniques at Lang Tengah Island, Terengganu. There are two methods used in this study, which is linear method (Benny and Dawson method) and ratio method. Both methods require the same pre-processing process, included geometric correction, atmospheric correction, and masking. The results obtained were compared with ground truth data. The accuracy of the methods is discussed and the compared between the two methods. The result shows that Band 2 for Benny and Dawson method has the highest correlation coefficient, R^2, among the three bands, which is 0.9533. Ratio method has a higher R^2 compared to the Band 2 for Benny and Dawson method as its R^2 achieve 0.9607. Ratio method is better in deriving bathymetry from satellite imagery compared to linear method. Ratio method is more robust as it only needs two tunable parameters whereas linear method requires more than two tunable parameters.

Penentuan Kedalaman Air Kawasan Cetek Dengan Menggunakan Penderiaan Jauh Di Pulau Lang Tengah, Terengganu

ABSTRAK

Penyiasatan hidrografi secara tradisioanl adalah dijalankan melalui pemerum gema. Kaedah tradisional ini mampu untuk menjana kedalaman air yang tepat tetapi kaedah ini memerlukan kos operasi yang tinggi, memerlukan sumber tenaga manusia yang banyak, memakan masa dan kurang kecekapan. Untuk mengatasi masalah ini, aplikasi penderiaan jauh dalam kajian batimetri telah diterokai dengan luas pada tahun-tahun kebelakangsn. Berbanding dengan kaedah tradisional, teknik penderiaan jauh lebih berjimat, mudah dan cepat. Di samping itu, kajian batimetri melalui penderiaan jauh juga boleh mengumpul data di kawasan yang luas secara ringkas. Kajian ini membincang tentang penentuan batimetri di kawasan air cetek dengan menggunakan teknik penderiaan jauh di Pulau Lang Tengah, Terengganu. Terdapat dua kaedah yang digunakan dalam kajian ini, iaitu kaedah linear (kaedah Benny and Dawson) dan kaedah nisbah. Kedua-dua kaedah ini mempunyai pra-pemprosesan yang sama, termasuk pembetualn geometri, pembetulan atmosfera, dan penyolekan. Keputuan yang diperolehi dari dua kaedah akan dibandingkan. Hasilannya merujukan Kaedah nisbah (0.9607) mempunyai ketepatan yang lebih tinggi daripada kaedah linear (0.9533) sedangkan kaedah nisbah hanya memerlukan dua parameter boleh laras tetapi kaedah linear memerlukan lebih dari dua parameter boleh laras.