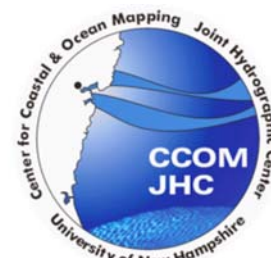


**48th UNB-OMB / UNH-CCOM  
Multibeam Sonar Training Course  
Singapore, November 24 to 29, 2008**



**Co-hosted by  
The Maritime and Port Authority of Singapore (MPA)**

- When** : From 0800H Monday 24 November 2008  
To 1630H Saturday 29 November 2008
- Where** : Grand Ballroom I, Furama City Centre Hotel,  
60 Eu Tong Sen Street, Singapore 059804  
[01°17'13"N, 103°50'42"E]
- Cost** : The registration fee is USD 3,450 which includes course materials and lunch for 6 days, but not accommodation.
- Accommodation** : Is available at the Furama City Centre Hotel (<http://www.furama.com/citycentre>), from SGD 200++ /night (Deluxe); SGD 238++ /night (Single, Executive Club) SGD 268++ /night (Twin, Executive Club). Breakfast is included.
- For Bookings, contact hotel through Ms Fei Wong (Email: [feiwong@furama.com](mailto:feiwong@furama.com); Tel: +65 6531 5320; Fax: +65 6538 4875) by **24 October 2008**.

**For more details, do not hesitate to contact:**

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## **Course Description**

This six-day, 36-lecture course is designed to provide a theoretical and practical background in marine swath survey technology and techniques for hydrographic surveys, continental shelf boundary delimitation, offshore engineering, harbour dredging, fisheries habitat, route survey and scientific research, and provides overviews of:

- the technology and problems associated with shallow water multibeam surveys,
- processing and visualization techniques designed to address the complexities of swath mapping,
- constraints on using swath bathymetry to produce highest quality data.

<b>Day</b>	<b>Lecture Topic</b>	<b>Instructor</b>
Monday	<b>INTRODUCTION AND REVIEW OF FUNDAMENTAL CONCEPTS</b>	
	01 Historical Perspective and Course Overview	JHC
	02 Fundamentals of Echo-Sounding	CdM
	03 Oceanographic and Geologic Concepts	LM
	04 Fundamentals of Sonar	CdM
	05 Spatial Referencing Terms and Concepts	DW
	06 Visualization Terms and Concepts	LM
Tuesday	07 Hydrographic Performance Standards	DW
	<b>SWATH SONAR ISSUES</b>	
	08 Sidescan Sonar Methods (Single & Multi-row)	CdM
	09 Multibeam Sonar Methods	CdM
	10 Bottom Detection Methods	CdM
	11 Sidescan / Backscatter Imaging with Swath Sonars	JHC
	<b>ANCILLARY SENSOR ISSUES</b>	
	12 Multisensor Integration for Swath Bathymetric Systems	JHC
Wednesday	13 Sound Refraction in the Water Column	CdM
	14 Refraction Operational Limitations due to Watermass Variability	JHC
	15 Horizontal, Vertical & Orientation Positioning Requirements	DW
	16 Positioning Models and Methods I	DW
	17 Positioning Methods II	DW
	18 Error Estimation in Swath Methods	LM
Thursday	<b>SEABED ACOUSTIC BACKSCATTER</b>	
	19 Acoustic Seabed Interaction Theory	CdM
	20 Acoustic Backscatter Image Interpretation	JHC
	21 Introduction to Seafloor Characterization	LM
	22 Oblique Incidence Characterization Methods	CdM
	<b>SURVEY DESIGN AND QUALITY CONTROL</b>	
	23 Survey Design and Planning	LM
	24 The Patch Test and Sensor to Ship Reference Frame Alignment	JHC
Friday	25 Requirements for Decimetre Bathymetry	DW
	26 Field Quality Control: Dynamic Error Recognition and Analysis	JHC
	<b>DATA PROCESSING</b>	
	27 DTM Generation Methods & Pitfalls	CdM
	28 Swath Bathymetry Data Cleaning – Interactive and Automated	JHC
	29 Data Reduction for Chart Compilation Purposes	JHC
	30 The Swath Processing Pipeline	LM
Saturday	31 Impact and Management of Dense Digital Bathymetry	DW
	<b>CURRENT &amp; FUTURE TECHNOLOGY</b>	
	32 Alternative Approaches for High Density Bathymetric Data Collection	LM
	33 Characteristics of Available Swath Sonar Systems	CdM
	34 Operational Field Trials: Assessing Performance	JHC
	35 New Data Presentation Methods	LM
	36 Course Roundup and Discussion on Emerging Issues	ALL

## Advance preparation by attendees

This course is very intensive and fast-paced. Attendees come from various backgrounds and some have found they benefited from some pre-reading for the course. There is no mandatory preparation but we recommend the following resources be consulted by those feeling the need for such preparation:

### **Available at no cost:**

International Hydrographic Organization Publication M-13 *Manual on Hydrography* (2005, corrected May 11, 2007), particularly chapters 2, 3, 4 and 7  
[http://www.iho.shom.fr/PUBLICATIONS/download\\_M13.htm](http://www.iho.shom.fr/PUBLICATIONS/download_M13.htm)

L3 Seabeam's *Multibeam Sonar Theory of Operations Manual* at  
<http://www.mbari.org/data/mbsystem/formatdoc/>  
(scroll down to "How Mapping Sonars Work" for 7 downloadable pdf files)

Chapter 11: "Acoustic multibeam survey systems for deep-draft navigation projects" in the US Army Corps of Engineers *Hydrographic Engineer Manual* (2002, corrected Apr 2004) free download at  
<http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-1003/toc.htm>

Chapter 11 "Acoustic (single- and multibeam) and airborne sounding methods, sidescan and oblique sonars" de Jong, Lachapelle, Skone & Elema (2002) *Hydrography* 351 pp. ISBN 9040723591 Euro 29.50.  
<http://www.vssd.nl/hlf/landmeet.html#hydro>

The MB-System Cookbook  
<http://www.mbari.org/data/mbsystem/mb-cookbook/index.html>

### **Available for purchase:**

Chapter 9: "Sonar" by Lloyd Huff and Guy Noll, in the book edited by David Maune (2007) *Digital Elevation Model Technologies and Applications: The DEM Users Guide, 2<sup>nd</sup> Edition* ASPRS publications, ISBN 1570830827 \$155  
<https://eserv.asprs.org/eseries/source/Orders/index.cfm>

Chapter 8: "Underwater acoustic mapping systems" in Xavier Lurton (2002) *An Introduction to Underwater Acoustics: Principles and Applications* 347 pp. Springer Verlag ISBN 3540429670 \$159  
<http://www.springer.com/west/home?SGWID=4-102-22-2225124-0&changeHeader=true>

R.J. Urick (1983) *Principles of underwater sound*, 3rd Ed. Peninsula Publishing, ISBN 0-932146-62-7 \$71 in the USA, \$76 international price.  
<http://www.peninsulapublishing.com>

**Registration Form**  
**48th UNB-OMB / UNH-CCOM**  
**Multibeam Sonar Training Course**  
**Singapore, November 24 to 29, 2008**

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

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Briefly describe your past experience with Multibeam Sonar Systems; and/or

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future plans for work with Multibeam Systems.

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**Please email or fax registration forms for each attendee to:**

**HydroMetrica Limited**

**Fax: +1 506 454 0352**

**Email: dew@unb.ca**

**48<sup>th</sup> OCEAN MAPPING GROUP MULTIBEAM COURSE  
CO-HOSTED BY THE MARITIME AND PORT AUTHORITY OF SINGAPORE**

### **Introduction**

As part of its objectives to raise the standards of hydrography in the East Asia region through hydrographic training, the Maritime and Port Authority of Singapore (MPA) is pleased to announce that Singapore will be the regular venue for holding the Multibeam Course. MPA will be co-hosting the 48<sup>th</sup> Ocean Mapping Group Multibeam Course and the course will be held from 24-29 November 2008 at Furama City Centre Hotel, Singapore.

### **Course Background**

The Multibeam Course was originally developed in 1994 to provide theoretical and practical training to users of marine multibeam survey systems. Since then, over 46 successful and oversubscribed courses have been run worldwide and the Multibeam Course has become internationally recognised as one of the world's most comprehensive multibeam survey courses.

The Multibeam Course is conducted by expert instructors from the Ocean Mapping Group (University of New Brunswick) and the Center for Coastal and Ocean Mapping (University of New Hampshire).

### **Course Description**

The Multibeam Course is a 36-lecture, 6-day course primarily designed to provide a theoretical and practical background in marine multibeam survey technology and techniques. The information is tailored for those using marine multibeam survey systems in both the traditional hydrographic survey field (for safety of navigation and nautical charting) as well as non-traditional ocean survey fields (such as continental shelf boundary delimitation, offshore engineering, harbour dredging, fisheries habitat, route survey and scientific research fields).

The aim of the Multibeam Course is to prepare and train experienced hydrographic surveyors in the use of multibeam sonar systems. In particular the Multibeam Course is designed to provide overviews of:

- the technology and problems associated with shallow water multibeam surveys;
- processing and visualization techniques designed to address the complexities of multibeam mapping; and
- constraints on using multibeam bathymetry to produce hydrographic quality data.

While the emphasis is on "coastal surveying", this is primarily a response to the greater demands placed on the surveying hardware in the spatially and temporally variable environment in the inner continental shelf and immediate coastal zone. Nevertheless, the material presented includes, and is equally

applicable to, the multibeam bathymetric data collected in the outer continental shelf and deep-ocean.

### **Course Registration and Information**

Course enrolment is limited and the 48<sup>th</sup> Ocean Mapping Group Multibeam Course will be the only course in Asia Region for 2008. The registration fee of USD3,450/- includes all course materials and lunch for all 6 days (but excludes accommodation). Accommodation is available at the venue from SGD200/- per night (breakfast included). For bookings of accommodation, please contact hotel through Ms Fei Wong (email: [feiwong@furama.com](mailto:feiwong@furama.com)) by 24 Oct. 2008.

Course application form could be downloaded from :  
[http://www.mpa.gov.sg/calendar\\_events/mb\\_course.htm](http://www.mpa.gov.sg/calendar_events/mb_course.htm)

For more information, please do not hesitate to contact either of the following persons:

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**Tel:** +1 603 431 1773  
**Fax:** +1 506 454 0352  
**Email:** [lgee@ivs3d.com](mailto:lgee@ivs3d.com)

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