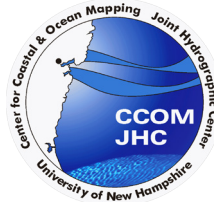


77th Multibeam Sonar Training Course New Orleans, January 7 to 12, 2019



- When:** From 0815H Monday January 7, 2019
To 1600H Saturday January 12, 2019
- Where:** Orleans Ballroom, 2rd Floor
Bourbon Orleans Hotel
717 Orleans St, New Orleans, Louisiana 70130
[29° 57' 32" N, 90° 3' 53" W]
- Cost:** The registration fee is \$3,850, which includes course materials and lunch for 6 days, but not accommodation.
- Accommodation:** A block of 40 rooms is reserved for the course at the Bourbon Orleans Hotel, and the reservation cut-off date is December 17, 2018. The Government per diem rate will apply to those with government ID.
When you register we will provide further information to allow you to book rooms for the course.
- More Information:** Contact Lindsay Gee
Email mbcinfo@hydrometrica.com
Phone +1 603 957-1461

Course Description and Outline

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.

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

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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 resources listed below be consulted by those feeling the need for such preparation.

Attendees at previous courses recommended that we provide access to some course materials in advance of the course. Hence, a download link is included in the receipt for payment of course fees, for binder 1 of 3 (we recommend looking at the first 7 lectures in particular). Printed copies will still be provided at the course.

Available at no cost:

International Hydrographic Organization Publication C-13 *Manual on Hydrography* (2005, corrected Feb 2011), particularly chapters 2, 3, 4 and 7
http://www.iho.int/iho_pubs/CB/C13_Index.htm

International Hydrographic Organization Special Publication S-44 *IHO Standards for Hydrographic Surveys*, 5th Edition, February 2008
http://www.iho.int/iho_pubs/standard/S-44_5E.pdf

L3 Seabeam's *Multibeam Sonar Theory of Operations Manual* (2000) at
<http://www.mbari.org/data/mbsystem/sonarfunction/SeaBeamMultibeamTheoryOperation.pdf>

US Army Corps of Engineers *Hydrographic Engineer Manual* (2013-11-30) particularly chapters 3, 6 and 7, and appendices D and F (example projects appendices H to Q). download at
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1003.pdf

de Jong, Lachapelle, Skone & Elema (2003) *Hydrography* Second Edition, e-book with corrections (2010) 354 pp. ISBN: 90-407-2359-1. Particularly Chapter 11 *Sounding Methods*. Free download from
http://www.ucalgary.ca/engo_webdocs/SpecialPublications/Hydrography_2ndEdition_eBook_2010.pdf

The MB-System Cookbook (version 2006-02-16)
<http://www.mbari.org/data/mbsystem/mb-cookbook/index.html>

FIG Guide on the Development of a Vertical Reference Surface for Hydrography (2006), FIG Pub. No. 37.
<http://www.fig.net/pub/figpub/pub37/pub37.pdf>

Lurton & Lamarche (Eds) (2015) *Backscatter measurements by seafloor-mapping sonars. Guidelines and Recommendations*. GeoHab Backscatter Working Group Report. 200p.
<http://geohab.org/wp-content/uploads/2014/05/BSWG-REPORT-MAY2015.pdf>

Available for purchase:

Xavier Lurton (2010) *An Introduction to Underwater Acoustics: Principles and Applications* Second Edition, (Particularly Chaps 2, 5, 6, 7, 8) 480 pp. Springer Verlag ISBN13: 978-3-540-78480-7 \$419
<http://www.springer.com/earth+sciences+and+geography/oceanography/book/978-3-540-78480-7>

R.J. Urick (1983) *Principles of underwater sound*, 3rd Ed. Peninsula Publishing, ISBN 0-932146-62-7 \$74
http://peninsulapublishing.com/index.php?main_page=product_book_info&cPath=16&products_id=18

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New Orleans, 7 to 12 January, 2019**

Instructions:

Download free Acrobat Reader <<http://www.adobe.com/go/reader>>. Open this document and fill in under Acrobat. Save and **email to <mbcinfo@hydrometrica.com>**

Name:

Company:

Address:

Phone:

Mobile:

Official E-mail (which, in some organizations, may restrict document downloads):

Personal E-mail (for download of the course materials):

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

future plans for work with Multibeam Systems.

Upon receipt of this registration, we will send you an **invoice** by email, with payment instructions.
Upon receipt of payment, we will send you a **receipt**, including a link for downloading course Binder 1 (of 3).