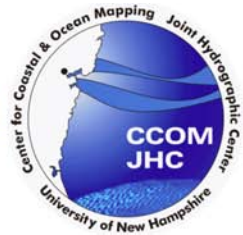


**53rd UNB-OMG / UNH-CCOM
Multibeam Sonar Training Course
Malmo Sweden, 15 to 20 March, 2010**



**SWEDISH MARITIME
ADMINISTRATION**



**Co-hosted by
Swedish Maritime Administration**

When: From 0800H Monday 15 March 2010
To 1630H Saturday 20 March 2010

Where: Malmö Börshus
Skeppsbron 2, 21120 Malmö, Sweden
<http://www.malmoborshus.se/>
[55-36-31 N, 12-59-55 E]

Cost: The registration fee is USD 3,750, which includes course materials and lunch for 6 days, but not accommodation.

Accommodation: The course venue is in the centre of Malmö and there are a number of hotels in the area that should meet most budgets. Some suggestions will be provided when participants register for the course.

For more details, do not hesitate to contact:

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Hotels

Malmö has many hotels, found by internet search. Here are some examples.

Hotels providing special rates: The following five hotels are contracted by the Swedish Government, so the price for a single room will be as shown if you use booking reference: ***“Multibeam Sonar Training Course, Malmö Sweden, 15 to 20 March, 2010”***

Best Western Hotel Noble House noblehouse@hkchotels.se	Gustaf Adolfs Torg 47 www.hkchotels.se	T +46 40 664 30 00 Single room	SEK 1095
Comfort Hotel Malmö co.malmö@choice.se	Carlsgatan 10 C www.choicehotels.se	T +46 40 33 04 40 Single room	SEK 995
First Hotel Garden info.garden@firsthotels.se	Baltzarsgatan 20 www.firsthotels.se	T +46 40 665 62 00 Single room	SEK 855
First Hotel Jörgen Kock jorgenkock@firsthotels.se	Jörgen Kocksgatan 3 www.firsthotels.se	T +46 40 10 18 00 Single room	SEK 947
Quality Hotel Konserthuset q.konserthuset@choice.se	Amiralsgatan 19 www.choicehotels.se	T +46 40 664 60 00 Single room	SEK 895

Hotels close to the course venue (Börshus):

Elite Hotel Savoy, Malmö info.savoy@elite.se	Norra vallgatan 62 www.elite.se/hotell/malmo/savoy/	T +46 40 66 44 800	
Elite Hotel Residens, Malmö info.residens@elite.se	Adelgatan 7 www.elite.se/?q=eng/node/707	T +46 40 66 44 890	
Hotell Baltzar info@baltzarhotel.se	Baltzargatan 45 www.baltzarhotel.se/	T +46 40 66 55 700	
Hotel Kramer kramer@scandichotels.com	Stortorget 7 www.scandichotels.se	T +46 40 693 54 00	

Instructors

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Course Schedule

The standard daily schedule is:

0830-0930 - lecture [Monday we start at 0800, to allow time for student introductions.]
0930-0945 - break
0945-1045 - lecture
1045-1100 - break
1100-1200 - lecture
1200-1330 - lunch [If we run overtime in the morning, lunch starts as late as 1230]
1330-1430 - lecture
1430-1445 - break
1445-1545 - lecture [Saturday open-ended feedback session (Lect 36) starts after Lect 35]
1545-1600 - break
1600-1700 - lecture
1700-1800 - informal happy hour daily

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.

Day	Lecture Topic	Instructor	
Monday	INTRODUCTION AND REVIEW OF FUNDAMENTAL CONCEPTS		
	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	
Tuesday	06 Visualization Terms and Concepts	LM	
	07 Hydrographic Performance Standards	DW	
	SWATH SONAR ISSUES		
	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	
	ANCILLARY SENSOR ISSUES		
	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	SEABED ACOUSTIC BACKSCATTER		
	19 Acoustic Seabed Interaction Theory	CdM	
	20 Acoustic Backscatter Image Interpretation	JHC	
	21 Introduction to Seafloor Characterization	LM	
	22 Oblique Incidence Characterization Methods	CdM	
	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 Requirements for Decimetre Bathymetry	DW
		26 Field Quality Control: Dynamic Error Recognition and Analysis	JHC
DATA PROCESSING			
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	
	CURRENT & FUTURE TECHNOLOGY		
	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 27, 2008), particularly chapters 2, 3, 4 and 7
http://www.iho.shom.fr/PUBLICATIONS/download_M13.htm

International Hydrographic Organization Special Publication S-44 *IHO Standards for Hydrographic Surveys*, 5th Edition, February 2008
http://www.iho.shom.fr/publicat/free/files/S-44_5E.pdf

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://140.194.76.129/publications/eng-manuals/em1110-2-1003/toc.htm>

Chapter 11 "*Sounding methods*" de Jong, Lachapelle, Skone & Elema (2003) *Hydrography* 351 pp. ISBN13: 978-90-407-2359-9 Euro 30.25
<http://www.vssd.nl/hlf/landmeet.html#hydro>

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
FIG Publication No. 37, September 2006
<http://www.fig.net/pub/figpub/pub37/pub37.pdf>

Available for purchase:

Chapter 9: *Sonar* by Lloyd Huff and Guy Noll, and Chapter 10: *Enabling Technologies*, by Bruno Scherzinger, Joseph Hutton and Mohamed Mostafa, in the book edited by David Maune (2007) *Digital Elevation Model Technologies and Applications: The DEM Users Guide, 2nd Edition* ASPRS publications, ISBN 1570830827 \$155
<https://eserv.asprs.org/eseries/source/Orders/index.cfm>

Chapter 8: "*Underwater acoustic mapping systems*" in Xavier Lurton (2003) *An Introduction to Underwater Acoustics: Principles and Applications* 356 pp. Springer Verlag
ISBN13: 978- 3-540-42967-8 \$189
<http://www.springer.com/earth+sciences/oceanography/book/978-3-540-42967-8>

R.J. Urick (1983) *Principles of underwater sound*, 3rd Ed. Peninsula Publishing, ISBN 0-932146-62-7 \$71 in the USA, \$74 international price.
<http://www.peninsulapublishing.com>

Registration Form
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Malmo, Sweden, 15 to 20 March, 2010

Instructions:

Manual method - print this page, fill in, and **fax to +1-506-454-0352**.

Acrobat method - download free Acrobat Reader <<http://www.adobe.com/go/reader>>, open this document and fill in under Acrobat, save and **email to <dew@unb.ca>**

Name: _____

Company: _____

Address: _____

Phone: _____

Mobile: _____

Fax: _____

E-mail: _____

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

future plans for work with Multibeam Systems.
