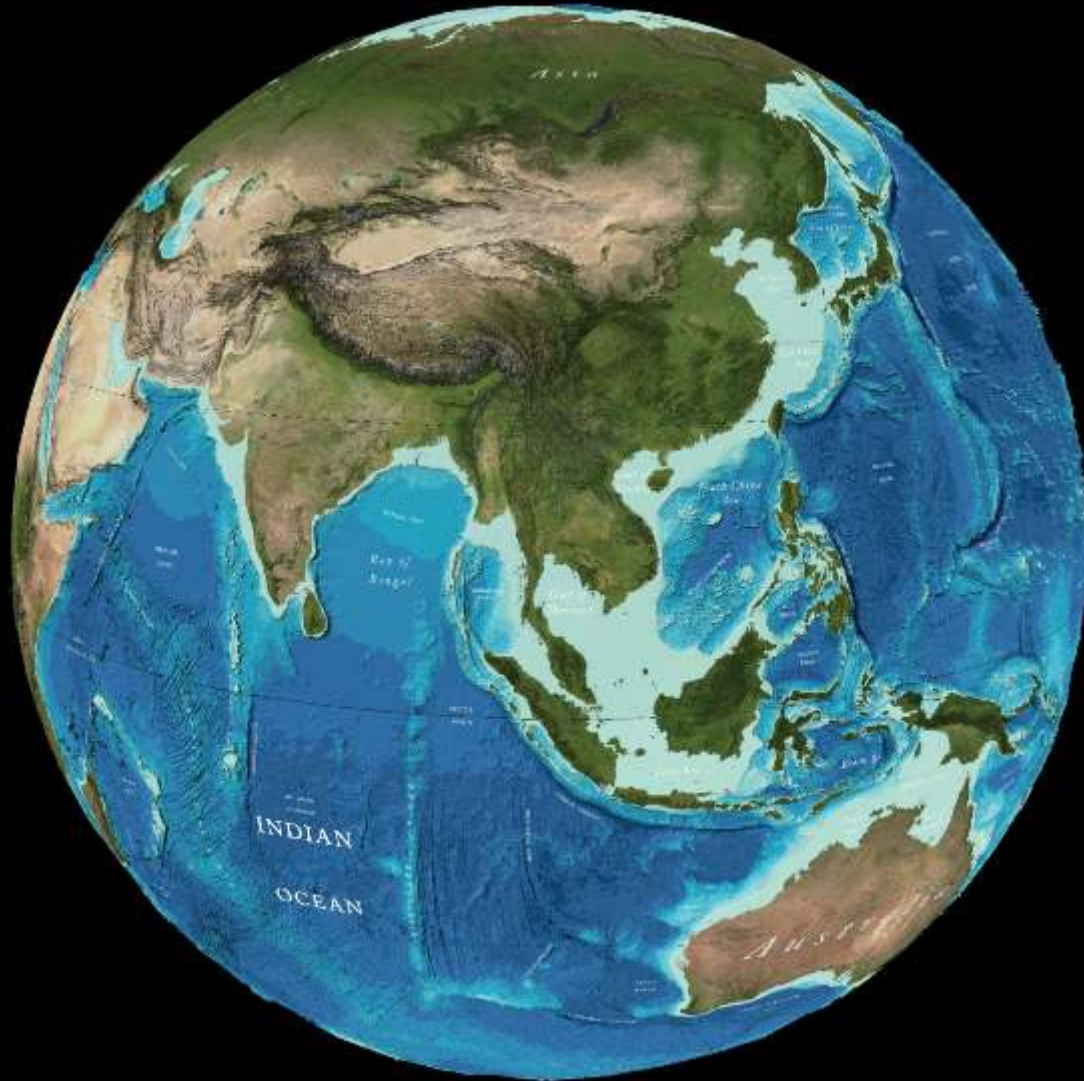




TSCOM-SCRUM

Kuala Lumpur 2015



Kuala Lumpur Convention Center, Oct. 5, 2015

*Paul Elmore, Convener; 15 Oral and 22 Poster
Presentations; ~180 attendees*

Thanks!!





TSCOM-SCRUM

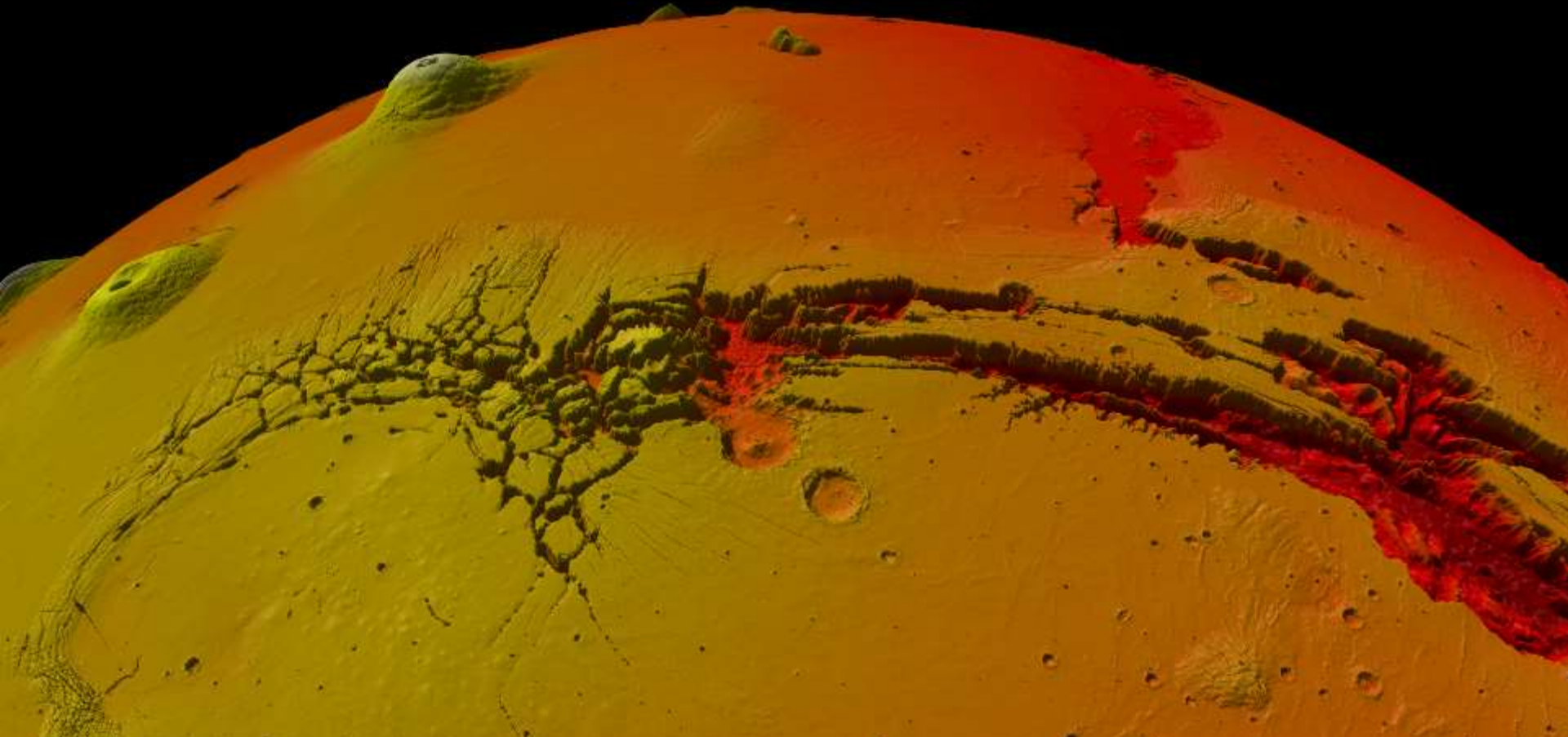
Kuala Lumpur 2015



GEBCO overarching goal:

To produce the most authoritative coherent portrayal of the seafloor, from the coast to the deepest parts of the oceans

How do our knowledge about the shape of the World oceans floor reach this level of detail?



Mars was mapped already in 1998 and 1999 by NASA's Mars Orbiter Laser Altimeter (MOLA). From Mars Express High-Resolution Stereo Camera (HRSC) images, DTMs of 50x50 m resolution are produced and ortho-images with 12.5 m resolution (Gwinner, et al., EPSSL, 2010)

Tuesday Oct. 6 (SCRUM and TSCOM)

Tun Sri Lanang Room, Royal Chulan Hotel



08:45-09:00 Arrival of delegates

09:00-09:30 Welcome address by Radm Zaaim Hasan, Director General, National Hydrographic Center of Malaysia

09:30-09:35 Agenda (Jakobsson/Marks)

09:35-09:45 TSCOM Overview (Karen Marks)

09:45-09:55 SCRUM Overview (Martin Jakobsson)

Status Reports from regional bathymetric compilations and technical work on bathymetric grid

Status of GEBCO grid (Weatherall)

EMODNet (Thierry Schmitt)

Announcement of Crowd Source Bathymetry Meeting (Taylor)

GEBCO Outreach update- Plan for webpages for students (Sung/Chang/Weatherall)

GEBCO High-Resolution Product (Ferrini)

GEBCO/Nippon Foundation Indian Ocean Bathymetric Compilation (IOBC) (Wigley)

North Atlantic Seabed Mapping Project (Jencks/Wyatt)

IBCAO/IBCSO/Baltic (Jakobsson)

GEBCO Topic (Tani)

10.30-11:00 Refreshment Break

11:00 -12:00 Continue status reports

12:00-13:00 Plenary: Update the GEBCO grid (Marks/Jakobsson)

13.00-14:00 Lunch Break

14:00-15:30 Break-outs: 1) Update GEBCO Grid, 2) Outreach, 3)?

15:30-16:00 Refreshment Break

17:00 Adjourn

20:00-20:15: Arrival of guests for Welcome Dinner at Taming Sari 3, Ground Floor, Royale Chulan Hotel



Wednesday Oct. 7 (SCRUM and TSCOM)

Tun Sri Lanang Room, Royal Chulan Hotel

9:00-9:30 Summary of TSCOM/SCRUM Meeting

9:30-13:00 Crowd-Source Bathymetry Meeting (Taylor)

10:30-11:00 Refreshment Break

13:00-14:30 Lunch Break

14:30-17:00 Visit to PETRONAS Data Management Centre

17:00 Adjourn



What is TSCOM?

Technical Sub-Committee on Ocean Mapping

1. Terms of Reference

1.1 The Sub-Committee reports to the Joint IOC-IHO GEBCO Guiding Committee (GGC) as its designated authority for all technical matters relevant to the goals of GEBCO as set out in the Guiding Committee Terms of Reference and Rules of Procedure.

1.2 The Sub-Committee shall:

1.2.1 Maintain and improve GEBCO products and supporting data such as, but not limited to:
a) A global bathymetric grid;

....designated authority for all technical matters relevant to the goals of GEBCO as set out in the Guiding Committee Terms of Reference and Rules of Procedure.

1.2.2 Monitor developments in data availability and relevant technology as may impact GEBCO activities, and recommend to the GC actions that will maintain the excellence of GEBCO products.

1.2.3 Provide advice to individuals and appropriate authorities on the scientific and technical aspects of bathymetric mapping, as requested.

1.2.4 Encourage and facilitate the location, acquisition and exchange of sounding, shoreline, remotely sensed and other data supporting bathymetric mapping.

1.2.5 Investigate the application of GEBCO products, beyond the cartographic sciences, with the aim of producing products that are easily applied to other ocean sciences.

1.2.6 Establish, nurture, and/or disband working groups, as needed, to carry out specific tasks or product developments that relate to the technical advance of the GEBCO Project.

1.2.7 Work with SCUFN on matters of joint interest, such as, but not limited to, the shapes or outlines of named features and the automatic placement of feature names.

What is SCRUM?

Sub-Committee on Regional Undersea Mapping

- The Sub-Committee shall:

1.2.1 Maintain liaison and cooperate with all existing regional mapping efforts chartered by the IOC under the International Bathymetric Chart (IBC) initiative as well as other relevant regional bathymetric mapping projects.

- 1.2.2. Act as an Editorial Board by reviewing and validating the resulting regional products before incorporation into the

GEBCO global grid.

1.2.1 Maintain liaison and cooperate with all existing regional mapping efforts

- 1.2.4 Encourage the establishment of new IHO/IOC regional bathymetric mapping projects to fill current gaps in global bathymetry.
- 1.2.5 Establish, support, and/or disband working groups, as needed, to carry out specific tasks or product developments that advance of the GEBCO Project.
- 1.2.6 Work with SCUFN on matters of joint interest, such as, but not limited to, facilitating the proposal of new undersea feature names within IBC areas, defining the geometry of named undersea features, and providing contacts with region specific expertise in bathymetry, geomorphology, and marine geology.



TSCOM 2015 (Chaired by Karen Marks)

Committee Members

Jenifer Austin – Google Earth, USA

Vicki Ferrini – LDEO, USA

John Hall – Geological Survey of Israel

Timothy Kearns – OneOcean Corporation, USA

Karen Marks – NOAA, USA

Marzia Rovere – Istituto di Scienze Marine, Consiglio Nazionale delle Ricerche, Italy

Thierry Schmitt – SHOM, France

Walter Smith – NOAA, USA

Shin Tani – Hydrographic and Oceanographic, Coast Guard, Japan

Pauline Weatherall – British Oceanographic Data Center, UK

Scientific Advisors

Paul Elmore, NRL, USA

Tony Pharosah, IHO, Monaco

Martin Jakobsson, Stockholm University, Sweden

David Sandwell, Scripps Institution of Oceanography, USA

There are many more active in TSCOM work

SCRUM 2015 (Chaired by Martin Jakobsson)



Name	Organisation	Country
Armando De Lisa Bornachera	CIOH	Colombia
Barry Eakins	NOAA/National Geophysical Data Center	USA
Benjamin Hell	Swedish Maritime Administration	Sweden
Boris Dorschel	AWI	Germany
Choi Sung Ho	Korea Hydrographic and Oceanographic Administration	Republic of Korea
Eric Moussat	IFREMER	France
Federica Foglini	Institute for Marine Sciences (ISMAR)	Italy
Fernando Oviedo Barrero	CIOH	Colombia
Hans Öiås	Swedish Maritime Administration	Sweden
Hugo Montoro	Dirección de Hidrografía	Peru
John Hall	Geological Survey of Israel (retired)	Israel
Li Sihai	National Marine Data and Information Service	China
Martin Jakobsson	Stockholm University	Sweden
Mohammad Chowdhury	University of Chittagong	Bangladesh
Paul Elmore	US Naval Research Laboratory	USA
Pauline Weatherall	British Oceanographic Data Centre	UK
Robert Anderson	Leidos Inc.	USA
Rochelle Wigley	University of New Hampshire	USA
Serge Levesque	Canadian Hydrographic Service	Canada
Shin Tani	Hydrographic and Oceanographic, Coast Guard,	Japan
Suzanna Carbotte	Lamont-Doherty Earth Observatory	USA



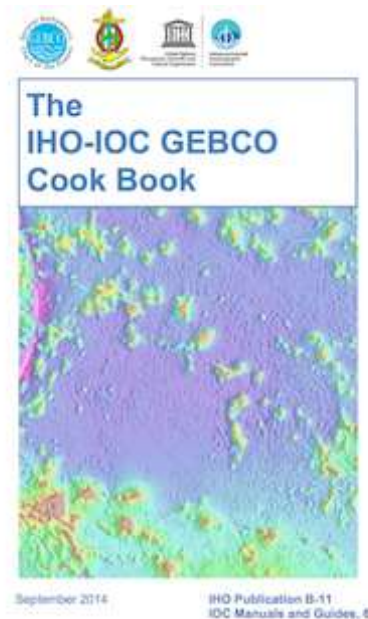
TSCOM Status – Fall 2015

GEBCO_2014 grid released

GEBCO Release paper published

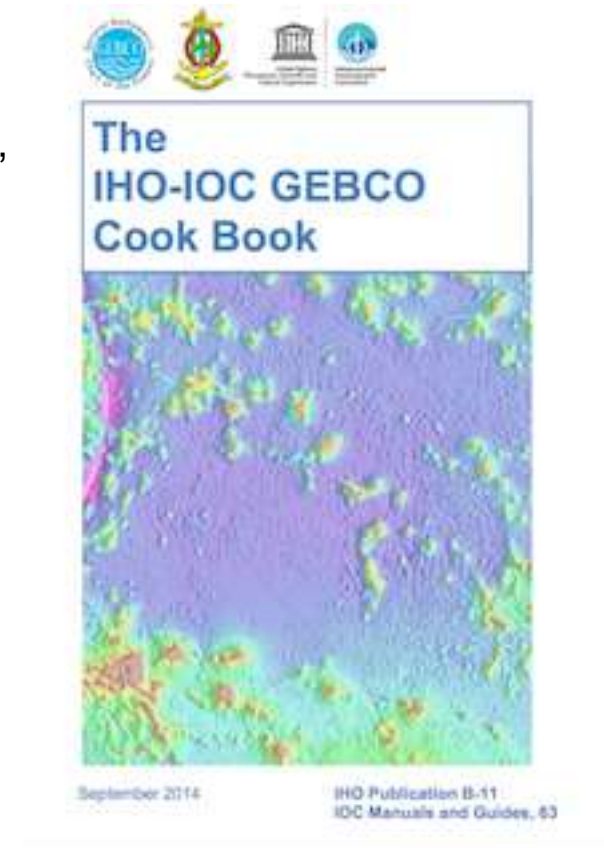
Weatherall, P., K. M. Marks, M. Jakobsson, T. Schmitt, S. Tani, J. E. Arndt, M. Rovere, D. Chayes, V. Ferrini, and R. Wigley (2015), A new digital bathymetric model of the world's oceans, *Earth and Space Science*, 2, 331–345, doi:[10.1002/2015EA000107](https://doi.org/10.1002/2015EA000107).

Cook Book contributions



At the 2009 GEBCO 25th Meeting of TSCOM, the “Cook Book Working Group” was formed to “create a manual that enables users to prepare and grid data for inclusion in GEBCO products,” resulting in:

- IHO-IOC GEBCO Cook Book:
 - IHO Publication B-11 (April, 2012)
 - IOC Manuals and Guides, 63 (Oct. 2012)
 - EOS “News Brief” announcing Cook Book was published in EOS Trans. AGU, Feb. 2013
 - Article in Hydro Int’l (April, 2014) highlighted Cook Book
- Used as educational resource, including:
 - UNH CCOM/JHC Ocean Mapping classes
 - Texas A&M University
 - Workshops
 - Used internationally
- Available for Download: <http://www.gebco.net>
- Citation format is published on GEBCO website
- **Last update September 2014, seeking new materials**



Status : Fall 2015 Regional Mapping Projects

IBCAO: 3.0 completed
in [GEBCO_2014](#)

IBCAO 3.0 printed map completed

3.1 is on the way.....

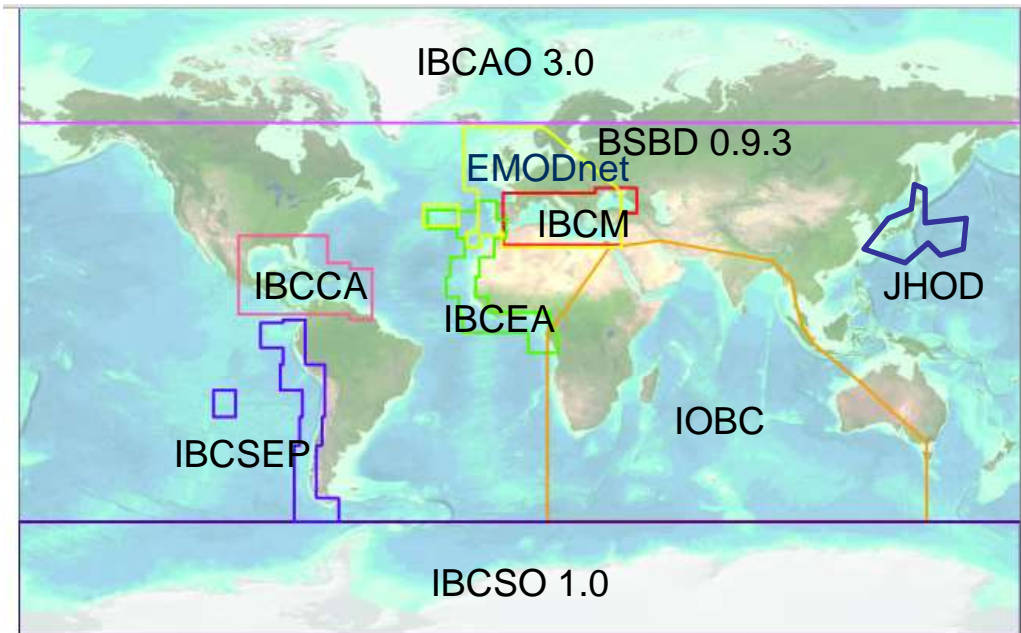
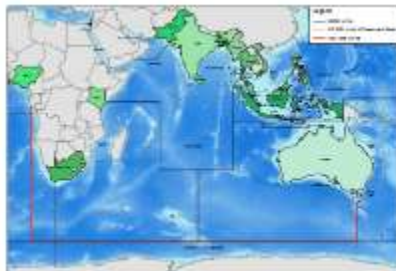
IBCSO
Version 1.0 completed
in [GEBCO_2014](#)

JHOD
in [GEBCO_2014](#)

BSBD 0.9.3
in [GEBCO_2014](#)

EMODnet
in [GEBCO_2014](#)

IOBC
Work ongoing<



Intergovernmental Oceanographic Commission (IOC) Regional Mapping Projects

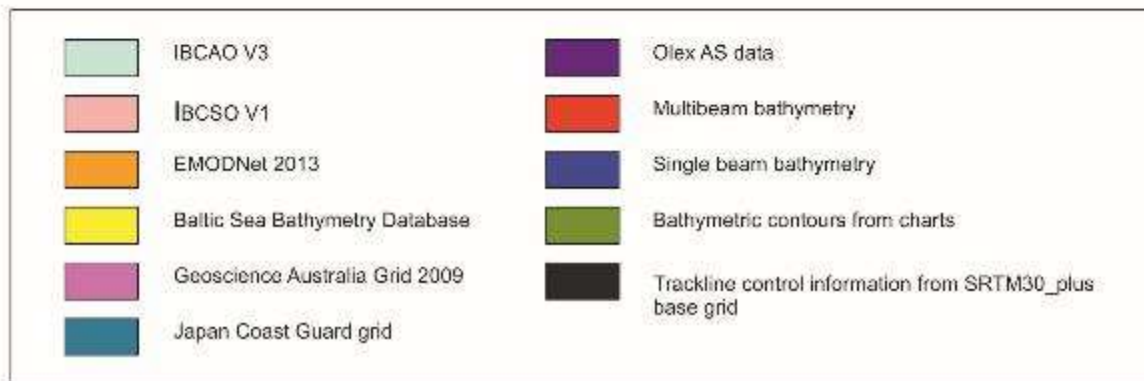
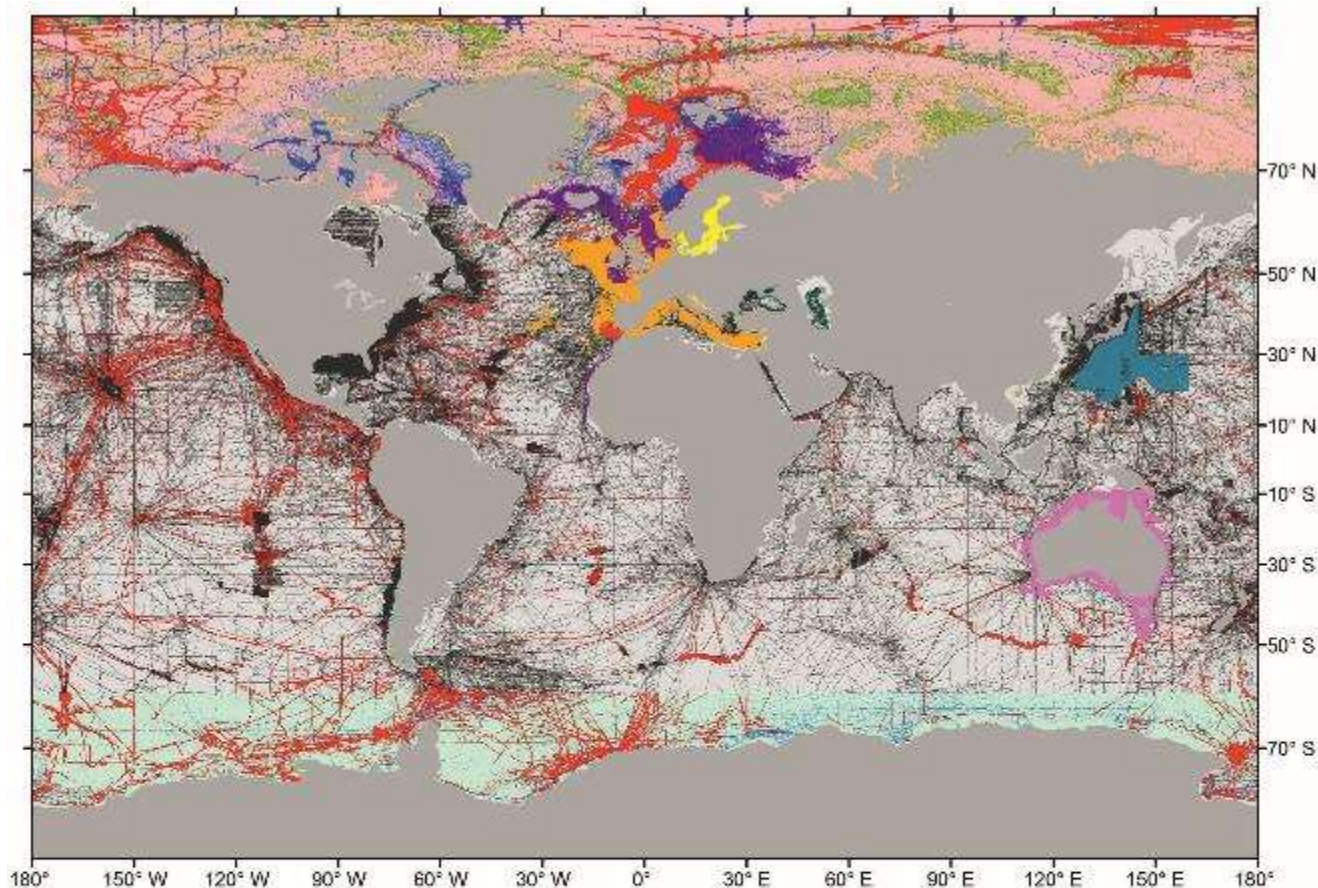
GEBCO has long benefitted from contributions from the work of the IOC Regional Mapping Projects. Find out more about the individual projects from their web sites (where available) hosted at the US National Geophysical Data Center:

- International Bathymetric Chart of the Arctic Ocean ([IBCAO](#))
- International Bathymetric Chart of the Southern Ocean ([IBCSO](#))
- International Bathymetric Chart of the Caribbean Sea & Gulf of Mexico ([IBCCA](#))
- International Bathymetric Chart of the Central Eastern Atlantic ([IBCEA](#))
- International Bathymetric Chart of the Mediterranean ([IBCM](#))
- International Bathymetric Chart of the South Eastern Pacific ([IBCSEEP](#))
- International Bathymetric Chart of the Western Indian Ocean ([IBCWIO](#))
- International Bathymetric Chart of the Western Pacific ([IBCWP](#))

19% is comprised of grids provided by regional compilations



2014





New SCRUM/TSCOM initiatives and engagements

- North Atlantic?
- IBCAO-Greenland
- IBCAO-Svalbard
- ARDEM (New Western Arctic and North Pacific Digital Elevation Model)
- swIOBC (Southwest IOBC)
- Arctic-Antarctic seafloor mapping meeting in Monaco 2016
- Crowd source bathymetry



Some Highlights

Release Paper Metrics

A New Digital Bathymetric Model of the World's Oceans

Overview of attention for article published in Earth and Space Science, June 2015



About this score

In the top 5% of all articles scored by Altmetric

High score compared to articles of the same age (97th percentile)

LESS...

Mentioned by

1 blog
56 tweeters
8 Facebook pages

What is this page?

SUMMARY

Blogs

Twitter

Facebook



So far, Altmetric has seen 8 public wall posts from 8 users.



PInoy Geologist, 04 Jul 2015

A New Digital Bathymetric Model of the World's Oceans! *General Bathymetric Chart of the Oceans (GEBCO) has released the...



INFOHAR, 02 Jul 2015

Find out all you need to know about the General Bathymetric Chart of the Oceans GEBCO_2014 grid, a new digital bathymetric...



ARC Earth Sciences, 01 Jul 2015

ooo!!



Earth Science Portal, 01 Jul 2015

A New Digital Bathymetric Model of the World's Oceans <http://ow.ly/OZKz9> #AGUpubs



ASGA - Asociación Guatemalteca de Geociencias Ambientales, 30 Jun 2015

Nuevo mapa batimétrico digital mundial de los océanos.



Observatorio Sismológico - UNIL, 30 Jun 2015

Novo mapa batimétrico!! Disponível!!!



Géologie de Pierre, 30 Jun 2015

Sera sans doute utile pour départager la souveraineté des fonds marins contestée par les pays riverain de l'Arctique. Une...



American Geophysical Union (AGU), 30 Jun 2015

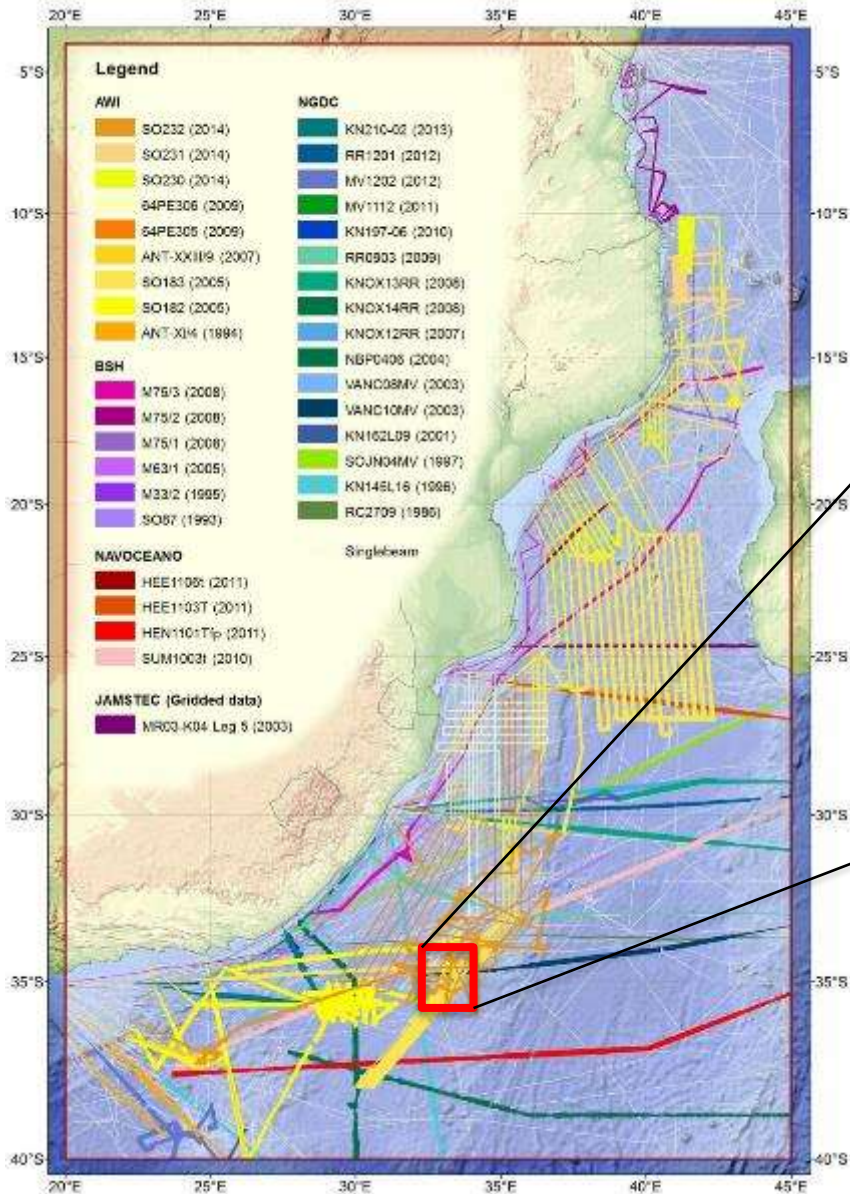
A New Digital Bathymetric Model of the World's Oceans <http://ow.ly/OZKz9> #AGUpubs

Attention ranking

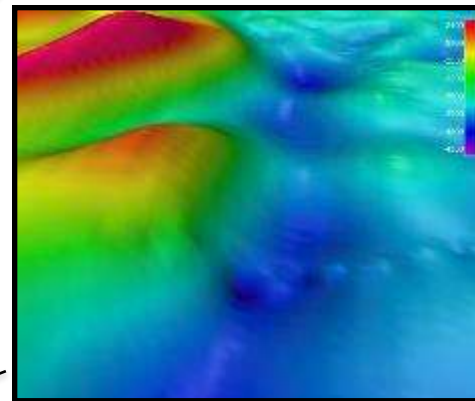
Top 5% of articles scored

Mentioned by Facebook, Twitter, Blog

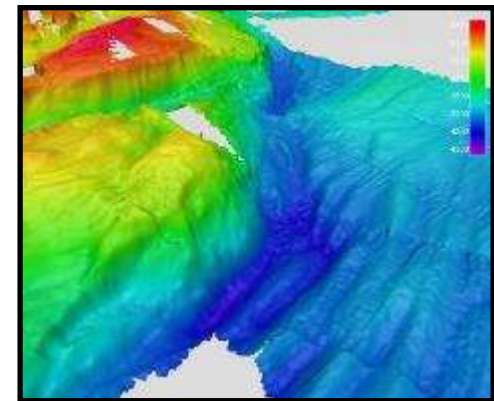
swIOBC using IBCSO gridding



- Database: About 21% high resolution data and 79% GEBCO
- Data from 10 different institutes
- swIOBC is derived at AWI by Laura Jensen, with support by Jan Erik Arndt
- V1.0 is expected to be published in 2016 ► will become part of the IOBC



Existing GEBCO data, ~ 1000 m Resolution



Bathymetry data of SO232 (2014), ~ 250 m resolution as the swIOBC will provide.

A regional bathymetric map of the Eastern Mediterranean area was previously published in 1994, compiled from all the depth measurements available at the time. In recent years a large amount of new gridded bathymetric data was collected offshore Israel within the framework of research and hydrocarbon exploration activities.

The continuing interest in the Israeli EEZ (Exclusive Economic Zone) by oil and gas companies, academia and governmental agencies requires an up-to-date high resolution bathymetric grid of the EEZ. In this work we present a detailed bathymetric grid of the Israeli EEZ that was compiled from all available data sets.

Data Sets Used to Create the Map (see details in Images B & C)

- Multibeam bathymetry acquired by IOLR between 2001-2010
- 3D Seismic Surveys
 - o Southern Israel
 - o Emed 2009 2010 Merge
 - o Sara Myra
 - o Aris
 - o Pelagic
 - o Neta Royse
 - o Ruth C
- 2D Seismic Surveys
 - o Horizon 1983
 - o Israenco 1988
 - o Israenco 1991
 - o Petro Med
 - o Spectrum 2001
 - o TGS 2000
 - o TGS 2008
- Legacy data sets
 - o Northern Area
 - o French lifermer's 'Shalimar' EM302 survey by R/V Surot in 2004 for the Lebanese government.
- GSI-MGD seismic survey of Ras al Bayada during "Operation Litani" in 1978
- Lebanese coastal and fishing charts
- Northwestern Area
- Medimap Group Mediterranean multibeam sonar compilation available to contributing members as a 500m grid.
- Eastern Area
- GSI-IOLR-SOI Israel NBS EM1002 multibeam sonar survey 2001-2013.
- Oceana coastal pipeline survey done for the Ministry of National Infrastructures in 1999.
- GSI-MGD reconnaissance seismic surveys 1971-80.
- The land data is from NASA METI ASTER2 30m GDEM global topographic dataset.

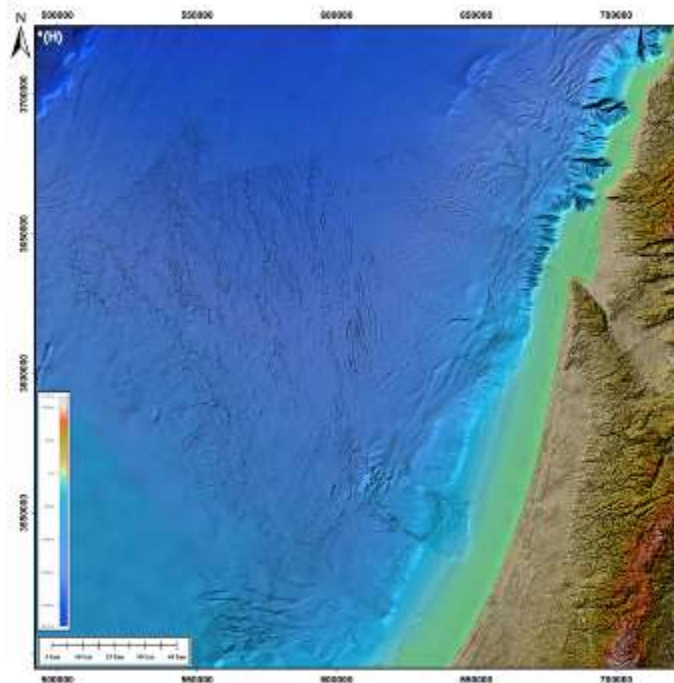
In the shallow area (10 to 1600 m below MSL) mapping is primarily based on multibeam. In the deeper part of the EEZ mapping is based on 2D and 3D seismic surfaces and well control. The 3D seismic sets used in this work consist of seven adjacent and overlapping seismic cubes (Fig. A), in areas with no multibeam or 3D seismic coverage, data from 2D seismic profiles was used (Fig. B). The depth to the sea-floor in the seismic data is correlated to the 'peak' of the first seismic reflection across the 3D cube or 2D profile. When the seismic data was available only in two-way travel time it was converted to depth using speed of sound in the water column (1520 m/s).

Working Steps

1. Manual picking of WB seismic reflector on 3D data (Fig. C)
2. Auto-picking of entire 3D cube (Fig. D)
3. Surface creation (spatial resolution as seismic data)
4. Depth conversion (where needed)
5. Surface adjustment to WB from well control (Fig. E)
6. Merge 3D surfaces (Fig. F)
7. Manual picking of WB seismic reflector on 2D lines
8. Create surface of 2D picking
9. Depth Conversion of surface
10. Merge 3D & 2D water bottom surfaces
11. Merge seismic water bottom surface with legacy & land data (Fig. G,H)

Hell J.K. (1), Lippman S. (2), Gardosh M. (2), Tibor G. (3), Sade A.R. (3), Sade H. (3), Golan A. (3), Amit G. (3), Gur-Arie L. (4), Nissim I. (2)

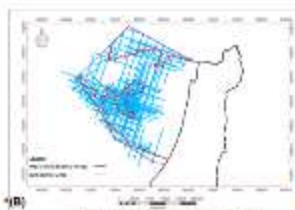
1. Geological Survey of Israel, 30 Malkhe Israel, Jerusalem 96501, Israel
2. Ministry of Energy and Water Resources Administration, 216 Jaffa, Jerusalem, 94363, Israel
3. Israel Oceanographic & Limnological Research Ltd., Tel-Shikmona, P.O.Box 8030, Haifa 31080, Israel
4. Survey of Israel, 1 Lincoln, Tel-Aviv 14171, Israel



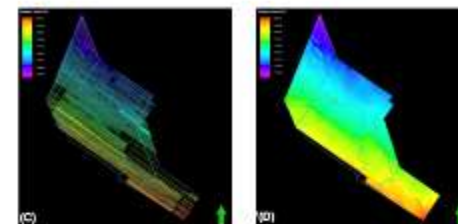
*1:120,000, UTM projection (WGS-84 datum - Zone 3E).



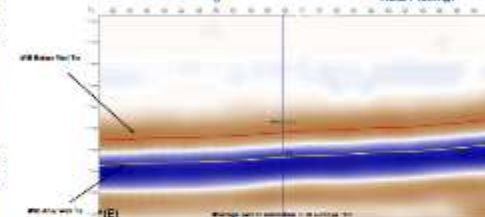
(A) Spatial Resolution of Seismic 3D Surveys & Location of Multibeam Data.



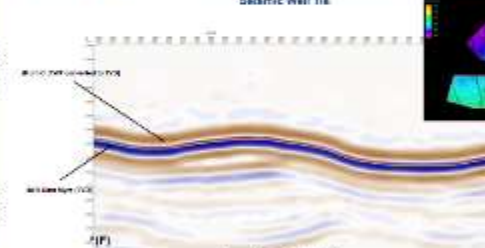
(B) Areas of 2D Seismic Lines Filling.



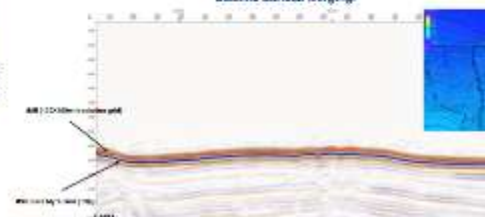
(C) Manual Picking (D) Auto Picking.



(E) Seismic Well Tie



(F) Seismic Surface Merging.



(G) Seismic Surface & WB Data Merging.

The new bathymetric surface is compiled from various data sets with different spatial resolutions (A). As a result there are areas with clear and distinct features while other areas show faded and non-continuous features. We plan to update the present surface with new multibeam surveys that will be conducted by the R/V Bat Galim which will be operational in 2015. A high resolution version of the bathymetric grid will be used by government agencies whereas a lower resolution version will be available to the general public.

1. Abstract

The extensive exploration and production activities in the Israeli Exclusive Economic Zone (EEZ) in recent years, the need to monitor it and to collect systematic environmental and marine data have lead the Israeli Government to purchase a new research vessel for the deep water. In June 2014 the *Bat Galim*, a Klein Klasse German support vessel, was purchased from the Israeli Navy who owned it since 2006. The refitting of the *Bat Galim* into a modern research vessel with capabilities to map, sample and analyze the seafloor, sub-bottom and water column from WD of 10-3,000 m was based on the guidelines set in the Science Mission Requirements (SMR) for Regional Class oceanographic vessels. The R/V *Bat Galim* will serve the needs of the different governmental agencies and academia for marine data and will be fitted to combat oil spills and assist in search and rescue missions.

2. Background

In 1932 David Ben-Gurion, the primary founder and first Prime Minister of Israel, said that *"Both seas of Israel – The Mediterranean Sea and the Red Sea are the prolongation of Israel's economy and contain enormous hidden possibilities"*. Sixty eight years later this vision came true as large-scale natural gas deposits have been discovered within the EEZ of Israel (Fig. 1). The 1st offshore discovery was Noa gas field in 1999 than exploration activity increased drastically after the discovery of the giant Tamar and Leviathan fields in 2009-2010. The Leviathan gas field (~18 Tcf) is one of the world's larger offshore gas finds of the past decade.



Figure 1: Israel EEZ

Figure 2: Maximum range

3. R/V *Bat Galim* missions & capabilities

The R/V *Bat Galim* will be a general-purpose research vessel serving the needs of the different governmental agencies and academia. It will have the capabilities to map, sample and analyze the seafloor, sub-bottom and water column from WD of 10-3,000 m. The R/V *Bat Galim* will also be fitted to combat oil spills, operate ROV and other autonomous vessels that will also assist in search and rescue missions.

5. Acoustic testing

The acoustic testing was conducted by **Gates Acoustic Services**. The *Bat Galim* appears to be a relatively quiet platform for a future multibeam sonar installation. Propeller cavitation characteristics are good and no machinery noise was noted that will impact future sonar data. It is predicted that in the absence of bubbles, the acoustic levels expected during normal ship operations will be similar to other vessels equipped with mid-depth multi beam sonar systems (Fig. 3). These expected levels should not cause acoustic degradations to sonar operations.



Figure 3: Acoustic level of future gondola location. The red line is the US Navy research vessel acoustic signature at each of these frequencies. Note that typically sonar levels are 15 to 20 dB quieter than omnidirectional hydrophone data.

4. The Klein Klasse Vessel

The *Bat Galim*, a Klein Klasse support vessel, was built in 1990 by Larssen Shipyards in Germany. General features:

Material	Year	Max. draft	Max. speed	Endurance at sea	W. Displ.
Steel	1990	7.5	12.7 knots	12 days	1,000 tons
Length	30.0 m	Beam	12.7 m	Propulsion	Fig. 20
Max. draft	7.5 m	Max. speed	12.7 knots	Endurance at sea	12 days
Max. draft	7.5 m	Max. speed	12.7 knots	Endurance at sea	12 days
Max. draft	7.5 m	Max. speed	12.7 knots	Endurance at sea	12 days

6. Refitting to modern R/V

The refitting of the *Bat Galim* into a modern research vessel follows most of the guidelines set in the Science Mission Requirements (SMR) for Regional Class oceanographic vessels that were developed as part of the Academic renewal efforts by the University-National Oceanographic Laboratory system (UNOLS). The *Bat Galim* will be equipped with a L3 DP level 0 system; 36 m² of Dry B. Wet labs built in 20-25' removable containers (Fig. 4); 4 ton, 4 m width and 5-7 m high telescopic A-Frame (Fig. 5).



Figure 6: The gondola

The acoustic equipment will be installed in a 3.5 m x 2.6 m gondola (Fig. 6); it will include: **Kongsberg** EM-302 (1X2 deg.) and EM-2040 multibeam systems; **Knudsen** Chirp 3260 sub-bottom profiler and 12 kHz single beam echo sounder; **Teledyne RDI** Ocean Surveyor 75 kHz ADCP; **LinkQuest** TCS000ha USB; **Teledyne Reson** 5Hz-120kHz hydrophones and **Valeport** mini sound velocity sensor. Other sampling and mapping equipment will include: **GEO Marine Survey Systems** high resolution seismic imaging with Geo-Spark 2000X and multichannel streamer; **SBE** 12 Carousel water sampler with CTD; box and 9 m piston cores (built similar to USGS design).

Figure 4: Wet/Dry Labs

Figure 5: Telescopic A-Frame

- Acquired by Israeli Government for marine data collection
- R/V *Bat Galim* to conduct multibeam surveys of EEZ

Fram 2014/15 Ice Drift



Ice drift station FRAM-2014/15 summary

Why ice drift stations?

An ice drift station is a logistic alternative to:

- i) explore areas of the Arctic Ocean not accessible to icebreakers,
- ii) carry out scientific field experiments which cover the full annual cycle and requires physical presence.

FRAM-2014/15 was an ice drift station using a medium sized hovercraft as logistic and scientific platform operated by a crew of two persons. The hovercraft was equipped as a scaled-down modern research vessel. Work space for geologic and oceanographic work was set up on the ice separately. The station was deployed on first year ice from icebreaker *Polarstern* on 30 Aug. 2014 in the Makarov Basin, upstream of the target, the Lomonosov Ridge (Fig. 1). The drift during the next 12 months covered over 1.900 km with scientific data acquisition and includes an unprecedented five complete crossings of Lomonosov Ridge. The drift during November through April were in a part of the Arctic Ocean not accessed by diesel driven icebreakers unless assisted by a nuclear icebreaking vessel. The expedition was recovered by the sealing vessel *Havsel* at 81° N on 18 Aug. 2015.



Fig. 1 - The drift track of FRAM-2014/15 (red line)

FRAM-2014/15 drift of R/H Sabvabaa in the Arctic Ocean is completed

- Successful mission
- Scientific data were collected:
 - Bathymetry
 - Seismic reflection
 - Current profiles
 - Ocean temperature
 - Weather
 - Atmospheric data



Nautical Chart Adequacy Workshop

- Workshop developed and hosted by NOAA Coast Survey and UNH/CCOM
- Trained hydrographers on procedures to assess adequacy of nautical charts using public information
- Used Chapter “LANDSAT 8- Satellite-Derived Bathymetry” of Cook Book
- Included visit to NOAA Laboratory for Satellite Altimetry



Workshop- July 2015

Shachak Pe'eri and Rochelle Wigley, UNH/CCOM