

# TSCOM report to GC 2015

Preliminary report

8-9 October 2015

Hosted by the Royal Malaysian Navy

Kuala Lumpur, Malaysia

# Venue

TSCOM met jointly with SCRUM October 6-7, 2015, at the Royale Chulan Hotel.

We gratefully acknowledge the Royal Malaysian Navy for:

- excellent logistical support
- fine venue
- superb hospitality provided by our hosts

# TSCOM Membership

## **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 Pharoah, IHO, Monaco

Martin Jakobsson, Stockholm University, Sweden

David Sandwell, Scripps Institution of Oceanography, USA

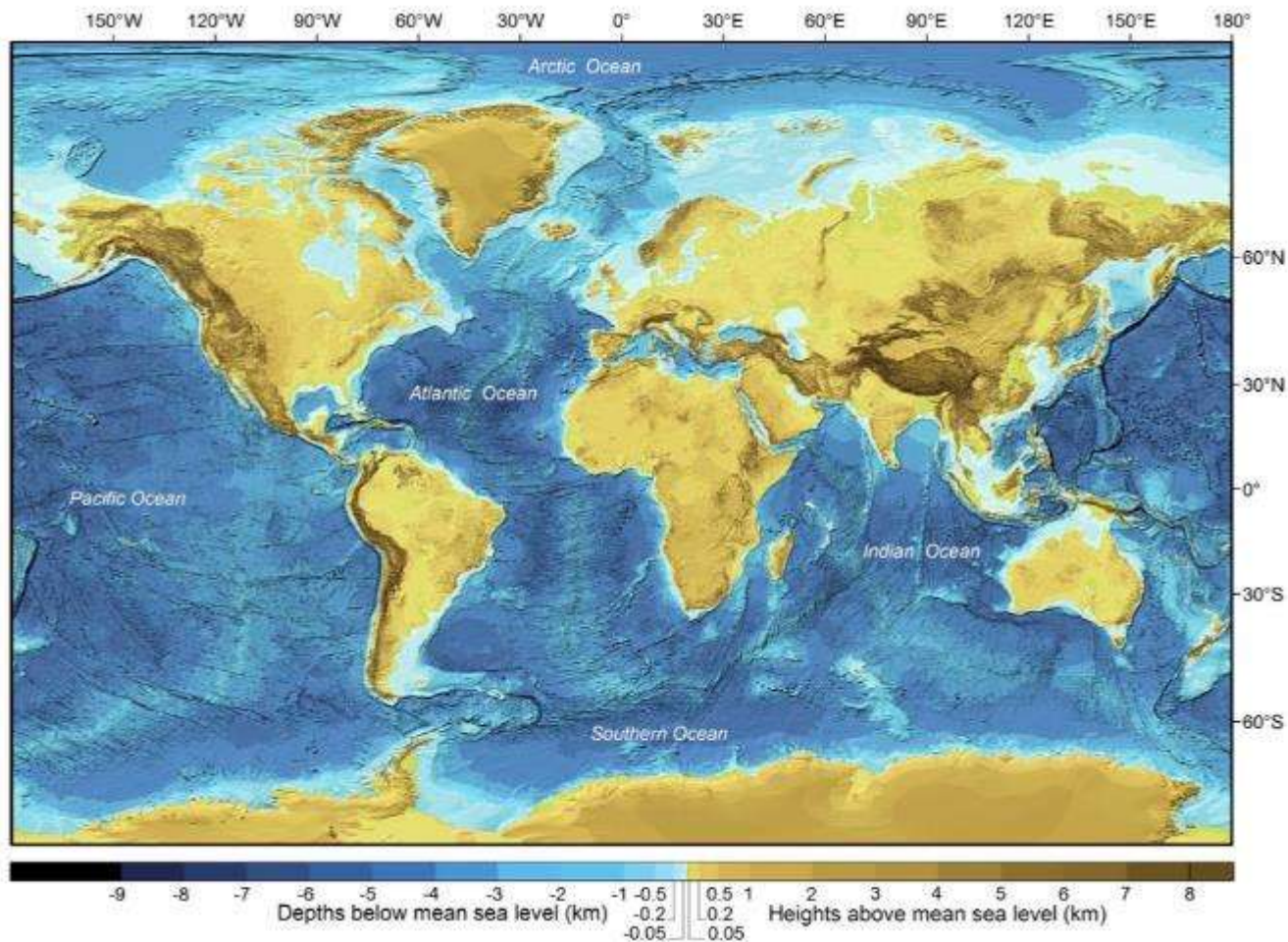
# TSCOM Leadership

- Karen Marks appointed Chair at 2013 GEBCO GC Meeting, currently no Vice-Chair
- 10 Members on TSCOM committee, but many more attend meetings and are active in TSCOM/SCRUM
- Should all TSCOM/SCRUM workers be listed on GEBCO website?

# TSCOM Activities

- TSCOM tabled reports and plenary on:
  - GEBCO\_2014 grid
  - Updating future GEBCO grid
  - Outreach- Plan for Webpages for Students
  - High-Resolution Product
- GEBCO\_2014 grid released
- GEBCO\_2014 release paper published in AGU's Earth and Space Science
- Successful GEBCO Science Day
- Cook Book used as educational resource

# GEBCO\_2014



- New global bathymetry model released Dec. 2014
- Download from <http://www.gebco.net>

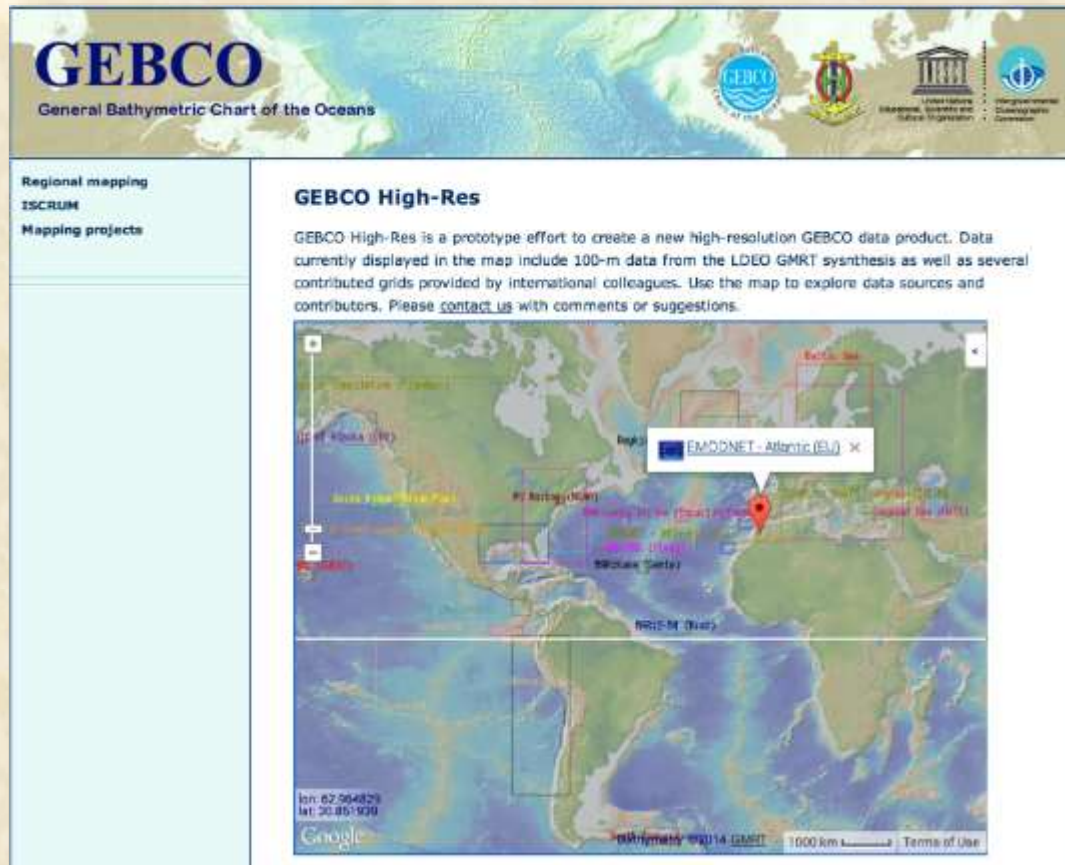
# Plenary: Update the GEBCO Grid

- GEBCO will actively seek bathymetric compilations from individual member states
- Move from 30 arc second to 15 arc second grid
- Seek use of current version of SRTM15\_Plus, without copyright restrictions
- Support drilling down to higher-resolution source bathymetry
- All TSCOM/SCRUM participants attended



# GEBCO Hi-Res Product Update

- Technical Components from GMRT ✓
  - Integration with GEBCO\_2014
  - Grid Composition
  - Image Creation
  - Attribution
  - Web Services
- Needs of Contributors
  - Attribution
  - Analytics
- Workflow
  - Extent of Coverage
  - Integration with Data Store
  - Editorial Process

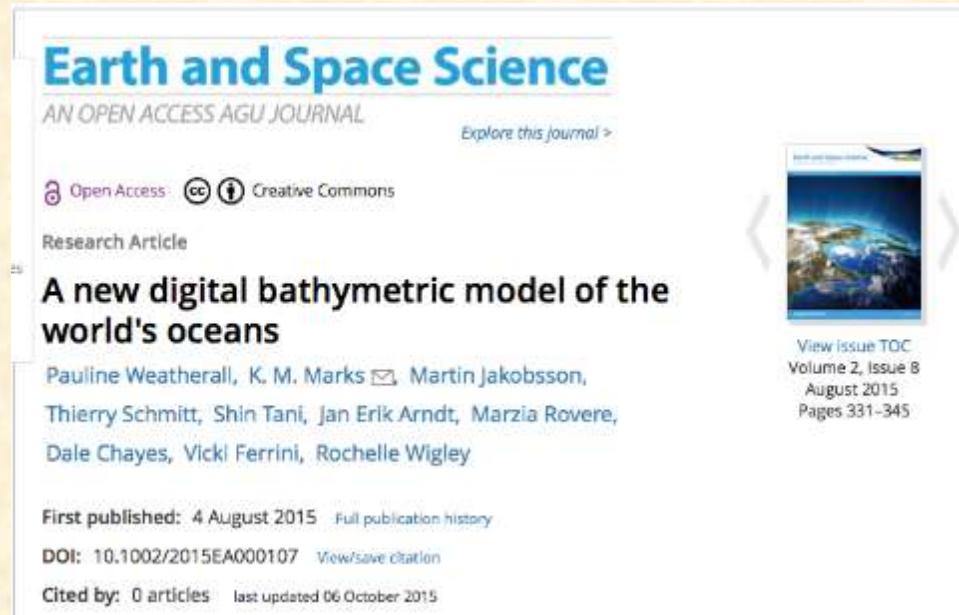




# GEBCO\_2014 Release Paper Published

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).

- Published in AGU's new Earth and Space Science Journal, Aug. 2015
- Obtained DOI
- Open Access – free use and download
- Manuscript documents history, data sources, construction methods and scientific results



The screenshot shows the article page for "A new digital bathymetric model of the world's oceans" in the journal Earth and Space Science. The page includes the journal title, subtitle "AN OPEN ACCESS AGU JOURNAL", and a link to "Explore this journal". It features the Open Access and Creative Commons icons, the article title, authors (Pauline Weatherall, K. M. Marks, Martin Jakobsson, Thierry Schmitt, Shin Tani, Jan Erik Arndt, Marzia Rovere, Dale Chayes, Vicki Ferrini, Rochelle Wigley), and publication details: "First published: 4 August 2015", "DOI: 10.1002/2015EA000107", and "Cited by: 0 articles". A thumbnail image of the Earth is visible on the right side of the page.

# 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



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

# 2015 Science Day

- 10<sup>th</sup> Annual GEBCO Bathymetric Science Day was held at the Kuala Lumpur Convention Center
- 15 oral and 34 poster presentations, 10 booths
- ~180 attendees at Science Day
- We were honored by Deputy Minister of Defense of Malaysia - Hon. Dato' Wira Mohd Johari Baharum, speaking at the Opening Ceremony



# 2014 TSCOM/SCRUM Meeting and GEBCO Science Day

- TSCOM/SCRUM meeting held at Google Headquarters, Mountain View, CA
- Host was Jenifer Austin, Manager of Google Ocean Program
- GEBCO Science Day was at a Fall 2014 AGU Meeting Special Session
- 4 Ocean Sciences sessions
- 16 oral and 29 poster presentations





# IHO-IOC GEBCO Cook Book

At the 2009 GEBCO 25<sup>th</sup> 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 in the press:**

- 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

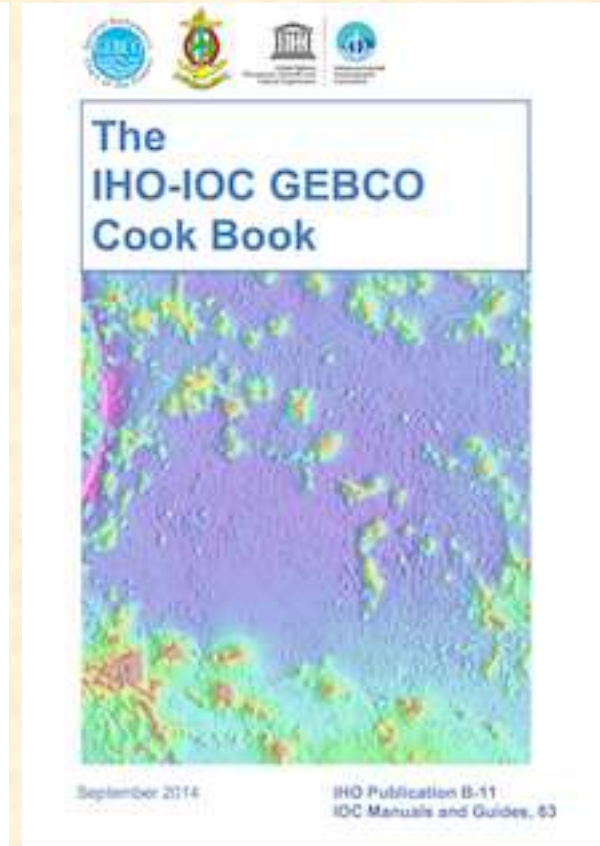
- **Used as educational resource**, including:

- 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

- **New contribution received, another anticipated, update soon**



# 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



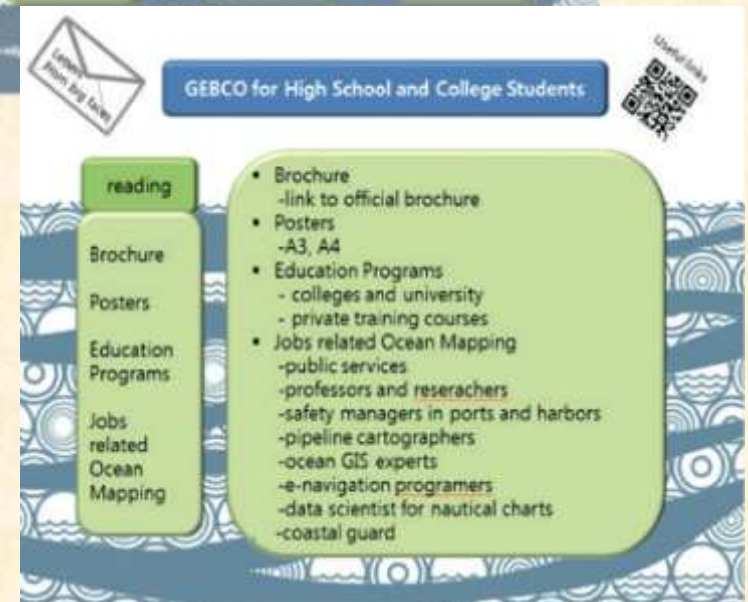
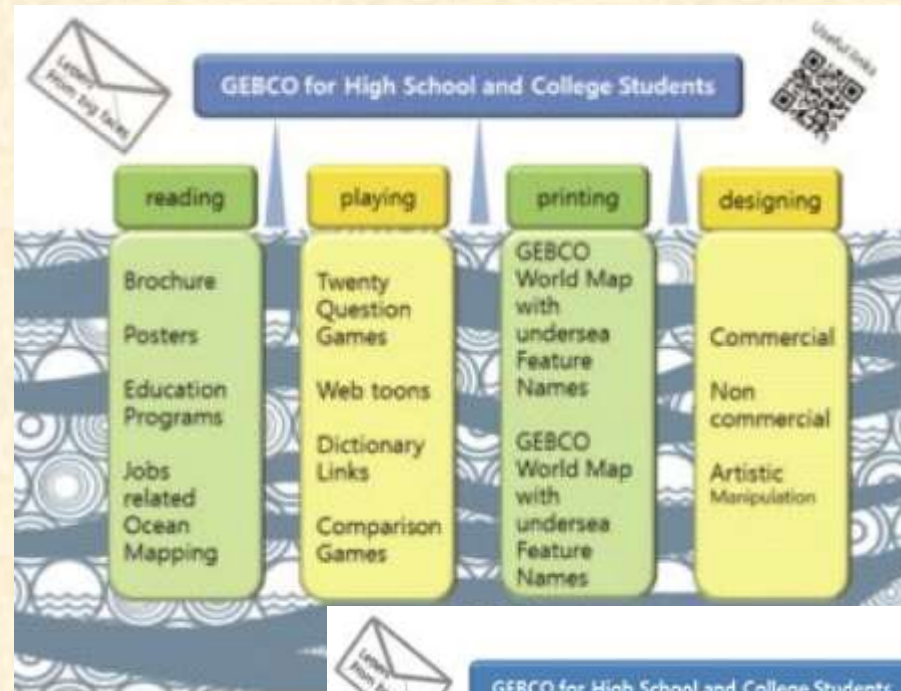
Workshop- July 2015

Shachak Pe'eri and Rochelle Wigley, UNH/CCOM



# Break-out Session: Outreach Working Group

- Break-out had 7 participants
- Discussions on outreach for High School and College students
- Master plan for subpages on GEBCO website
- On-going activity



Eunmi Chang, Hyo Hyun Sung, Pauline Weatherall

# Break-out on Grid Uncertainties

- Led by Paul Elmore
- 9 participants
- Discussed how to determine uncertainties and application to GEBCO grid
- Activity is on-going

# GEBCO Data Store

- **On hold until host funding can be allocated**
- A repository for already-processed bathymetric trackline and gridded data used to produce GEBCO grid
- To be part of IHO Data Center for Digital Bathymetry (IHO DCDB)
  - Prototype portal webpages under development
  - Data Store scope and services summary circulated Feb 2015

**IHO Data Center for Digital Bathymetry (IHO DCDB)**

The National Geophysical Data Center in Boulder, Colorado, USA, operates a worldwide digital data bank of oceanic soundings on behalf of the Member Countries of the International Hydrographic Organization (IHO). The IHO is based in Monaco and presently has approximately 80 Member Countries. An initial proposal was forwarded to the IHO (jointly from the National Ocean Service, NOAA, and the US Defense Mapping Agency) recommending formation of an International data center. On June 1, 1980, the IHO Data Center for Digital Bathymetry (DCDB) was officially established. Since that time, the IHO DCDB has made substantial progress toward establishing itself as the focal point for digital hydrographic data services for IHO Member Countries.

**DATABASES**

The worldwide digital data bank of oceanic soundings are maintained in several data bases, including the GEODAS global marine geophysical data base, and the Hydrographic Survey Data System. The NOSHDB (National Ocean Service Hydrographic Database) is a subset of the Hydrographic Survey Data System.

**SERVICES PROVIDED BY THE IHO DCDB**

The following services are provided by the NGDC on behalf of the IHO:

1. Operation of the data center with a focus of activity on oceanic regions with depths greater than 100 meters.
2. Provision, free of charge to the IHO for use by its Member Countries, of the data needed for their national or international projects. IHO Member Countries' Hydrographic Offices are requested to provide the IHO DCDB with digital bathymetric data collected by their nation's institutions in oceanic regions.
3. Maintenance of a quality control facility whereby data provided to the IHO DCDB are checked for violation of physical principles (e.g., instantaneous changes in ship position, high ship speeds) and completeness of metadata for continuous cruises.
4. Maintenance of inventories in digital form of all digital bathymetric data held in the data center.
5. Collaboration with various international organizations in the development of exchange formats and standards to expedite bathymetric data exchange.

**Related External Links:**

- International Hydrographic Organization (IHO)
- GEBCO
- International Ocean Mapping

**Search GEODAS**

**Databases:**

- GEODAS
- Hydrographic Surveys

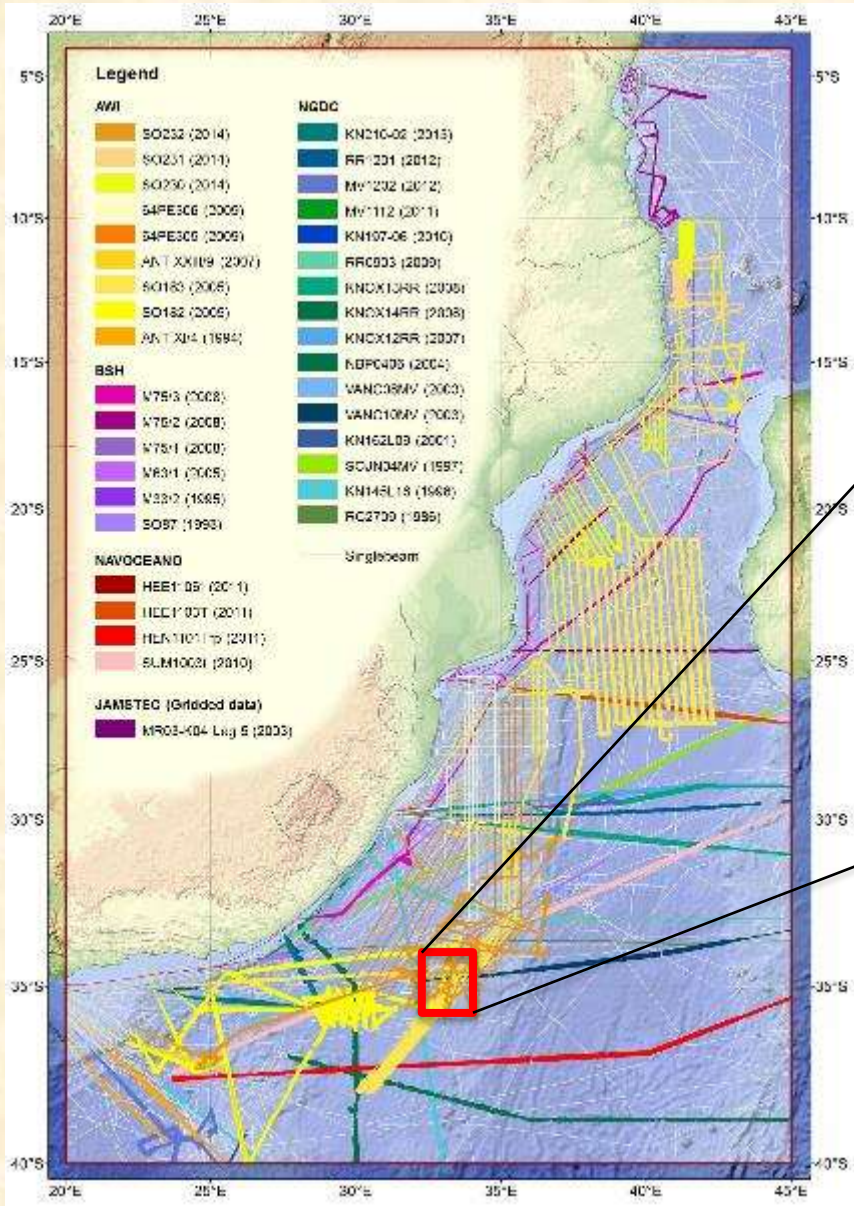
**Data Submission**

The IHO DCDB can accept data via File Transfer Protocol (FTP), e-mail, CD and DVD as well as other mutually agreed upon digital media. Data are preferably in the ISO 19115 exchange formats, but any well documented format is acceptable.

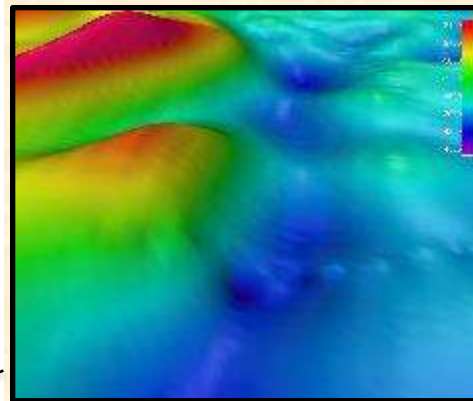
**Mailing Address:**  
NOAA/NMFS  
3000 35th Broadway  
Boulder, CO USA 80508-3009



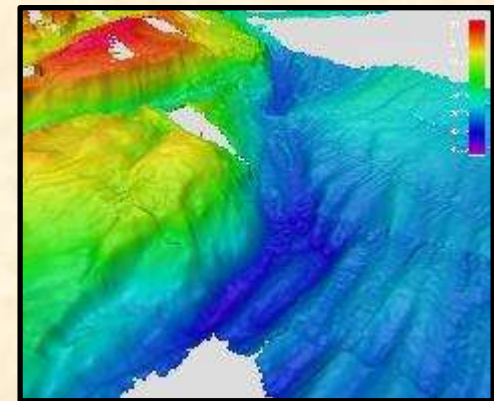
# swIOBC using IBCSO gridding



- 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.

Jan Erik Arndt, AWI

# 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:

- 1) explore areas of the Arctic Ocean not accessible to icebreakers,
- 2) 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 1,500 km with scientific data acquisition and includes an unprecedented five complete crossings over 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 *Hansel* 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





# New Bathymetric Map of Israeli EEZ

A regional bathymetric map of the Eastern Mediterranean area was previously published in 1994, compiled from all the depth maps/resources available at the time. In recent years a large amount of new gridded bathymetric data were 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, academic and governmental agencies resulted in 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 6 & 7)

- Multi beam bathymetry acquired by IOR between 2011-2016
- 3D Seismic Surveys:
  - Southern Israel
  - Emerald 2009 2010 Merge
  - Zara Maya
  - Arie
  - Polagic
  - Nava Hayee
  - Ruffi C
- 2D Seismic Surveys:
  - Horizon 1983
  - Searam 1985
  - Isramco 1991
  - Petro Med
  - Spectrum 2001
  - TGS 2000
  - TGS 2008
- Legacy data sets:
  - Northern Area
  - French (former) 'Shalimar' EM302 survey by IOR (sumit) in 2014 for the Lebanese government.
- GSI-MGD seismic survey of Ras al Bizrate during 'Operation Uzan' in 1979
- Lebanese coastal and fishing charts
- North-Israel Area
- Medmap Group Mediterranean multibeam sonar compiled or available to contributing members as a 500 m grid
- Eastern Area
- GSI-IOIR-SOI Israel NBS EM1002 multibeam sonar survey 2001-2013
- Crown's coastal pipeline survey done for the Ministry of National Infrastructure in 1986
- GSI-MGD reconnaissance seismic surveys 1971-80.

The land data is from NASA METI ASTER 30m GDEM global topographic dataset.

In the shallow area (10 to 1000 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 calculated as 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 (1500 m/s).

### Working Steps

1. Manual picking of WB seismic reflection 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 acquisition to WB from well control (Fig. E)
6. Merge 3D surfaces (Fig. F)
7. Manual picking of WB seismic reflection 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)

Hall J.K. (1), Uppman B. (2), Gardosh M. (2), Tibor G. (3), Sado A.R. (3), Sado H. (3), Golani A. (3), Amir G. (3), Gur-Ari L. (4), Meisim I. (2)

1. Geological Survey of Israel, 30 Malkha Street, Jerusalem 95501, Israel
2. Ministry of Energy and Water Resources Administration, 216 Jaffa, Jerusalem, 94388, Israel
3. Israel Oceanographic & Limnological Research Ltd., Tel-Shikmona, P.O. Box 8290, Haifa 31080, Israel
4. Survey of Israel, 1 L. Lincoln, Tel-Aviv 14115, Israel

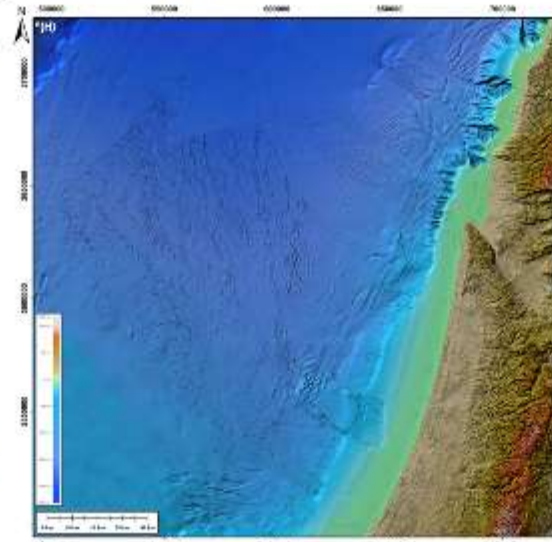


Fig. 1. Bathymetric map of the Israeli EEZ (133,000, 10°N projection) (WBSS data set - 2016-18)



Fig. 2. Spatial Resolution of Seismic 3D Surveys & Locations of Multibeam Tracks

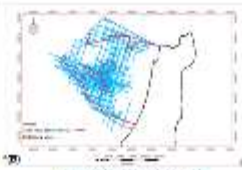
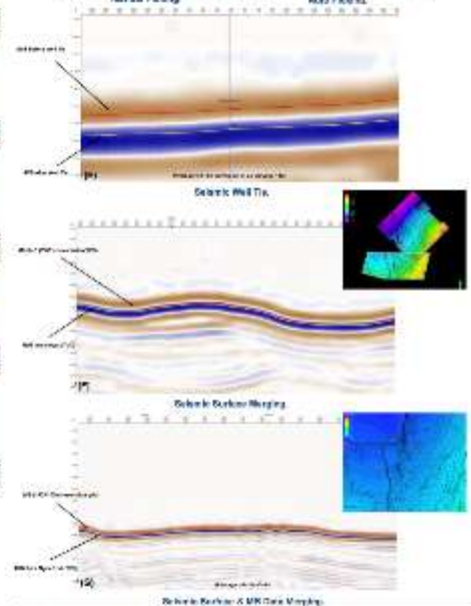
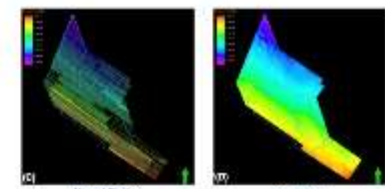


Fig. 3. Area of 3D Seismic Line Picking



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 'Shalimar' and 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.

- New bathymetric map is compiled from various data sets
- Plan is to update with multibeam surveys



# R/V Bat Galim

**The New Israeli Research Vessel for the Exclusive Economic Zone**  
Gideon Tibor - Israel Oceanographic & Limnological Research, Haifa, Israel

**1. Abstract**  
The offshore 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 10-3,000m 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 academics for marine data and will be fitted to conduct 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 immense 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 Neta gas field in 1999 than exploration activity increased drastically after the discovery of the giant Tamar and Leviathan fields in 2006-2010. The Leviathan gas field (~28 Tpcf) is one of the world's largest offshore gas finds of the past decade.

**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 academics. 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 conduct oil spills, operate ROV and other autonomous vessels that will also assist in search and rescue missions.

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

Item	Value
Year build	1990
Length	128.00 m
Beam	17.00 m
Max. Draught	10.00 m
Max. Speed	17.00 knots
Max. Deck Load	1000 kg/m <sup>2</sup>
Max. Deck Area	1000 m <sup>2</sup>
Max. Deck Height	10.00 m
Max. Deck Width	10.00 m
Max. Deck Length	10.00 m
Max. Deck Area	1000 m <sup>2</sup>
Max. Deck Height	10.00 m
Max. Deck Width	10.00 m
Max. Deck Length	10.00 m

**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.

**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 research efforts by the University-National Oceanographic Laboratory System (UNOLS). The Bat Galim will be equipped with a 3.5 m x 2.8 m x 2.8 m Dry & Wet Lab built in 20-25' intermodal containers (Fig. 4) 4 ton, 4 m width and 5.7m high in location 4 Frame (Fig. 5)

**Figure 1: Map of the Mediterranean Sea showing the EEZ of Israel and the location of the Neta, Tamar, and Leviathan gas fields.**

**Figure 2: Telexcel A-Frame**

**Figure 3: Acoustic testing results showing the quiet platform characteristics of the Bat Galim.**

**Figure 4: Wet/Dry Lab**

**Figure 5: The govinde**

The acoustic equipment will be installed in a 3.5 m x 2.8 m govinde (Fig. 5). It will include: **Kongsberg EM 302** (182 deg.) and **EM-2040** multibeam systems; **Knudsen Chirp 3200** side-bottom profiler and 12 kHz single beam echo sounder; **Teledyne RB** Ocean Surveyor 75 kHz ADCP; **Shikoku** TCS2000s USB; **Teledyne Reson** SH-120kHz Hydrophones and **Valport** mini sound velocity sensor. Other sampling and mapping equipment will include: **660 Marine Survey Systems** high resolution stereo imaging with **Geo-Spark 2500C** and motorized streamer; **SBE 12** Carousel water sampler with CTD, box and 9 m piston cores (built similar to USCG design).

**contact info: Dr. Gideon Tibor (050950544@yotol.org.il)**

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

John Hall, Geological Survey of Israel (ret.)

**END OF PRESENTATION**