TSCOM Activities and Preoccupations

Preliminary report
6-7 October 2015
Hosted by the Royal Malaysian Navy
Kuala Lumpur, Malaysia

TSCOM Updates

- TSCOM membership
- New GEBCO_2014 grid and release paper
- 2015 GEBCO Science Day
- EMODNet
- Working Groups
  - Crowd Sourced Bathymetry
  - Outreach Master Plan for Students
- GEBCO High-Resolution Product
- Cook Book, 2014 TSCOM/SCRUM Meeting, and GEBCO Science Day
- Break-out Topics and Related Activities

TSCOM Membership

Committee Members

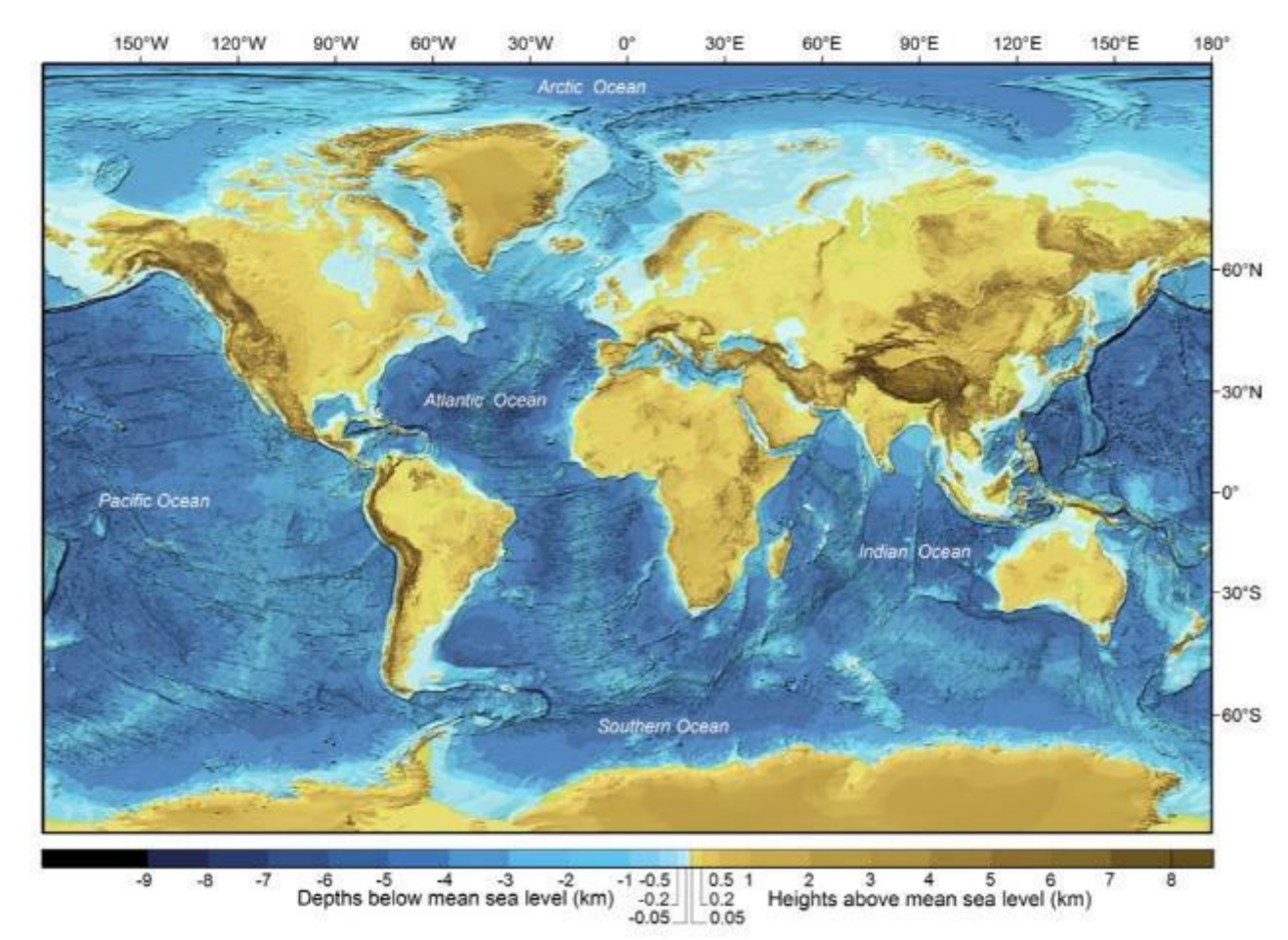
Jenifer Austin – Google Earth, USA
Vicki Ferrini – LDEO, USA
John Hall – Geological Survey of Israel
Timothy Kearns – OneOcean Corporation, USA
Karen Marks – NOAA, USA
Marzia Rovere – Istituto di Scienze Marine, Consiglio Nazional delle Ricerche, Italy
Thierry Schmitt – SHOM, France
Walter Smith – NOAA, 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

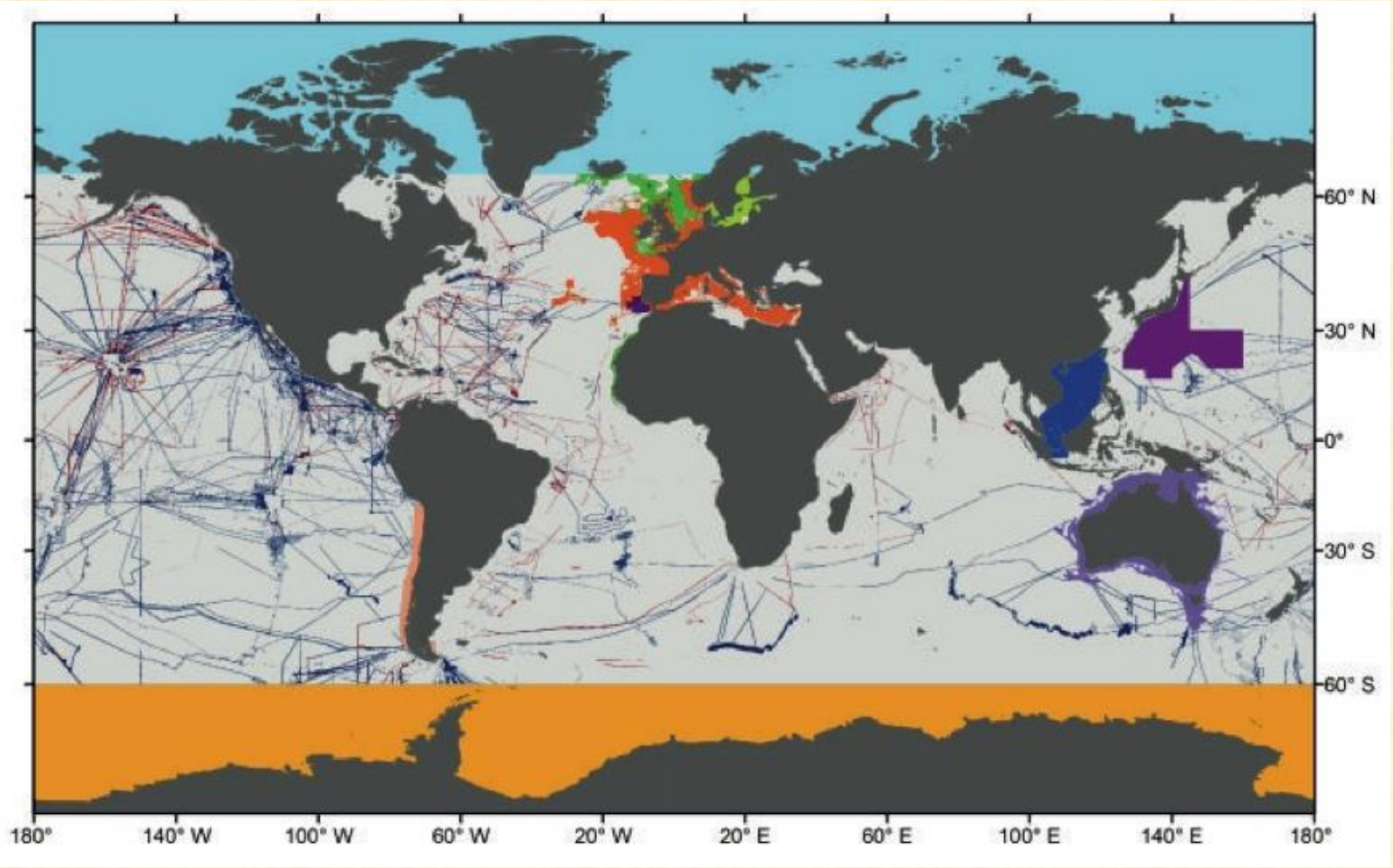
There are many more active in TSCOM work

GEBCO_2014



- New model released Dec. 2014
- Global bathymetry on 30 arc-sec grid
- Ocean floor depths merged with land topography

GEBCO_2014



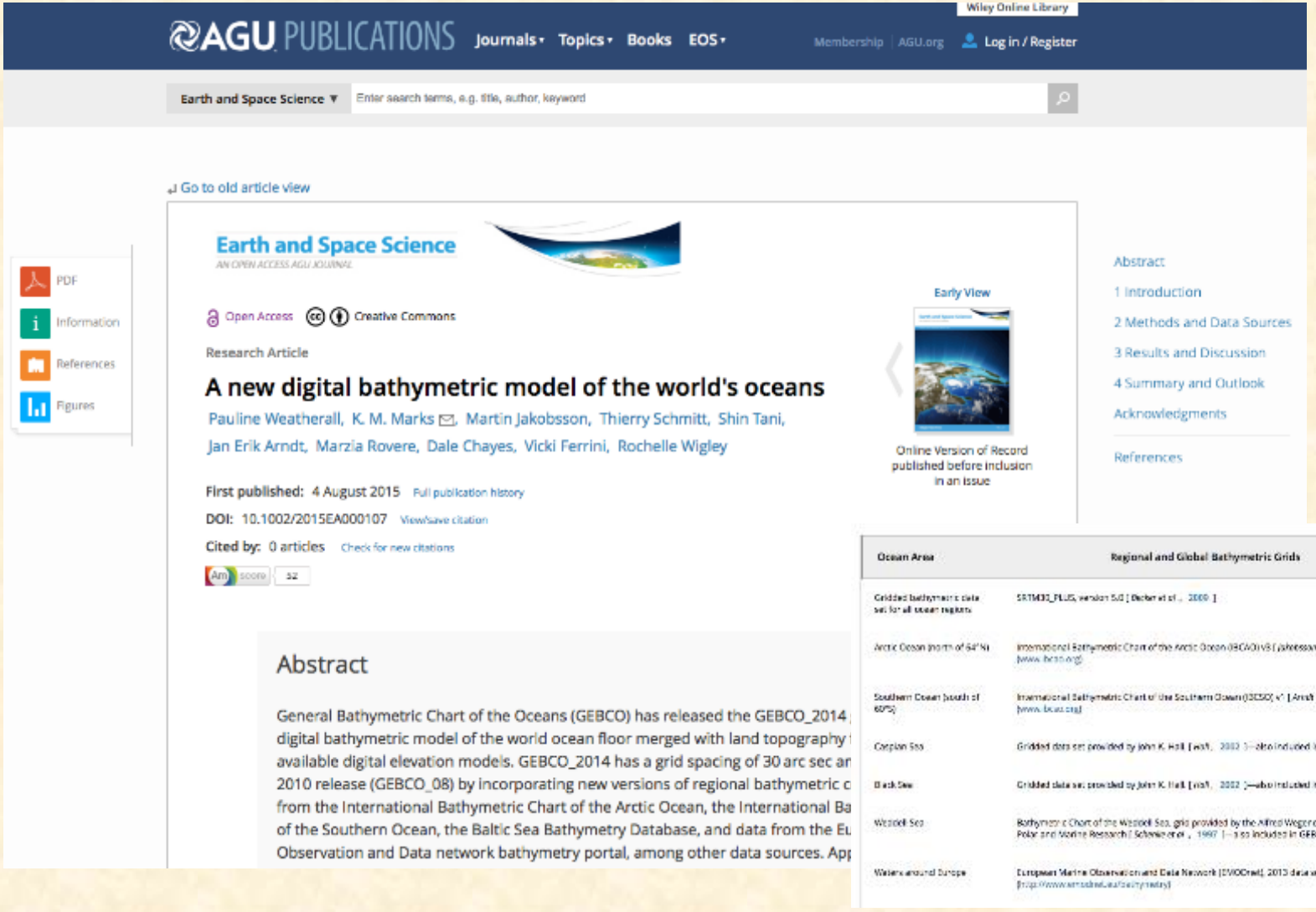
- New data added since GEBCO_08 (2010 release)
- ~33% of ocean grid cells (not area) have been updated

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.

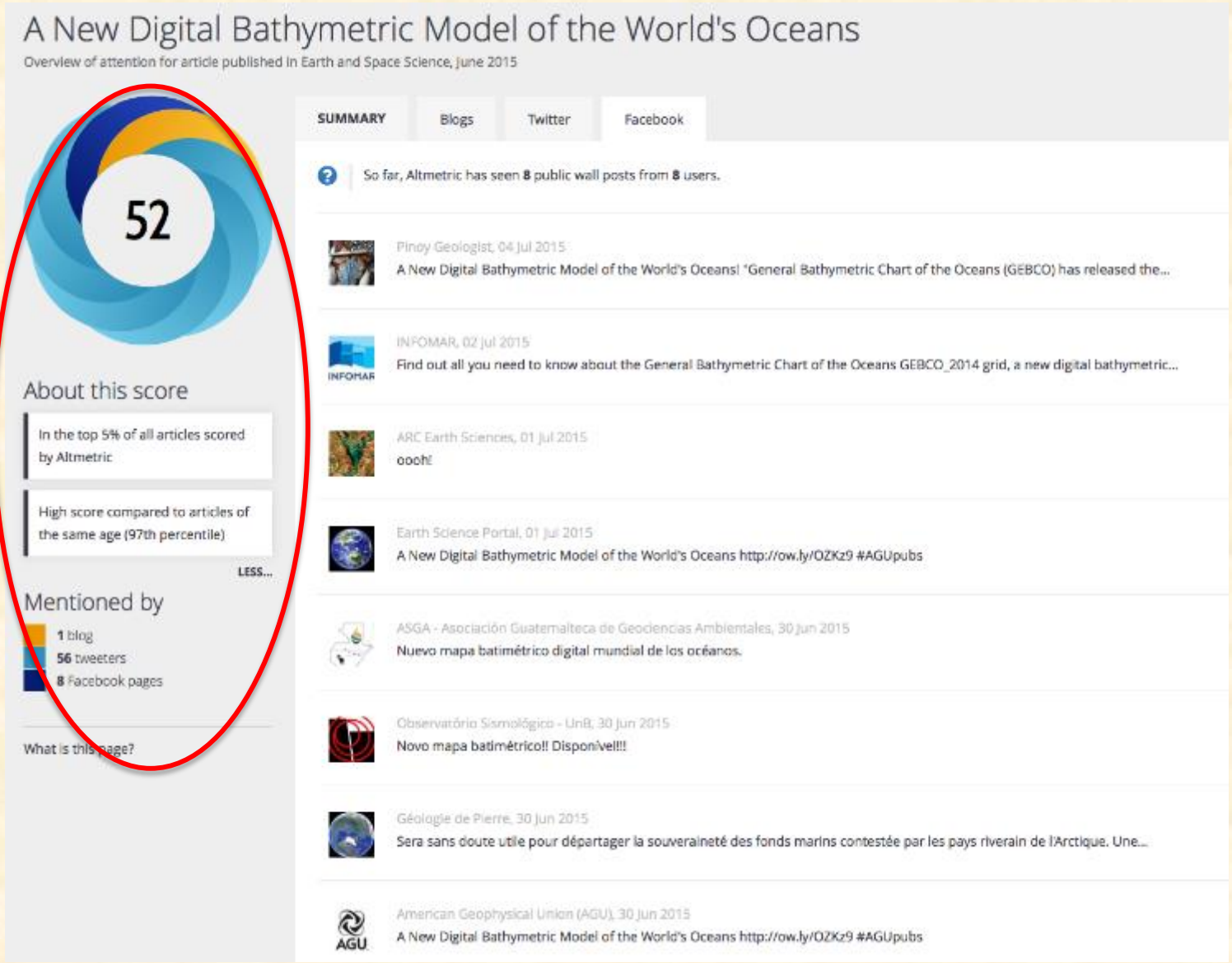
- Published in AGU's new Earth and Space Science Journal, Aug. 2015
- Obtained DOI
- Open Access – Creative Commons license permits free use and distribution
- Manuscript documents history, data sources, construction of grid, and scientific results
- We submitted images for journal cover, but not used

GEBCO_2014 Release Paper Published



http://onlinelibrary.wiley.com/doi/10.1002/2015EA000107/full

Release Paper Metrics



Attention ranking

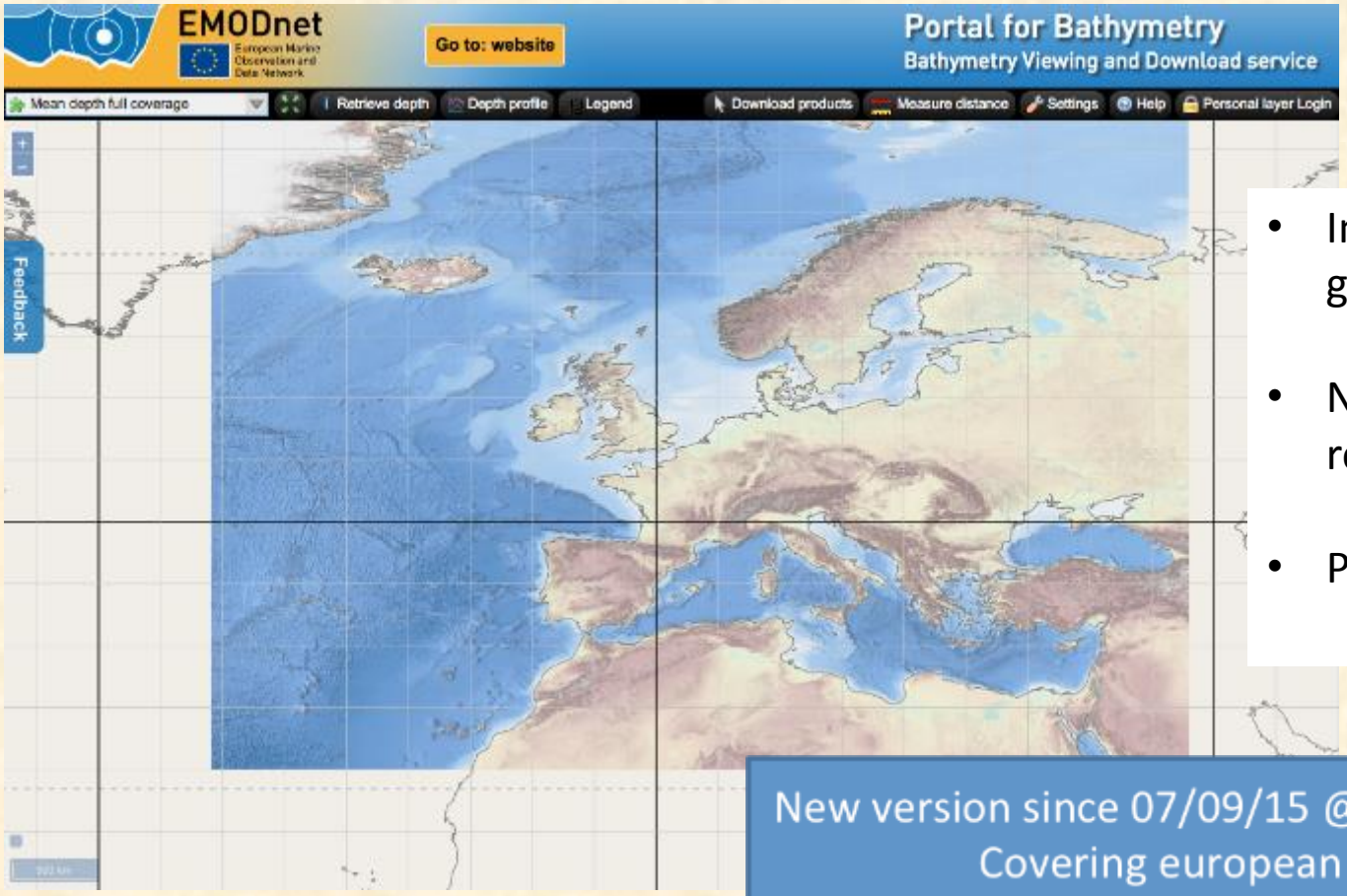
Top 5% of articles scored

Mentioned by Facebook, Twitter, Blog

10th Annual GEBCO Science Day

- Kuala Lumpur Convention Center, Oct. 5, 2015
- Paul Elmore, Convener
- 13 Oral and 8 Poster Presentations
- 50+ attendees from all over the world

EMODNet Update



- Ingested into GEBCO grid
- New 250 m resolution version
- Portal demonstration

New version since 07/09/15 @ 250m resolution
Covering european waters
Over 7000 data sources from 31 data providers
Source data referencing system (CDI)
Strong linkeage with GEBCO
Hi-res DTM prototypes

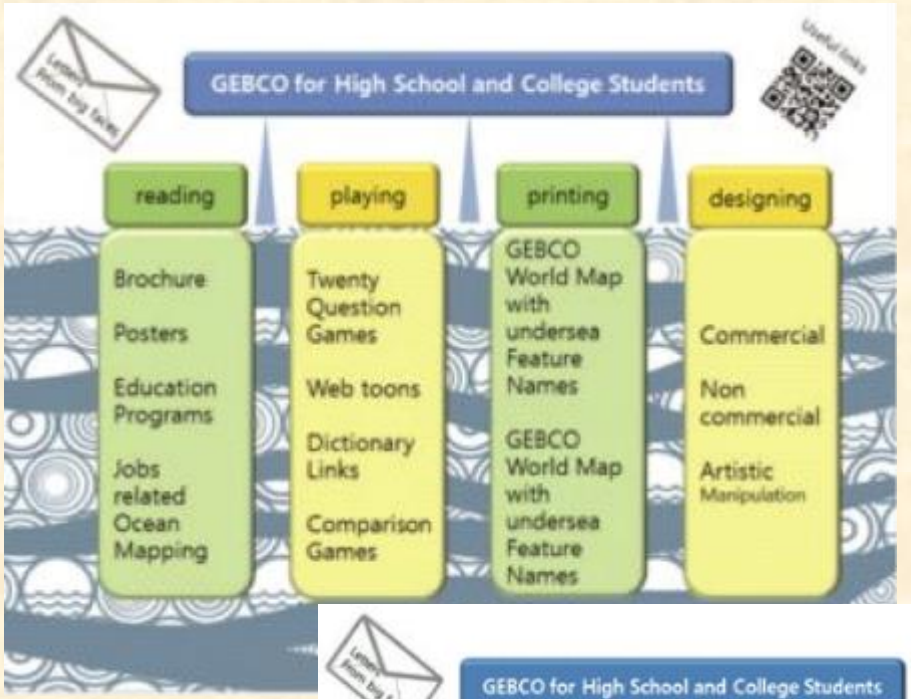
Thierry Schmitt, SHOM

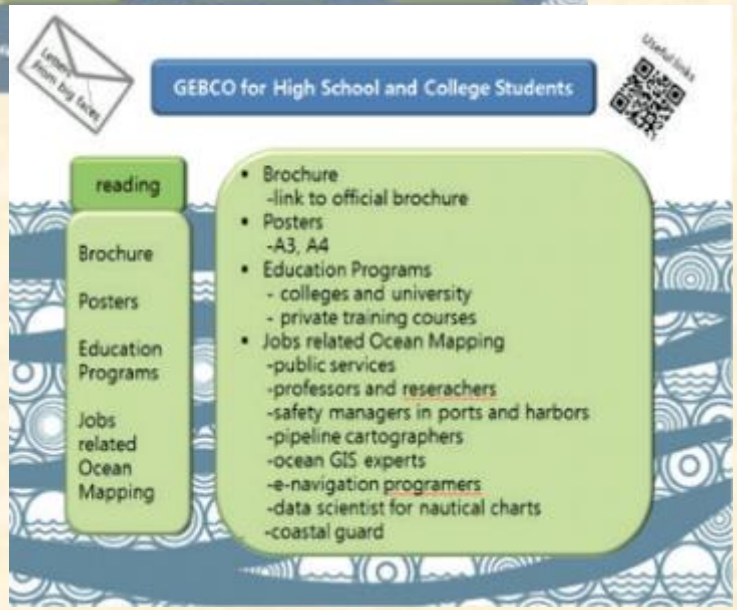
Crowd-Sourced Bathymetry WG

- Crowd-Sourced Bathymetry Working Group (CSBWG) established by the IHO IRCC
- Lisa Taylor appointed Chair; members are from IHO Member States and invited Expert Contributors and Observers
- Examine how to best incorporate, manage, and use bathymetric data acquired while yachting or other ship activities
- Draft policy and guidelines on the collection and assessment of crowd-sourced bathymetry
- Enhance the IHO Data Center for Digital Bathymetry (DCDB) to serve as a data portal for Crowd-Sourced Bathymetry
- Break-out session scheduled

Outreach Working Group

- Outreach for High School and College Students
- Developed master plan for subpages on GEBCO website
- Break-out session scheduled





Eunmi Chang, Hyo Hyun Sung, Pauline Weatherall

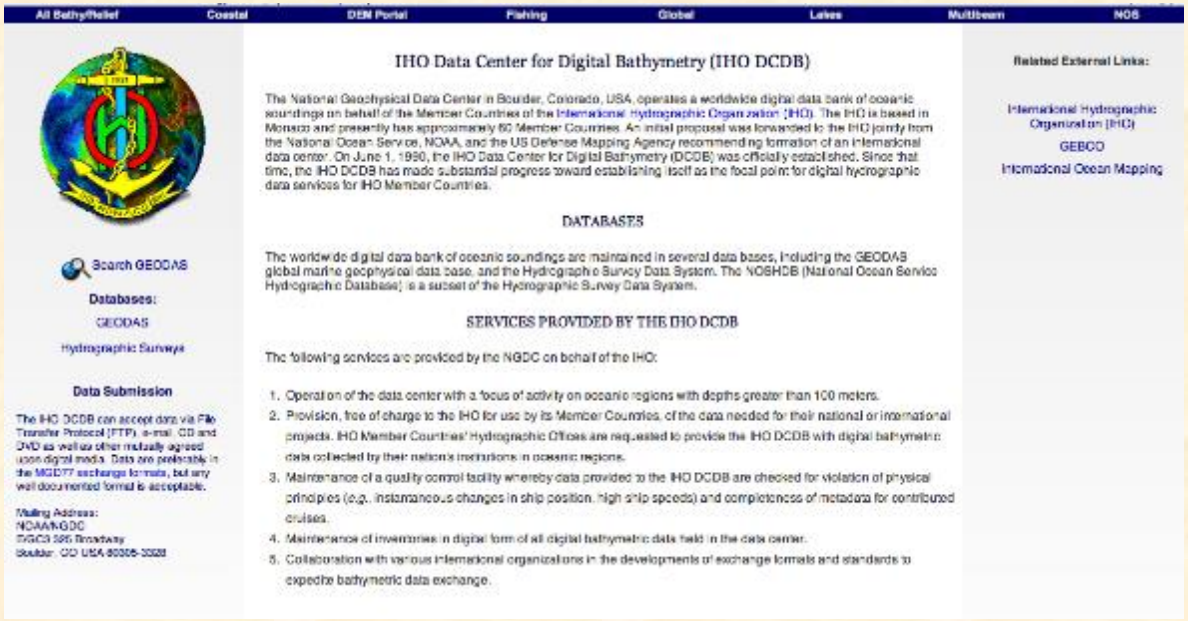
GEBCO Hi-Res Product Update

- 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

Vicki Ferrini, LDEO

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


All Bathy/Relief | Coastal | DEM Portal | Fishing | Global | Lakes | Multibeam | NOS

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 MGD77 exchange formats, but any well documented format is acceptable.

Mailing Address:
NOAA/NGDC
EGC3 325 Broadway
Boulder, CO USA 80305-3328

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 60 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, 1990, 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 contributed 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

IHO-IOC GEBCO Cook Book

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:

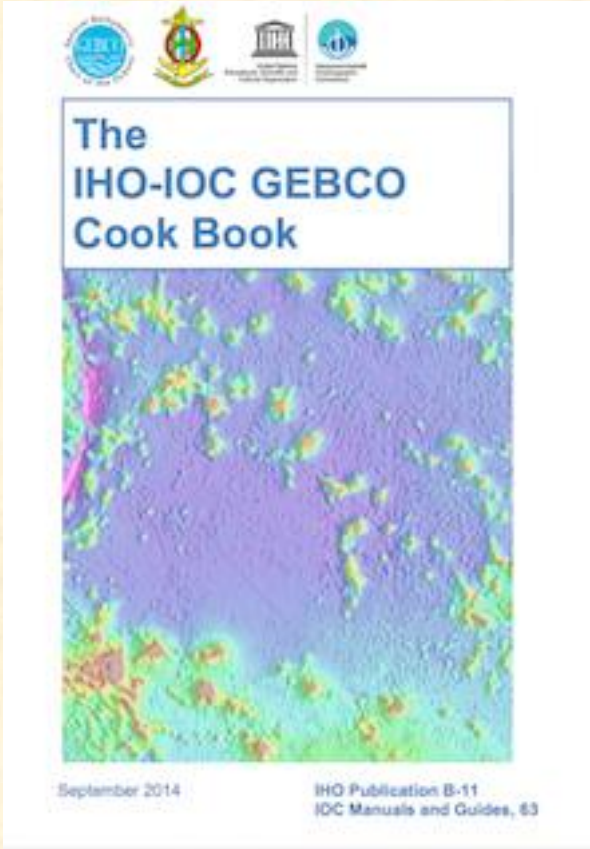
- IHO-IOC GEBCO Cook Book:
  - IHO Publication B-11 (April, 2012)
  - IOC Manuals and Guides, 63 (Oct. 2012)
  - EOS "News Brief" announcing Cook Book was published in EOS Trans. AGU, Feb. 2013
  - Article in Hydro Int'l (April, 2014) highlighted Cook Book

- 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**



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

2014 TSCOM/SCRUM Meeting

- TSCOM/SCRUM meeting held Dec. 11-12, 2014 at Google Headquarters, Mountain View, CA
- Host was Jenifer Austin, Manager of Google Ocean Program
- 38 Participants

GEBCO Bathymetric Science Day
at
Fall 2014 AGU Meeting Special Session

New Perspectives on Seafloor Morphology from High-Resolution Ocean Mapping

- Wednesday, Dec. 17, 2014
- Ocean Sciences sessions OS31A, OS31B, OS33A, OS34D
- 16 oral and 29 poster presentations
- Conveners
  - Paul Elmore- Primary Convener
  - Jenifer Austin
  - Martin Jakobsson

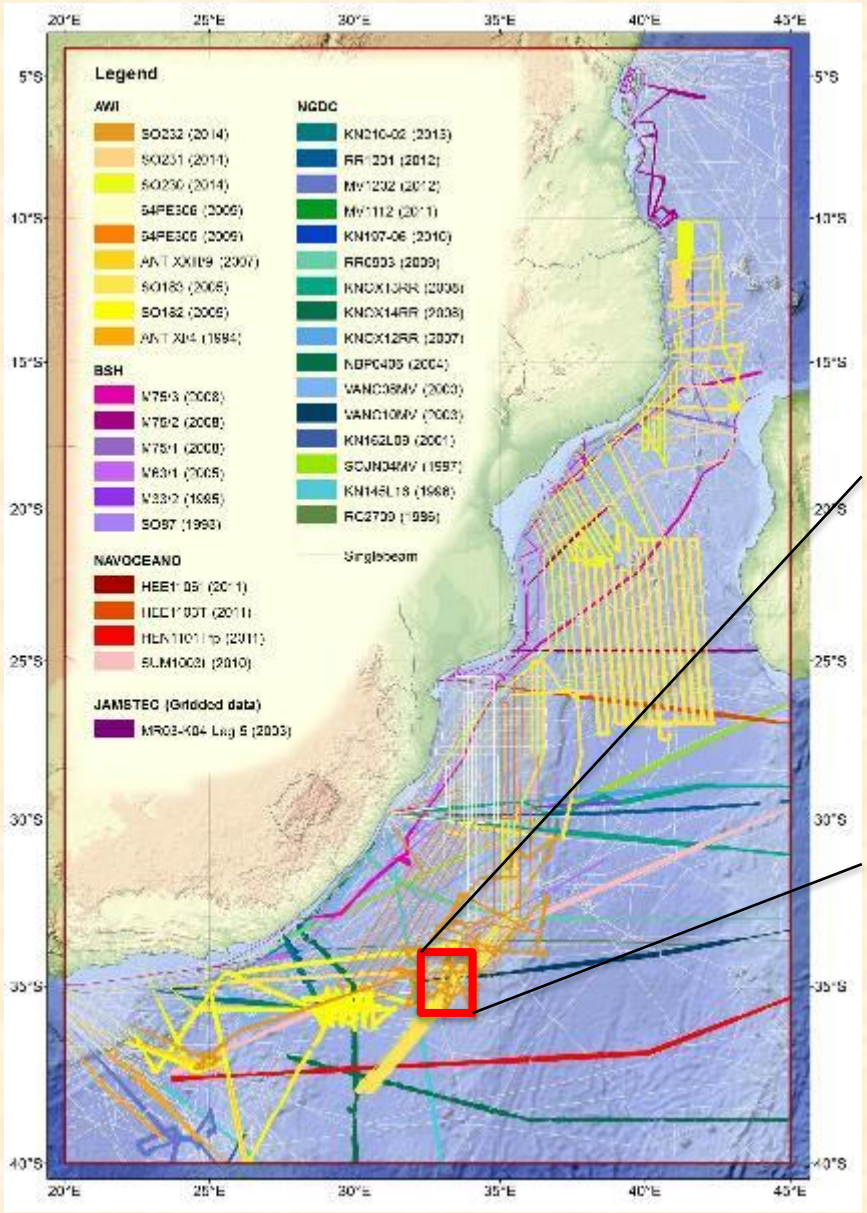
Break-out Sessions

- Crowd-Sourced Bathymetry Working Group (Taylor)
- Outreach Working Group- Webpages for Students (Sung/Chang/Weatherall)
- Update the GEBCO grid: Regional compilations and base grid (Jakobsson/Marks)

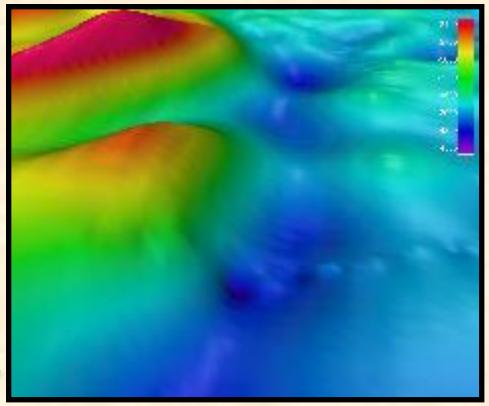
Related Activities

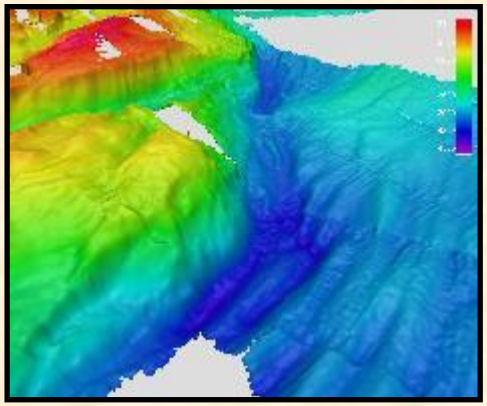
- IBCSO gridding algorithm used in swIOBC (Arndt)
- FRAM- 2014/15 Drift of R/H SABVABAA (Hall)
- New Bathymetric Map of Israeli EEZ (Hall)
- R/V Bet Galim to survey EEZ (Hall)

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



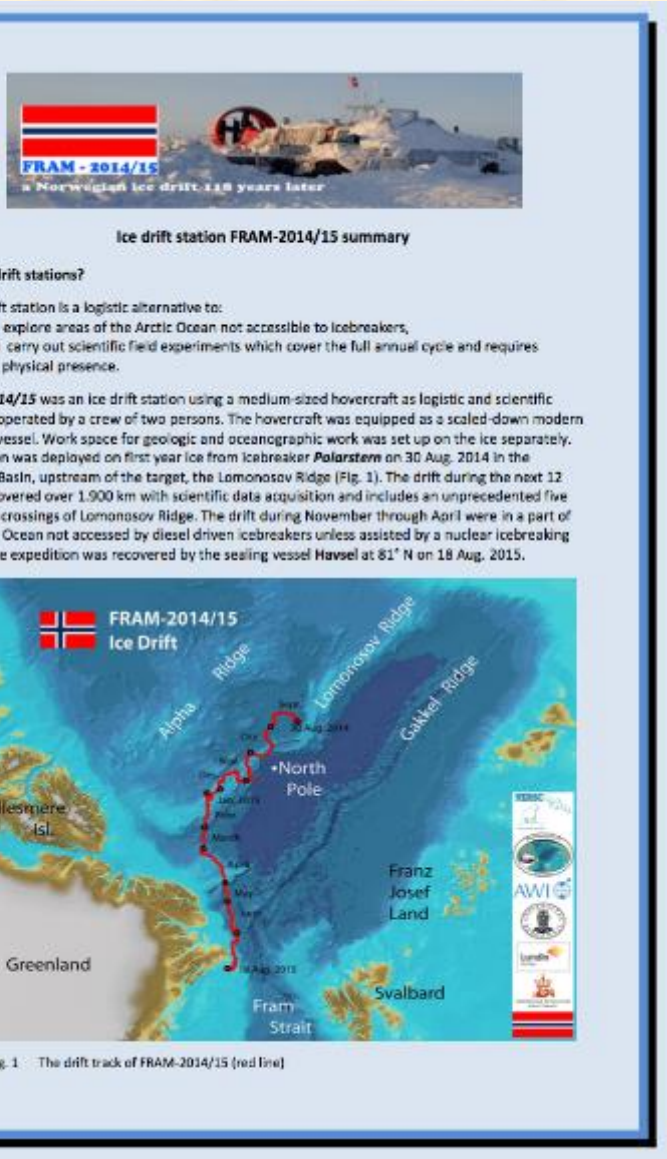


Existing GEBCO data, ~ 1000 m Resolution

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

Jan Erik Arndt, AWI

Fram 2014/15 Ice Drift



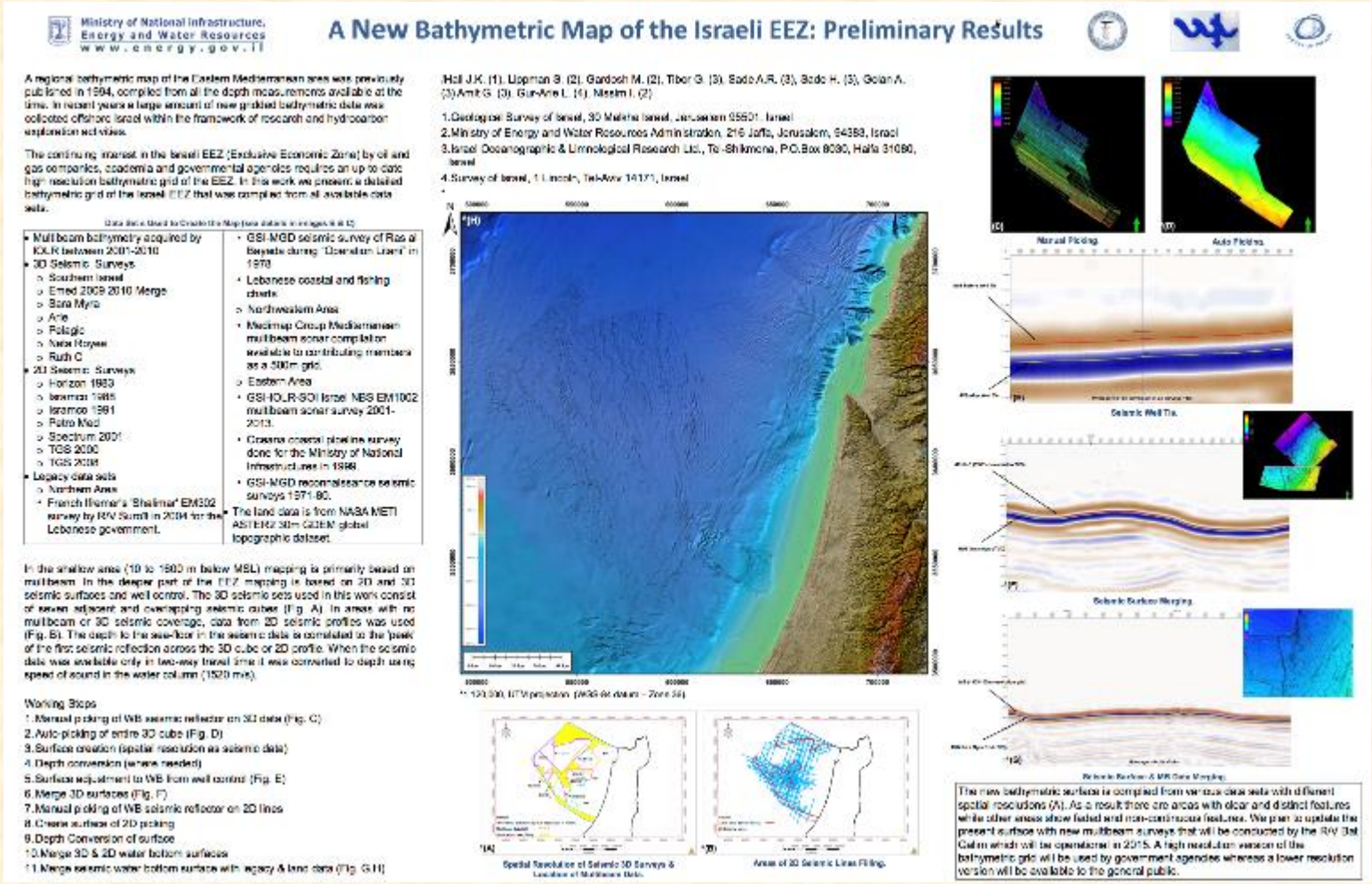
FRAM-2014/15 drift of R/H Sabvabaa in the Arctic Ocean is completed

- Successful mission

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

John Hall, Lee Freitag

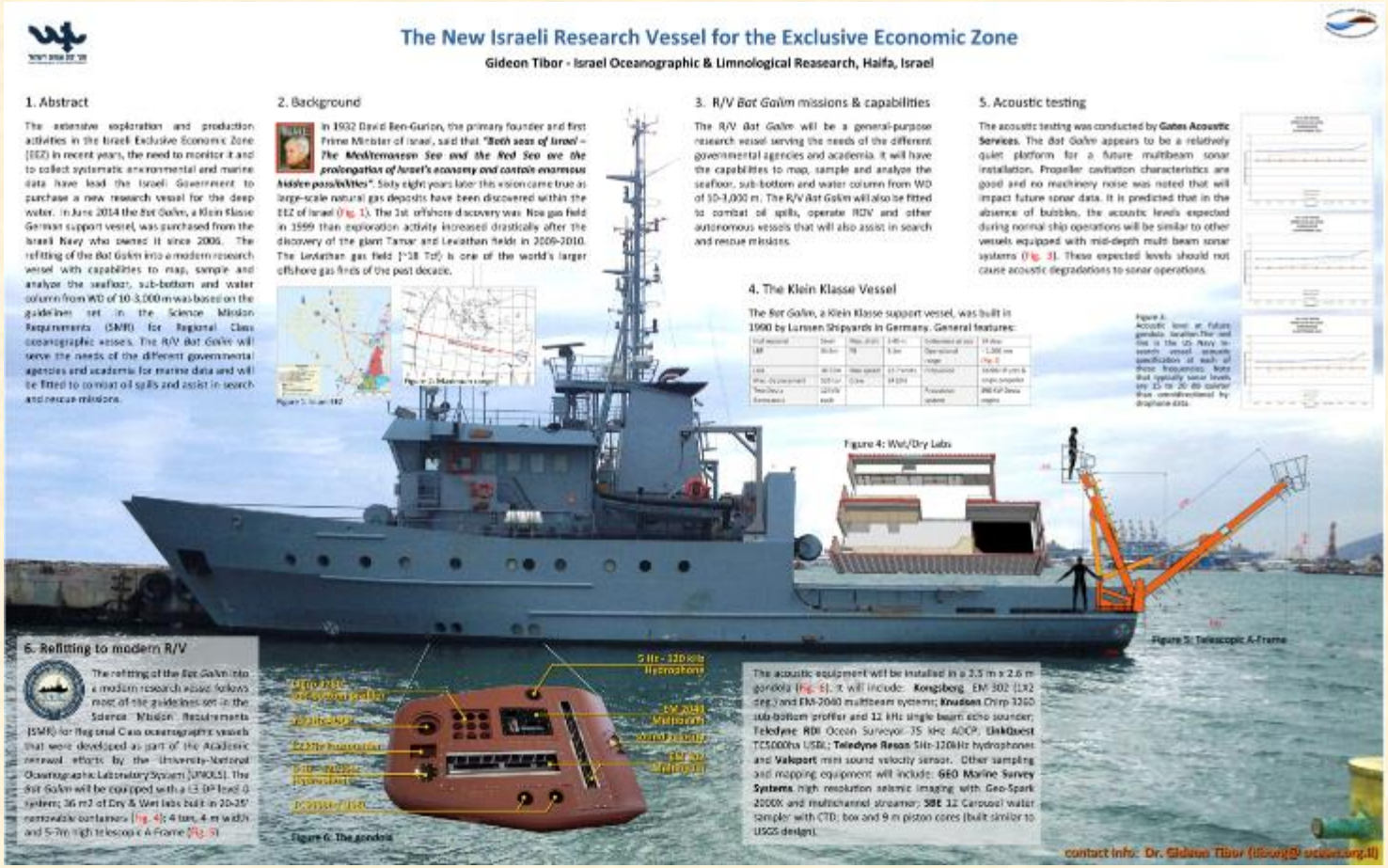
New Bathymetric Map of Israeli EEZ



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

John Hall, Geological Survey of Israel (ret.)

R/V Bat Galim

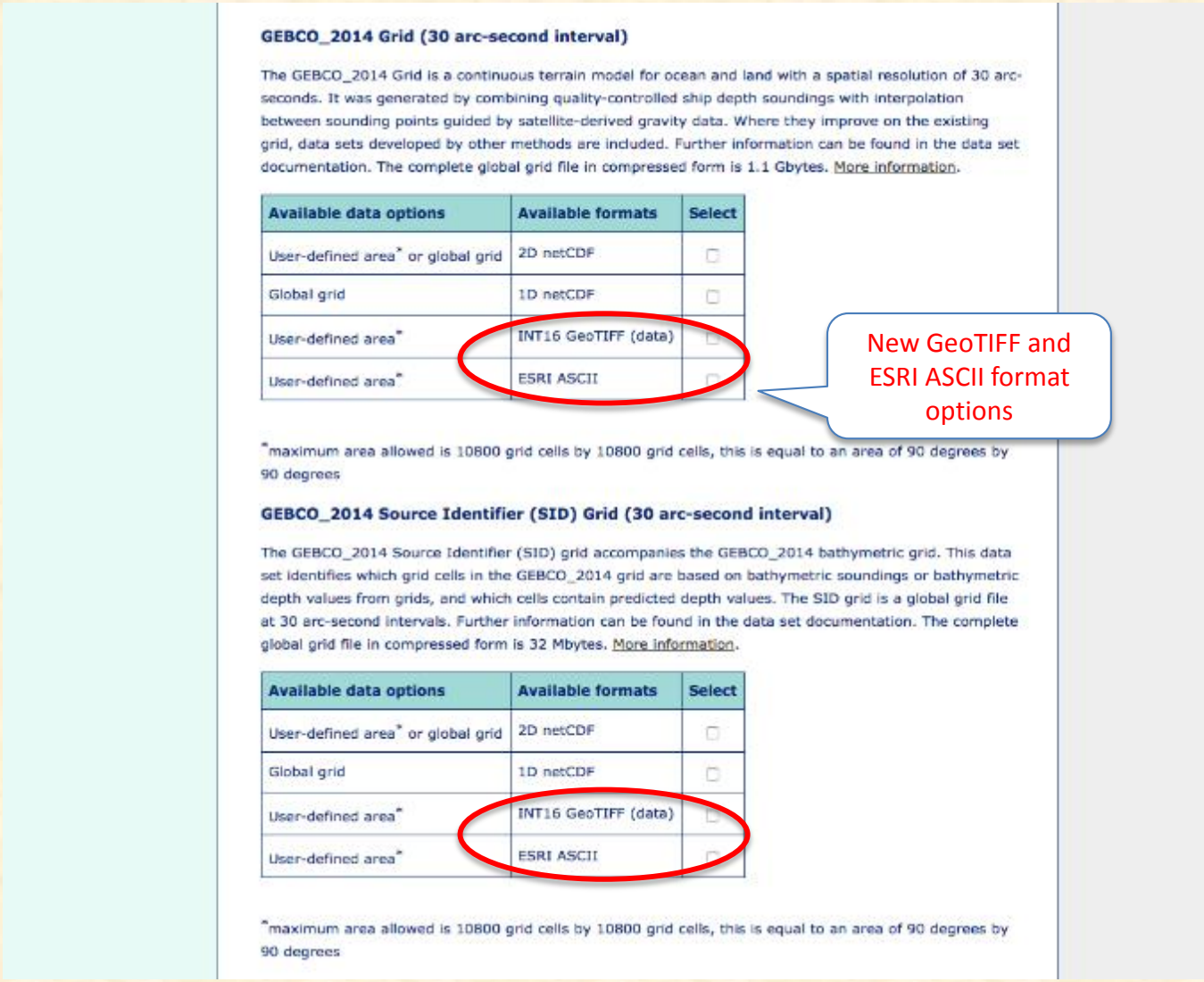


- Acquired by Israeli Government for marine data collection
- R/V Bat Galim to conduct multibeam surveys of EEZ

John Hall, Geological Survey of Israel (ret.)

END OF PRESENTATION

GEBCO_2014 Download Webpage



GEBCO_2014 Grid (30 arc-second interval)

The GEBCO_2014 Grid is a continuous terrain model for ocean and land with a spatial resolution of 30 arc-seconds. It was generated by combining quality-controlled ship depth soundings with interpolation between sounding points guided by satellite-derived gravity data. Where they improve on the existing grid, data sets developed by other methods are included. Further information can be found in the data set documentation. The complete global grid file in compressed form is 1.1 Gbytes. More information.

Available data options	Available formats	Select
User-defined area* or global grid	2D netCDF	☐
Global grid	1D netCDF	☐
User-defined area*	INT16 GeoTIFF (data)	☐
User-defined area*	ESRI ASCII	☐

New GeoTIFF and ESRI ASCII format options

*maximum area allowed is 10800 grid cells by 10800 grid cells, this is equal to an area of 90 degrees by 90 degrees

GEBCO_2014 Source Identifier (SID) Grid (30 arc-second interval)

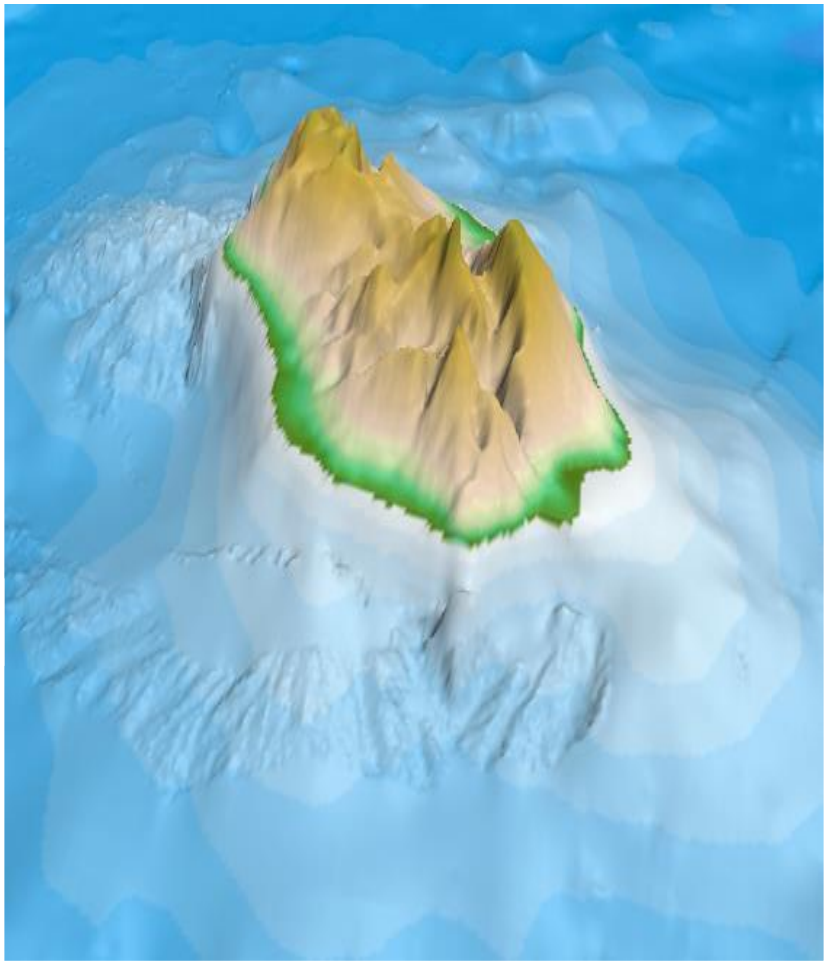
The GEBCO_2014 Source Identifier (SID) grid accompanies the GEBCO_2014 bathymetric grid. This data set identifies which grid cells in the GEBCO_2014 grid are based on bathymetric soundings or bathymetric depth values from grids, and which cells contain predicted depth values. The SID grid is a global grid file at 30 arc-second intervals. Further information can be found in the data set documentation. The complete global grid file in compressed form is 32 Mbytes. More information.

Available data options	Available formats	Select
User-defined area* or global grid	2D netCDF	☐
Global grid	1D netCDF	☐
User-defined area*	INT16 GeoTIFF (data)	☐
User-defined area*	ESRI ASCII	☐

*maximum area allowed is 10800 grid cells by 10800 grid cells, this is equal to an area of 90 degrees by 90 degrees

New bathymetry and SID download options

Capacity-building workshop – Introducing the IBCSO gridding algorithm to IOBC working group

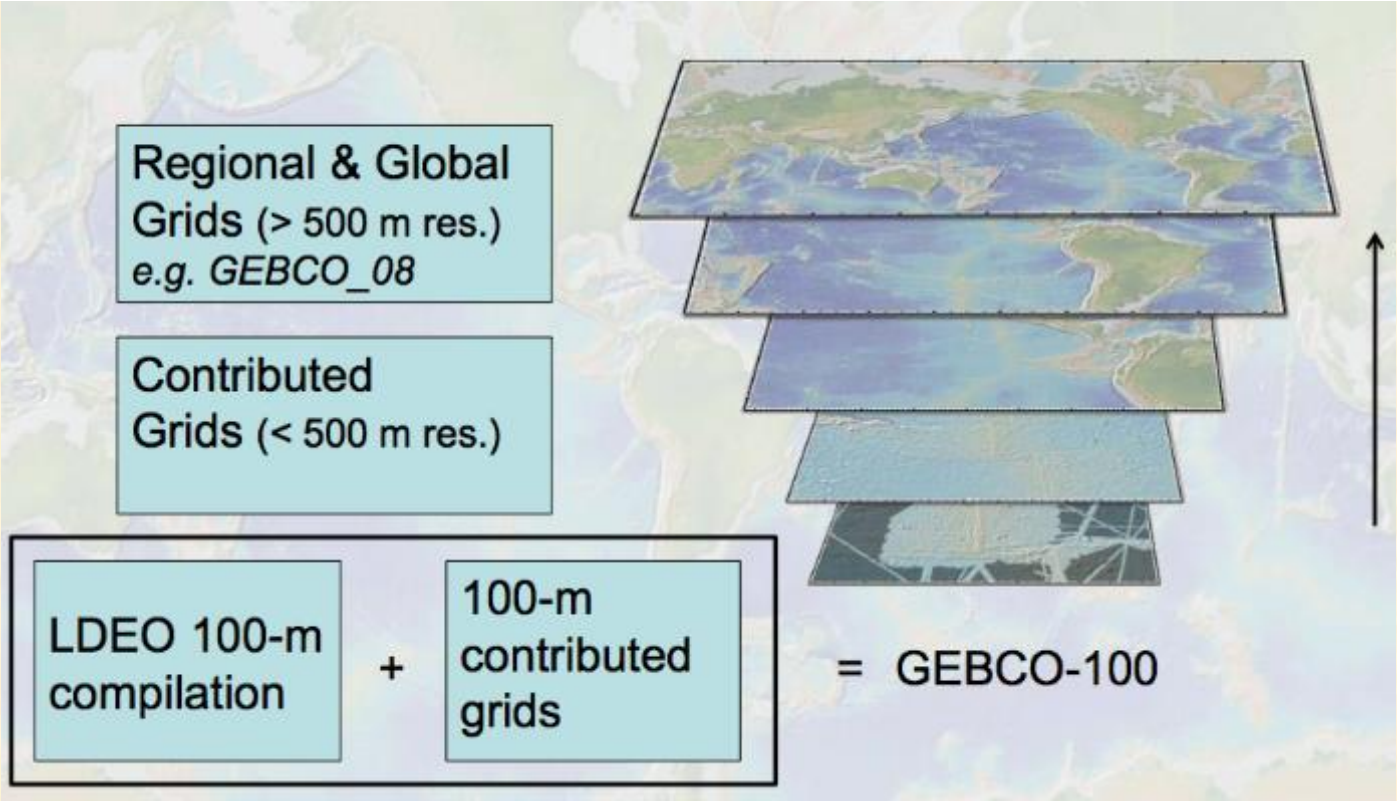


Jan Erik Arndt, AWI

Workshop- May 2014

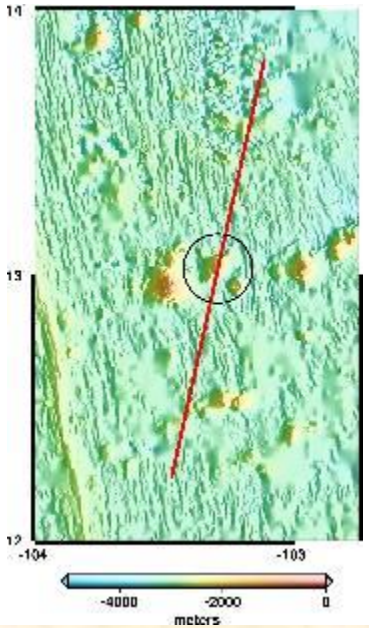
GEBCO Hi-Res Product

- GEBCO Hi-Res is a prototype effort to create a new high resolution GEBCO product
- Global Multi-Scale Resolution Topography (GMRT) is a synthesis of terrestrial and seafloor elevation data in image and grid form that can be viewed in various resolutions
- GEBCO_2014 grid is combined with LDEO compilations and contributed grids
- Users can zoom-in, view data attributes, and access data

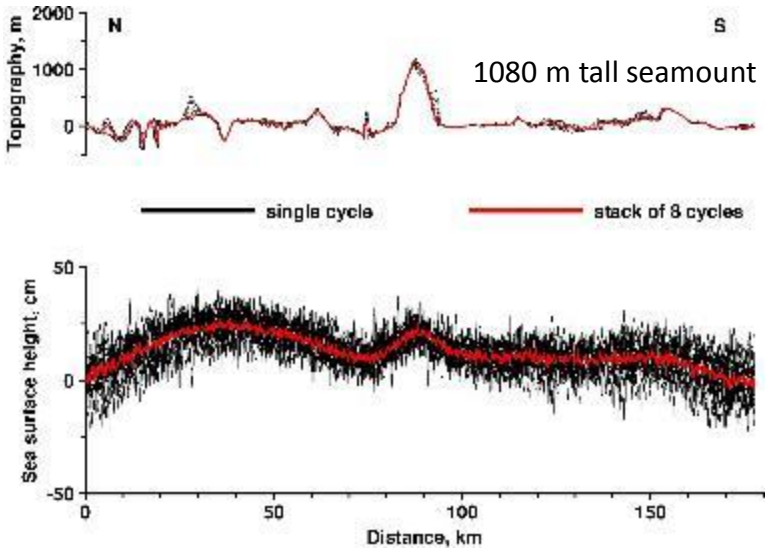


Detecting Very Small Seamounts

East Pacific Rise



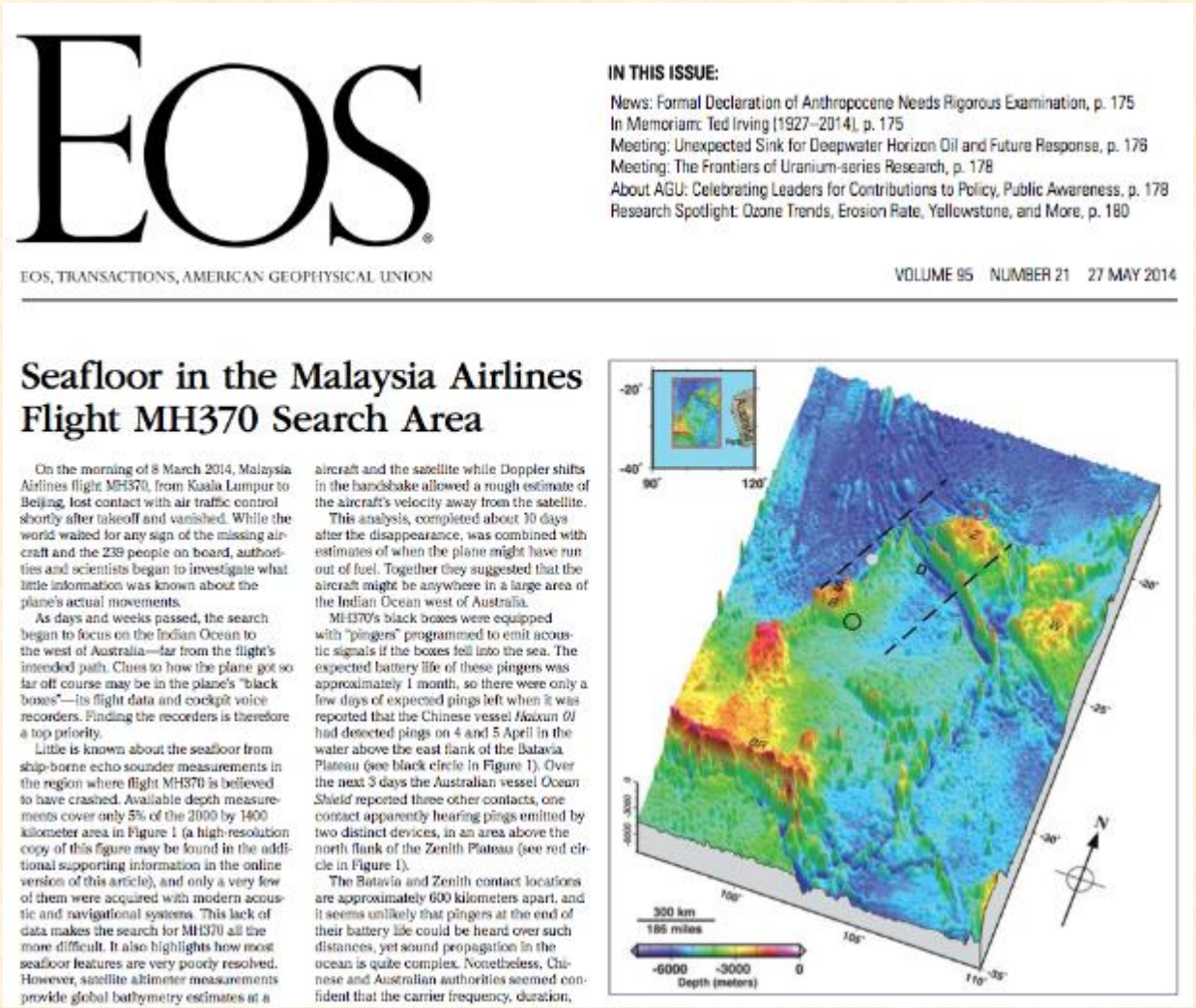
Stacked AltiKa repeat cycles



- Seamounts taller than ~2 km are easy to find in marine gravity fields derived from satellite altimetry
- Smaller seamounts are hard to find because the amplitude of their geoid anomaly is small
- Stacking AltiKa repeat cycles reduces noise and improves resolution of small seamounts

Marks and Smith, NOAA

Eos Feature Article



EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

IN THIS ISSUE:

VOLUME 95 NUMBER 21 27 MAY 2014

Seafloor in the Malaysia Airlines Flight MH370 Search Area

On the morning of 8 March 2014, Malaysia Airlines flight MH370, from Kuala Lumpur to Beijing, lost contact with air traffic control shortly after takeoff and vanished. While the world waited for any sign of the missing aircraft and the 239 people on board, authorities and scientists began to investigate what little information was known about the plane's actual movements.

As days and weeks passed, the search began to focus on the Indian Ocean to the west of Australia—far from the flight's intended path. Clues to how the plane got so far off course may be in the plane's "black boxes"—its flight data and cockpit voice recorders. Finding the recorders is therefore a top priority.

Little is known about the seafloor from ship-borne echo sounder measurements in the region where flight MH370 is believed to have crashed. Available depth measurements cover only 5% of the 2000 by 1400 kilometer area in Figure 1 (a high-resolution copy of this figure may be found in the additional supporting information in the online version of this article), and only a very few of them were acquired with modern acoustic and navigational systems. This lack of data makes the search for MH370 all the more difficult. It also highlights how most seafloor features are very poorly resolved. However, satellite altimeter measurements provide global bathymetry estimates at a

aircraft and the satellite while Doppler shifts in the handshake allowed a rough estimate of the aircraft's velocity away from the satellite.

This analysis, completed about 10 days after the disappearance, was combined with estimates of when the plane might have run out of fuel. Together they suggested that the aircraft might be anywhere in a large area of the Indian Ocean west of Australia.

MH370's black boxes were equipped with "pingers" programmed to emit acoustic signals if the boxes fell into the sea. The expected battery life of these pingers was approximately 1 month, so there were only a few days of expected pings left when it was reported that the Chinese vessel *Haixun 01* had detected pings on 4 and 5 April in the water above the east flank of the Batavia Plateau (see black circle in Figure 1). Over the next 3 days the Australian vessel *Ocean Shield* reported three other contacts, one contact apparently hearing pings emitted by two distinct devices, in an area above the north flank of the Zenith Plateau (see red circle in Figure 1).

The Batavia and Zenith contact locations are approximately 600 kilometers apart, and it seems unlikely that pingers at the end of their battery life could be heard over such distances, yet sound propagation in the ocean is quite complex. Nonetheless, Chinese and Australian authorities seemed confident that the carrier frequency, duration,

- GEBCO data used in:

- Eos Feature Article on seafloor in the MH370 search area (Smith and Marks, Eos, 27 May 2014)

- Science Magazine News article figure ("Lost at Sea," Science, 30 May 2014)

GEBCO data displayed in news articles

BBC News Sport Weather Capital

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27 May 2014 Last updated at 10:10 ET

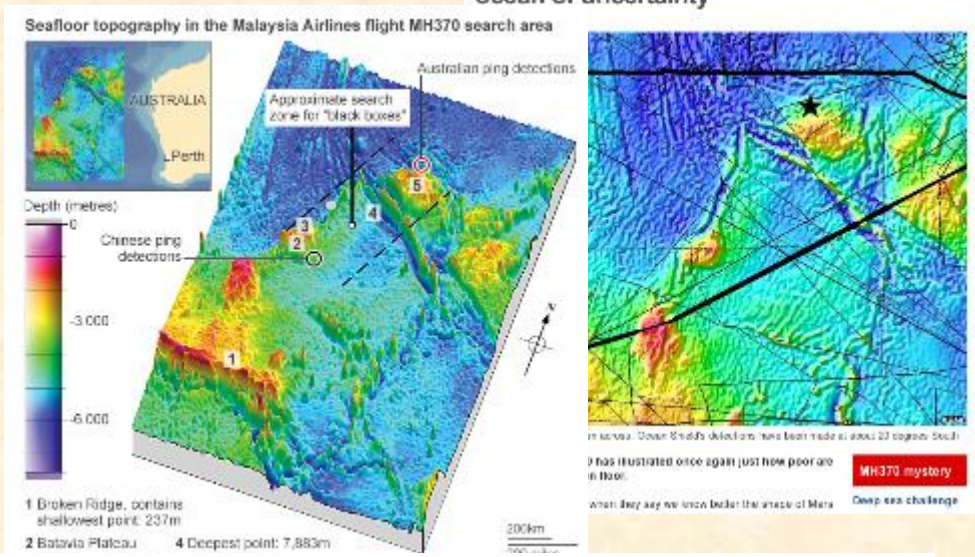
Jonathan Amos
Science correspondent
More from Jonathan | Follow Jonathan on Twitter

MH370 spur to 'better ocean mapping'

COMMENTS (5)

Scientists have welcomed the decision to make all ocean depth data (bathymetry)

Malaysia Airlines MH370: Searching in an ocean of uncertainty



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