# How to map the floor of an entire ocean – a new textbook: work in progress

## Dave Monahan - Center for Coastal and Ocean Mapping, University of New Hampshire

## APPROACH

The range of countries in which potential readers reside has increased tremendously in recent years. More than 60 Coastal States have established or are attempting to establish, national, continental shelf, or maritime claims. The need for professionals and an understanding of seabed mapping and ocean bathymetry has never been greater.

THE NEED

There is no textbook producing deep water, wide area bathymetry.

While there is a lot of published material about mapping small areas with intense human use, particularly shallow, high-traffic shipping lanes and harbors, this body of literature applies, to a large extent, to the collection of one set of measurements using one set of instruments and software.

However, maps of large areas, ocean basin wide and larger, must be made from an assemblage of data of different types, accuracies and provenances collected over many years. Although this is what GEBCO does, nowhere is the process described in a format that others can learn from and emulate.

This post: a) reports on progress in the preparation of a book explaining the processes involved in making such assemblages and then making maps and grids from the assembled data and b) invites your comments and suggestions.

## INTENDED READERSHIP

MAP MAKERS

GEBCO and other wide area maps are produced primarily by two groups of professionals with different educational backgrounds: Geoscientists and Hydrographers. The book must contribute to the knowledge of both.

Although primarily intended for beginners, it is hoped that very experienced practitioners also will benefit.

Some readers will deal with new data only: for them, the book is organized so that readers who only deal with modern new data (GPS multibeam) can read about that without having to read the sections on the older data. Reading it in its entirety deals with all the data, i.e. old data and modern data.

MAP USERS

As well as providing an instructional manual on how bathymetric maps of large areas are prepared, this book provides non-specialists with an overview of the strengths and limitations of bathymetric maps.

## INCLUDE

- Words: A traditional style text arranged in Chapters and subchapters: see outline box
- Sidebars – Mini-sections about related topics but whose inclusion in the main text would interrupt the flow – see sidebar box.
- Figures – many, many
- Animations (via links) – graphics and tables
- Links – to websites and data sets
- Questions, exercises, projects for students
- References

(Not all will appear in the First Edition)

## TIMELINE

- **2004-10**
  - The Nippon Foundation GEBCO Training Program at UNH
  - Lecture notes, labs, exercise become sources
- **2010 – NOW**
  - Significant production first draft
  - October-December Guest Committee
  - Seek input from other bathymetricists
  - Receive and incorporate input
- **2011 – 2012**
  - Produce second draft
  - National Sea Grant
  - K'Oh'rend'fet second draft in class at UNH
  - Produce third draft based on class input
- **2013-2014**
  - Produce First Edition
  - Arrange Publication and distribution

## YOUR PARTICIPATION IS WANTED

All comments and advice welcome

Review

You can review the current draft by downloading it at [http://monahan.endnotes.com](http://monahan.endnotes.com). Account = anonymous, Password = your email address, Folder MonahanText.

Text = a text only Word doc

References – my working list of references keyed to chapters. If you are not included, you should be please send me your applicable references or suggest others Figures – a list of figures keyed to chapters. I think this is the weakest category. Please send your figures for inclusion – or suggest others

## PUBLISHING AND DISTRIBUTION

The world of publishing is changing very rapidly: we will try to use the most valuable modern approaches and not go down any blind alleys.

Probably first edition will be both a print-on-demand paper book and an eBook – subsequent editions will increasingly web-based with hot links to exercises and animations.

I hope the book will be published by GEBCO or CCOM or both in partnership. Even more, I hope that it will be updated by successive generations of GEBCO and CCOM members.

## ACKNOWLEDGMENTS

I thank the Nippon Foundation for their support of the Nippon Foundation GEBCO Training Program at the University of New Hampshire within which I taught the classes whose lecture notes this book began with. I thank Larry Mayer for his immediate and enthusiastic support of the concept and Robin Falotico for his encouragement.

## FOR FURTHER INFORMATION

Please contact

Dave Monahan - monahan@ccom.unh.edu

## APPENDIX

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2. Cartography

2.1 What are maps?

2.2 The processional (i.e. the exchange of scales)

2.3 Resolution of maps and measurements.

2.4 Map Generalization

2.5 How to map anything?

2.6 A perfect map would, AT ITS SCALE:

3. Types of seabed maps produced to date

3.1 Navigational and scientific seabed depictions

3.2 Deep Ocean Offsets From Inshore Areas

4. Measurements in Theory

4.1 Measurements as numbers

4.1.1 Reductions

4.1.2 Numerical Error and Uncertainty

4.2 Measurements as Spatial Samples

4.2.1 Distribution of spatial samples

4.2.2 Sample error and uncertainty

4.3 Put the two types of errors together

5. Types of measurements used in bathymetry

5.1 Acoustics

5.1.1 Single beam echo sounder

5.1.2 Multi beam echo sounder

5.1.3 Side Scan Sonar

5.2 Non-acoustic methods

5.2.1 Satellite Altimetry

5.2.2 LIDAR

5.2.3 Other Systems.

6. From measurement to data

6.1 Meta Data

6.2 Combined Error and uncertainty

6.3 An ideal data set

7. From Data To Surface

7.1 Fundamental Assumption

7.2 Interpretation

7.3 Mollweide

7.3.1 Distribution of spatial samples

7.3.2. Surface and Uncertainty

8. Organizing to map the oceans

8.1 GEBCO

8.2 The Role of Standards.

8.3 Data Bases and Data Centers

9. Stages in the production of large area maps and grids

9.1 Data Assembly

9.1.1 Meta data about the map

9.1.2 Inclusion of existing maps

9.2 Role for GIS

9.3 Quality Assurance—determining uncertainty

9.4 Map Design

9.4.1 Model map designs

9.4.2 Portraying uncertainty

9.5 Grids

9.6 Nomenclature

9.7 Dissemination and Updating

[[1]](http://www.geo-union.org)