

# Introduction

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The Digital Mapping Techniques '06 (DMT'06) workshop was attended by more than 110 technical experts from 51 agencies, universities, and private companies, including representatives from 27 state geological surveys (see Appendix A of these Proceedings). This workshop was similar in nature to the previous nine meetings, which were held in Lawrence, Kansas (Soller, 1997), Champaign, Illinois (Soller, 1998), Madison, Wisconsin (Soller, 1999), Lexington, Kentucky (Soller, 2000), Tuscaloosa, Alabama (Soller, 2001), Salt Lake City, Utah (Soller, 2002), Millersville, Pennsylvania (Soller, 2003), Portland, Oregon (Soller, 2004), and Baton Rouge, Louisiana (Soller, 2005). This year's meeting was hosted by the Ohio Geological Survey, from June 11-14, 2006, on the Ohio State University campus in Columbus, Ohio. As in the previous meetings, the objective was to foster informal discussion and exchange of technical information. It is with great pleasure that I note that the objective was successfully met, as attendees continued to share and exchange knowledge and information, and renew friendships and collegial work begun at past DMT workshops.

Each DMT workshop has been coordinated by the Association of American State Geologists (AASG) and U.S. Geological Survey (USGS) Data Capture Working Group, the latter of which was formed in August 1996 to support the AASG and the USGS in their effort to build a National Geologic Map Database (see Soller, this volume, and <http://ngmdb.usgs.gov/info/standards/datacapt/>). The Working Group was formed because increased production efficiencies, standardization, and quality of digital map products were needed for the database—and for the State and Federal geological surveys—to provide more high-quality digital maps to the public.

At the 2006 meeting, oral and poster presentations and special discussion sessions emphasized: 1) methods for creating and publishing map products (here, “publishing” includes Web-based release); 2) field data capture software and techniques, including the use of LIDAR; 3) digital cartographic techniques; 4) migration of digital maps into ArcGIS Geodatabase format; 5) analytical GIS techniques; and 6) continued development of the National Geologic Map Database.

## ACKNOWLEDGEMENTS

I thank the Ohio Geological Survey (OGS) and their Chief and State Geologist, Thomas M. Berg, for hosting this meeting and for arranging for corporate sponsorship. During the past 10 years, I have worked closely with the Association of American State Geologists and, in particular, with Tom, who retired soon after the DMT'06 meeting. I wish to thank him profusely for his many years of guidance, support, and friendship.

In the tradition of past DMT meetings, the attendees were given a very informative, productive, and enjoyable experience. I especially thank Jim McDonald (OGS), who coordinated the events. Other OGS staff who deserve thanks are those who provided essential support for this meeting, including Lisa Van Doren (for preparing graphics, signs, and maps), Mac Swinford (poster boards), Ed Kuehnle (poster boards), Madge Fitak (registration), Sharon Stone (meeting logistics), Garry Yates, and Dennis Hull (poster boards).

The meeting was co-hosted by The Ohio State University Department of Geological Sciences, and I thank them for their hospitality and for their significant contributions to this meeting. Specifically, I thank Franklin Schwartz (Department Chair and meeting sponsor), Karen Tyler (facilities setup), Garry McKenzie (general assistance), Ken Shelberg (finances, registration), Sue Shipley (finances, registration), Mary Scott (Sunday reception host), Dale Gnidovec (Sunday reception host), Michael Seuffer (web site), Betty Heath (registration), Mary Hill (registration), and Kelley Barrett, Kelley Carroll, Mike Fidler, Steve Goldsmith (setup, registration), and Brent Curtis (WiFi setup).

The meeting was greatly improved through the generous financial donations of the National Office and the Ohio Chapter of the American Institute of Professional Geologists (AIPG), the Ohio Industrial Minerals and Aggregates Association, and the Ohio Oil and Gas Association. The Eastern Section of AAPG and the West Virginia Geological Survey generously provided the poster boards, and for this we owe them a warm thank you.

I also thank the members of the Data Capture Working Group (Warren Anderson, Kentucky Geological Survey;

Elizabeth Campbell, Virginia Division of Mines and Geology; Rob Krumm and Barb Stiff, Illinois State Geological Survey; Scott McColloch, West Virginia Geological and Economic Survey; George Saucedo, California Geological Survey; and Tom Whitfield, Pennsylvania Geological Survey) for advice in planning the workshop's content.

I warmly thank Lisa Van Doren (Ohio Geological Survey) for typesetting the Proceedings. And, last but not least, I thank all attendees for their participation; their enthusiasm and expertise were the primary reasons for the meeting's success.

## PRESENTATIONS AND POSTERS

The workshop included 32 oral presentations and 25 posters. Many are supported by a short paper contained in these Proceedings. The papers describe technical and procedural approaches that currently meet some or all needs for digital mapping at the respective agency. There is not, of course, a single "solution" or approach to digital mapping that will work for each agency or for each program or group within an agency; personnel and funding levels, and the schedule, data format, and manner in which we must deliver our information to the public require that each agency design their own approach. However, the value of this workshop and other forums like it is through their roles in helping to design or refine these agency-specific approaches to digital mapping, and to find applicable approaches used by other agencies. In other words, communication helps us to avoid having to "reinvent the wheel."

During the course of the 10 annual DMT meetings, it has been my pleasure to meet, and work with, the many talented people who have authored papers in these Proceedings. As the subjects addressed by the DMT meetings have become even more essential to the Nation's geological surveys, the demands placed on them have risen to the point where many authors scarcely have time to address their work fully. Predictably, less time is then available to compose written summaries of their work; I'm sure the readers (or at least other editors) can sympathize with this predicament. Therefore, I include with this Introduction a list of all presentations and posters (Appendix A of this paper). If the reader finds an interesting title that isn't recorded in these Proceedings, I encourage them to contact the authors directly. Further, some presentations and related information is available for download at <http://ngmdb.usgs.gov/Info/dmt/DMT06presentations.html>.

## THE NEXT DMT WORKSHOP

The eleventh annual DMT meeting will be held in the Spring of 2007, on the campus of South Carolina University, in Columbia, South Carolina. Please consult the Web site (<http://ngmdb.usgs.gov/Info/dmt/>) for updated information. While planning for that event, the Data Capture Working Group will carefully consider recommendations for meeting content and format offered by DMT'06 attendees.

## REFERENCES

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- Soller, D.R., editor, 1997, Proceedings of a workshop on digital mapping techniques: Methods for geologic map data capture, management, and publication: U.S. Geological Survey Open-File Report 97-269, 120 p., accessed at <http://pubs.usgs.gov/of/of97-269/>.

## APPENDIX A

List of oral and poster presentations, and discussion sessions.

### Oral Presentations

A 10-year retrospective on the Digital Mapping Techniques workshops

By David R. Soller (U.S. Geological Survey)

The new Geology Ontario web portal - an “out-of-the-box” solution for discovering and delivering Ontario’s geoscience data

By Zoran Madon (Ontario Geological Survey)

Building a water well database for GIS analysis

By A. Wayne Jones and Kelly A. Barrett (Ohio Department of Natural Resources, Division of Water)

Identifying sensitive aquifers in Ohio

By Chris Kenah, Michael Slattery, Linda Slattery, and Michael Eggert (Ohio EPA)

Discussion Session - “Topographic maps and framework data in the future”

This session focused on plans for creating and updating topographic and other framework map data, through local, state, and national partnerships. The session began with these presentations:

- Enhancing USGS topo quads, and GIS for the Gulf, by Stafford Binder (U.S. Geological Survey)
- Building NSDI through local, state, and national partnerships, by Stu Davis (National States Geographic Information Council (NSGIC))
- The National Map, by Charles Hickman (U.S. Geological Survey)

GeoSciML, a GML application for geoscience information interchange

By the CGI Data Model and Testbed working group

Open source web-mapping, the Oregon experience

By David Percy (Portland State University)

High Resolution DEM's from digital photogrammetry, stereo-autocorrelation, and morphological filtering as an alternative to LIDAR for mapping applications

By Peter G. Chirico (U.S. Geological Survey)

Integration of high-resolution satellite imagery for coastal mapping and monitoring

By Ron Li, Xutong Niu, Sagar Deshpande, Feng Zhou, and Kaichang Di (The Ohio State University)

GIS in use at an industrial minerals company

By Steve Murdoch (Oglebay Norton Company / O-N Minerals)

Discussion Session on LIDAR

This session focused on LIDAR technology, image processing techniques, and its application to geologic mapping. The session began with these presentations:

- LIDAR basics, by Jim Giglierano (Iowa Geological Survey)
- Airborne Laser Swath Mapping (LIDAR) and geology: The B4 project, by Michael Bevis, David Raleigh, Shan Shan, Dana Caccamise, Eric Kendrick, and Wendy Shindle (The Ohio State University), Ken Hudnut (U.S. Geological Survey), and Dorota Grejner-Brzezinska and Charles Toth (The Ohio State University)
- LIDAR and various levels of accuracy. by Mark Brooks (Optimal Geomatics)

The National Park Service Geologic Resources Evaluation; Subtitle: "Using GIS to get GIS"

By Timothy B. Connors (National Park Service)

The concept and development of the National Geological Map Database in the Czech Republic

By Robert Tomas (Czech Geological Survey)

Geological Map Database - A practitioner's guide to delivering the information

By Jeremy Giles (British Geological Survey)

The Publishing Process Integration system for the Geological Survey of Canada publication products

By Linda Guay (Geological Survey of Canada)

Building Geodatabase coded-value domains from National Geologic Map Database vocabularies

By Steve Richard (Arizona Geological Survey), and Jon Craigue and Dave Soller (U.S. Geological Survey)

Visualizing earthquake hazard information in Google Earth

By J. Luke Blair, Marco Ticci, James Lienkaemper, and Heather Lackey (U.S. Geological Survey)

Preserving North Carolina legacy geologic and topographic maps

By Jeffrey C. Reid (North Carolina Geological Survey), Jeff Essic (North Carolina State University Libraries), Steve Morris (North Carolina State University Libraries), and Smitha Ramakrishnan (University of North Carolina, Greensboro)

Saturation and value modulation: A new method for integrating colour and grey-scale imagery

By David Viljoen and Jeff Harris (Geological Survey of Canada)

Geographic Imager software for Adobe Photoshop

By David Andrec and Doug Smith (Avenza Systems, Inc.)

Acquiring unpublished geologic evidence to augment Web dissemination of Kentucky's geologic maps

By Jerry Weisenfluh (Kentucky Geological Survey)

The challenges and benefits of distributing digital data: Lessons learned

By Kenneth Papp, Susan Seitz, and Larry Freeman (Alaska Division of Geological & Geophysical Surveys), and Carrie Browne (formerly with ADG&GS)

The Alabama Metadata Portal: A new solution for serving large amounts of data

By Philip Patterson (Geological Survey of Alabama)

IT Security - How it affects digital mapping

By Harry McGregor (University of Arizona and the U.S. Geological Survey)

From Geek to Illiterate Manager: following the road wherever it leads, enjoying the scenery and ignoring the address ranges

By Jay Parrish (Director, Pennsylvania Bureau of Topographic and Geologic Survey)

3D geological modeling: Solving a classification problem with the Support Vector Machine

By Alex Smirnoff, Eric Boisvert, and Serge J. Paradis (Geological Survey of Canada)

Qualitative and quantitative 3D modeling of surficial materials at multiple scales

By Erik Venteris (Ohio Geological Survey)

Discussion Session - "A vision for web-accessible 3D geological mapping"

Led by Harvey Thorleifson (Director, Minnesota Geological Survey), this session offered for discussion this vision and how it might be implemented:

"People require geological mapping to fulfill their objectives related to health, heritage, safety, and economic development, and they expect public information to be web-accessible and readily usable. Could the geoscience community cooperate in order to make available an international database that provides known and predicted subsurface conditions, based on consistent global coverage, zoomable down to the most detailed coverage available, with links to the source map? To address societal issues, the database should include bathymetry, soils, onshore and offshore surficial and bedrock geology, and 3D geology depicting extent, thickness, and properties of geologic units, so that web-accessible drillhole forecasts can be issued for any point."

## Poster Presentations

Geologic map of the Ouachita Mountain region in Arkansas

By Boyd R. Haley and Charles G. Stone (Arkansas Geological Commission)

Template for a geologic map at 1:24,000 scale

By William D. Hanson and Jerry W. Clark (Arkansas Geological Commission)

A Geodatabase schema for geologic map production

By Vic Dohar (Geological Survey of Canada)

The Publishing Process Integration system for the Geological Survey of Canada publication products

By Linda Guay (Geological Survey of Canada)

The art of mapping with a catalogue of geo-knowledge: Sable Island Bank and the Gully, Scotian Shelf, offshore eastern Canada

By Edward L. King and Gary M. Grant (Geological Survey of Canada)

Saturation and value modulation: A new method for integrating colour and grey-scale imagery

By David Viljoen and Jeff Harris (Geological Survey of Canada)

Digital map production at the Czech Geological Survey, Czech Republic

By Zuzana Krejci (Czech Geological Survey)



Compression of digital orthophotography collections  
By Deette Lund (Illinois State Geological Survey)

Recent LGS StateMap geologic maps; Recent LGS geologic lithographs; The impact of Hurricane Katrina  
By R. Hampton Peele, Richard P. McCulloh, Paul Heinrich, John Snead, Lisa Pond, Robert Paulsell, DeWitt Braud, Ahmet Binselam, Ivor van Heerden, and Rob Cunningham (Louisiana Geological Survey and Louisiana State University)

Surficial and 3-D geological mapping in support of land and water management in Manitoba, Canada  
By Greg Keller and Gaywood Matile (Manitoba Geological Survey)

Converting Adobe Illustrator maps to ArcMap format  
By Jennifer Mauldin (Nevada Bureau of Mines and Geology)

Preserving North Carolina legacy geologic and topographic maps  
By Jeffrey C. Reid (North Carolina Geological Survey), Jeff Essic (North Carolina State University Libraries), Steve Morris (North Carolina State University Libraries), and Smitha Ramakrishnan (University of North Carolina, Greensboro)

Using GIS to create and analyze potentiometric-surface maps  
By Paul N. Spahr, A. Wayne Jones, Kelly A. Barrett, Michael P. Angle, and James M. Raab (Ohio Department of Natural Resources, Division of Water)

Detailed, three-dimensional, surficial-geology mapping of the Milan, Ohio 1:24,000 Quadrangle  
By Rick Pavey (Ohio Geological Survey)

Updates to the Known and Probable Karst Map of Ohio  
By Donovan Powers (Ohio Geological Survey)

New map of the surficial geology of the Lorain and Put-In-Bay 30 x 60 Minute Quadrangles, Ohio  
By E.M. Swinford, R.R. Pavey, G.E. Larsen, and K.E. Vorbau (Ohio Geological Survey)

Airborne Laser Swath Mapping (LIDAR) and Geology: The B4 project  
By Michael Bevis, David Raleigh, Shan Shan, Dana Caccamise, Eric Kendrick, and Wendy Shindle (The Ohio State University), Ken Hudnut (U.S. Geological Survey), and Dorota Grejner-Brzezinska and Charles Toth (The Ohio State University)

The National Park Service Geologic Resources Evaluation; Subtitle: "Using GIS to get GIS"  
By Timothy B. Connors (National Park Service)

GIS and GPS utility in the geologic mapping of complex geologic terrane on the Mascot, Tennessee 7.5' Quadrangle  
By Barry W. Miller and Robert C. Price (Tennessee Division of Geology)

Spatial adjustment and digital capture of unprojected geologic data for the USGS 2004 oil and gas assessment of the Michigan Basin  
By Joseph A. East (U.S. Geological Survey)

Prototype GIS database for the DNAG Geologic Map of North America  
By Christopher Garrity and David Soller (U.S. Geological Survey)

Publications Warehouse: A database of verified, Web-enabled citations, USGS publications, and their metadata (<http://pubs.usgs.gov>)  
By Carolyn McCullough and Greg Allord (U.S. Geological Survey)

The National Geologic Map Database  
By David R. Soller (U.S. Geological Survey), Thomas M. Berg (Ohio State Geologist), and Nancy R. Stamm (U.S. Geological Survey)

USGS National Surveys and Analysis projects: Preliminary compilation of integrated geological datasets for the United States  
By Doug Stoeser, Ric Wilson, Steve Ludington, Connie Dicken, and Suzanne Nicholson (U.S. Geological Survey)

Banding birds with MapServer  
By Rob Wardwell and Kevin Laurent (U.S. Geological Survey)