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Volume 36

BOREAS HYD-8 DEM Data over the NSA-MSA and SSA-MSA in the UTM Projection

X. Wang, L.E. Band, and D.E. Knapp

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

July 2000
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BOREAS HYD-8 DEM Data over the NSA-MSA and SSA-MSA in the UTM Projection

Xuewen Wang, L.E. Band, David Knapp

Summary

The BOREAS HYD-8 team focused on describing the scaling behavior of water and carbon flux processes at local and regional scales. These DEMs were produced from digitized contours at a cell resolution of 100 meters. Vector contours of the area were used as input to a software package that interpolates between contours to create a DEM representing the terrain surface. The vector contours had a contour interval of 25 feet. The data cover the BOREAS MSAs of the SSA and NSA and are given in a UTM map projection. Most of the elevation data from which the DEM was produced were collected in the 1970s or 1980s. The data are stored in binary, image format files.

Note that the binary files of this data set on the BOREAS CD-ROMs have been compressed using the Gzip program. See Section 8.2 for details.

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1. Data Set Overview

1.1 Data Set Identification
BOREAS HYD-08 DEM Data over the NSA-MSA and SSA-MSA in the UTM Projection

1.2 Data Set Introduction
These data are provided as part of the BOREal Ecosystem-Atmosphere Study (BOREAS) Staff Science Geographic Information System (GIS) Data Collection Program, which included the collection of pertinent map data, in both hardcopy and digital form.
1.3 Objective/Purpose
The objective of these Digital Elevation Models (DEMs) is to provide the BOREAS investigators with a data product that characterizes the topography of the Northern Study Area (NSA) and Southern Study Area (SSA) Modeling Sub-Areas (MSAs). These data are to be used for modeling purposes.

1.4 Summary of Parameters
Elevation above mean sea level in meters.

1.5 Discussion
The input vector data were acquired through the Canadian Centre for Remote Sensing (CCRS) from the National Topographical Data Base (NTDB) in Standard Interchange Format (SIF). The vector data were digitized from 1:50,000-scale topographic maps and had a contour interval of 25 feet. The BOREAS HYD-08 team gridded the data into a Universal Transverse Mercator (UTM) projection.

1.6 Related Data Sets
BOREAS Regional DEM in Raster Format and AEAC Projection
BOREAS HYD-08 DEM Data over the NSA-MSA and SSA-MSA in the AEAC Projection

2. Investigator(s)

2.1 Investigator(s) Name and Title
Dr. L.E. Band, Professor

2.2 Title of Investigation
Simulation of Boreal Ecosystem Carbon and Water Budgets: Scaling from Local to Regional Extents

2.3 Contact Information

Contact 1:
Xuewen Wang
Dept. Geography, U. Toronto
Toronto, Ontario
Canada M5T 1A1
(416) 978-5070
wangx@esker.geog.utoronto.ca

Contact 2:
L.E. Band
Dept. Geography, U. Toronto
Toronto, Ontario
Canada M5T 1A1
(416) 978-3375
lband@eos.geog.utoronto.ca

Contact 3:
David Knapp
Raytheon ITSS
NASA GSFC
Code 923
Greenbelt, MD 20771
(301) 286-1424
David.Knapp@gsfc.nasa.gov
3. Theory of Measurements

The user is referred to the NTDB to obtain information about the processes used to create the vector contour data.

4. Equipment

4.1 Sensor/Instrument Description
   Unknown.

4.1.1 Collection Environment
   Unknown.

4.1.2 Source/Platform
   Unknown.

4.1.3 Source/Platform Mission Objectives
   Unknown.

4.1.4 Key Variables
   Unknown.

4.1.5 Principles of Operation
   Unknown.

4.1.6 Sensor/Instrument Measurement Geometry
   Unknown.

4.1.7 Manufacturer of Sensor/Instrument
   Unknown.

4.2 Calibration
   Unknown.

4.2.1 Specifications
   Unknown.

4.2.1.1 Tolerance
   Unknown.

4.2.2 Frequency of Calibration
   Unknown.

4.2.3 Other Calibration Information
   Unknown.

5. Data Acquisition Methods

The data were acquired from the NTDB and received from CCRS. The data came in SIF, digitized from 1:50,000-scale topographic maps. These vector contour data were used by the HYD-08 team to produce the DEMs in this data set.
6. Observations

6.1 Data Notes
Unknown.

6.2 Field Notes
Unknown.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

NSA:
The image area that was modeled covers an area that is approximately 54 km x 37 km. This area includes areas just northwest of Thompson, extending as far south as Nelson House, Manitoba. The North American Datum of 1927 (NAD27) corners of the data set are as follows. The following UTM coordinates are in UTM zone 14.

<table>
<thead>
<tr>
<th>Corner</th>
<th>Easting</th>
<th>Northing</th>
<th>Longitude</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>503100</td>
<td>6212100</td>
<td>98.95022W</td>
<td>56.05600N</td>
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<tr>
<td>Northeast</td>
<td>556900</td>
<td>6212100</td>
<td>98.08645W</td>
<td>56.05263N</td>
</tr>
<tr>
<td>Southwest</td>
<td>503100</td>
<td>6175500</td>
<td>98.95064W</td>
<td>55.72715N</td>
</tr>
<tr>
<td>Southeast</td>
<td>556900</td>
<td>6175500</td>
<td>98.09414W</td>
<td>55.72382N</td>
</tr>
</tbody>
</table>

SSA:
The image area that was modeled covers an area that is approximately 54 km x 44 km. This area is located northeast of Prince Albert, Saskatchewan. The NAD27 corners of the data set are as follows. The following UTM coordinates are in UTM.

<table>
<thead>
<tr>
<th>Corner</th>
<th>Easting</th>
<th>Northing</th>
<th>Longitude</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>484800</td>
<td>5993800</td>
<td>105.23240W</td>
<td>54.09410N</td>
</tr>
<tr>
<td>Northeast</td>
<td>538300</td>
<td>5993800</td>
<td>104.41442W</td>
<td>54.09290N</td>
</tr>
<tr>
<td>Southwest</td>
<td>484800</td>
<td>5949500</td>
<td>105.23020W</td>
<td>53.69594N</td>
</tr>
<tr>
<td>Southeast</td>
<td>538300</td>
<td>5949500</td>
<td>104.41996W</td>
<td>53.69475N</td>
</tr>
</tbody>
</table>

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
These data were gridded in the UTM projection to a cell size of 100 meters in both the X and Y directions.

7.1.4 Projection
UTM under NAD27.

7.1.5 Grid Description
The data are gridded in the UTM projection (zone 14 in the NSA, zone 13 in the SSA) at a cell size of 100 meters in both the X and Y directions.
7.2 Temporal Characteristics

7.2.1 Temporal Coverage
Most of the elevation data from which the DEM was produced were collected in the 1970s or 1980s.

7.2.2 Temporal Coverage Map
Not available.

7.2.3 Temporal Resolution
These elevations represent the state of the terrain at a point in time. Most of the elevation data from which the DEM was produced were collected in the 1970s or 1980s.

7.3 Data Characteristics

7.3.1 Parameter/Variable
Elevation above mean sea level.

7.3.2 Variable Description/Definition
Elevation above mean sea level - The vertical distance between a plane at mean sea level and a parallel plane intersecting the given location.

7.3.3 Unit of Measurement
Meters.

7.3.4 Data Source
The HYD-08 team received the original data from CCRS, who acquired them from the NTBD.

7.3.5 Data Range
Not available.

7.4 Sample Data Record
Not applicable to binary image data.

8. Data Organization

8.1 Data Granularity
The smallest amount of data that can be obtained from this data set is the entire data set.

8.2 Data Format(s)

8.2.1 Uncompressed Data Files
This data product contains the following three files:
- File 1: American Standard Code for Information Interchange (ASCII) Header File listing the files that are on the tape. The file contains 9 records of 80 bytes each.
- File 2: DEM data file for the NSA. This is a binary file containing 1,076 bytes in each of 366 records. Each binary record is a line of the image file and contains 538 2-byte (16-bit) values stored as low-order byte first. Each binary value is the mean elevation above sea level of the location in meters.
- File 3: DEM data file for the SSA. This is a binary file containing 1,070 bytes in each of 443 records. Each binary record is a line of the image file and contains 535 2-byte (16-bit) values stored as low-order byte first. Each binary value is the mean elevation above sea level of the location in meters.
8.2.2 Compressed CD-ROM Files
On the BOREAS CD-ROMs, file 1 is stored as ASCII text; however, files 2 and 3 have been compressed with the Gzip compression program (file name *.gz). These data have been compressed using gzip version 1.2.4 and the high compression (-9) option (Copyright (C) 1992-1993 Jean-loup Gailly). Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP programs. The compressed files may be uncompressed using gzip (-d option) or gunzip. Gzip is available from many Web sites (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms
The Topog software package was used to interpolate between contours and create these DEMs. Any details beyond this information is unknown.

9.2 Data Processing Sequence

9.2.1 Processing Steps
HYD-08 used the Topog software to interpolate elevations between the contours. BOREAS Information System (BORIS) personnel processed the data by:
• Visually reviewing the data on a display system.
• Inventorying the data in the online data base.
• Documenting the data contents.
• Copying the ASCII and compressing the binary files for release on CD-ROM.

9.2.2 Processing Changes
None.

9.3 Calculations

9.3.1 Special Corrections/Adjustments
None.

9.3.2 Calculated Variables
None.

9.4 Graphs and Plots
None.

10. Errors

10.1 Sources of Error
The Topog program interpolates the values to grid cells from vector and point data (digitized contours). Errors occur where the original vector data are too sparse spatially, particularly in flat lowland areas and large lakes.
10.2 Quality Assessment

10.2.1 Data Validation by Source
See Section 10.1.

10.2.2 Confidence Level/Accuracy Judgment
See Section 10.1.

10.2.3 Measurement Error for Parameters
See Section 10.1.

10.2.4 Additional Quality Assessments
See Section 10.1.

10.2.5 Data Verification by Data Center
BORIS staff visually reviewed the images to verify that they did appear to represent DEMs without any obvious anomalies. The only quantitative assessment made was to see that the minimum and maximum elevation values in the raster file approximated those shown on topographic maps of the area.

11. Notes

11.1 Limitations of the Data
Elevational variations exist within the lakes, especially large lakes, as explained in Section 10.1.

11.2 Known Problems with the Data
Elevational variations exist within the lakes, especially large lakes, as explained in Section 10.1.

11.3 Usage Guidance
Elevational variations exist within the lakes, especially large lakes, as explained in Section 10.1. Before uncompressing the Gzip files on CD-ROM, be sure that you have enough disk space to hold the uncompressed data files. Then use the appropriate decompression program provided on the CD-ROM for your specific system.

11.4 Other Relevant Information
None.

12. Application of the Data Set
The data can be used to perform analyses of terrain and related effects on hydrology and vegetation.

13. Future Modifications and Plans
None.
14. Software

14.1 Software Description
TOPOG Version 5.0
Division of Water Resources
CSIRO
Canberra, Australia.

Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP commands.

14.2 Software Access
Contact Division of Water Resources, CSIRO Canberra, Australia

Gzip is available from many Web sites across the Internet (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

15. Data Access

The HYD-08 DEM data are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information
For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification
Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data
Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans
The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.
16. Output Products and Availability

16.1 Tape Products
The DEM data can be made available on 8-mm, Digital Archive Tape (DAT), or 9-track tapes at 1600 or 6250 Bytes Per Inch (BPI).

16.2 Film Products
None.

16.3 Other Products
These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation


17.2 Journal Articles and Study Reports


17.3 Archive/DBMS Usage Documentation
None.
18. Glossary of Terms

None.

19. List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>BOREAS</td>
<td>BOReal Ecosystem-Atmosphere Study</td>
</tr>
<tr>
<td>BORIS</td>
<td>BOREAS Information System</td>
</tr>
<tr>
<td>BPI</td>
<td>Bytes Per Inch</td>
</tr>
<tr>
<td>CCRS</td>
<td>Canadian Centre for Remote Sensing</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Compact Disk-Read-Only-Memory</td>
</tr>
<tr>
<td>DAAC</td>
<td>Distributed Active Archive Center</td>
</tr>
<tr>
<td>DAT</td>
<td>Digital Archive Tape</td>
</tr>
<tr>
<td>DEM</td>
<td>Digital Elevation Model</td>
</tr>
<tr>
<td>EOS</td>
<td>Earth Observing System</td>
</tr>
<tr>
<td>EOSDIS</td>
<td>EOS Data and Information System</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GSFC</td>
<td>Goddard Space Flight Center</td>
</tr>
<tr>
<td>MSA</td>
<td>Modeling Sub-Area</td>
</tr>
<tr>
<td>NAD27</td>
<td>North American Datum of 1927</td>
</tr>
<tr>
<td>NAD83</td>
<td>North American Datum of 1983</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NSA</td>
<td>Northern Study Area</td>
</tr>
<tr>
<td>NTDB</td>
<td>National Topographic Data Base</td>
</tr>
<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
</tr>
<tr>
<td>PANP</td>
<td>Prince Albert National Park</td>
</tr>
<tr>
<td>SIF</td>
<td>Standard Interchange Format</td>
</tr>
<tr>
<td>SSA</td>
<td>Southern Study Area</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
</tr>
<tr>
<td>UTM</td>
<td>Universal Transverse Mercator</td>
</tr>
</tbody>
</table>

20. Document Information

20.1 Document Revision Dates
Written: 03-Nov-1994
Last Updated: 05-Feb-1999

20.2 Document Review Dates
BORIS Review: 05-Jun-1997
Science Review:

20.3 Document ID
20.4 Citation

When using these data, please include the following acknowledgement as well as citations of relevant papers in Section 17.2:

These data originated as vector data from CCRS. This data product was gridded from the original vector data by the BOREAS Science Team HYD-08, led by Prof. L.E. Band at the University of Toronto.

If using data from the BOREAS CD-ROM series, also reference the data as:


Also, cite the BOREAS CD-ROM set as:


20.5 Document Curator

20.6 Document URL
**Title and Subtitle:**
Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS) BOREAS HYD-8 DEM Data over the NSA-MSA and SSA-MSA in the UTM Projection

**Authors:**
Xuewen Wang, L.E. Band, and David E. Knapp
Forrest G. Hall and David E. Knapp, m Editors

**Performing Organization:**
Goddard Space Flight Center
Greenbelt, Maryland 20771

**Sponsoring/monitoring agency:**
National Aeronautics and Space Administration
Washington, DC 20546-0001

**Abstract:**
The BOREAS HYD-8 team focused on describing the scaling behavior of water and carbon flux processes at local and regional scales. These DEMs were produced from digitized contours at a cell resolution of 100 meters. Vector contours of the area were used as input to a software package that interpolates between contours to create a DEM representing the terrain surface. The vector contours had a contour interval of 25 feet. The data cover the BOREAS MSAs of the SSA and NSA and are given in a UTM map projection. Most of the elevation data from which the DEM was produced were collected in the 1970s or 1980s. The data are stored in binary, image format files.

**Subject Terms:**
BOREAS, hydrology.