

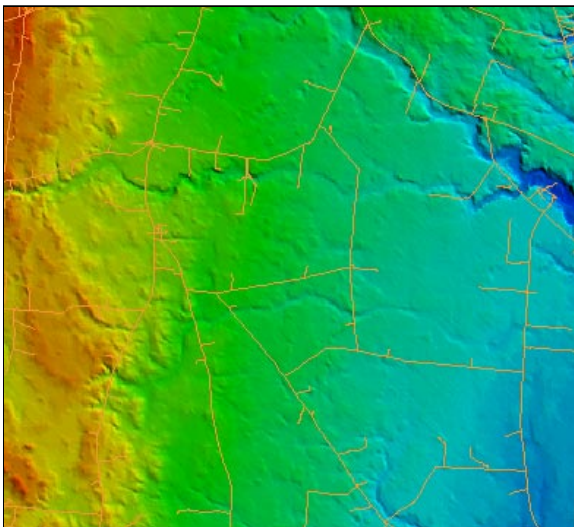
Digital Elevation Model (DEM) FILES

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DEFINITION -- A digital file in raster format consisting of terrain elevations for ground positions at regularly spaced intervals. These digital cartographic/geographic data files are produced by the U.S. Geological Survey (USGS) as part of the National Mapping Program.

FEATURES

The topographic features (e.g., contours, drain lines, ridge lines, lakes, and spot elevations) are first digitized and then processed into the required matrix form and interval spacing. Elevation is sampled every 30 meters in the 1:24000 scale maps and at 3 arc second intervals for 1:250,000 scale maps. (An arc second is 1/3600th of a degree (1 second) of latitude or longitude). There are some DEMs which have been sampled at 10 meter spacing. For DEM availability in Ohio refer to: <http://mcmcweb.er.usgs.gov/status/mac/oh/>.



DEM of Walnut Run Creek in Madison County, Ohio

USES

The DEM files may be used in terrain analysis, with the generation of graphics displaying slope, direction of slope (aspect), and terrain profiles between designated points. They may also be combined with other data types, such as TIGER/Line or Digital Line Graph (DLG) data. For example, DEM data can be combined with stream location data and weather data to assist in forest fire control or combined with remote sensing data to aid in the classification of vegetation. Applications include: (1) modeling terrain gravity data for use in locating energy resources, (2) determining the volume of proposed reservoirs, (3) calculating the amount of material removed during strip mining, (4) determining landslide probability, and (5) developing parameters for hydrologic models.

MAP SCALES

Large Scale

The DEM data for a 7.5- by 7.5-minute block provides the same coverage as the standard USGS 7.5-minute map series, corresponding to the USGS 1:24,000 and

1:25,000 scale topographic quadrangle map series for all of the United States and its territories. Each 7.5-minute DEM utilizes the Universal Transverse Mercator (UTM) coordinate system with the North American Datum of 1927 (NAD27). Elevation units are in meters or feet relative to National Geodetic Vertical Datum of 1929 (NGVD 29) in the continental U.S. (see glossary at <http://edcwww.cr.usgs.gov/glis/hyper/glossary/index> for an explanation of the datum concepts and terms).

Small Scale

The 1-degree DEM provides coverage in 1- by 1-degree blocks for all of the contiguous United States, Hawaii, and most of Alaska.. The 1-degree DEMs are also referred to as 3-arc-second or 1:250,000 scale DEM data. The 1-degree DEM consists of a regular array of elevations referenced horizontally on the geographic (latitude/longitude) coordinate system of the WGS 72, converted to WGS 84. The information content is approximately equivalent to that which can be derived from contour information represented on 1:250,000 scale maps. Elevations are in meters relative to NGVD 29 in the continental U.S.

CURRENT FORMATS

USGS provides DEM in an ASCII and Spatial Data Transfer Standard (SDTS). The ASCII format is organized is a series of three records A, B, and C. The A record is the general characteristics including its name, boundaries, units of measurement, minimum and maximum elevations, and number of B records, and projection parameters. The B record is the elevation profile with associated header information. The C record is the statistics on the accuracy of the data. Each file contains a single A and C record with a separate B record for each elevation profile.

The data is also available in a SDTS format (*.DDF). This is a new format being implemented transferring earth-referenced spatial data between

dissimilar computer systems with the potential for no information loss.

The large scale DEM files are SDTS format. This is a Federal Information Processing Standard (FIPS) and Federal Geographic Data Committee (FGDC) standard for the nonproprietary, vendor-neutral distribution and archive of geo-spatial data and for the exchange of geo-spatial data between dissimilar digital geographic information systems. Files in SDTS format can be unzipped with WinZip or similar decompression programs. The resulting files have filenames such as 7050catd.ddf.

There is several processes involved to create the format and is fairly detailed to mention in this publication. More information about SDTS format is available at: <http://mcmweb.er.usgs.gov/sdts/>

FINDING THE FILES YOU NEED

The OGRIP/GIS Data Support Center supports free availability of 1:24,000 (7.5 minute) DEMs in native format at <ftp.geodata.gis.state.oh.us/geodata/dem/>. The 7.5 minute tiled data is also available as SDTS free of charge at the GeoComm International Corporation at <http://gisdatadepot.com/dem>, from MapMart.com at <http://www.mapmart.com>, and ATDI at <http://64.42.116.14>.

The 1:250,000 scale DEM is available free at: http://edcwww.cr.usgs.gov/glis/hyper/guide/1_dgr_demfig/index1m.html

The availability of USGS SDTS formatted DEM in 7.5, 15 and 30 minute maps can also be obtained by CD, 8mm tape and FTP for a fee at: <http://earthexplorer.usgs.gov>.

The National Elevation Dataset (NED) is the result of the maturation of the USGS effort to provide 1:24,000-scale DEM data for the conterminous U.S. and 1:63,360-scale DEM data for Alaska in a seamless form. Available data formats include ArcGrid, Floating Point, and BILS. For more information visit the Seamless Data Distribution System at <http://gisdata.usgs.gov/ned>

SOFTWARE AND USE IN GIS

ArcView's SDTS Grid Import Extension allows you to utilize the ddf files. This extension is provided in Spatial Analyst and 3D Analyst. Choose "import data source" in the pulldown File menu, and choose "USGS SDTS DEM". (Note that Digital Line Graph files in SDTS format also carry the ddf extension, but because dlG files are vector not raster files, dlG files with the ddf extension cannot be imported using this extension.)

Surfer uses both *.dem and *.ddf. DEM files containing arc-second XY coordinates are automatically converted to latitude/longitude decimal degrees. Surfer can also import TGA format files. Dem2tga is a public domain program that will convert 1:250,000 scale (DEM) data and create a TGA (Targa Image) file from it. It is available from <http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/public.html>.

Small scale DEMs download as ASCII files, which can be given the extension .dem. Import these files into ArcView as USGS DEM files. These can also be viewed as USGS DEM files using DLGV32. This is available free for Windows from: http://mcmweb.er.usgs.gov/sdts/public_domain.html.

DEM3D Viewer is a free software provided by the USGS that allows you to view and move dem files through a 3-dimensional perspective. <http://craterlake.wr.usgs.gov/dem3d.html>

MICRODEM is another program which can read the 1:250,000 DEMS. It is available through the mcmweb site and also at <http://www.usna.edu/Users/oceano/pguth/website/microdem.htm>. Microdem also accepts data in the following formats: DTED, USGS ASCII for 1:24K and 1:250K DEMs, and SDTS for 1:24K DEMs. MICRODEM has capabilities to merge imagery and vector data sets (TIGER or DLG formats) with the DEMs.

There are various utility programs and software for working with DEM and SDTS formats at: <http://data.geocomm.com/>.

REFERENCES

Many helpful user guides and definitions are found at the following sites.

<http://www.esri.com/news/arcuser/0799/webdata6.html>
<http://www.engineering.usu.edu/cee/faculty/dtarb/SDTSext.html>
<http://gisdata.usgs.gov/ned>
<http://edcwww.cr.usgs.gov/glis/hyper/glossary/>
http://edcwww.cr.usgs.gov/Webglis/glisbin/guide.pl/glis/hyper/guide/usgs_dem
<http://ask.usgs.gov/digidata.html>
<http://everest.hunter.cuny.edu/~chuck/gt380/lab04.html>
<http://edcwww.cr.usgs.gov/products/elevation/dem.html>

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