

Introduction

AERMAP can be used to process XYZ data. This can be done by copying and renaming a United States Geological Survey (USGS) Digital Elevation Model (DEM) file to a relevant name that the user understands for their XYZ data. By using a copy of a USGS DEM file, the formats are already there and the file can be modified with XYZ data and related data using the table at the end of this guide.

For editing the XYZ data into the copied file, a text editor is recommended instead of a word processor. When using a word processor it is fairly easy to save extraneous header and body characters used in forming a document. In addition, some text editors have the capability of editing columns of data as opposed to lines of data (e.g. <http://www.ultraedit.com>). Be cautious with some text editors as some have file size limitations that can be easily exceeded by DEM file sizes.

The data in the USGS DEM files are standardized on the USGS “Blue Book” format standard. A copy of the “Blue Book” format is available in the AERMAP User’s Guide. An extract of that standard is tabulated at the end of this User’s Guide. A search on the Internet using USGS “Blue Book” uncovers a number of URLs such as:

<http://www.faqs.org/faqs/graphics/fileformats-faq/part3/> where a copy can be obtained.

It is very important that the user read the AERMAP User’s Guide and thoroughly understand how UTM grids are constructed and oriented in a 7.5 minute DEM file.

Guide

The following is a guide on processing XYZ data into a “Blue Book” DEM format and assumes the user has a thorough understanding of the USGS “Blue Book” file format.

The user’s XYZ data have to be uniformly spaced in the X direction and uniformly spaced in the Y direction. The two horizontal spacing constants do ****not**** have to be the same value. For example, you could have an X spacing value of 25 meters and a Y spacing value of 15 meters. The data do ****not**** need to be oriented parallel to the local UTM grid. However, if the resultant DEM file is going to be used concurrently with other DEM files in the same AERMAP run, the data grid should run parallel to the local UTM grid and be anchored (See AERMAP User’s Guide Keyword: ANCHOR) to that UTM coordinate system. Otherwise, the user is advised to process their XYZ data in a separate AERMAP run where all the receptor and sources are referenced to the same coordinate system. The user should use the general UTM coordinates for the area from which the XYZ data were extracted. However, if the XYZ DEM file is going

to be used concurrently with other USGS DEM files in an AERMAP run, the exact locations need to be entered.

The Blue Book format has two record format specifications (See table below). The first record format, Record A, is a general header record that provides a description of the map data using text and various types of values and codes. The second record format, Record B, is a repeatable format which contains elevation data (nodes) in lines called profiles that are oriented parallel to the local UTM Northing grid line. Each line of elevation data is preceded with a fixed profile starting pair of coordinates along with additional elevation related data.

Notes on Constructing an XYZ DEM File

The user should read in a USGS DEM file and “save as” the file under a different name. When using the table below, most of the information that you will modify should be self-explanatory. For instance, in Record A, data variable #13 needs to be set to “1” for UTM coordinates.

The Record A corner coordinates, variables 16 through 23, need to be in UTM. Adjoining DEM files with common corners can supply the user with the coordinate values.

The spacing between elevations (nodes) is set with variables 28 and 29.

Note: For variable 28, the X or Easting horizontal spacing value ****overrides**** the actual Easting distances that may have been entered in Record B. The user is advised to check the AERMAP output file, mapdetail.out, to make sure the spacing values were entered and then read correctly by AERMAP. There is no way to state the node spacing in the Northing direction other than with variable 29. It is very important to have these two variables correctly read by AERMAP.

Variable 30 is used to set an elevation multiplier. For instance, if the elevations were recorded in tenths of a meter, the multiplier would be 0.1 but entered in Record A as 1.00000D-01.

Maximum and minimum overall elevations need to be entered especially if the XYZ file will be used in conjunction with other USGS DEM files. AERMAP uses the maximum elevation to determine if a critical hill height might be located in an adjacent file that might happen to be the XYZ file you are preparing.

Variables 42 and 43 need to be entered depending upon how the XYZ data was collected. Was the data collected using a transit and USGS benchmark? Was the data obtained from a GPS device? Was the data obtained stereoscopically from aerial photographs? The answer to these questions will determine the setting for these values.

Note that some of the variables in the sample file below had no data. The spaces the data would normally occupy were left blank and were so noted in the examples.

Each record below has a record length of 1024 bytes (characters). Most Record B records contain data which exceeds 1024 bytes in length. In those cases, the data wraps around to the next line. The lines keep wrapping until the record is finished. If the data can not fill a complete line, the rest of the line is filled with spaces until reaching the 1024th byte. Each line is ended at the 1025th and 1026th position with a Carriage Return (CR) and Line Feed (LF) ASCII value of 0Dh and 0Ah, respectively. Text editors do not normally show the CR and LF values.

The following table lists the variables in the order that they are read, the data type and format, data description, and what the user needs to enter with respect to their XYZ data. This table is based on the USGS Blue Book Format. For Record A, the first column of numbers corresponds to the Data Element in the USGS Blue Book. The second column corresponds to the variable position in the record followed by its descriptive name, Fortran format, ending byte location in the record and lastly, descriptive remarks with some suggestions.

Extracted from the USGS Blue Book Table in AERMAP

Record A (main header record - entered only once)

Data Variable	Variable	End'g	
El. No	Name	Format	Byte Description/Remarks/Possible Data
1	1 Map Name:	A40	40 Use these first three variables to
2	2 Addtl Data:	A40	80 describe your location and data
3	3 Filler:	A55	135 (eg Nome, AK, Schuler 3/5/89)
4	4 Process Code:	A1	136 Enter "2" for manual profile
5	5 Filler:	A1	137 Not important, suggest leave alone
6	6 Sectional Indicator:	A3	140 Not important, leave alone or enter something relevant to you
2	7 Mapping Center origin Code:	A4	144 Not important, enter own acronym?
3	8 DEM Level Code:	I6	150 Enter "2", unless you know otherwise
4	9 Elevation Pattern:	I6	156 Enter "1" for a regular pattern
5	10 Planimetric Ref. Sys:	I6	162 Enter "0" for Lat/Long "1" for UTM
6	11 Coordinate Zone:	I6	168 Enter UTM zone if #10 is 1, otherwise enter "0"
7	12 Map Projection Params:	15F24.15	528 Normally all zeros unless you know otherwise
8	13 Horizontal Coordinate Units:	I6	534 Enter "0" for radians "1" for feet "2" for meters "3" for arc-seconds
9	14 Elevation Units:	I6	540 Enter "1" for feet "2" for meters
10	15 Number of map sides:	I6	546 Not Used but normally a "4"
11	16 SW Corner Easting or Lon:	F24.15	570 If variable #13 is "3",
17	SW Corner Northing or Lat:	F24.15	594 use Lat/Long corner coords
18	NW Corner Easting or Lon:	F24.15	618 for 1-degree DEMs
19	NW Corner Northing or Lat:	F24.15	642
20	NE Corner Easting or Lon:	F24.15	666 If variable #13 is "1 or 2",
21	NE Corner Northing or Lat:	F24.15	690 use UTM corner coords
22	SE Corner Easting or Lon:	F24.15	714 for 7.5-minute DEMs. Can use common
23	SE Corner Northing or Lat:	F24.15	738 adjoining DEM map corner coordinates
12	24 Elevation - Min:	F24.15	762 Overall minimum based on variable #14 units
25	Elevation - Max:	F24.15	786 Overall maximum based on variable #14 units
13	26 CClockwise angle:	F24.15	810 Normally set to "0" not processed in AERMAP
14	27 Accuracy elevation code:	I6	816 Normally set to "0"

15	28	Spatial Res. X:	F12.6	828	Distance based on units
	29	Spatial Res. Y:	F12.6	840	specified by variable #13
	30	Spatial Res. Z:	F12.6	852	Based on variable #14 units (eg Decimeters would be 0.1 with variable #14 set to "2")
16	31	Number of Rows:	I6	858	Normally set to "1". Have not seen it set to anything else
	32	Number of Profiles in row:	I6	864	Set to number of columns or profiles in data set
17	33	Largest Primary			
		Contour Interval:	I5	869	Read but not used
18	34	Contour Unit:	I1	870	See variable #13
19	35	Smallest Primary			
		Contour Interval:	I5	875	Read but not used
20	36	Contour Unit:	I1	876	See variable #13
21	37	Data Source Date:	I4	880	Read, but not used
22	38	Data Insp/Rev Date:	I4	884	Read, but not used
23	39	Insp/Rev. Flag:	A1	885	Read, but not used
24	40	Data Validation Flg:	I1	886	Read, but not used
25	41	Suspect & Void area flag:	I2	888	Read, but not used
26	42	Vertical Datum:	I2	890	Find on map you drew elevations from "1" local mean sea level "2" National Geodetic Vertical Datum (NGVD) 1929 "3" North American Vertical Datum (NAVD) 1988
27	43	Horizontal Datum:	I2	892	Find on map you drew elevations from "1" North American Datum 1927 (NAD) 27 "2" World Geodetic System 1972 (WGS) 72 "3" WGS 84 "4" NAD 83 "5" Old Hawaiian Datum "6" Puerto Rico Datum
28	44	Data Edition:	I4	896	Read, but not used
29	45	Percent Void:	I4	900	Read, but not used

Example:

Record A

Variable Number(s)	Data
1	NORTHWEST DURHAM, NC - 24000 LAT:: 36 L
2	ONG:: -78.875 SCALE:: 24000 SDTS to DEM
3 thru 7	, By Sol Katz, Nov 1998, ver .018
8 thru 11	1 1 1 17
12	0.000000000000000D+00 0.000000000000000D+00 0.000000000000000D+00
	0.000000000000000D+00 0.000000000000000D+00 0.000000000000000D+00
	0.000000000000000D+00 0.000000000000000D+00 0.000000000000000D+00
	0.000000000000000D+00 0.000000000000000D+00 0.000000000000000D+00
	0.000000000000000D+00 0.000000000000000D+00 0.000000000000000D+00
13,14,15	2 2 4
16,17	6.802710000000000D+05 3.985598000000000D+06
18,19	6.799859375000000D+05 3.999464750000000D+06
20,21	6.912366250000000D+05 3.999703750000000D+06
22,23	6.915395000000000D+05 3.985836750000000D+06
24,25	5.400000000000000D+01 2.290000000000000D+02
26	0.000000000000000D+00
27 thru 30	0 3.00000D+01 3.00000D+01 1.00000D+00
31 thru 41	1 385 (Note: variable 33 through 41 not entered due to no data)
42 thru 45	2 1 (Note: variables 44 & 45 not entered)

Record B (Data Elevation record - Repeatable)

Each data record, as defined below, is repeated; once for each profile. As noted above, each line ends at byte #1024. Data, in a profile, that would normally go beyond the 1024th position is continued on the next line. When the data profile ends and can not fill the rest of the line, the line is filled with blank spaces until the 1024th position is reached. Each line ends with a set of Carriage Return (CR) and Line Feed (LF) characters that are not normally displayed by a text editor.

Data Variable	Variable	End'g	
No.Name	Format	Byte	Description/Remarks/Possible Data
1 Row Number	I6	6	Enter a "1"
2 Column (profile) Number	I6	12	Starts at "1" and is incremented by "1" for each column (profile)
3 Number of Nodes (Elevations) in profile	I6	18	Number of evenly spaced elevations based on variable #14 and #30 in Record A
4 Number of Columns (profiles)	I6	24	Enter a "1"
5 Easting or Longitude Coordinate of first point in profile	F24.15	48	Enter the easting or longitude depending on variable #10 in Record A
6 Northing or Latitude Coordinate of first point in profile	F24.15	72	Enter the northing or latitude depending on variable #10 in Record A
7 Base elevation heights for elevations in profile	F24.15	96	Usually enter 0.00; otherwise add base to node elevation to get "true" elevation
8 Enter minimum elevation of elevations in profile	F24.15	120	Read, but not used
9 Enter maximum elevation of elevations in profile	F24.15	144	Read, but not used
10 Elevations (nodes)	I6	1024	Elevations based on units specified in variable #14 and #30 in Record A Fill each line with elevations to text editor column #1020. If no additional elevations before reaching column #1020, Add blank spaces to fill the row of data to column #1020. Add 4 blank spaces after reaching each column #1020

Example:

Record B

Record 1

Variable Number(s)	Data
1 thru 4	1 1 2 1
5,6	6.800100000000000D+05 3.998310000000000D+06
7	0.000000000000000D+00
8,9	1.510000000000000D+02 1.670000000000000D+02
10	151 152 (repeated until reaching the end of the profile)

Record 2

|
|
V
Record 4

|
|
V
Record 5

|
|
V
Record n (last record)

