MAP GUIDE

Elevation and Depth Map

Summary

What is it? The Elevation and Depth Map depicts the topography of the earth's surface – its physical features. Land surface height is shown in yellow-orange tones, and ocean depth – bathymetry – in blue-magenta relative to the ocean's surface. The data are textured to provide a general sense of the roughness of the earth's surface. Features such as the Tibetan Plateau, Rocky Mountains and the Pacific Mariana Trench off the coast of Japan are apparent.

As you move your cursor around on the map a small text box near the cursor displays the elevation or depth at the cursor position. The gray status bars located just below the map display the name of the administrative unit, the elevation or depth at the cursor position, and the geographic coordinates at the cursor position.

Source of the *TerraViva!*® Map. The Elevation and Depth Map combines three U.S. government map products: SRTM30, GTOPO30, and ETOPO2. The depth portion of the Elevation and Depth Map is derived from the National Oceanic and Space Administration (NOAA) National Geophysical Data Center (NGDC) ETOPO2 global digital terrain model. The land elevation portion of this map is derived from NASA's SRTM30 digital elevation data, Version 1.1, where that was available, and from USGS's GTOPO30 elevation data where the SRTM30 data didn't exist.

Why were ETOPO2 and SRTM30 created? Before ETOPO2 was created, numerous renditions of various continents and ocean regions existed, but each with its own unique peculiarities – different formats and resolutions. NGDC developed the elevation model using the best data available to the general public at the time of its publication (2001) in order to provide a uniform depiction of topography of the entire globe. STRM30 was created to provide a consistent elevation map of nearly all the earth's land surfaces, avoiding the problems associated with merging elevation data from many sources into a single map.

How were ETOPO2 and SRTM30 constructed? ETOPO2 is composed of a diverse collection of regional data sets that were integrated into a single uniform global model. To achieve this model NGDC assembled five major data sources into the single ETOPO2 2-minute database without formal edge matching or other methods that altered the data as initially posted. Each 2-minute interval at the earth's equator represents slightly less than four kilometers (one minute is 1.85 kilometers at the equator). However, this varies according to latitude. Higher-resolution data were given precedence: data derived from GLOBE mask all other data, Smith/Sandwell data come next, followed by IBCAO, with the 5-minute data filling any gaps. Five-minute data from DBDBV and ETOPO5 and 30-second data from GLOBE were regridded to 2-minute spacing by bicubic spline interpolation. IBCAO data were originally gridded in a polar stereographic projection; these data were interpolated along lines of constant latitude at 2-minute steps for every two minutes of latitude from 72° North to the pole.

The SRTM30 data set was derived by NASA's Jet Propulsion Laboratory from a collection of 12 terabytes of raw data gathered as part of the Shuttle Radar Topography Mission on a flight that occurred Feb. 11-22, 2000. The processed data set represents a geographic area between 60 degrees north and 60 degrees south of the equator - roughly the southern tip of Greenland to the southern tip of South America. The data were collected in one mission, over a period of just 10 days, covering 80% of the earth's land surface, and the derived data set represents a significant improvement in accuracy and consistency over previous elevation data. Note that within the coverage area, good data were not collected for the earth's entire surface, and NASA substituted data from GTOPO30 for those pixels.

How was the *TerraViva!*® Map derived from the source data? Within the SRTM30 data set, several anomalies were corrected before it was combined with the ETOPO2 data set. Most of these anomalies resulted from combining the actual SRTM pixels with those from GTOPO30. Lake surfaces often resulted in poor radar returns, resulting in the use of GTOPO30 for portions of the lake's surface. However, there was often a considerable difference in elevation between the portions of the lake surface measured by the shuttle mission, and those portions where GTOPO30 was used, particularly if the GTOPO30 data was derived from Digital Chart of the World (DCW).

Lakes were leveled by masking on the pixels derived from SRTM data, selecting the sub-set that represented the lake's surface, cropping this set in a little from the shore, and then setting all of the remaining pixels to the median value of the set. Pixels within the lake that came from other sources had generally already been leveled in GTOPO30, but not to the same level as the SRTM pixels. Such pixels were also set to the median SRTM value.

Another anomaly occurred where the GTOPO30 data set was derived from contour lines in DCW, and there was fundamental disagreement between the location of these contour lines and the equivalent lines in SRTM. In these cases, where the original SRTM data set switched from radar derived pixels to using pixels from GTOPO30, large steps in elevation would occur, resulting not from elevation changes but instead from terrain features being in different locations in the two data sets. Examples of such are sections of the Congo (Zaire) River in Equateur, Congo, where use of GTOPO30 put the middle of the river channel 50-60 meters above the river bed, and S.E. Australia, where the dry lake bed of Lake Gairdner experienced jumps of 300 meters as GTOPO30 data was substituted. Errors of this type were corrected by replacing the DCW derived pixels with data derived from the surrounding SRTM pixels.

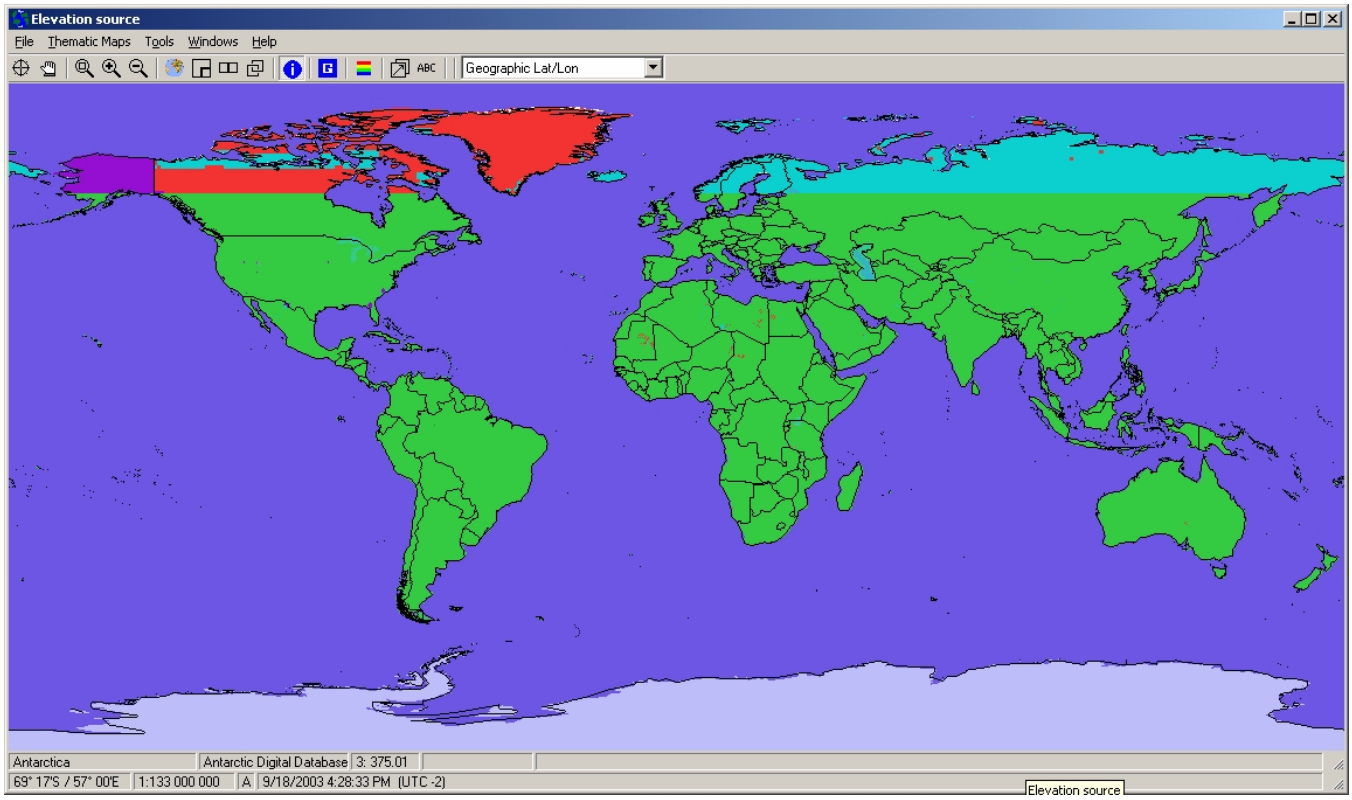
A final type of anomaly came from defective SRTM pixels. These would show up as abrupt and deep wells in the elevation data, such as those near Cologne, Germany, where the SRTM data drops to 180 meters below sea level. The wells were fixed by replacing those pixels with the average of the surrounding good SRTM data.

Once the SRTM data set had these anomalies corrected, it was combined with the ETOPO2 data set. If a pixel marked as ocean in the SRTM data, and the corresponding pixel in ETOPO2 was below sea level, the ETOPO2 data was used and marked as such on the source map. However, since the ETOPO2 pixel size was 2 minutes while the SRTM pixels were 30 seconds, some pixels that were ocean in the SRTM data appeared

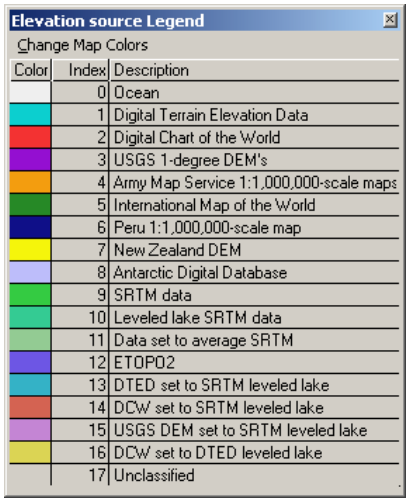
as land in the ETOPO2 data, as the ETOPO2 pixel represented the average data over a 4x4 square of 30 arc-second pixels. In these cases, the pixel value was set at -1 meter and left as “Ocean” in the source map.

Note that all of the data modified by ISciences are indicated as such in the elevation source map below, which also tracks the source of each pixel in the SRTM data set. While a full world image of this source map is shown below, the detailed 30 arc-second map is provided and can be imported into GDV for those that are interested.

Source Map



Source Map Legend

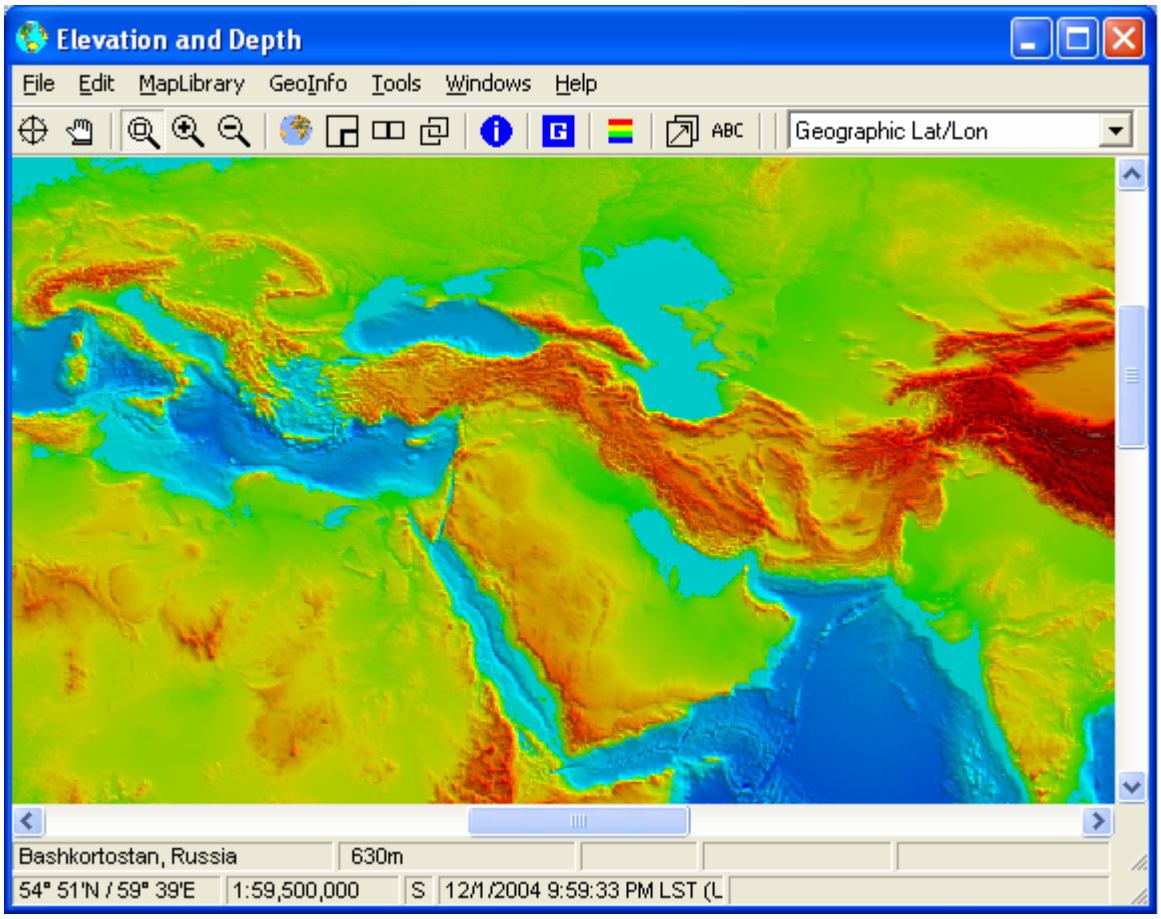


Color	Index	Description
	0	Ocean
	1	Digital Terrain Elevation Data
	2	Digital Chart of the World
	3	USGS 1-degree DEM's
	4	Army Map Service 1:1,000,000-scale maps
	5	International Map of the World
	6	Peru 1:1,000,000-scale map
	7	New Zealand DEM
	8	Antarctic Digital Database
	9	SRTM data
	10	Leveled lake SRTM data
	11	Data set to average SRTM
	12	ETOPO2
	13	DTED set to SRTM leveled lake
	14	DCW set to SRTM leveled lake
	15	USGS DEM set to SRTM leveled lake
	16	DCW set to DTED leveled lake
	17	Unclassified

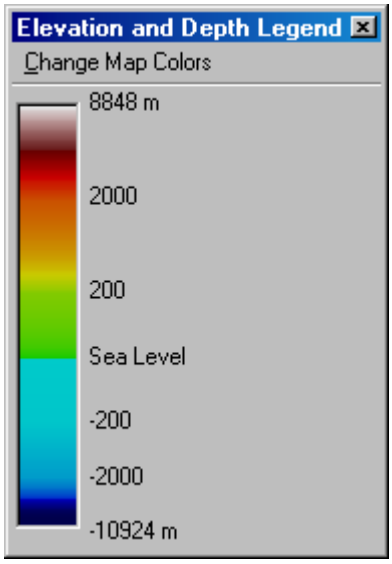
What do the Colors Mean?

Elevations above sea level are colored green to white. Depths below sea level are colored blue to violet. At sea level, colors transition from blue to green. Elevation is posted in meters for each 30 arc-second cell in the ***TerraViva!***® image. To convert to feet, multiply by 3.28: 1000 meters (one kilometer) is 3,281 feet (or use the ***TerraViva!***®***!*** units converter (under the Tools menu).

Elevation and Depth Map



Elevation and Depth Legend



A variety of color palettes are available to highlight elevation, depth, local change, or near-sea-level elevation and depth.

Information Mode

Information Mode enables access to Profiles. A left click on the map will display the Profile window for the country located at the cursor position, using the default database.

Sources and Acknowledgements

ETOPO2 is a product of the National Geophysical Data Center and World Data Center-A for Solid Earth Geophysics in Boulder, Colorado. GTOPO30 is a product of the U.S. Geological Survey's EROS Data Center in Sioux Falls, South Dakota. For additional information on GTOP030 contact Dean Gesch at gesch@edcmail.cr.usgs.gov, or Sue Greenlee at jenson@edcmail.cr.usgs.gov. SRTM30 is a product of NASA's Jet Propulsion Laboratory. See http://www.jpl.nasa.gov/srtm/ for more information on the mission and data.

For more information about these data sets visit ***TerraViva!***® User Headquarters at http://www.terraviva.net.

References

ETOPO2 Global 2' Elevations on CD-ROM, September 2001. Boulder, CO: NOAA National Geophysical Data Center. http://www.ngdc.noaa.gov/mgg/fliers/01mgg04.html.

SRTM mission and data information. http://www.jpl.nasa.gov/srtm/