New Global Digital Terrain Model

In 1996 *U.S. Geological Survey* (*USGS*) developed a global digital terrain model *GTOPO30* with the location resolution of 30" (approximately 1 km at the Equator). Despite the coarse resolution and limited attributes *GTOPO30* has been applied a lot for different hydrological, climatological, geomorphologic and military use on a regional, continental and a global level.

After finishing the development of *GTOPO30* model, a higher quality elevation data became available for the large geographic areas. New sources of information include global *Digital Terrain Elevation Data* (*DTED*) obtained from *Shuttle Radar Topography Mission* (*SRTM*), Canadian elevation data and data obtained from *Ice, Cloud, and land Elevation Satellite* (*ICESat*). Therefore *USGS*, in co-operation with *National Geospatial-Intelligence Agency* (*NGA*) has decided to develop a new improved digital terrain model called *Global Multi-resolution Terrain Elevation Data* (*GMTED2100*) as a substitution for *GTOPO30*.

The new model has been made in three different location resolutions: 30" (about 1 km), 15" (about 500 m) and 7.5" (about 250 m). Most data were given for continental areas between geographical latitudes 84°N and 90°S and a smaller part for areas between 84°N and 90°S. In fact, there are no available data in 15" and 7.5" resolutions for the areas of Greenland and Antarctica.

Access data for the new model have been different regarding the projection, coordinate units and horizontal and vertical datums. These characteristics of access data (besides the vertical datum) have been standardized in order to get a unique vertical database. Horizontal datum of the most access data is *WGS84* and the most common vertical datum is *EGM96 Geoid* (*Earth Gravitational Model* 1996). *ArcGIS* 9.3 is used for transforming all access data into *WGS84*. All vertical data are not transformed into *EGM96 Geoid* but there are applied datums registered in metadata, besides Greenland and Antarctica where the transformation has been committed by *NGA*. Elevation precision of the new *GMTED2010* model is expressed by mean square error *(RMSE*) in relation to the global set of checkpoints whose mean square error is 6 metres. Mean square error for 30" resolution model is between 25 and 42 metres, for 15" resolution model between 29 and 32 metres and for 7.5" resolution model between 26 and 30 metres. For comparison let us mention that mean square error of *GTOPO30* model has been globally reported to be 66 metres in relation to the same set of checkpoints.

GMTED2010 model data are available for free on the Internet and can be downloaded without any restrictions. The link has been given on *USGS EROS Center* web pages: http://eros.usgs.gov/#Find_Data/Products_and_Data_Available/GMTED2010.

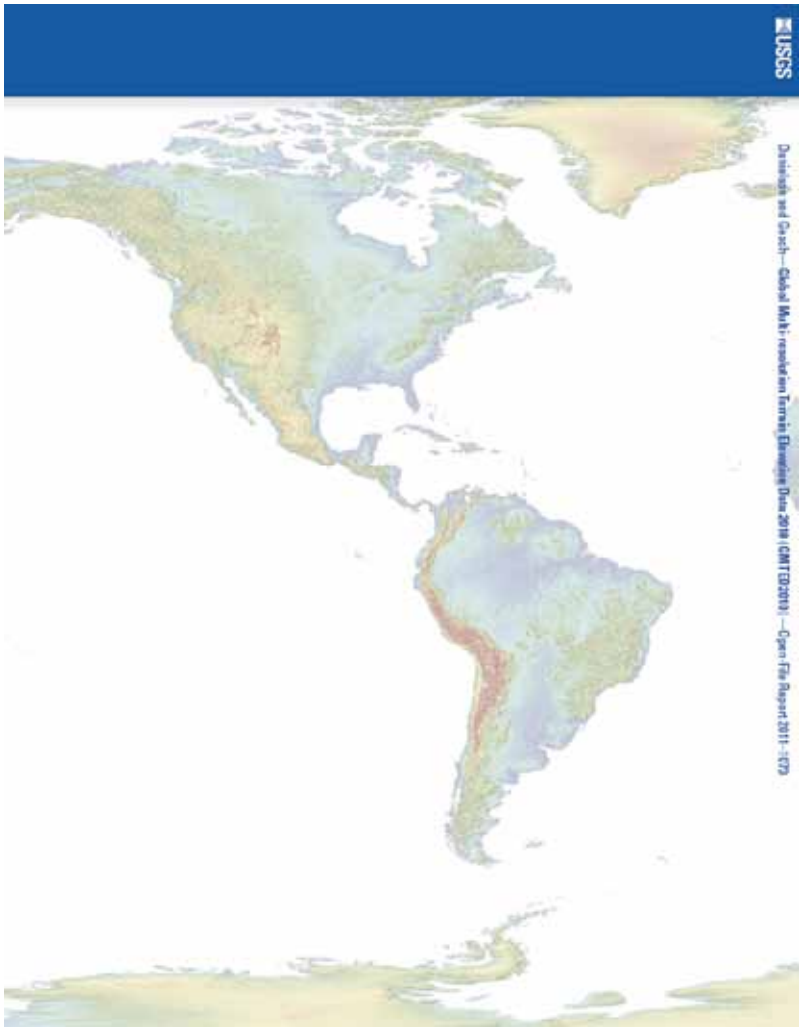
Sources:

Product News (2011): World Topography Gains in Accuracy, GIM International Newsletter; http://www.gim-international.com/news/productnews.php

Danielson, J. J., Gesch, D. B. (2011): Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010), Open-File Report 2011–1073, U.S. Department of the Interior, U.S. Geological Survey; http://pubs.usgs.gov/of/2011/1073/pdf/of2011-1073.pdf

Nedjeljko Frančula

Novi globalni digitalni model terena



U.S. Geological Survey (*USGS*) razvio je 1996. globalni digitalni model terena *GTOPO30* s položajnom rezolucijom od 30" (približno 1 km na ekvatoru). Unatoč gruboj rezoluciji i ograničenim atributima *GTOPO30* se mnogo primjenjivao za razne hidrološke, klimatološke, geomorfološke i vojne primjene na regionalnoj, kontinentalnoj i globalnoj razini.

Nakon završetka izrade modela *GTOPO30* postali su dostupni mnogo kvalitetniji visinski podaci za velika geografska područja. Novi izvori podataka uključuju globalni *Digital Terrain Elevation Data* (*DTED*) dobiven iz *Shuttle Radar Topography Mission* (*SRTM*), kanadske visinske podatke i podatke dobivene iz *Ice, Cloud, and land Elevation Satellite* (*ICESat*). Stoga je *USGS* u suradnji s *National Geospatial-Intelligence Agency* (*NGA*) odlučio izraditi novi poboljšani digitalni model terena nazvan *Global Multi-resolution Terrain Elevation Data* (*GMTED2100*) kao zamjenu za *GTOPO30*.

Novi model je izrađen u tri zasebne položajne rezolucije: 30" (oko 1 km), 15" (oko 500 m) i 7,5" (oko 250 m). Većina podataka dana je za kopnena područja između geografskih širina 84°N i 56°S, a manji dio za područja između geografskih širina 84°N i 90°S. Naime, za područja Grenlanda i Antarktike nisu dostupni podaci u rezolucijama 15" i 7,5".

Ulazni podaci za novi model razlikovali su se s obzirom na projekciju, koordinatne jedinice te horizontalni i vertikalni datum. Te karakteristike ulaznih podataka (osim za vertikalni datum) su standarizirane da bi se dobio jedinstveni skup visinskih podataka. Horizontani datum većine ulaznih podataka je *WGS84*, a najzastupljeniji vertikalni datum *EGM96 Geoid* (*Earth Gravitational Model* 1996). *ArcGIS* 9.3 je primijenjen za transformaciju svih ulaznih podataka u *WGS84*. Svi visinski podaci nisu transformirani u *EGM96 Geoid*, već su primijenjeni datumi registrirani u metapodacima, osim za Grenland i Antarktiku za koje je podatke transformirao *NGA*.

Visinska točnost novoga modela *GMTED2010* izražena je srednjom pogreškom (engl. *RMSE*) u odnosu na globalni skup kontrolnih točaka čija srednja pogreška iznosi 6 m. Srednja pogreška za model rezolucije 30" je između 25 m i 42 m, za model rezolucije 15" između 29 m i 32 m, a za model rezolucije 7,5" između 26 m i 30 m. Za usporedbu spomenimo da je srednja pogreška modela *GTOPO30* globalno iznosila 66 m u odnosu na isti skup kontrolnih točaka.

Podatci modela *GMTED2010* slobodno su dostupni na internetu i mogu se preuzeti bez ikakvih ograničenja. Poveznica je dana na mrežnim stranicama *USGS EROS Center*: http://eros.usgs.gov/#Find_Data/Products_and_Data_Available/GMTED2010.

Izvor:

Product News (2011): World Topography Gains in Accuracy, GIM International Newsletter; http://www.gim-international.com/news/productnews.php

Danielson, J. J., Gesch, D. B. (2011): Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010), Open-File Report 2011–1073, U.S. Department of the Interior, U.S. Geological Survey; http://pubs.usgs.gov/of/2011/1073/pdf/of2011-1073.pdf

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