The following was presented at DMT’11 (May 22-25, 2011).

The contents are provisional and will be superseded by a paper in the DMT’11 Proceedings.

See also earlier Proceedings (1997-2010)
http://ngmdb.usgs.gov/info/dmt/
Abstract

Shaded relief maps generated from raster elevation data associated with very high-resolution orthoimagery have been used and improved by Virginia Geographic Information Network (VGIN) cartographers to improve bedrock and surficial geologic mapping. They have been demonstrated to be useful in delineating geologic, geomorphic, and geologic-hazard features, especially in highly vegetated areas. Features such as terraces, solifluction fans, landslide deposits, and outcrops are often difficult to detect on the ground on topographic maps or on aerial photos and may only be visible on shaded relief maps derived from high-resolution digital terrain models (DTMs).

In the Elkton West 7.5-minute quadrangle, located in the Valley and Ridge Province near the southern end of the Blue Ridge Mountains, small terraces, scarps, and landslide deposits are visible in shaded relief maps generated from digital hillshade images. These shaded relief maps can be used to generate a variety of geologic and geomorphic features, such as terrace deposits, landslide deposits, scarps, and other small-scale features that are difficult or impossible to resolve on standard 7.5-minute topographic maps or other standard geologic maps of Virginia. These shaded relief maps are substantially better than standard 7.5-minute topographic maps and are in no way as detailed as DTMs generated from LiDAR data. In many cases nothing substitutes for boots-on-the-ground field work. Features such as the narrow debris flows (Qdf1) on the geologic map image above are not resolvable with the orthoimagery. Areas with densely spaced infrastructure such as roads, railroads, and buildings have many more breaklines and masspoints than do areas with little development. Also areas with high topographic relief have many more breaklines and masspoints than areas with low topographic relief. These DTMs can be used to identify karst features. The images above show a confluence of three debris flows (Qdf1, Qdf2, and Qdf3) at the entrance of an abandoned road cuts through the Massanutten Mountain Fault Zone- Augusta County, Virginia. Three generations of debris flow deposits (Qdf1, Qdf2, and Qdf3) and areas of residuum (Qrcl) are distinguishable on these DTMs. These deposits are difficult to distinguish from one another on the topographic map. These deposits are difficult to distinguish from one another on the topographic map.

Methodology

The Virginia Geographic Information Network (VGIN) developed a protocol to create orthoimages from high-resolution digital aerial photography to improve geologic mapping. Initial work was performed by Gilmer and Berquist (2010) on the Providence Forge 7.5-minute quadrangle, located in the Valley and Ridge Province west of the Blue Ridge Mountains. Gilmer and Berquist (2010) used anelevations data gathered during field work to create a Digital Terrain Model (DTM). The DTM was used with an orthoimage to produce a shaded relief map. The shaded relief map was used to create a geologic map with the orthoimage to produce a shaded relief map. The shaded relief map was used to create a geologic map.

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Conclusions

High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program. High-resolution DTMs have been used in the Virginia Geographic Information Network (VGIN) cartographic cooperative mapping program.