A Digital Elevation Model (DEM) is any digital representation of a surface. It normally consists of a list of elevation points, measured elevations, or grid cells with interpolated elevations. DEM collection methods include: land surveying, aerial and satellite digital imagery, airborne laser (LIDAR), radar, and interferometric synthetic aperture radar (IFSAR). In this example, a DEM was created from a combination of LIDAR and the Shuttle Radar Topography Mission (SRTM). The resulting DEM could be used for a variety of applications, but when datasets are fused properly improvements in accuracy may be realized.

<table>
<thead>
<tr>
<th>Source</th>
<th>Dates</th>
<th>Resolution</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>NED</td>
<td>1999-2000</td>
<td>1” x 1” (~30m)</td>
<td>Maps/Photos Radar</td>
</tr>
<tr>
<td>SRTM</td>
<td>2000-2004</td>
<td>1” x 1” (~30m)</td>
<td>Radar</td>
</tr>
</tbody>
</table>

The orthographic projection of the image allows it to be interpreted as a conformal map with a uniform scale. In the orthorectification process, the orthophotograph is spatially corrected using ground control parameters (e.g., surveyed station coordinates and contour elevations) and other differential information. Additional points that must be considered to the process are beyond the scope of this section. However, the accuracy of a DEM is related to the accuracy of the survey and positioning sensors and the accuracy of the sensors' interior orientation.

Orthomosiacs

The orthomosaic is a product that maximizes the geometric quality of the data. Orthomosaic generation corrects for tilt and terrain relief through the use of a Digital Elevation Model (DEM). The orthophotograph is a conformal map with a uniform scale. In the orthorectification process, the orthophotograph is spatially corrected using ground control parameters (e.g., surveyed station coordinates and contour elevations) and other differential information. Additional points that must be considered to the process are beyond the scope of this section. However, the accuracy of an orthophoto is also related to the accuracy of the survey and positioning sensors and the accuracy of the sensors' interior orientation.

Benefits of Using National Digital Elevation Models

- Accurate
- Cost Effective
- Can be Automated
- Products are Conformal Maps
- Feature Extraction or Base Map for GIS
- Consistency between Orthophotos
- 200% Increase in Mapped Area
- Multisource Data Fusion
- A Picture is Worth a Thousand Words

Summary

SRTM (2000-2004) data has slightly better fundamental accuracy than the NED (2000-2004) data due to the orthoradial projections for the orthophotos. In the orthomosaic, the orthorectified data is used to create a Digital Terrain Model (DTM). The DTM is created using a Digital Elevation Model (DEM) collected using ground control points (e.g., surveyed station coordinates and contour elevations) and other differential information. Additional points that must be considered to the process are beyond the scope of this section. However, the accuracy of a DEM is related to the accuracy of the survey and positioning sensors and the accuracy of the sensors' interior orientation.

Orthophotographs

Pictured to the right is the orthophotograph (3-10) used to test the accuracy of the orthomosaic. The accuracy of the orthomosaic is measured by comparing the orthophotos from different data sources to determine whether the orthomosaic is consistent with the orthophotos. Additionally, the orthophotos were fused with the orthosheets to produce an improved Digital Elevation Model while NED data is a Digital Terrain Model measuring accuracy than the NED (2.944m) data but may not represent the terrain accurately. SRTM (RMSE=2.097m) data has slightly better fundamental accuracy than the NED (2000-2004) data due to the orthoradial projections for the orthophotos. In the orthomosaic, the orthorectified data is used to create a Digital Terrain Model (DTM). The DTM is created using a Digital Elevation Model (DEM) collected using ground control points (e.g., surveyed station coordinates and contour elevations) and other differential information. Additional points that must be considered to the process are beyond the scope of this section. However, the accuracy of a DEM is related to the accuracy of the survey and positioning sensors and the accuracy of the sensors' interior orientation.