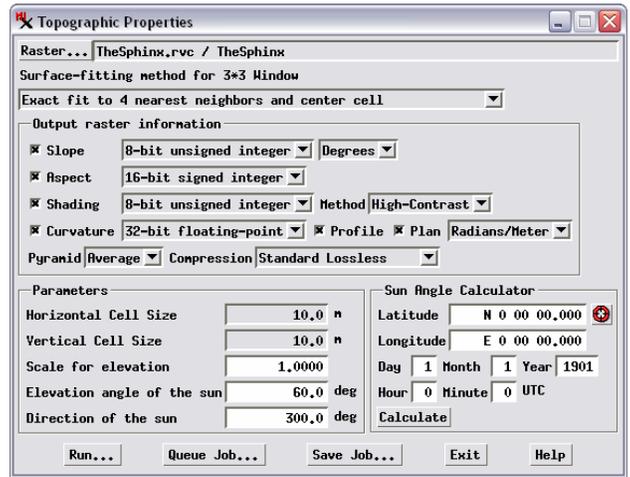


Computing Topographic Properties

The Topographic Properties process in TNTmips (Terrain / Topographic Properties) allows you to select a digital elevation raster and compute from it the fundamental topographic properties that define the spatially-varying shape and orientation of the terrain surface: slope magnitude (in degrees or percent), aspect (the azimuth of the down-slope direction), and curvature (in radians/meter or radians/100 meters), including both plan (horizontal) and profile (vertical) curvature. You can also compute shaded relief images from the elevation raster. You can choose to compute any or all of these topographic characteristics in a single run by using the toggle-button controls and also choose the desired datatype for each new raster object. These products can then be used as inputs for engineering studies or higher-order models of landscape processes such as overland flow and erosion.

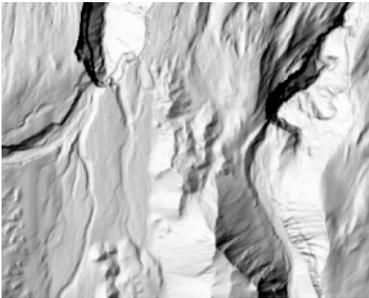


The topographic properties you choose are computed for each cell using the elevation values in a 3 x 3 kernel of cells surrounding the

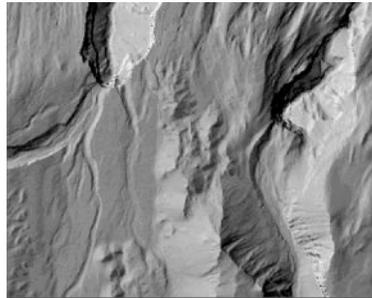
cell currently being processed. These values are used to construct a local mathematical surface from which the topographic properties are computed. Five different surface-fitting methods are provided for this purpose, as detailed in the Technical Guide entitled *Terrain Analysis: Methods for Computing Topographic Properties*. The surface-fitting method you select is used for computing all of your chosen topographic properties.

When you compute shaded relief you can tailor the illumination to the topography by specifying the elevation angle of the sun as well as its compass direction. If you need to match the illumination conditions at a particular location, date, and time (to match those of an overlapping satellite image, for example), you can use the fields in the Sun Angle Calculator to enter the location's latitude and longitude and the date and time of the image's acquisition to calculate the corresponding elevation angle and sun direction.

Two methods are included for computing shading. The Display method uses the same algorithm as the on-the-fly relief shading procedure in the Display process, so you can preview the result in Display and transfer the shading parameters to the Topographic Properties process to create and save an identical shading raster object. However, the brightest shading tone produced by this method is a medium gray. The High Contrast method produces a wider range of shading tones, so its products are more suitable when you plan to visually fuse the shading image with partially-transparent overlays (such as the elevation raster with color palette or thematic map polygons).



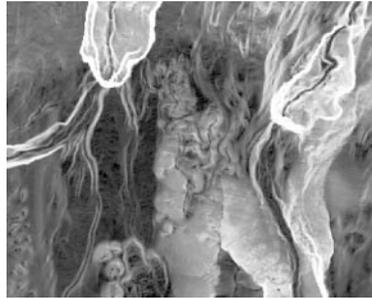
Shading: High-contrast method



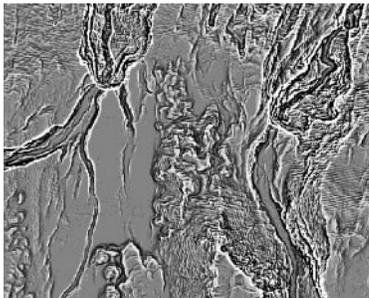
Shading: Display method



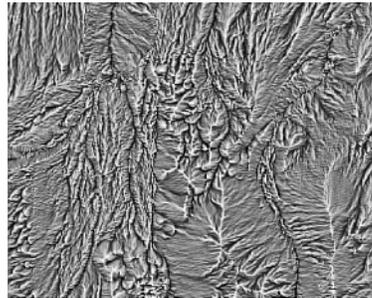
Aspect



Slope



Profile (Vertical) Curvature



Plan (Horizontal) Curvature

Sample terrain analysis products from the Topographic Properties process for a small portion of a 6-meter-resolution LIDAR elevation raster of Mount St. Helens area, Washington. The area shown is 2.6 kilometers wide.