Geospatial Validation and Topographic Map Revision of the Castner Glacier Area

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Project Background

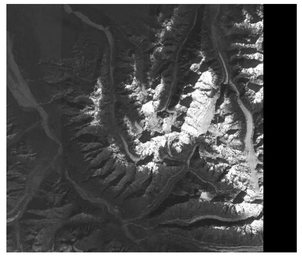
Mapping in the interior of Alaska has always been a challenge due to the vast and remote aspects of the region. One contemporary method that has been used to map certain areas of the state has been the application of optical satellite data such as the Panchromatic Remote Sensing Instrument for Stereo Mapping (PRISM). PRISM imagery, with the use of JAXA software, can produce a Digital Surface Model (DSM) and Orthorectified Image (Ortho). The use of these two products allows for a large area to be mapped. However, the quality of the DSM and Ortho are inherently affected by the lack of applied ground control points which georeference the image and provide greater accuracy. The objective of this project is to use a Trimble R7 GPS to acquire ground control points (GCPs) around the Castner Glacier area. The ground control points will provide a means to produce an accurate DSM and Ortho from a PRISM image of the chosen study area.

Project Objectives

- Create a DSM with 2.5 meter postings to provide accurate elevation values
- Collect and apply ground control to produce a georeferenced DSM
- Use georeferenced DSM to create a hillshade and contour intervals for topographic map revision
- Use project methods for future work by creating a seamless mosaic of a lager area consisting of multiple georeferenced DSMs

DSM/Ortho Creation

A PRISM triplet scene consisting of forward, nadir and backward images of the Castner Glacier were selected for DSM and Ortho production. The images selected consisted of < 0-2% cloud coverage which allowed for a significant part of the 35x35km frame to be mapped.



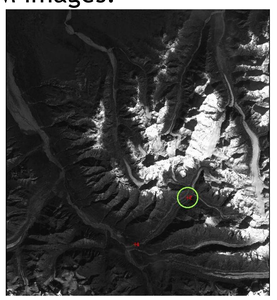
(35x35km PRISM nadir image)

Ground Control Point Collection

Two points (C1 and C2) were taken at 20 minute intervals with a Trimble R7 receiver in the Castner Glacier area in order to provide a means for georeferencing the DSM derived from the PRISM images.

Acquisition location of points were chosen by using a feature matching method between objects that could be seen in the field and recognized in the PRISM images.

(GCP C1 acquisition near Castner Creek and Richardson Hwy.)

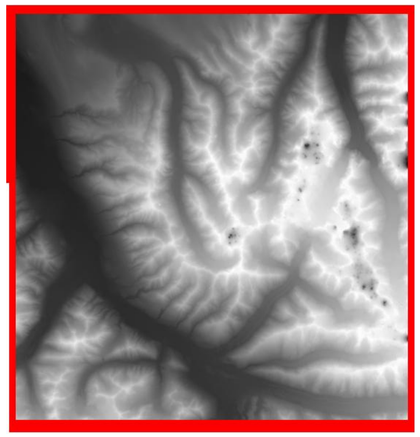


(Location of C1 and C2 displayed on PRISM nadir image)

(GCP C2 acquisition on the Castner Glacier)

Georeferenced DSM Results

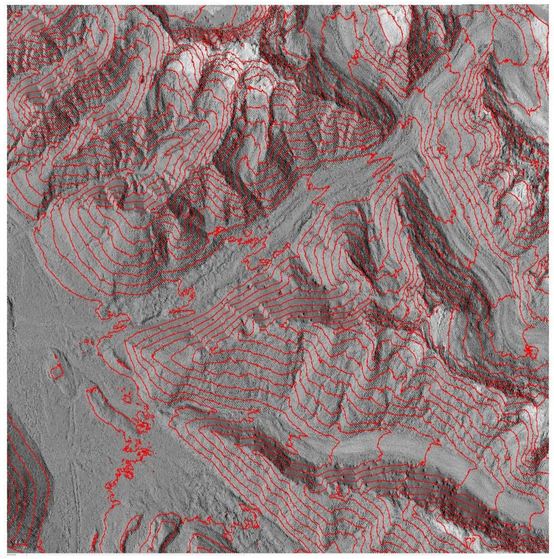
The DSM that was created with the applied ground control (georeferenced) showed horizontal and vertical accuracy improvement. The DSM was generated at 2.5 meter postings which provided significant detail for topographic revision.



(DSM results after application of GCPs C1 and C2)

Topographic Revision

The DSM was integrated into a GIS which allowed a hillshade to be created. Contours were produced at 100 meter intervals from elevation values provided by the original DSM.



(Castner Glacier Area with hillshade and contours derived from DSM)

Conclusions

DSM and Ground Control

The DSM results showed that the collected ground control increased the accuracy of the elevation values. However, the lack of obvious objects in the field due to snow coverage inhibited the use of the feature matching method. Application of several more GCPs would have allowed for greater vertical accuracy. Future collections of GCPs will be performed during the summer months to allow for a series of points to be taken.

Topographic Revision

The results of the topographic map proved that the 2.5 meter postings produced by the original georeferenced DSM created a higher accuracy and resolution within the topography. These improvements provided a comparison to other data such as the National Elevation Dataset (NED) in order to detect if there were any improvements in elevation accuracy and detail. Results also showed that the project methods were effective and justified future work consisting of multiple DSM production for a seamless mosaic .

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