Journal of Maps, submitted, 1-15

A DEM for the 2010 surface topography of Storglaciären, Sweden

ANDREW MERCER

[1]Department of Physical Geography - Stockholm University, Sweden; andrew.mercer@natgeo.su.se.

Abstract

During the summer of 2010 the surface elevation of Storglaciären in northern Sweden was measured using high precision GNSS and reflectorless Total Station surveys. The DEM created from this data contains less noise than those created from orthophotographic methods over snow covered glaciers and is therefore smoother, with fewer erroneous features in the data. The principal, though not sole, intended use for the DEM is in the calculation of surface mass balance, which has influenced decisions on what constitutes a functional part of a glacier, leading to the exclusion of features such as snow aprons and perennial ice above the bergschrund. Other peripheral features have changed since the previous, aerial survey from 1999 leading to a reduction in size of approximately 0.17 km^2

(Received new submission; Revised NA; Accepted NA)

ISSN 1744-5647
doi:10.4113/

for interpolating the TIN to a raster grid and for creating the contours and slope data. QGIS was also used for preparation of the final map.

5. Data

The GNSS receiver was set to record a point every five seconds as the surveyor walked across the glacier surface following a pseudo-regular grid and lines that would best describe the topography when interpolated to a TIN. This judgement was based on the surveyor's previous experience of terrain modelling using these techniques. Similarly, the points measured by Total Station were chosen to produce the best representation of the actual surface after triangulation. Some gaps in the data have been left deliberately to allow interpolation over crevassed surfaces where acquiring representative data would not be feasible, both because of access and because of the variation in the surface. The total number of data points collected was 12,548 and was thinned to 2956 using a distance based algorithm running. This was done on a csv file of the processed data using the following "awk" code:

" awk -v OFS="," -F"," 'NR == 1{xo = $3; yo = $2; zo = $4; print xo,yo,zo; next}
{x = $3; y = $2; z =$4; xd = xo -x; yd = yo - y; xyzd = sqrt((xd^2 + yd^2 + zd^2));
if (xyzd < 20) next; else print x,y,z; xo = x; yo = y; zo = z}' Points.csv > Points_thinned.csv "

This is not very intelligent code as it does not check all distance matches but it suffices here. The data are shown in figure 4.

6. Acknowledgements

The work of Koblet et al. (2010) has been essential to the production of this map and would very much like to acknowledge their contribution to this map.
I would like to thank the staff of the Tarfala Research Station, particularly Raphael Jensen for his help during the field work.
I would also like to thank Peter Jansson, Gunhild Rosqvist for their advice and input during this work.
Ian Brown, of Stockholm University, has provided indispensable guidance during the rewriting of this manuscript.