Correction to ICESat Data Product Surface Elevations

Update June 24, 2014: Corrections described on this page are now available in ICESat/GLAS Release 34. See the Data Releases page for details of campaigns now available in Release 34.

The ICESat Project Science Team announced that a correction to ICESat surface elevation data products is necessary due to an error in the range determination from transmit-pulse reference selection (centroid vs. Gaussian, G-C). The effect of this error of omission varies on a shot-to-shot basis and for the calibration passes over the Salar de Uyuni in Bolivia the campaign-averaged values varied from +/- 6 cm over the mission. Similar results were found when tabulating the track-averaged corrections (G-C) over Antarctica. Note that the track-averaged (G-C) values are fairly constant within a campaign, so any elevation-data adjustments that were made for campaign-level biases that were determined to an independent reference surface using data including the G-C error should eliminate the G-C error from the elevation data on an average basis. For a more detailed explanation, see the full statement from the ICESat Project below.

The following products are affected by this finding: GLA06 (global elevation), GLA12 (ice sheet), GLA13 (sea ice), and GLA15 (ocean). GLA14 users who use the range increment for the alternative Gaussian-fitted peaks also may want to use the correction.

The ICESat Project has provided the correction files to the NSIDC DAAC, which can be applied directly to the surface elevations on a shot-by-shot basis for each of the ICESat laser campaigns.

It is anticipated that at a later date a new release of the ICESat/GLAS data including all elevation corrections will be provided. You have the option to use the currently available correction process or wait for the GLAS data to be reprocessed.

Correction programs are available FORTRAN, and IDL. Each correction program reads one GLAS data input file. The correction program then scans the list of campaign correction files and finds the correction file that corresponds to the GLAS data input file. The correction program can only be run on one GLAS data file at a time.

1 HOW TO ACCESS CORRECTION FILES

The correction programs and files are available via HTTPS. Please refer to the 00README.txt file for information about the correction process.

If you have questions please contact nsidc@nsidc.org.

2 STATEMENT FROM NASA I-SIPS AND ICESAT PROJECT SCIENTISTS

January 30, 2013

ICESat Project I-SIPS Report to NSIDC

Jay Zwally, ICESat Project Scientist

Correction to the ICESat Data Product Surface Elevations due to an Error in the Range Determination from Transmit-Pulse Reference-Point Selection (Centroid vs Gaussian)

It has been determined that an important correction to the surface elevations on the ICESat products was not applied. The range from which the surface elevation should have been calculated is from the midpoint of the Gaussian peak on the transmit pulse to the midpoint of the Gaussian peak on the received pulse. However the location of the centroid of the transmit pulse was inadvertently used and the difference (defined as G-C) between the transmitted pulse centroid and Gaussian peak was never applied. The effect of this error of omission varies on a shot-to-shot basis and for the calibration passes over the Salar de Uyuni in Bolivia the campaign-averaged values varied from +/- 6cm over the mission. See Figure 1. Similar results were found from tabulating the track-averaged corrections (G-C) over Antarctica. See Figure 2.

Note that the track-averaged (G-C) values are fairly constant within a campaign, so any elevation-data adjustments that have been made for campaign-level biases that were determined to an independent reference surface using data including the G-C error should eliminate the G-C error from the elevation data on an average basis. Before and after (G-C correction) tests of dh/dt solutions over Antarctica using before and after campaign-bias adjustments have confirmed such elimination of the G-C error on an average basis at the 0.4 mm/yr level, which corresponds to approximately 4 Gt/yr.

The surface elevations on GLA06 (global elevation product), GLA12 (ice sheet), GLA13(sea ice), and GLA15(ocean) are affected. The GLA14 (land) elevations are computed using the centroid of the received pulse, as well as the centroid of the transmit pulse, and therefore the elevation calculation on GLA14 is correct as intended. However, GLA14 data users who use the range Increment for the up to six Gaussian-fitted peaks may want to use the G-C correction also.

The ICESat project will provide G-C correction files to NSIDC containing the time, unique record index, and the difference between the Gaussian and Centroid transmit peaks (G-C) that can be applied directly to the surface elevations on a shot-by-shot basis for each of the ICESat laser campaigns.

Before and after tests of the minimum along-track RMS of elevations over the relatively smooth Lake Vostok show that applying the per-shot G-C correction improves the range precision by approximately 1.7 cm. Applying the per-shot G-C changes, but does not remove all the inter-campaign biases. Any new "campaign level" bias adjustments should be determined with compatible (corrected) data and applied only to analysis of corrected data.

In Figure 1, the red rectangles show the campaign mean value and the black dots show the individual shot values.

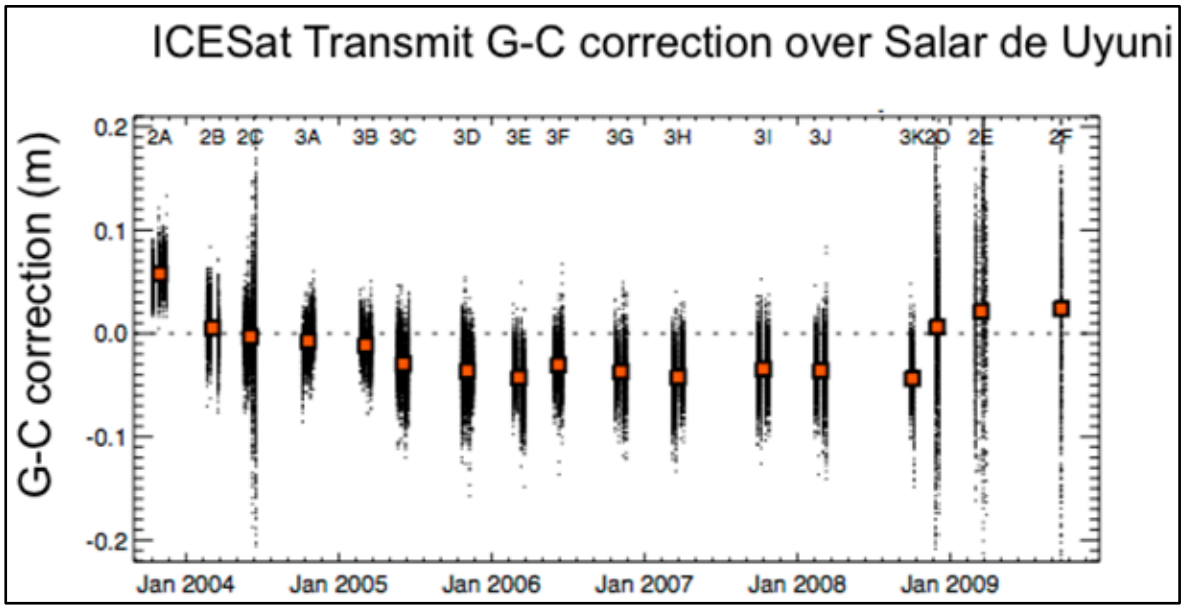

Figure 1. Elevation Correction Over Salar de Uyuni (courtesy of Adrian Borsa)

In Figure 2, the blue points indicate the 1-sigma variability of the shot-by-shot G-C. Figure 2 also includes Laser 1A, which was not included in Figure 1.

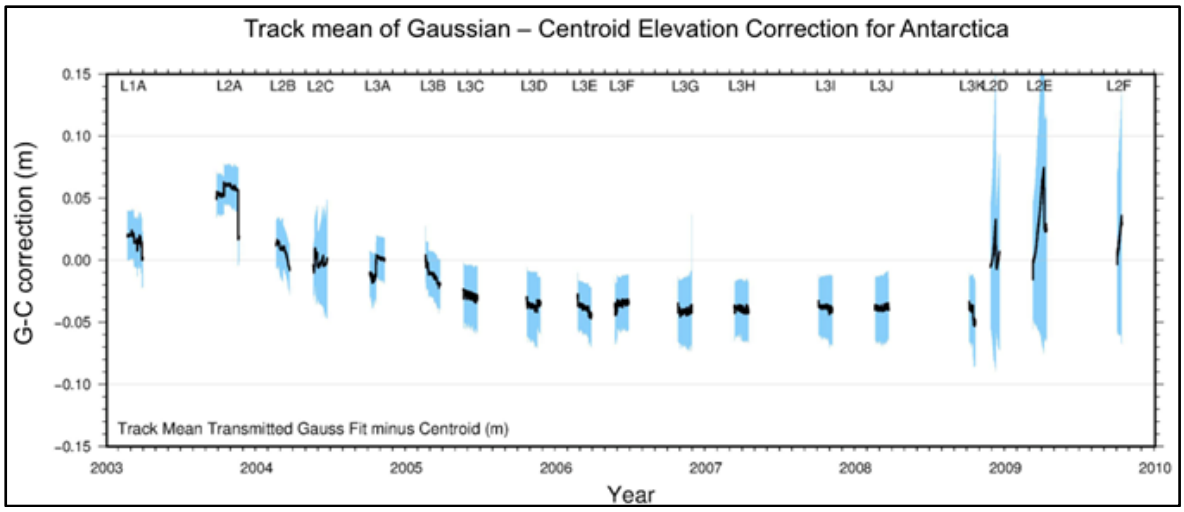

Figure 2, Track-mean (black) Elevation Corrections (G-C) Calculated from Data Traversing Antarctica