
# Illustration of Gain-Related Saturation Bias in Laser 1 Campaign Data from Lake Vostok Area Crossovers

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ICESat Laser 1 operations began on February 20, 2003 and ended on March 29, 2003 with the failure of Laser 1. Per Peggy Jester (mission ops documentation), prior to March 13, the minimum gain (GMIN) setting on the GLAS receiver was 4 and was in automatic mode except during some gain tests on February 26 and 27th. On March 13, GMIN was raised to 13 and continued to run in automatic mode for the duration of the campaign.

In the vicinity of Lake Vostok, East Antarctica, ICESat data prior to March 13 was generally acquired with Gains of 10 to 13 and at 13 and above for the duration of the campaign. A subsequent crossover analysis of these Laser 1 data (3J - 1AB) shows an elevation offset that increases with decreasing gain over the received energy range. In addition, the elevation offset is substantially greater than the available saturation correction on the data product for Gains 10-12 than for Gain 13 (Fig. 1).

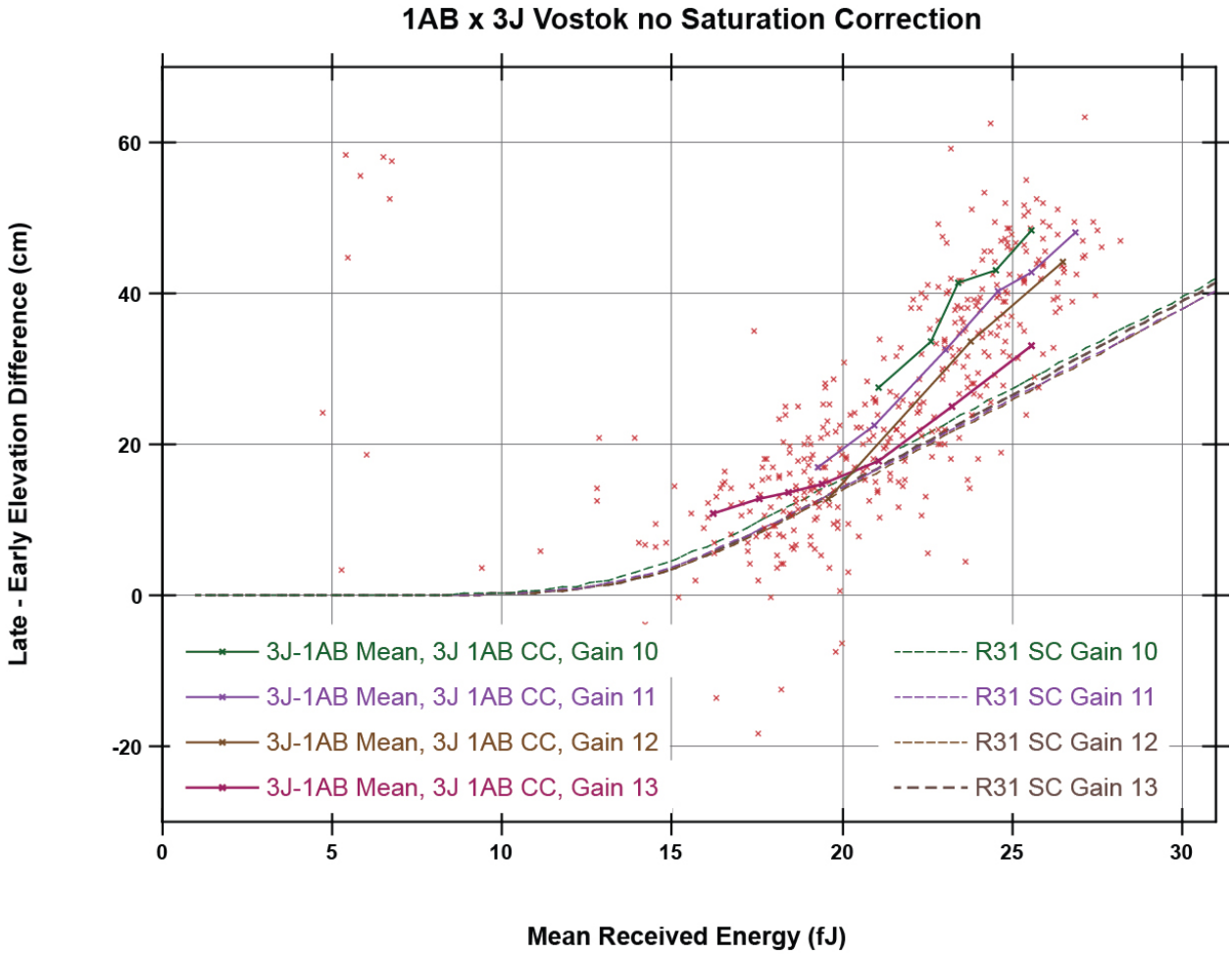


***Figure 1****- All crossover differences (red x's) as a function of received energy for Release 531 3J and 1AB elevation data. After cloud filtering, mean elevation differences as a function of Gain and mean received energy are shown by solid lines. In addition, the available R531 saturation correction magnitude for Gains 10-13 are shown by dashed lines.*

Using the available saturation correction magnitudes illustrated by the dashed lines in Figure 1, the resulting distribution is modified to indicate elevation differences as a function of received energy (Fig. 2).

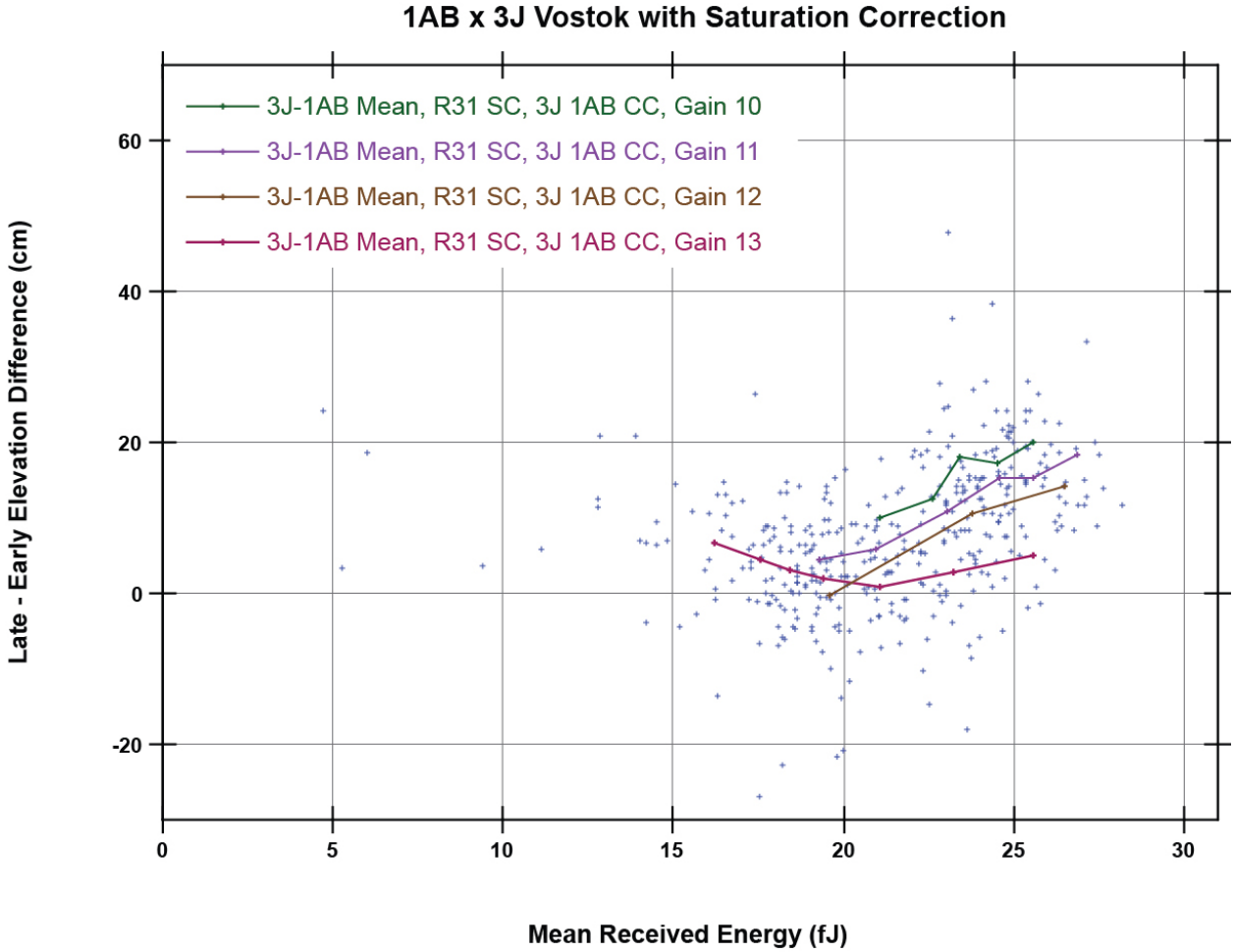


Figure 2 - *All crossover differences (blue +'s) as a function of received energy for Release 531 3J and 1AB elevation data. After cloud filtering, mean elevation differences as a function of Gain and mean received energy are shown by solid lines.*

Based on this analysis, users of ICESat Laser 1 data prior to March 13 should be aware that elevation values with gain values below 13 may have reduced precision relative to other Laser 1 and subsequent ICESat data. For many applications, the 10 to 15 cm low elevation bias will not be a concern. For studies requiring the most precision, users may want to exclude such data and rely instead on the subsequent GMIN 13 data that comprised most of the 2003-2009 mission. For a broader analysis of the ICESat Laser 1 campaign's issues, see: http://nsidc.org/data/icesat/pdf/ICESat-Laser-1-Summary-final.pdf