

To: The Record
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 Date: 2018-02-21
 Re: **Corrections for the G16/G17 Solar Calibration Gain Anomaly**

1. Issues

Starting 1500 UTC on 18 January 2019, incorrect solar calibration coefficients were used to generate the GOES-16 and GOES-17 ABI solar reflective channels (Figs. 1 & 2). It was caused by fetching incorrect files during a cold start of the Ground System. It was corrected for GOES-17 after a pre-scheduled solar calibration at ~0300 UTC on 19 January 2019. For GOES-16, it was corrected by manual intervention at ~1600 UTC on 22 January 2019. The erroneous procedure of fetching files has been corrected and extra vigilance has been added to cold start procedure.

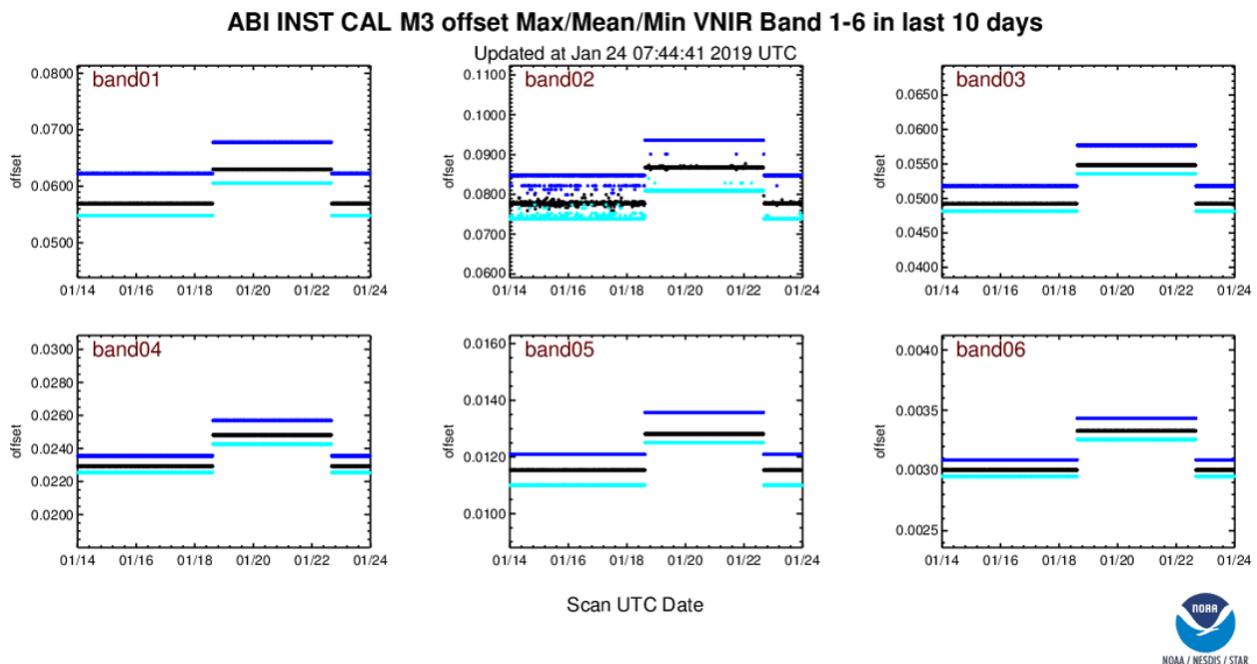


Figure 1: Time-series of the maximum (blue), mean (black), and minimum (cyan) gains of GOES-16 ABI VNIR channels from January 14-24, 2019. Anomaly occurred between ~1500 UTC on January 18 and ~1600 UTC on January 22.

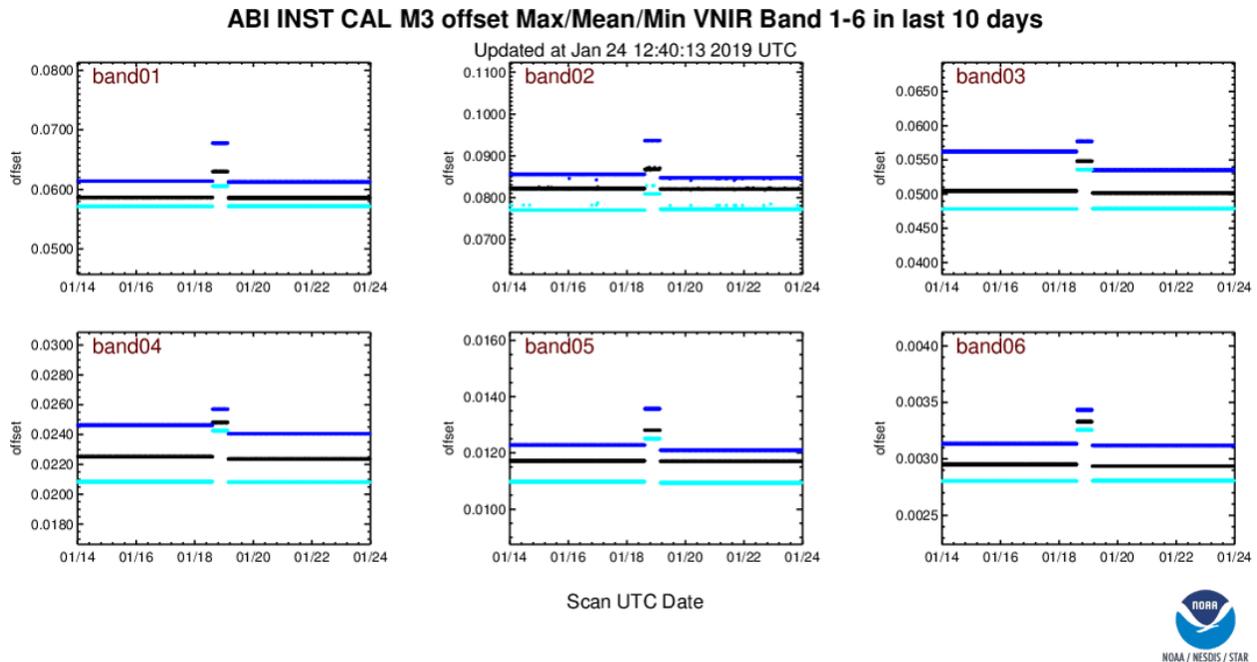


Figure 2: Same as Figure 1, except for GOES-17 and the anomaly occurred between ~1500 UTC on January 18 and ~0300 UTC on January 19.

This memo provides a way to correct for the GOES-16/17 visible and near-infrared (VNIR) channel radiances during this anomalous period when the erroneous gain were used.

2. Impacts of the Anomalies on the L1B data

The erroneous solar calibration gains caused both incorrect radiances and striping images for all VNIR bands of both ABIs during these anomalous periods. The incorrect radiance can be seen at https://www.star.nesdis.noaa.gov/GOESCal/G16_ABI_VNIR_InterCal_static.php, and has been reported by users (Figure 3). Strong striping was detected and displayed with the striping detection tool (Figure 4).

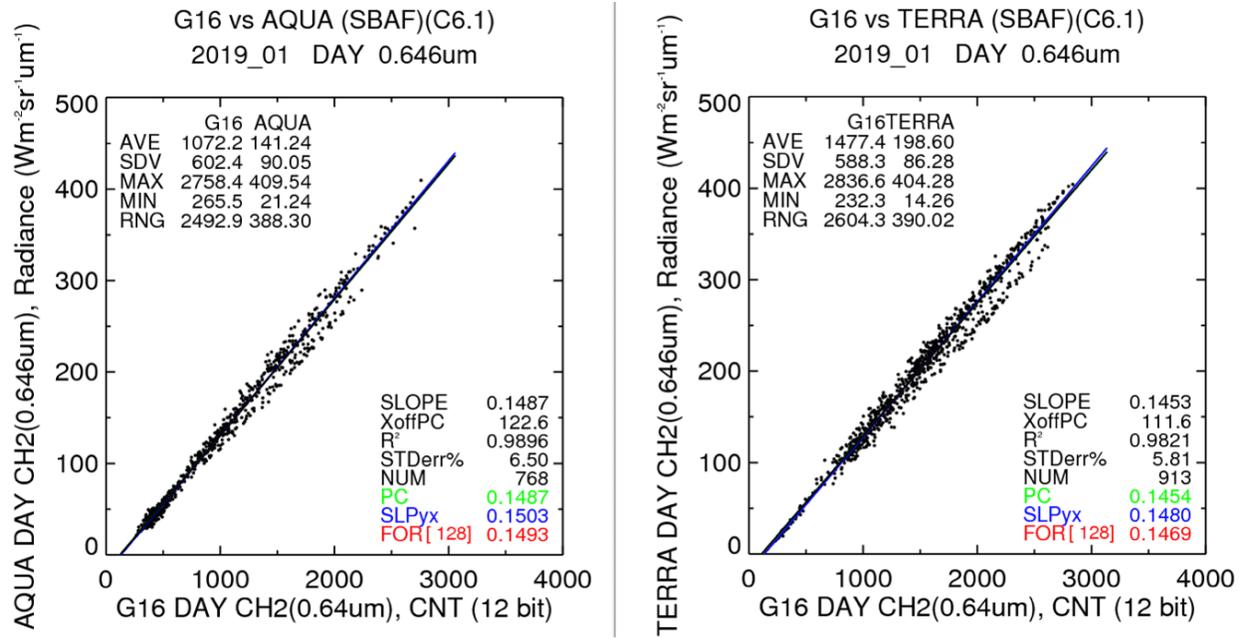


Figure 3: Deviated data on Jan. 19 and 20, 2019 as shown in the scatterplot between GOES-16 ABI calibrated counts versus Terra/Aqua radiance (provided by D. Doelling, NASA Langley).

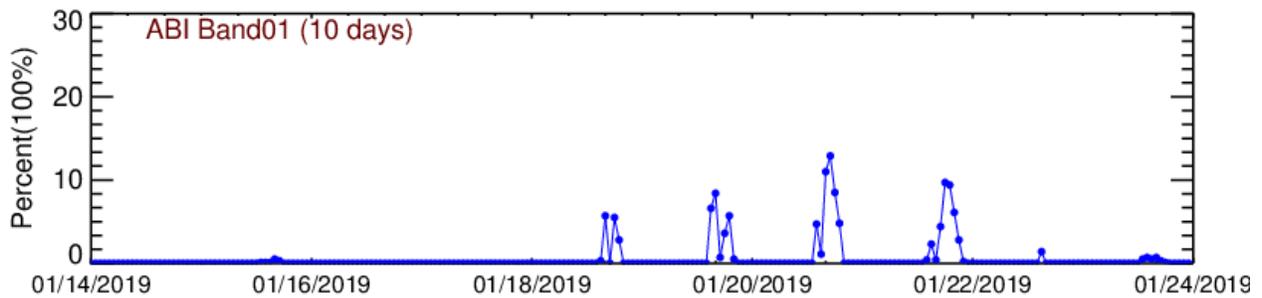


Figure 4: Time-series of daily striping index between January 14-24, 2019 for GOES-16 B01. Elevated level of striping are observed during the anomaly period. Other channels (not shown) are similar. See https://www.star.nesdis.noaa.gov/GOESCal/G16_ABI_StripingAll_daily.php, and https://www.star.nesdis.noaa.gov/GOESCal/G17_ABI_StripingAll_daily.php for more details.

3. Corrections for the Incorrect Radiance

The erroneous radiance during the anomalous period can be corrected as below:

$$R_{correct,ch} = R_{error,ch} * \frac{m_{correct,ch}}{m_{error,ch}} \quad (\text{Equation 1})$$

where $R_{correct,ch}$ is the corrected radiance for channel ch , $R_{error,ch}$ is the erroneous radiance, and $m_{correct,ch}$ and $m_{error,ch}$ are the mean values for the correct and erroneous detector gains, respectively. The ratio of $m_{correct,ch}$ and $m_{error,ch}$ are provided in Table 1.

Table 1: Correction parameters for use in Eq. 1.

$M_{correct,ch}/M_{error,ch}$	B01	B02	B03	B04	B05	B06
GOES16	0.904	0.896	0.898	0.924	0.900	0.902
GOES17	0.931	0.947	0.921	0.908	0.915	0.886

Notice that this correction can only remove the mean radiance bias. It cannot remove the image striping because most individual detectors are still calibrated (Figs. 5 & 6). Removing the striping can only be achieved by re-processing the L0 data using correct calibration coefficients for each individual detector, especially for GOES-16 B01/02/03.

G16 ABI detector gain correction ratio GS/GS_error for 01-18_vs_01-20.2019

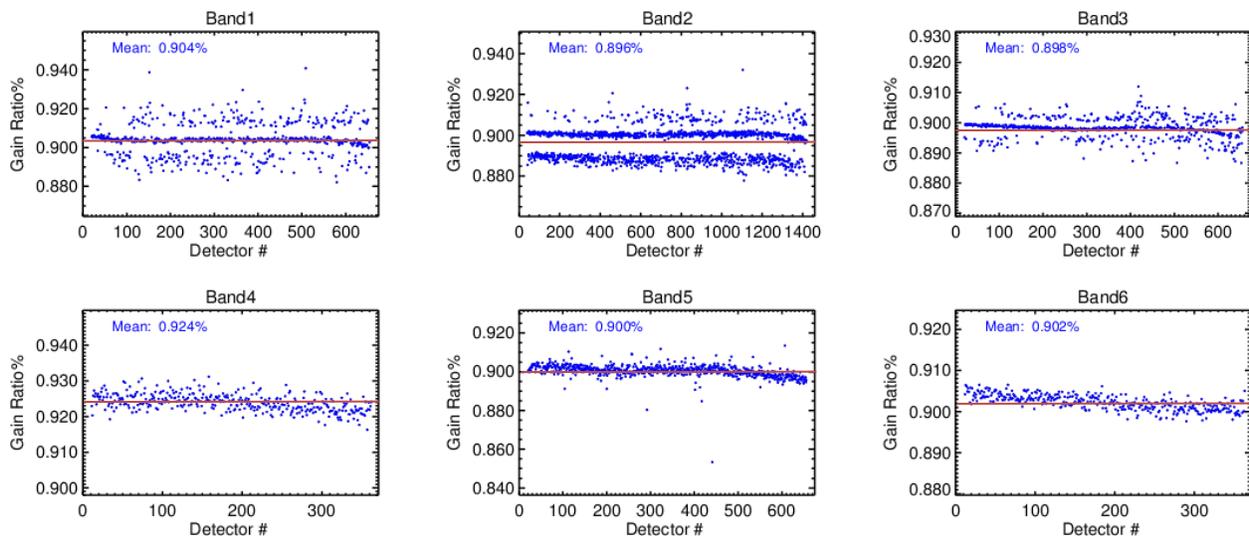
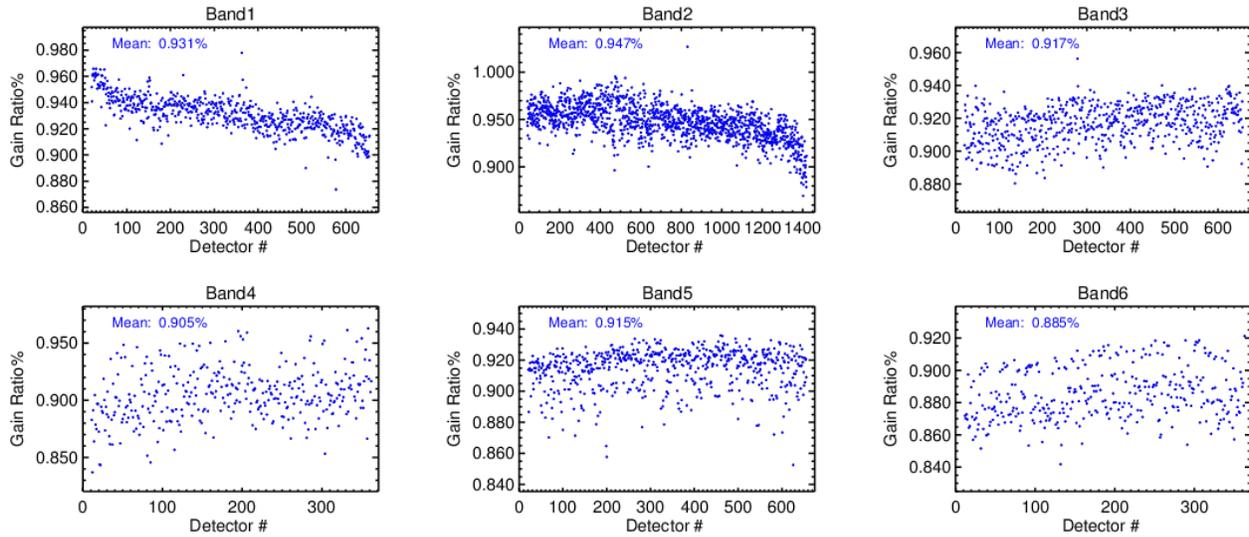


Figure 5: Ratio of the correct (01.20.2019) and incorrect gains (01.18-01.19.2019) for individual detectors of GOES-16 VNIR channels (blue dots) and the mean correction (red line). Although the value represented by the blue dots should be used for the corresponding detector, the value represented by the red line is used for all detectors instead, which is correct for only some detectors of the channel. Consequently the correction will remove the mean radiance bias but not the image striping.

G17 ABI detector gain correction ratio GS/GS_error for 01-18_vs_01-19.2018**Figure 6: Same as Figure 5, but for GOES-17.****4. Conclusion**

Incorrect gains were used for GOES-16/17 ABI VNIR channels calibration during a brief period in January 2019. This memo documents the details of the incident and its impacts on L1b radiance. A correction is provided to remove the mean radiance bias caused by the incorrect calibration. Unfortunately it is not expected to help with image striping during the period, which can only be removed by re-processing the L0 data using the correct calibration coefficients.