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To: EDGES Group

From: Alan E.E. Rogers

Subject: Galaxy calibration of low band data.

"Galaxy calibration" of lowband data was first reported in memo 202 using the original 10×10 m ground plane. The results show the absorption centered at about 80 MHz in Figures 1,2 and 3 but the depth is dependent on the soil parameters used in the beam correction and a search on the difference between the "Galaxy down" spectrum minus 0.3 times the "Galaxy up" fails to yield a definitive result. Galaxy calibration using data from the extended ground plane is discussed in memo 215. The broader structure seen clearly in Figure 1 of memo 215 was the first clear indication that the dips at 70 and 84 MHz were part of a broader structure. Figure 1 shows the "Galaxy up" and "Galaxy down" spectra along with the "corrected difference" given by $D = (G_d - 0.3\,G_u)/(1 - 0.3)$

Where G_d = spectrum from GHA = 6 to 18 hours

             G_u = spectrum from GHz = -1 to +1 hours

             D = difference corrected on the assumption that the signature is global with equal amplitude in G_d and G_u.

Figure 2 shows the result of a search in center frequency and FWHP for the lowband1 data from 2016_258 to 2017_017. Figures 3 and 4 show the results for the lowband2 data from 2017_082 to 2017_120 using the 2016 calibration. Figures 5 and 6 show the results using the 2017 calibration. Owing to the greatly reduced sensitivity to systematic errors using Galaxy calibration the results for the 2 calibrations are quite similar.
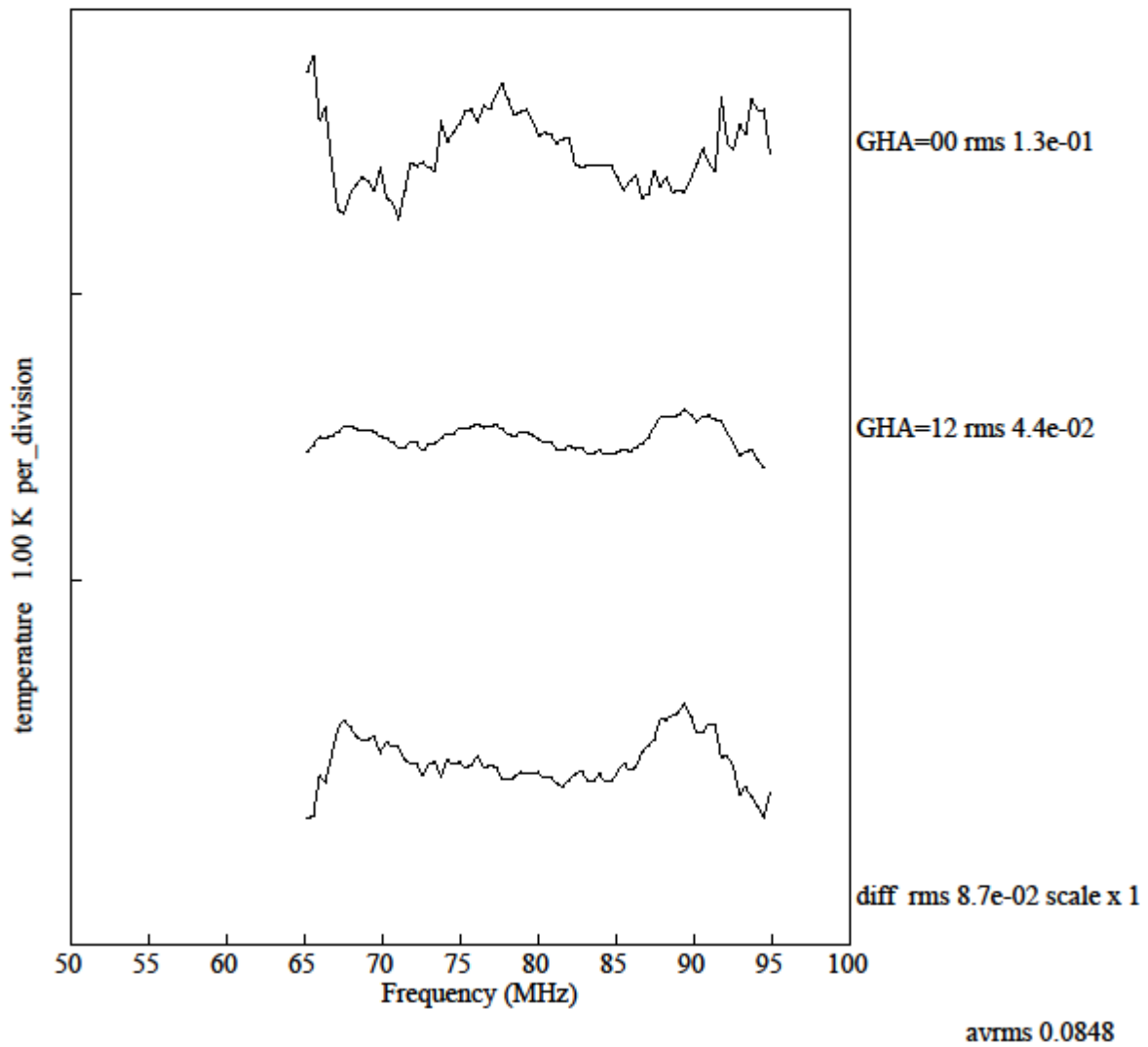
GHA=00 rms 1.3e-01

GHA=12 rms 4.4e-02

diff rms 8.7e-02 scale x 1

avrms 0.0848

Figure 1. "Galaxy up" (GHA=0), "Galaxy down" (GHA=12) residual spectra with 4 polynomial terms removed along with corrected difference for lowband1.
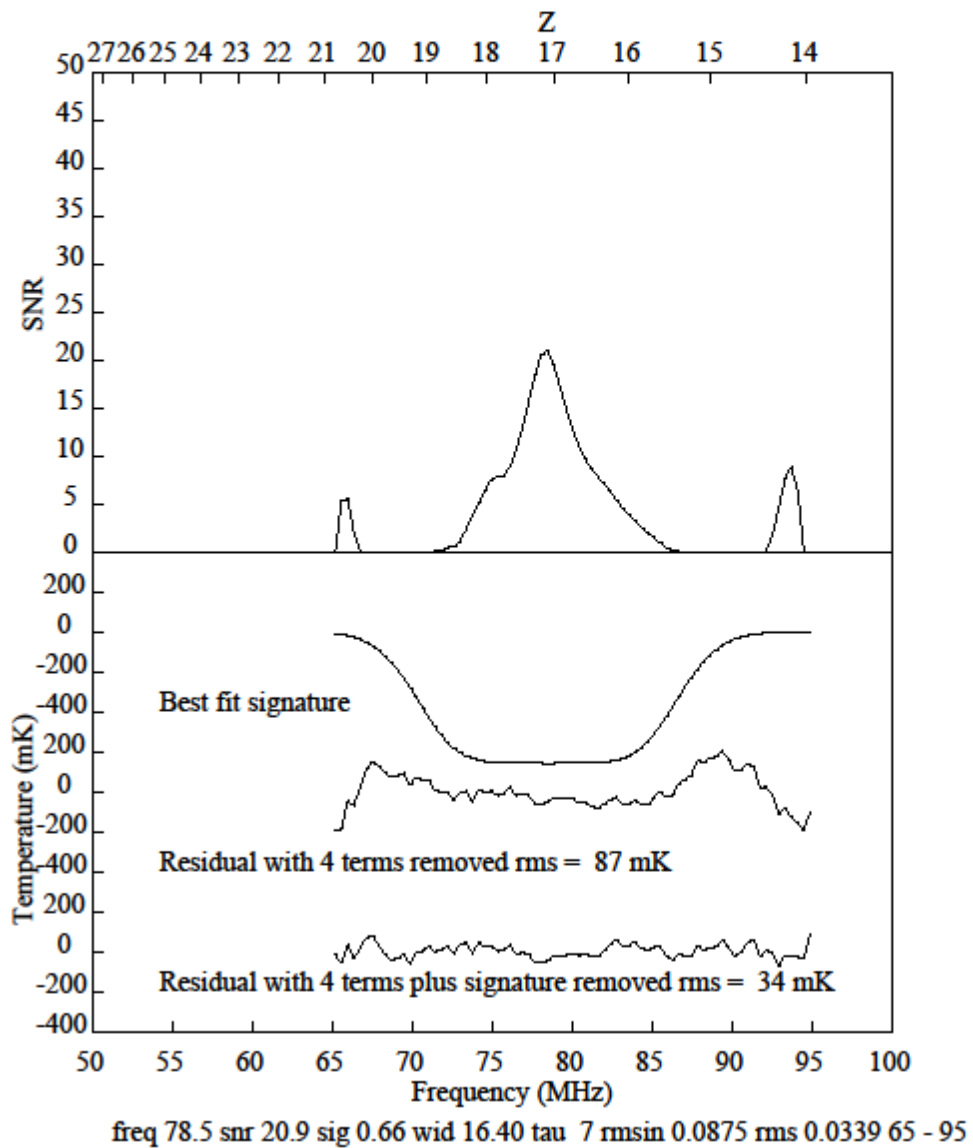
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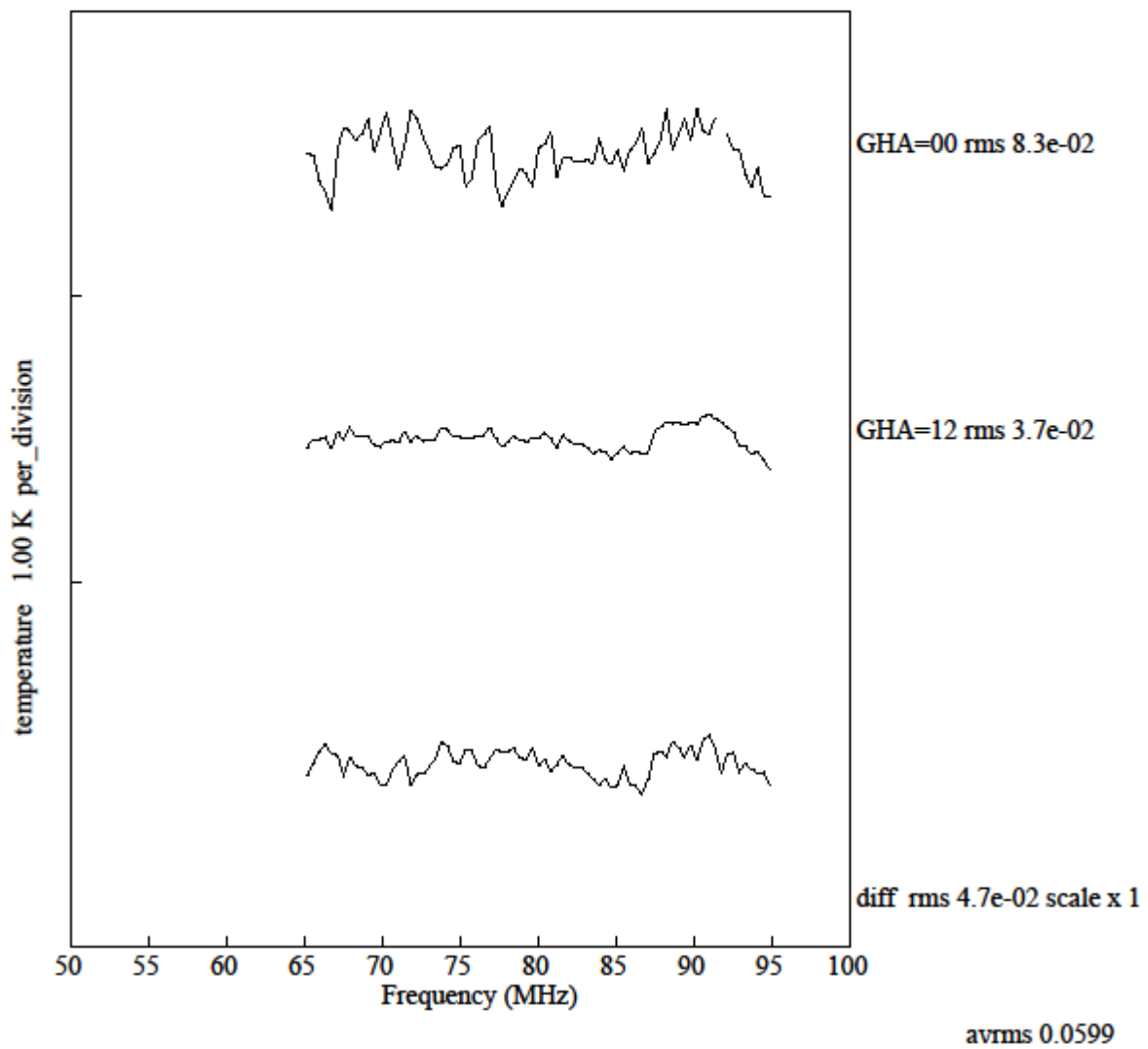Figure 2. Signature search using difference spectrum shown in Figure 1.

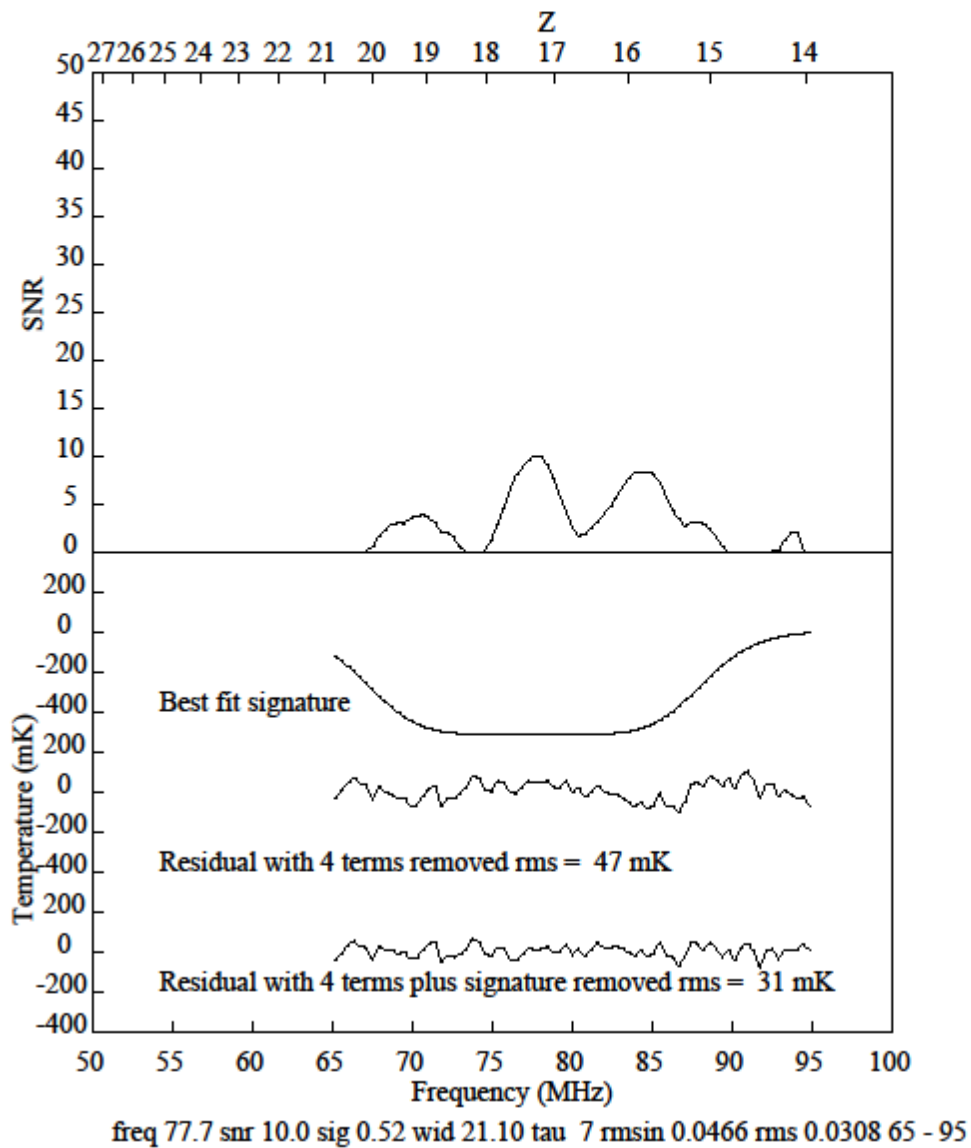Figure 3. Lowband2 results using 2016 calibration.

Figure 4. Signature search using lowband2 difference with 2016 calibration.
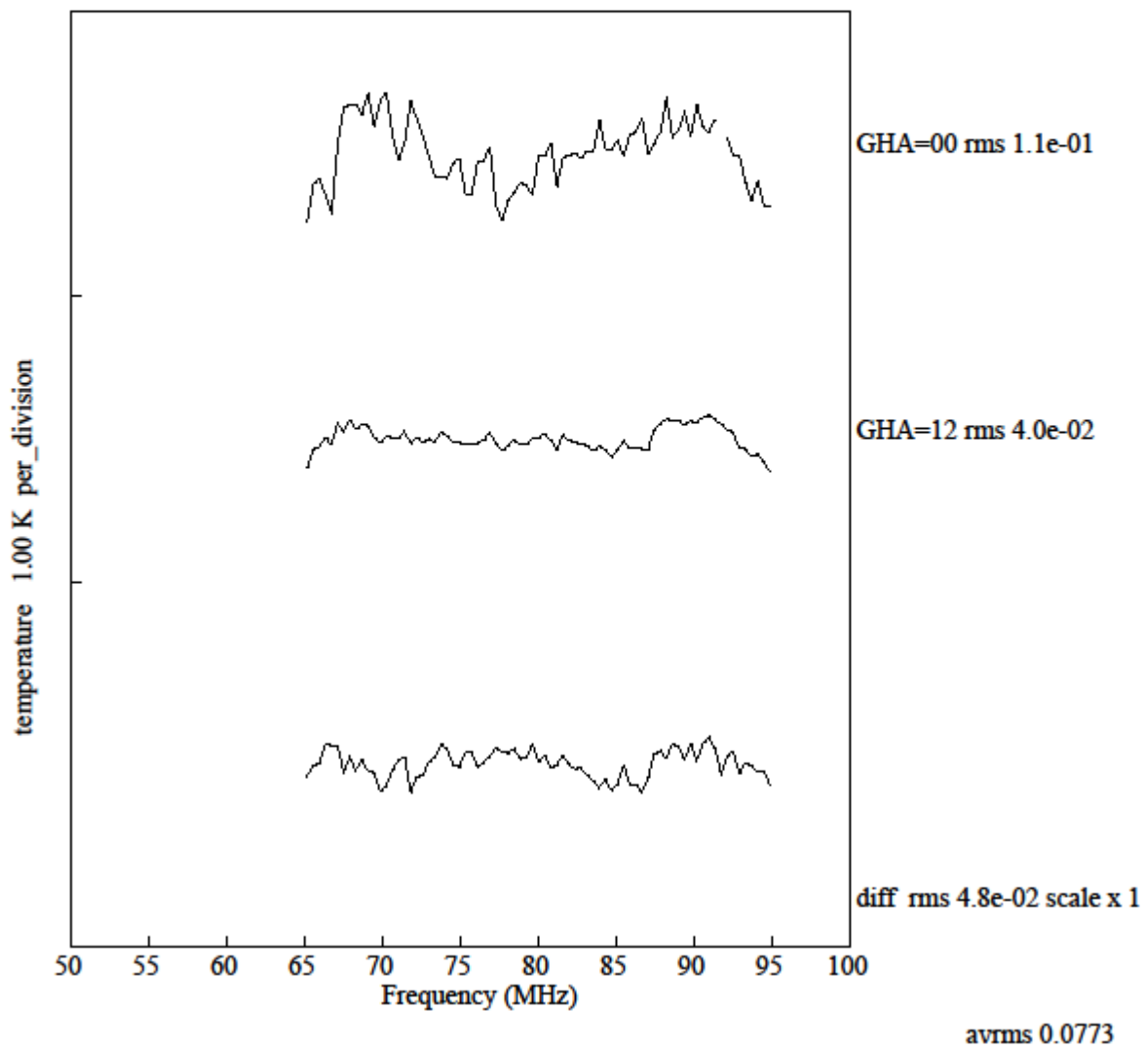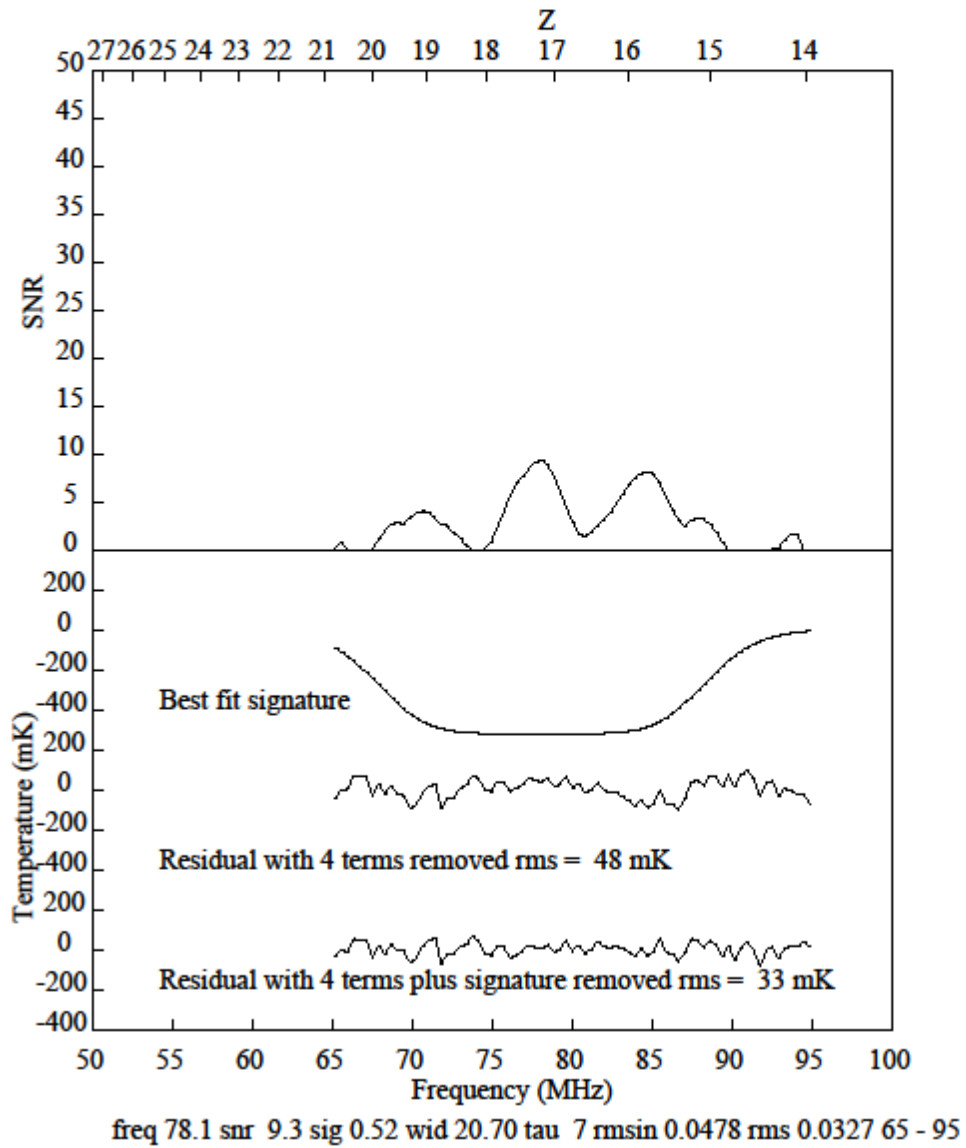
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Figure 5. Same as in Figure 3 using 2017 calibration.

Figure 6. Lowband2 using 2017 calibration.