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To: EDGES Group
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Subject: Tests of the effects of RFI from 50 to 100 MHz.

The low band is relatively free of RFI. As an example the data from 2016_335 to 2016_344 is shown in detail. Figure 1 shows the spectra with 5 polynomial terms removed for a 24-hour average for each day without any RFI excision. Figure 2 shows the same spectra with the “first level” of RFI excision. Despite the RFI excision there is still evidence of RFI on days 340, 343 and 344. Figure 3 shows the spectra from nighttime only data with the Sun more than 5 degrees below the horizon. For this 10-day period the “first level” is sufficient but the “bump” at about 72 MHz on day 343 is from a rogue satellite whose emissions are detailed in memo #213. In this case it happens to produce significant RFI during the day. The signal is very strong for the few minutes of a pass above the horizon but in some cases another pass just below the horizon results in RFI which is not strong enough to be excised in a single switch cycle and requires a longer integration to be detected.

Figure 4 shows the spectra for each hour of day 343. In this case the second level of RFI excision is to remove the data from 08 to 09 UT. Figure 5 shows the spectra from each hour of day 343. With a threshold of 1k on the rms of the residual to a 5 term polynomial fit. This “second level” of RFI excision removes the RFI from the satellite from 08 to 09 UT.

The RFI on days 341 and 344 is emission from the Sun. Figure 6 shows a “waterfall” plot of the emission. While some days are completely free of solar outbursts it is best to avoid daytime data.

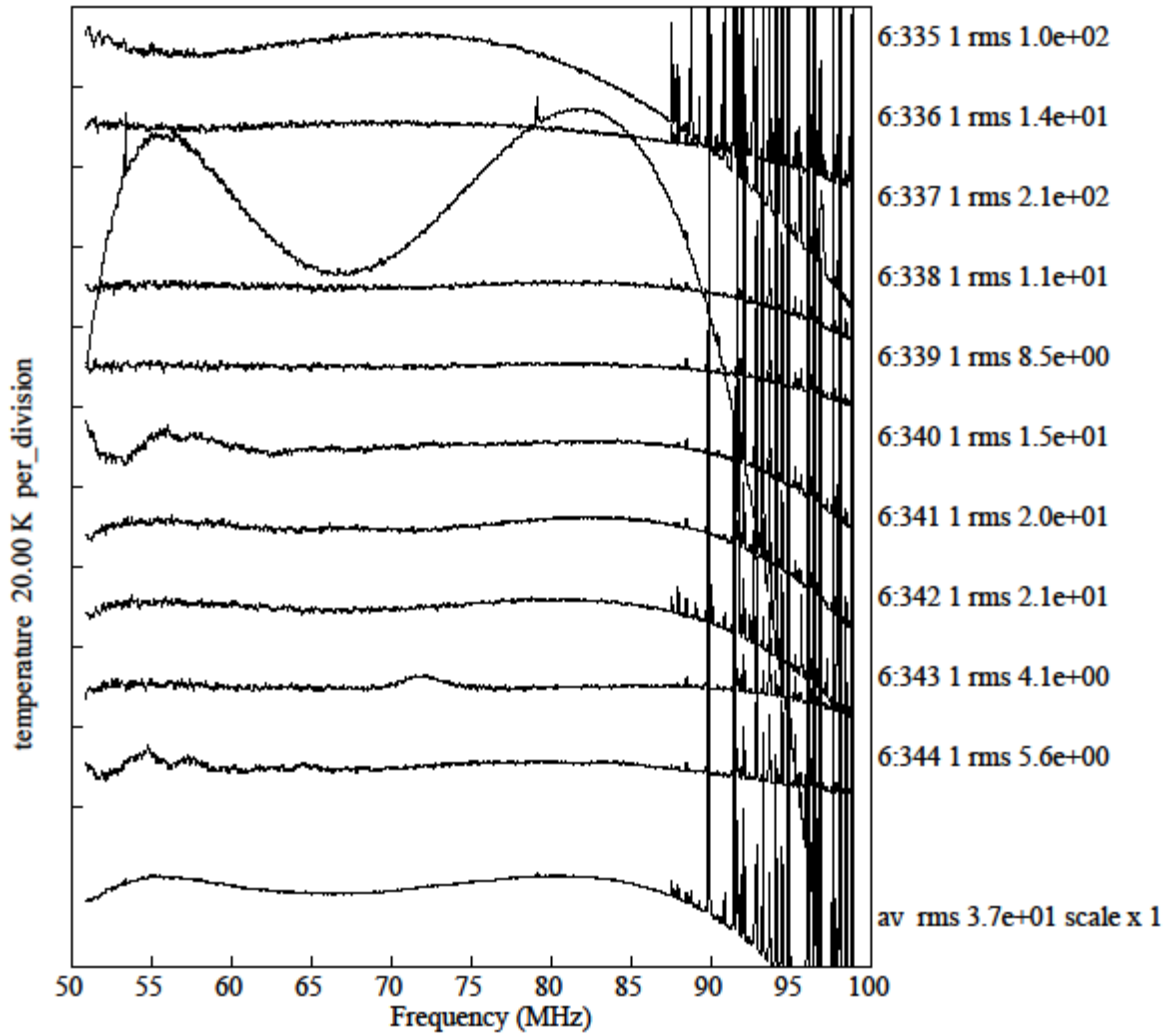
Day	Absorption amplitude (k)	SNR
335	0.53	8
336	0.45	6
337	0.37	7
338	0.36	6
339	0.63	9
340	0.45	6
341	0.44	7
342	0.41	6
343	0.58	9

Table 1. Best fit amplitude to absorption signature centered at 78 MHz FWHM 20 MHz flattening parameter = 7 4-term polynomial fit plus signature 60 – 99 MHz.

Table 1 shows the amplitude of SNR of the flattened absorption signature discussed in memos 225 and 226 from beam corrected nighttime data for each of the 10 days.

Conclusion

The effects of RFI in the low band are small and after excision are unlikely to have a significant influence on the detection of a global sky signature.



avrms 41.3260

Figure 1. No RFI excision.

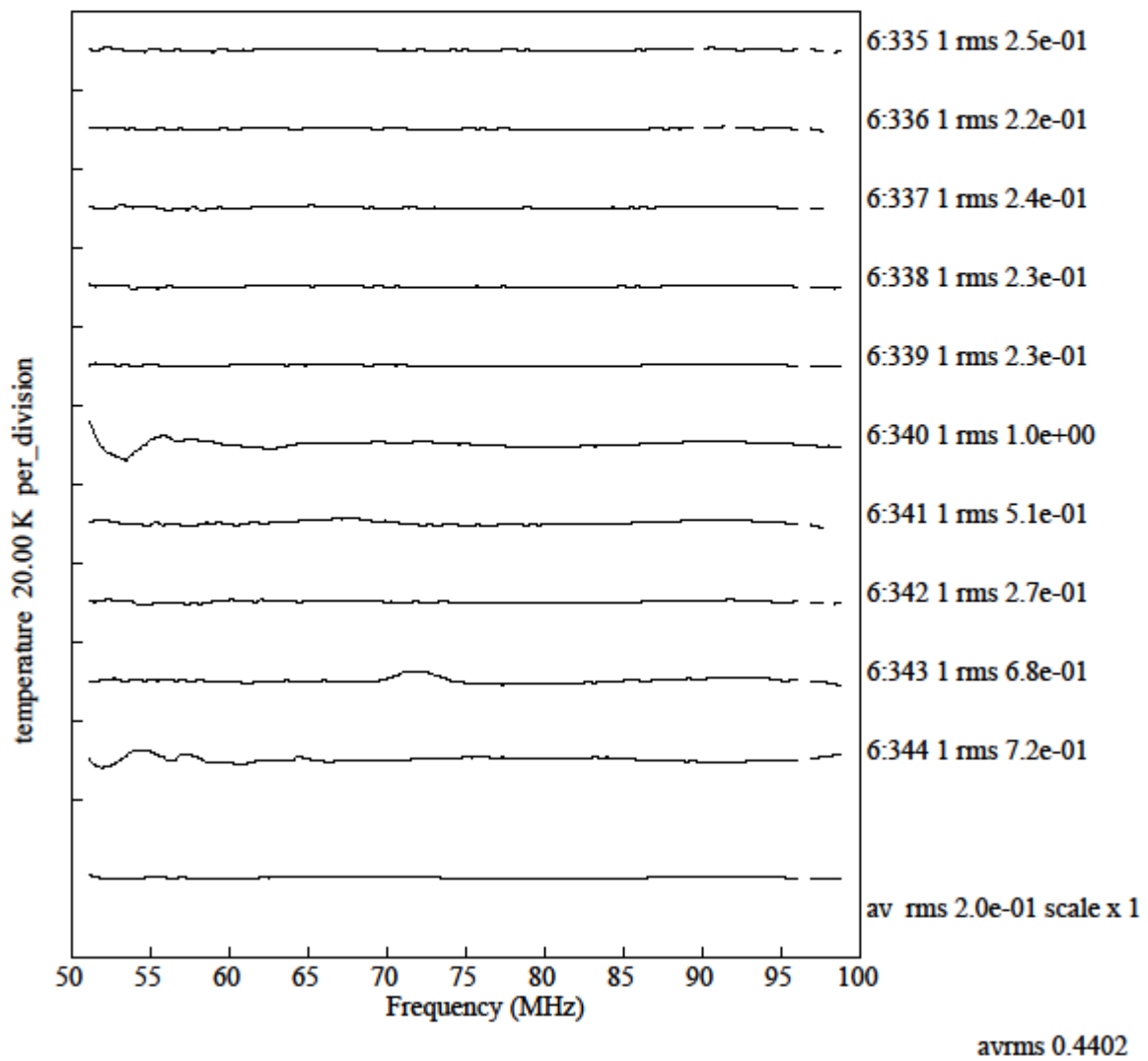


Figure 2. with 1st level RFI excision.

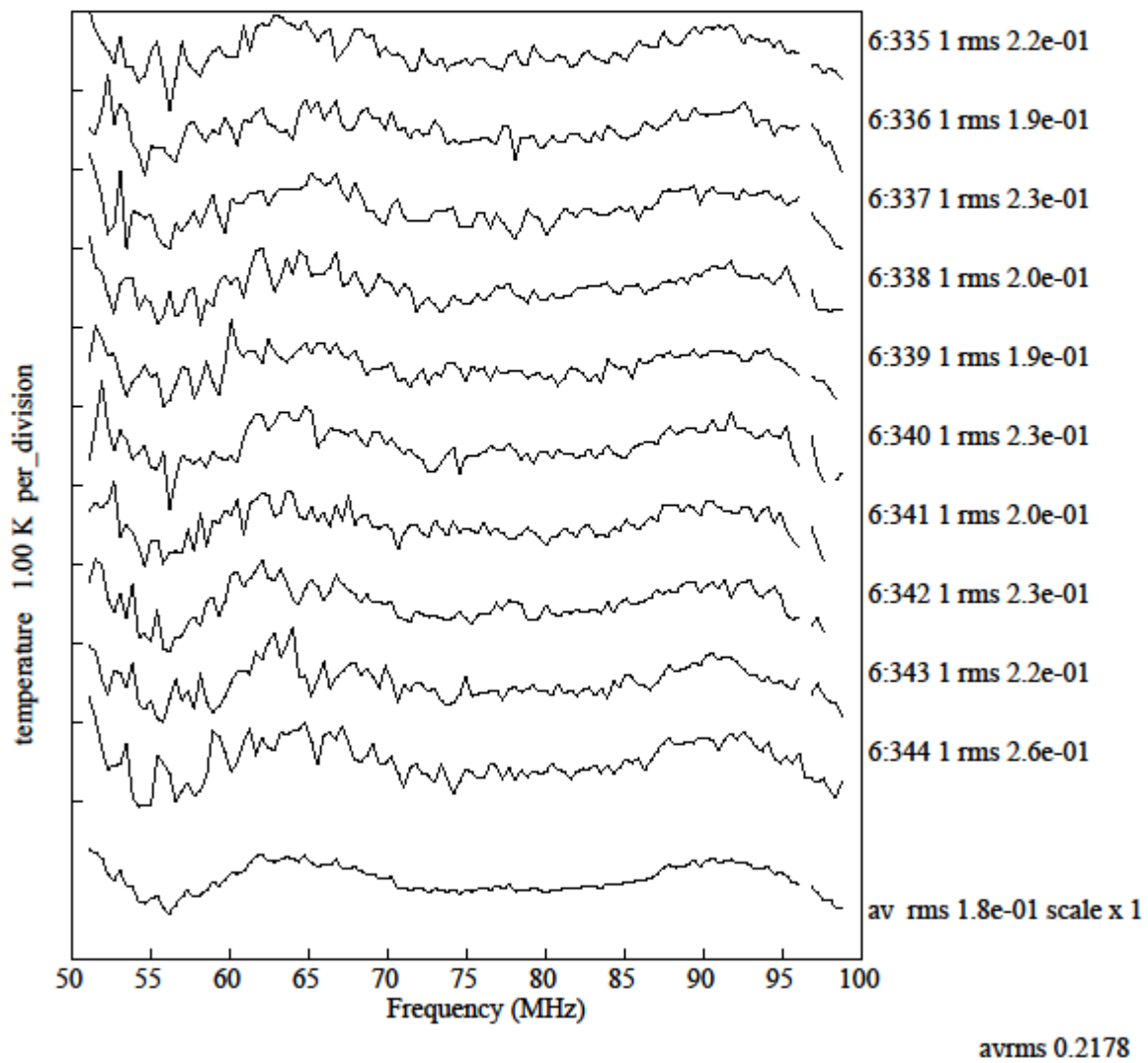


Figure 3. nighttime only

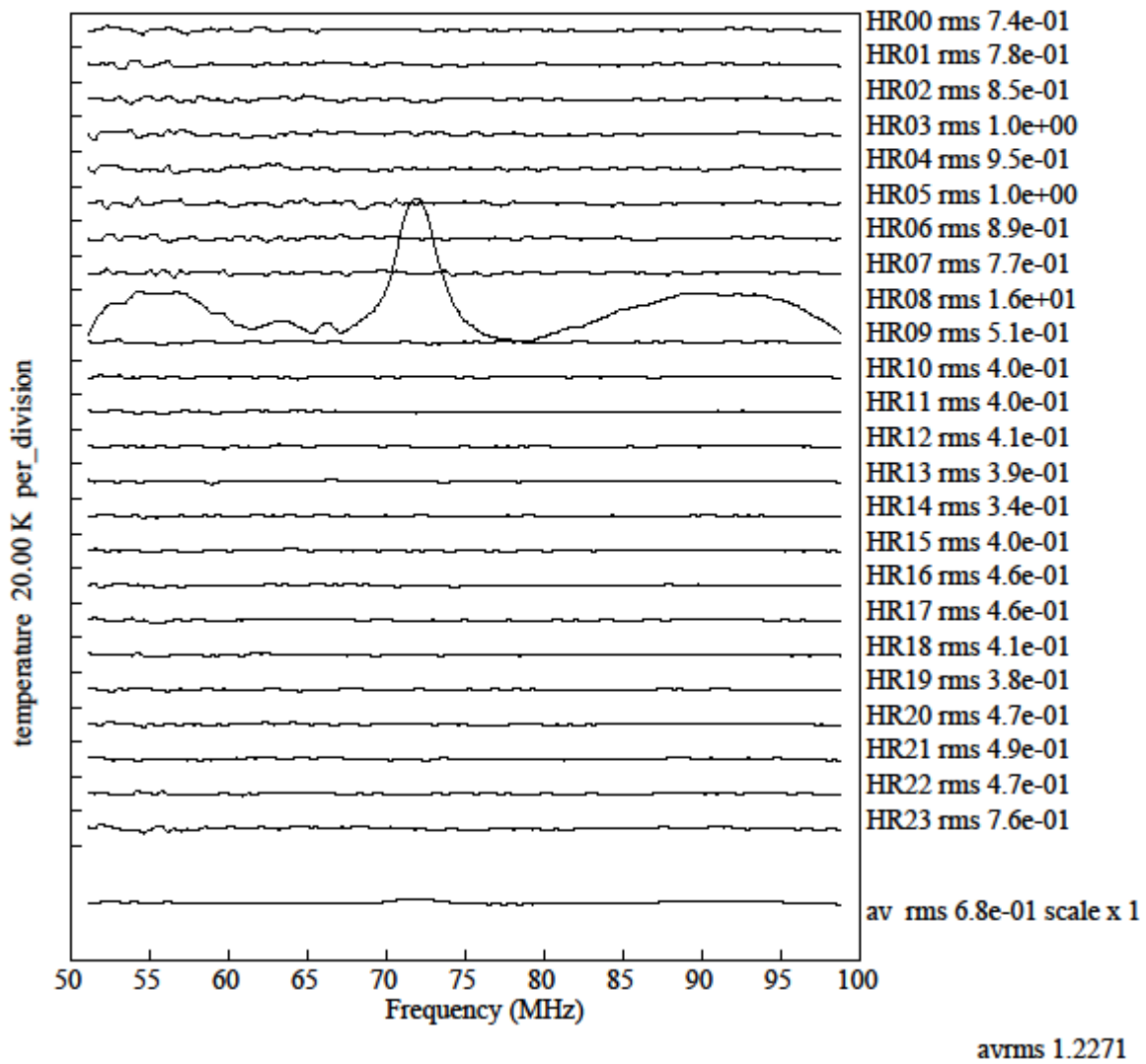


Figure 4. Examination of each one hour block of data clearly shows RFI from 08 to 09 hours.

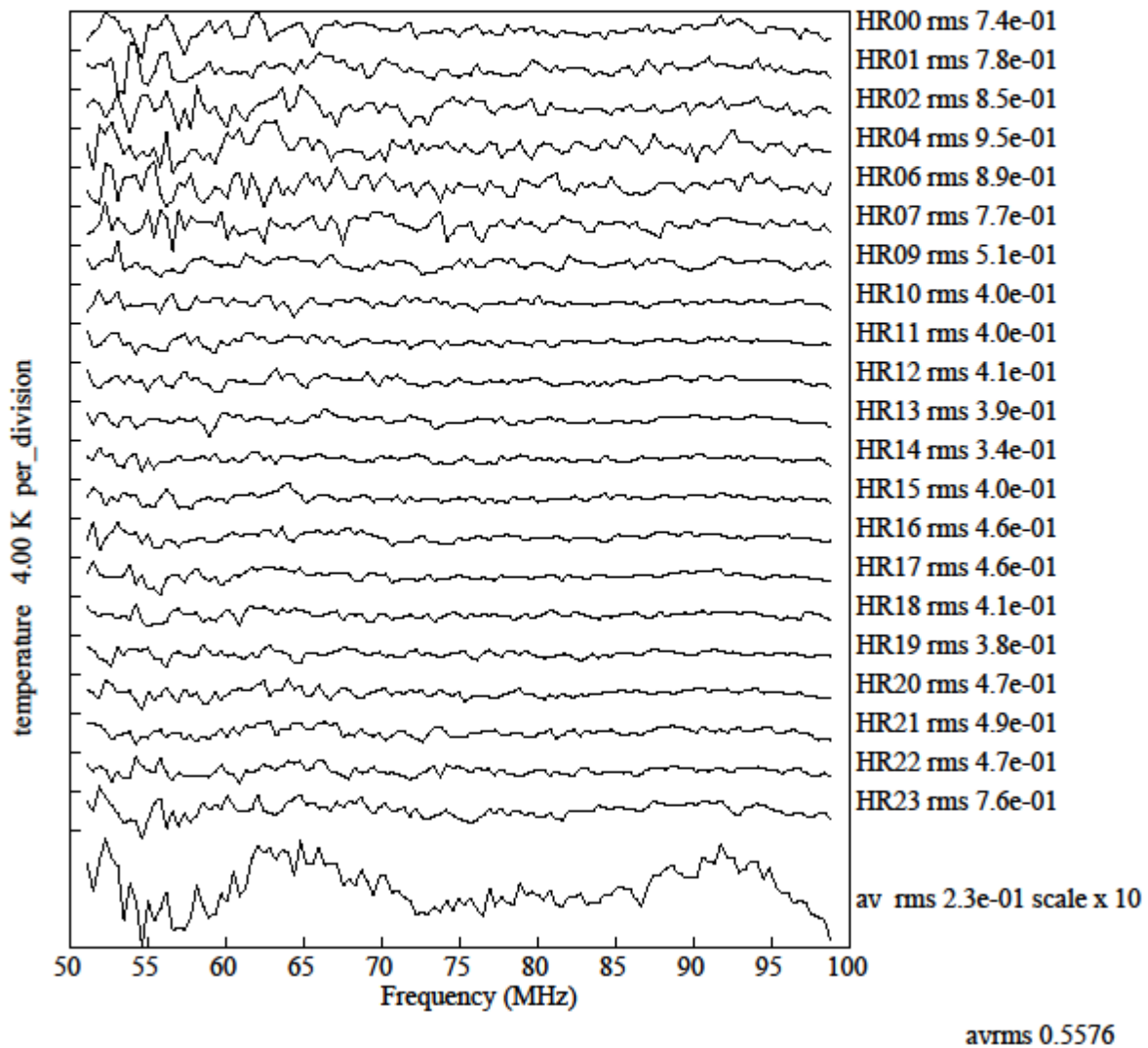
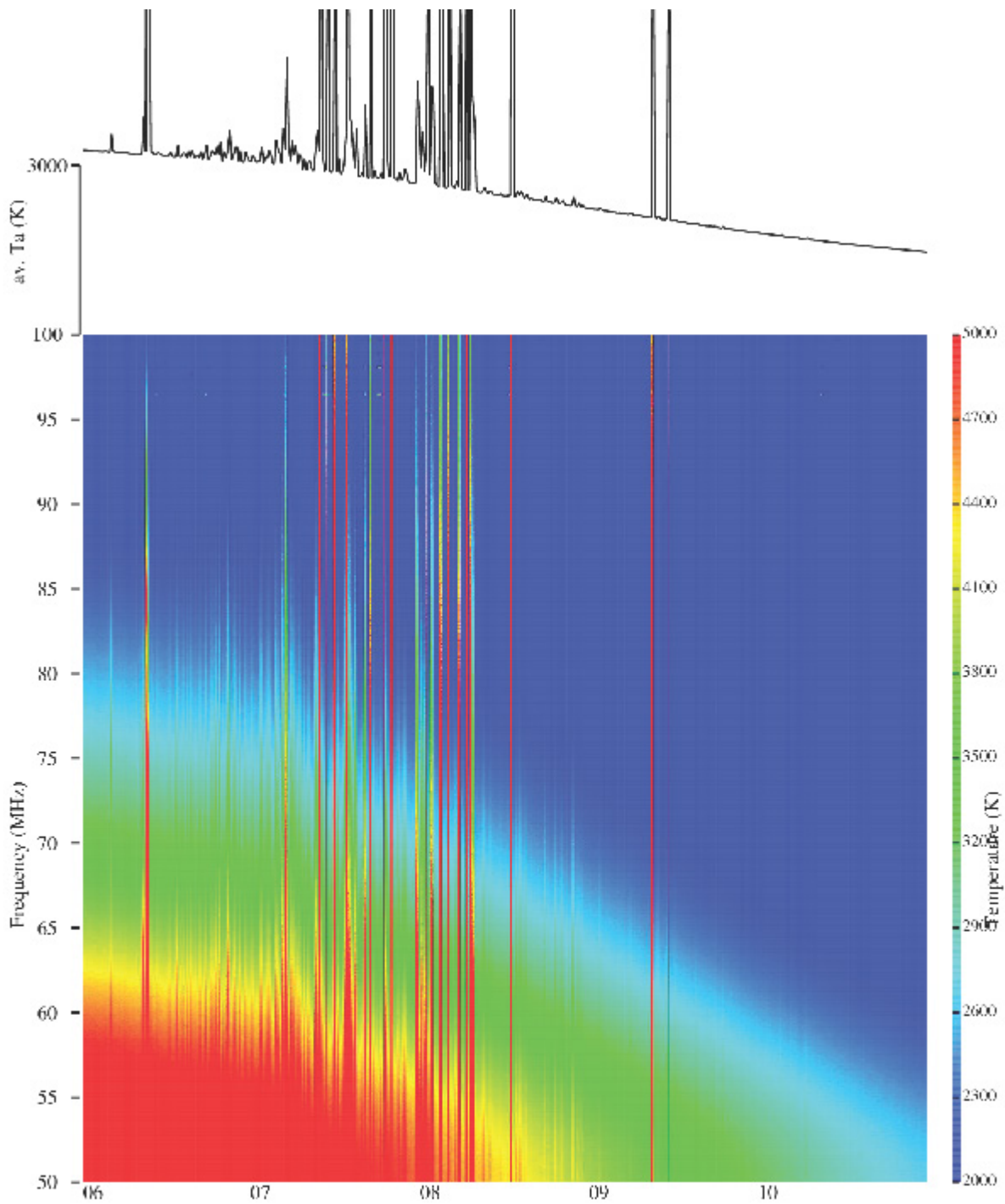


Figure 5. Example of the use of threshold on the rms residuals to remove weak RFI in a “second level” of RFI excision.



UT 06 to 10
 file: 2016_344_00.acq
 Tue Jan 3 17:10:22 2017
 fstart 50 fstop 100 pfit 5 smooth 0 resol 6 kHz rfi 0.0 nline 477 secint 3049

Figure 6.