Appendix B: SAMS Color Spectrograms for Unit F, Head B

The Principal Investigator Microgravity Services (PIMS) group has processed SAMS data from STS-87, Unit F, TSH B to produce the plots shown here. These data were collected at 125 samples per second, and a 25 Hz low pass filter was applied to the data by the SAMS unit prior to digitization. Prior to plot production, the raw SAMS data were compensated for gain changes, and then demeaned. Demeaning was accomplished by analyzing individual sections with a nominal length of 30 minutes. Users who are interested in further details for either of these operations are encouraged to contact the PIMS group.

Color spectrograms are used to show how the microgravity environment varies in intensity with respect to both the time and frequency domains. These spectrograms are provided as an overview of the frequency characteristics of the SAMS data during the mission. Each spectrogram is a composite of six hour's worth of data. The time resolution used to compute the spectrograms seen here is 16.4 seconds. This corresponds to a frequency resolution of 0.06 Hz.

In order to produce the spectrogram image, power spectral densities were computed for successive time intervals (the length of the interval is equal to the time resolution). For the PSD computation, a Hanning window was applied. In order to combine all three axes into a single plot to show an overall level, a vector magnitude (VM) operation was performed. Stated mathematically:

$$VM_k = \sqrt{PSD_{x_k}^2 + PSD_{y_k}^2 + PSD_{z_k}^2}\ .$$

By imaging the base 10 logarithm ($\log_{10}$) magnitude as a color and stacking successive PSDs from left to right, variations of PSD magnitude and frequency are shown as a function of time. Colors are assigned to discrete magnitude ranges, so that there are 207 colors assigned to the entire range of magnitudes shown.

The colorbar limits are chosen in order to minimize saturation in a given set of spectrogram plots. Data which fall outside of these limits will be imaged as either the highest or lowest magnitude, depending on which side they have saturated. If an area of interest seems to be saturated, care should be taken because the actual values may lie above or below the color mapping shown on the plot.

Due to the nature of spectrograms, care should be taken to not merely read a color's numeric value as being the "amount" of acceleration that is present at a given frequency. In order to get this type of information, the PSDs must be integrated between two frequencies. These frequencies (lower and upper) form the band of interest. The result of this integration is the g_{RMS} acceleration level in the $\left[f_{lower}, f_{upper}\right]$ band. The PIMS group is able to provide this type of analysis on a per-request basis.

Plot gaps (if any exist) are shown by either white or dark blue areas on the page. If a plot gap exists for an entire plot (or series of successive plots), a comment is placed on the page to let the user know there is a gap in the data. These "no data available" comments will not show exact times for which the data are not available, but will only indicate missing plots.

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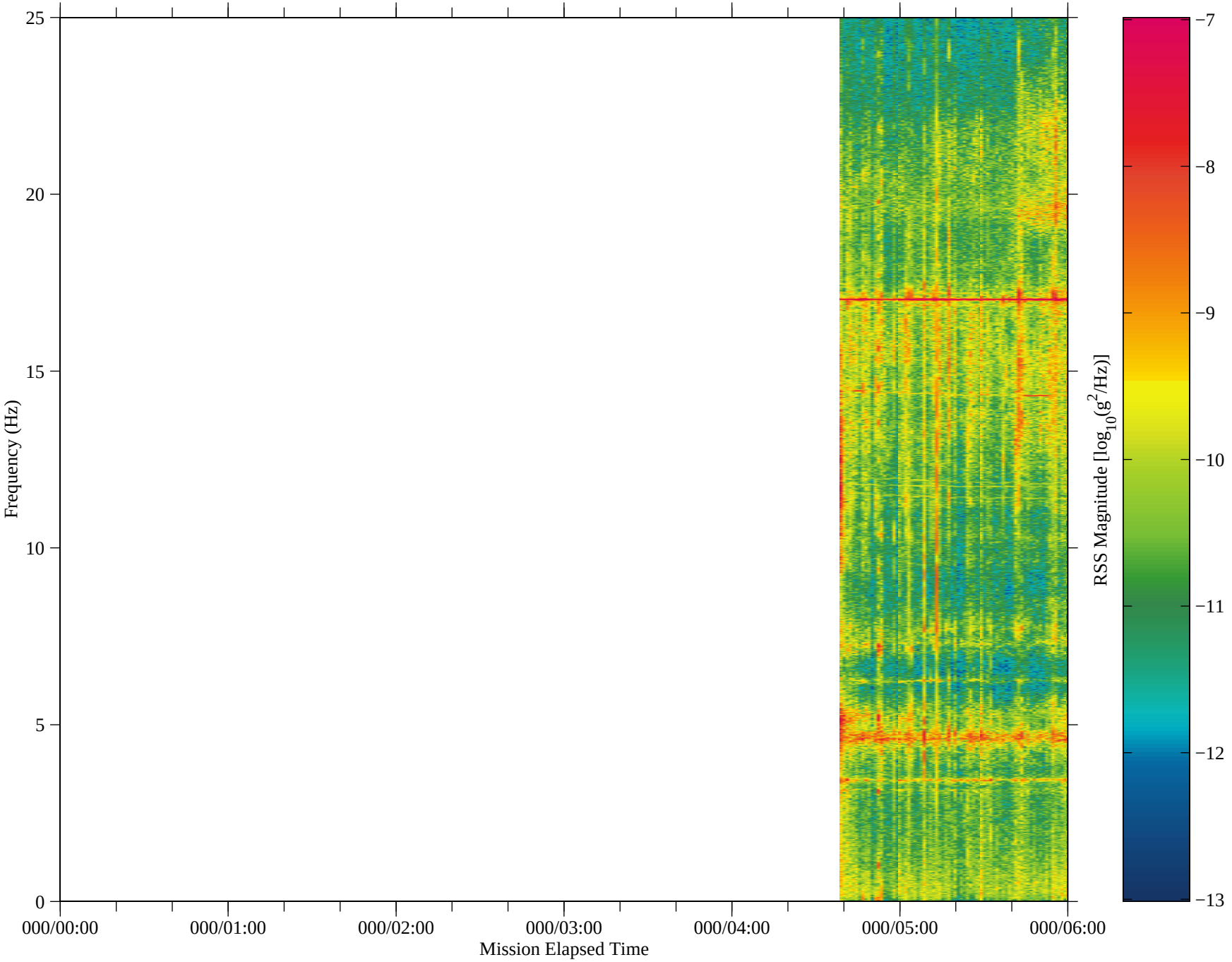
Figure 1: USMP−4, Unit F, TSH B



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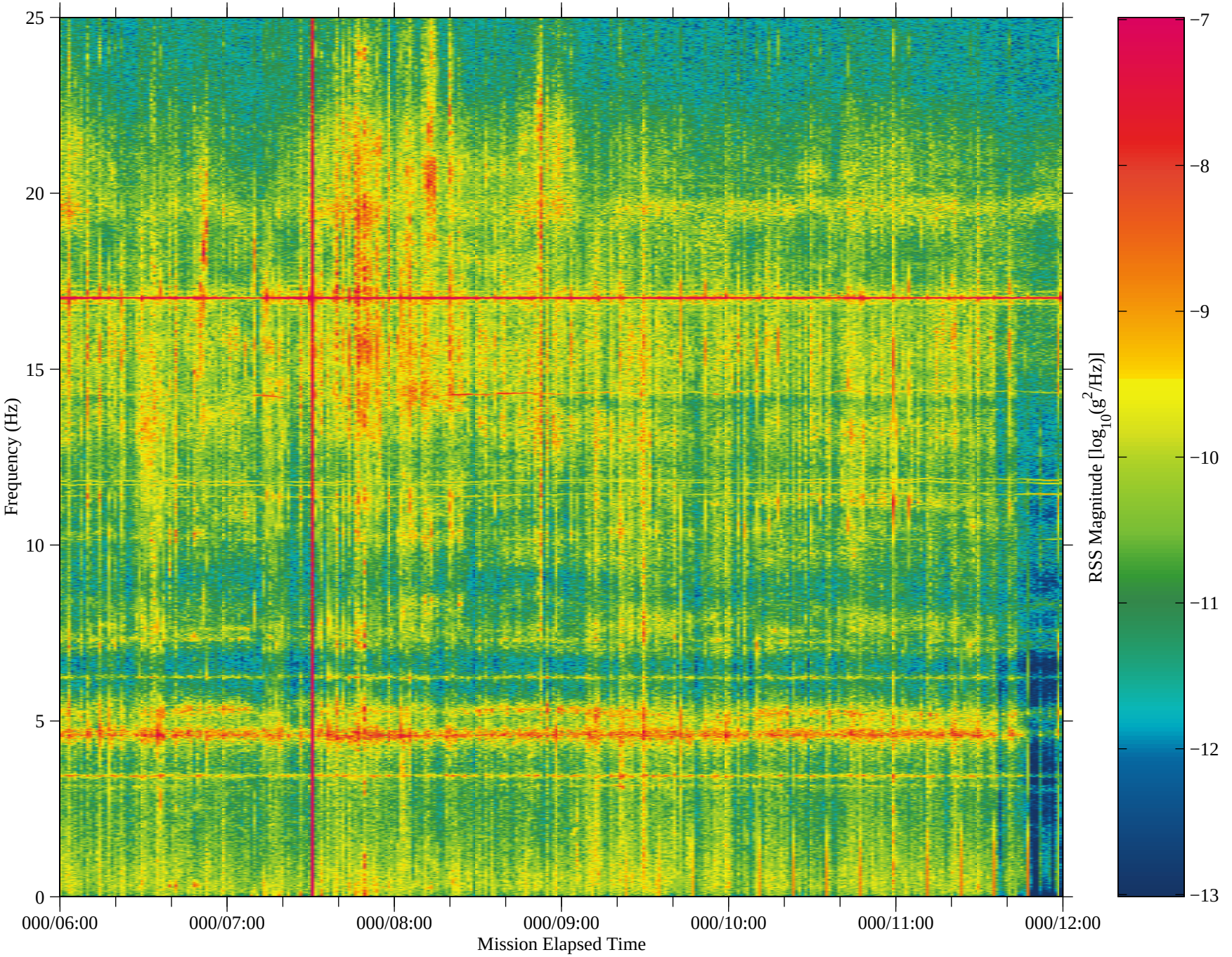

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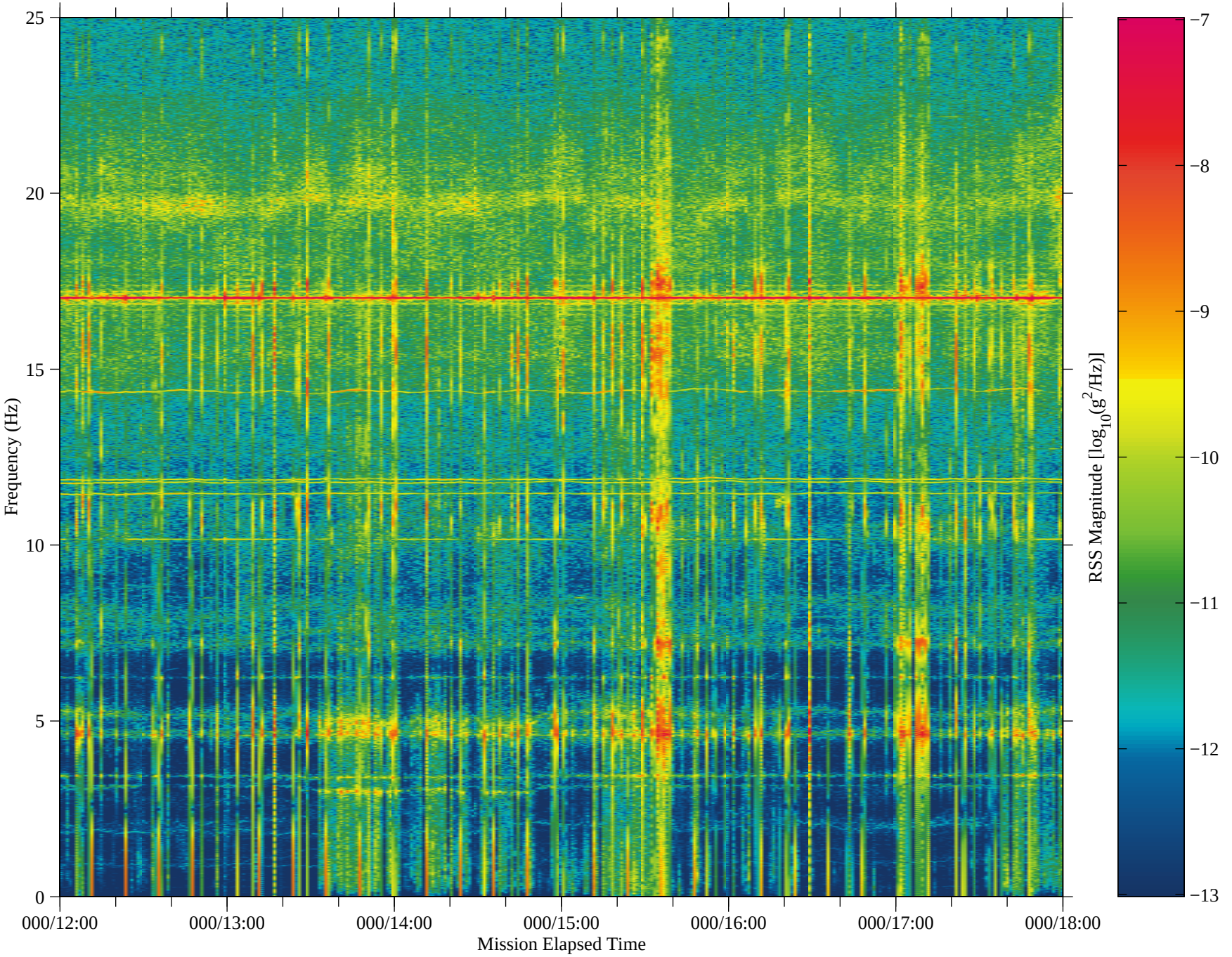

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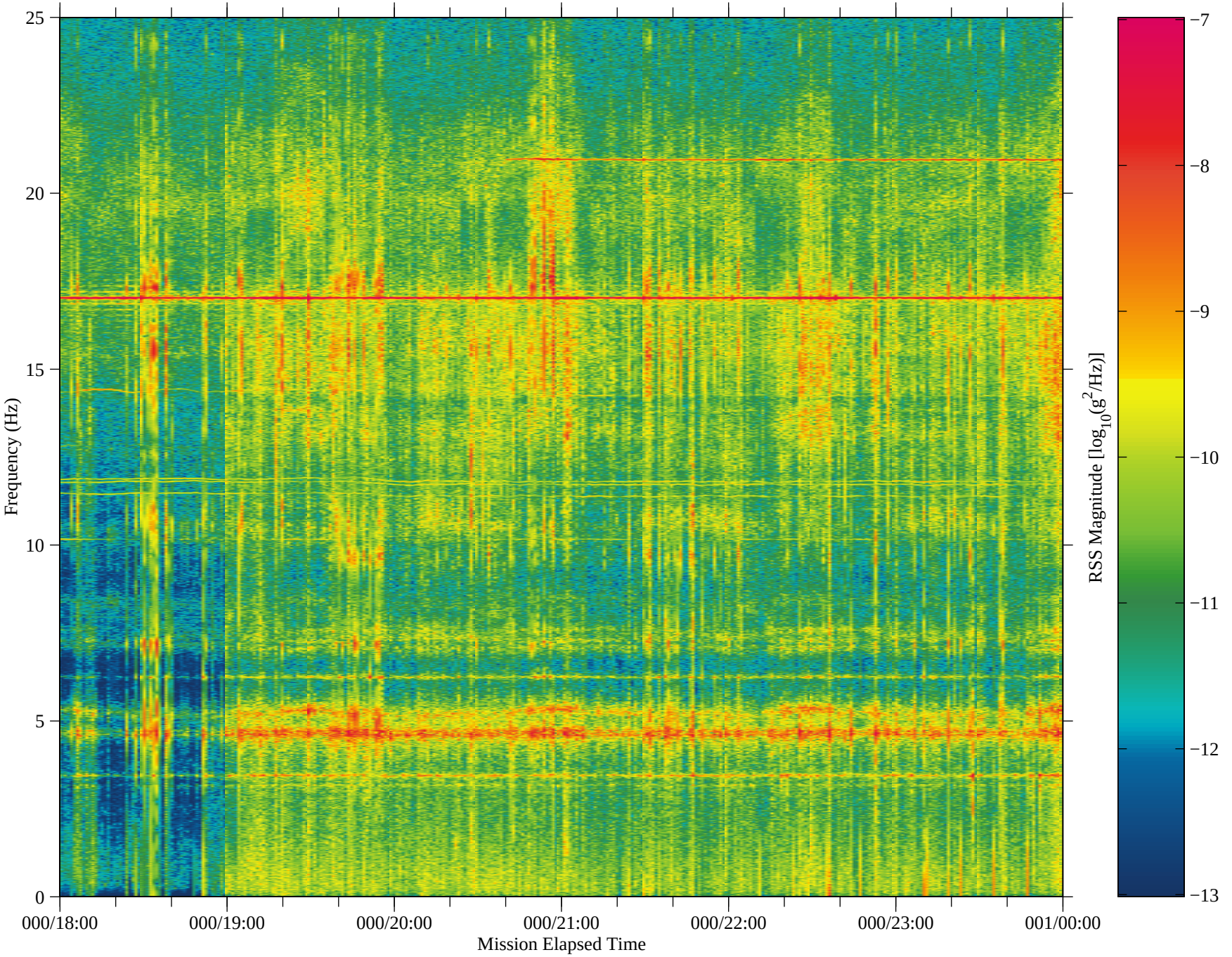

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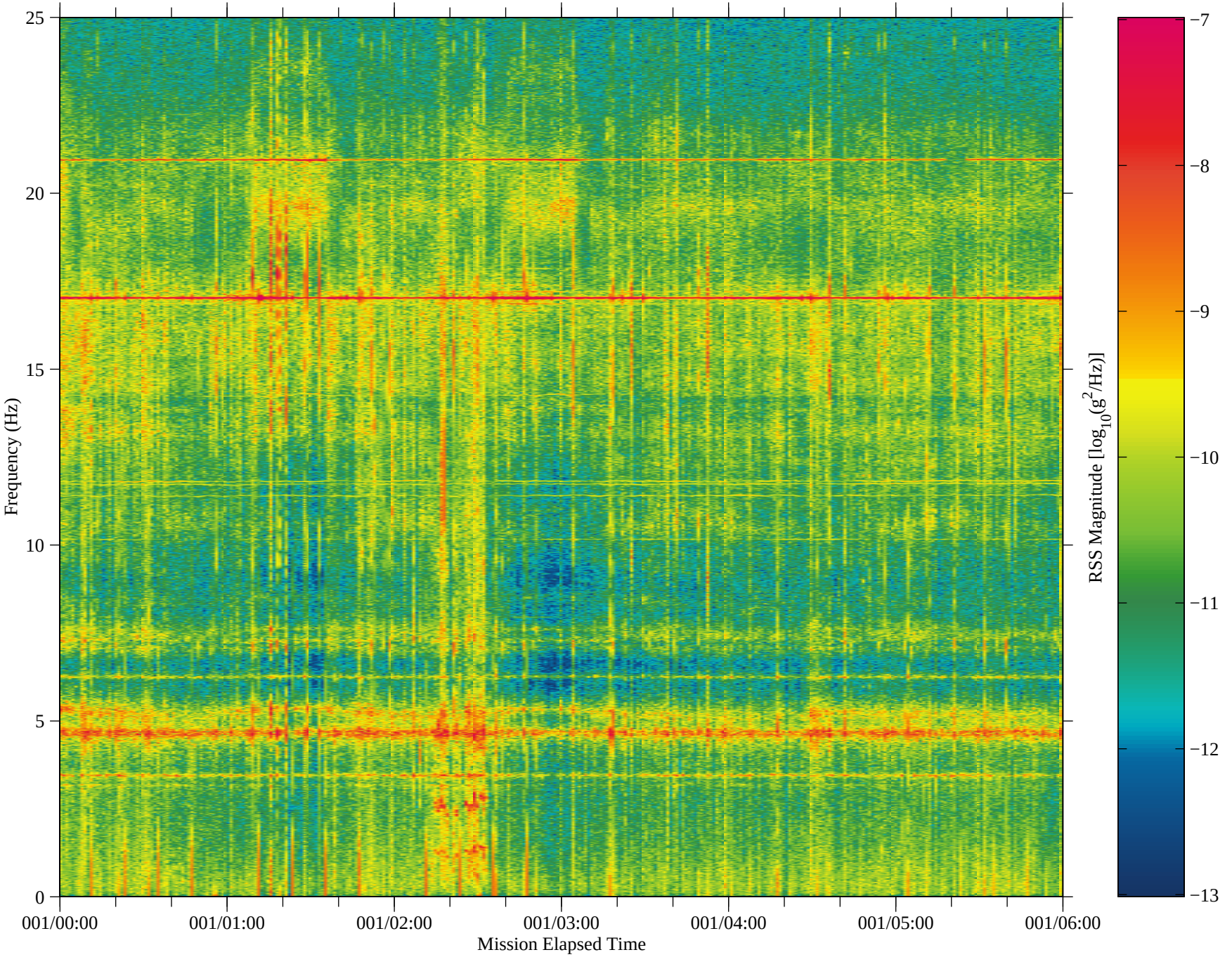

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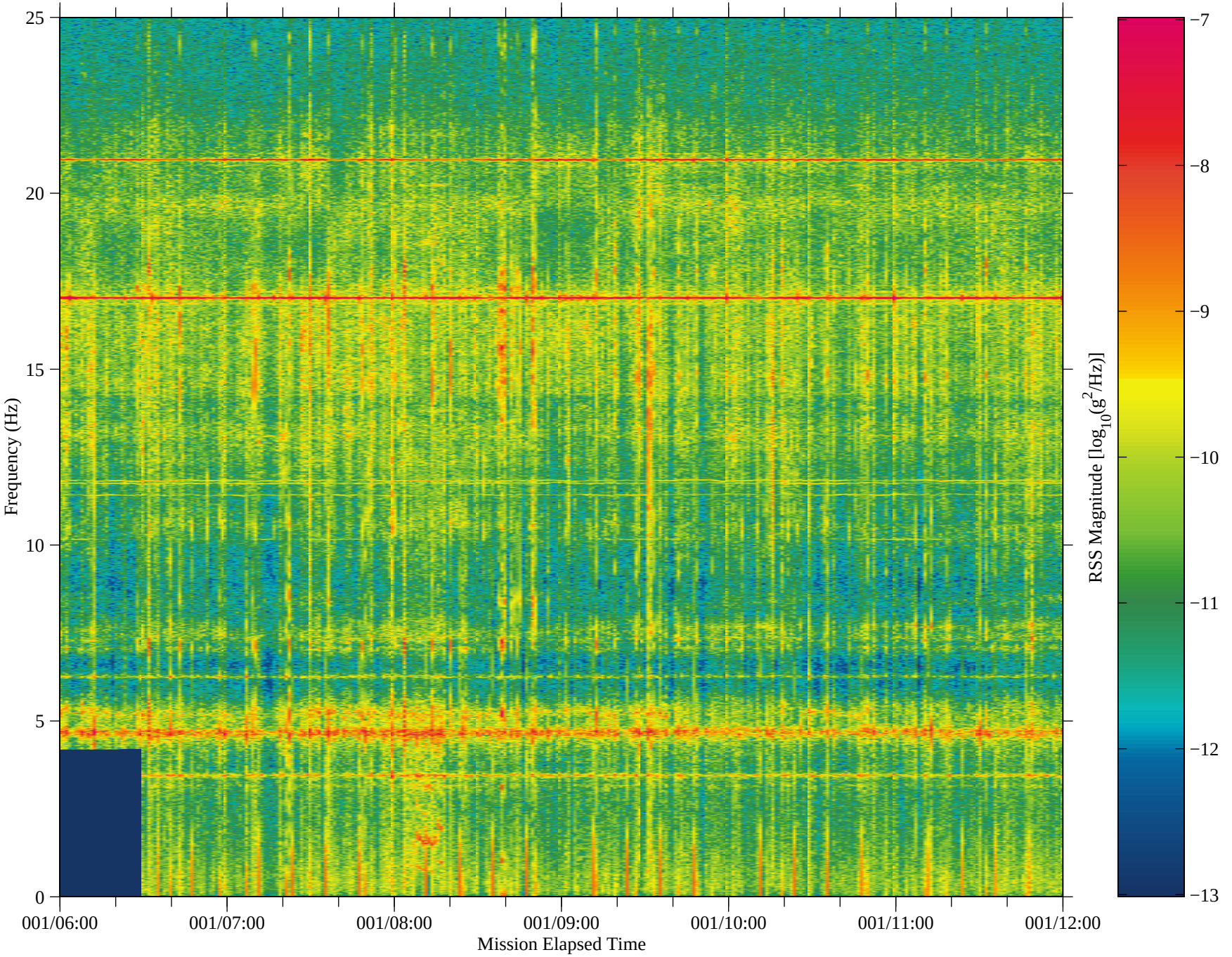

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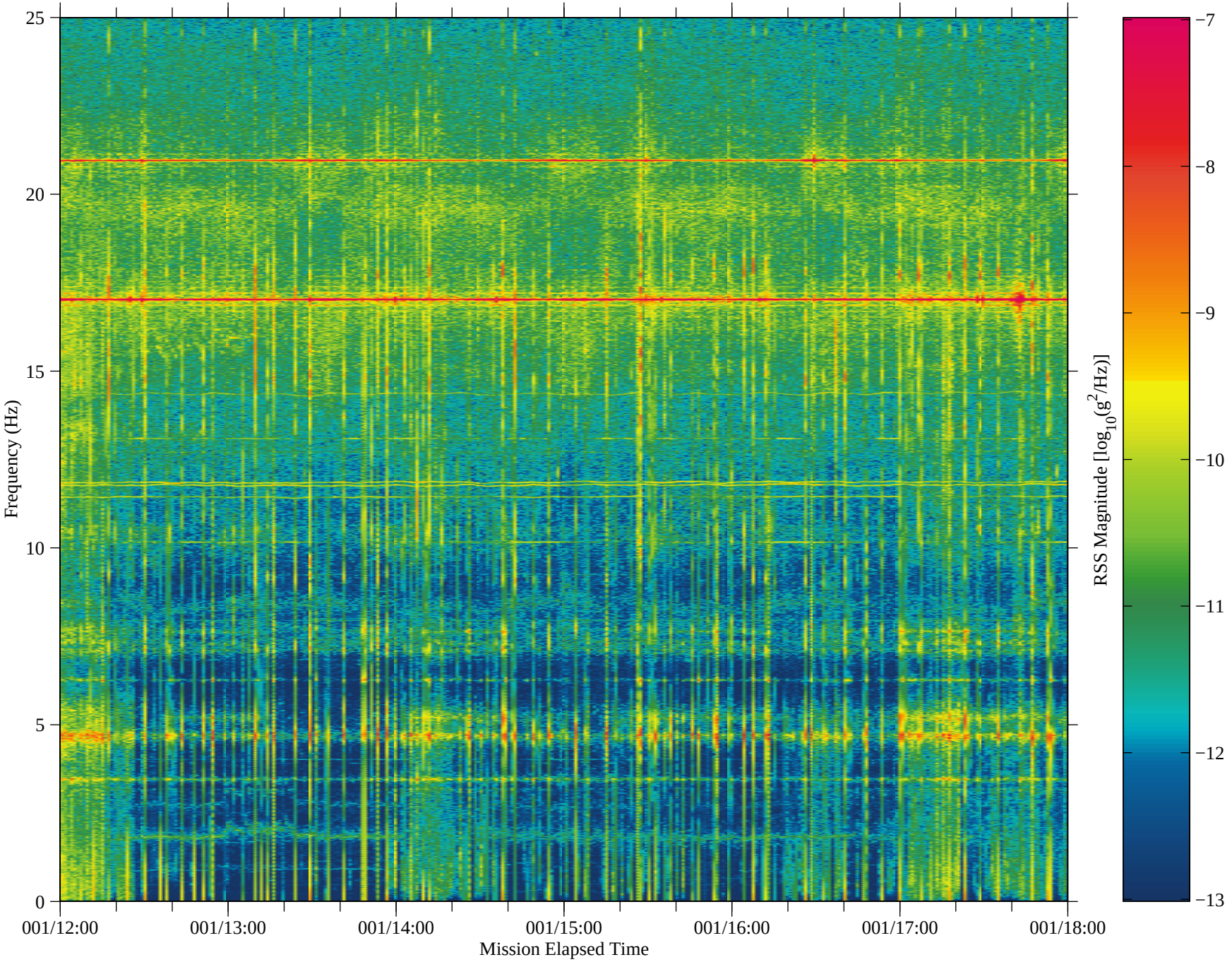

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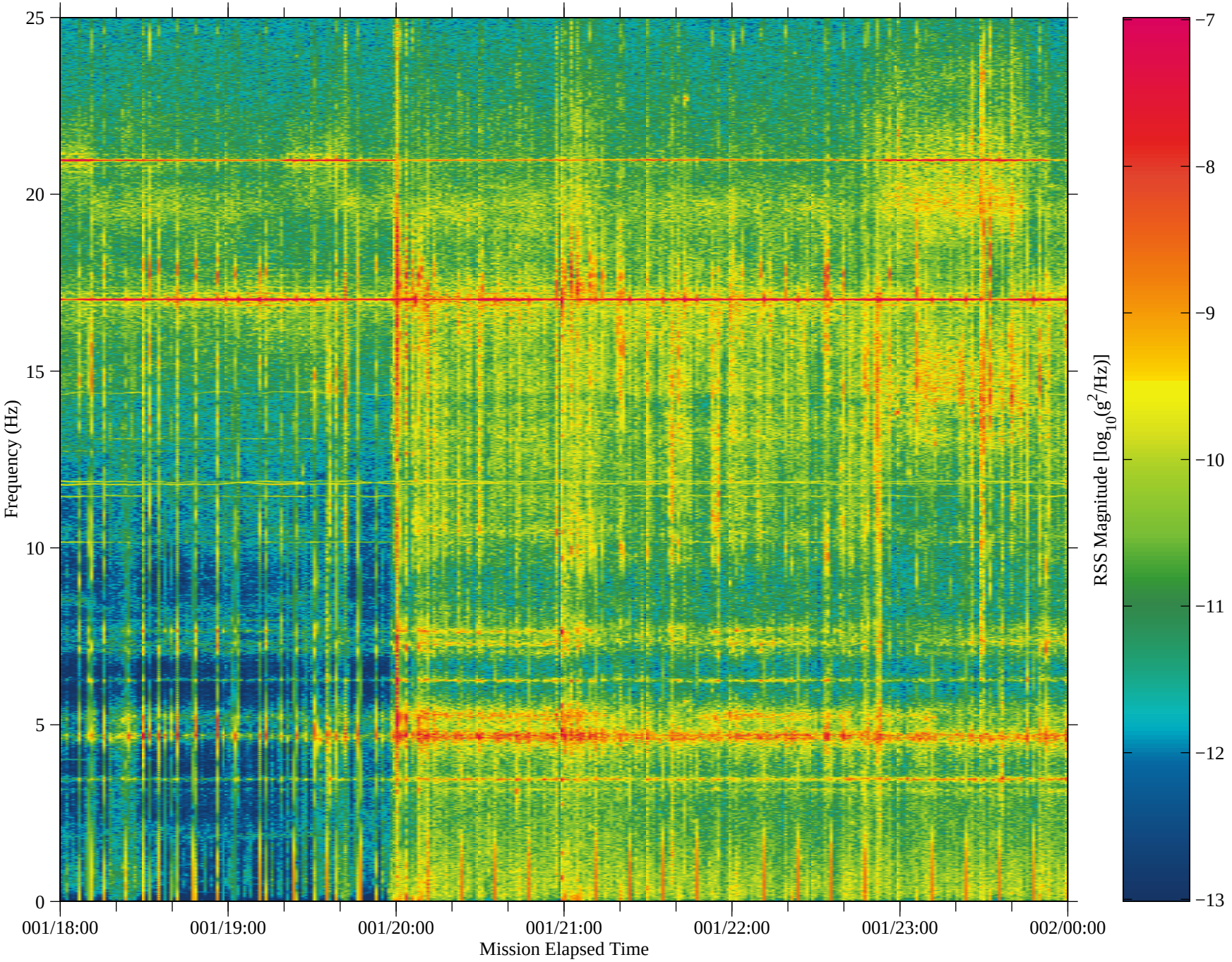

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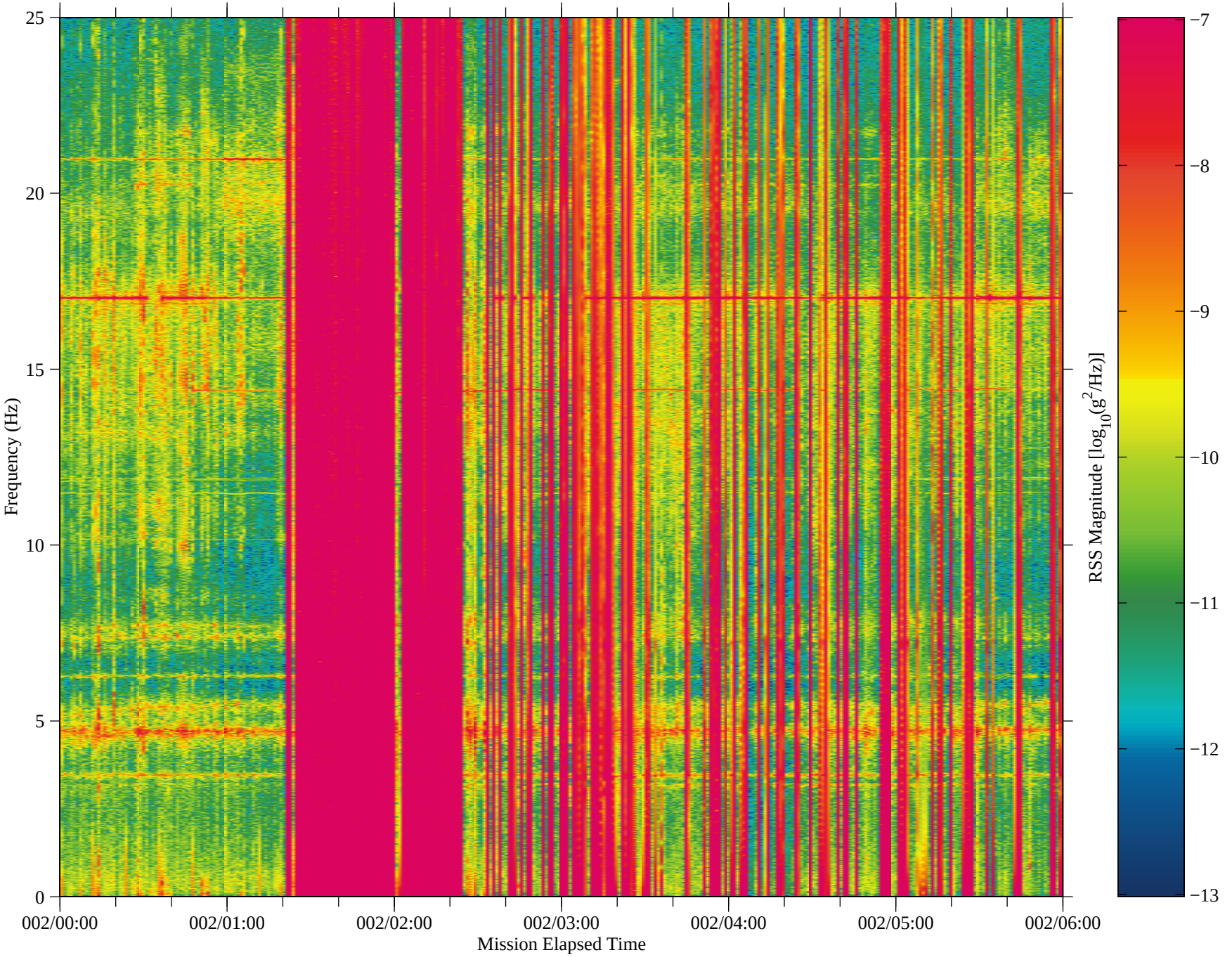

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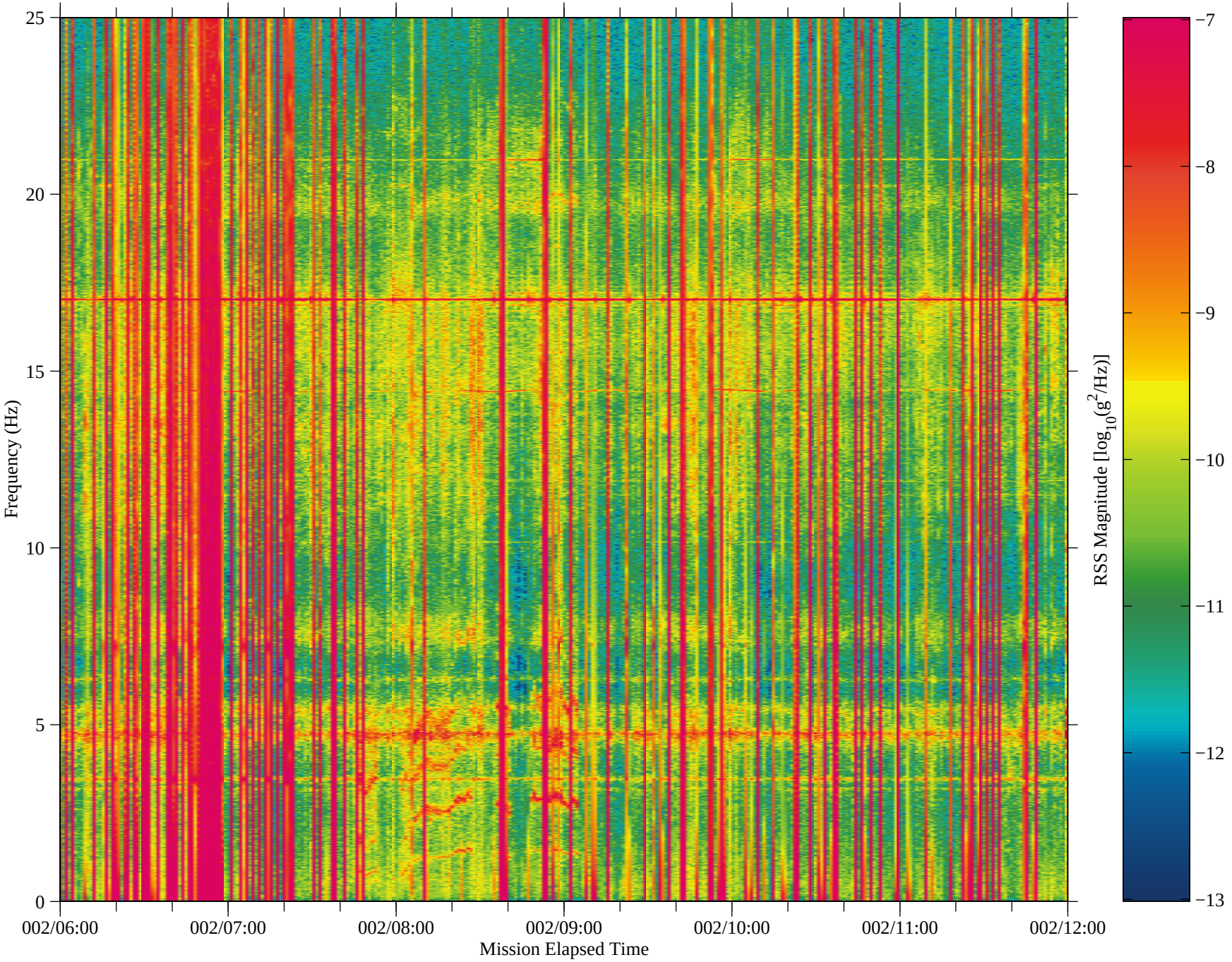

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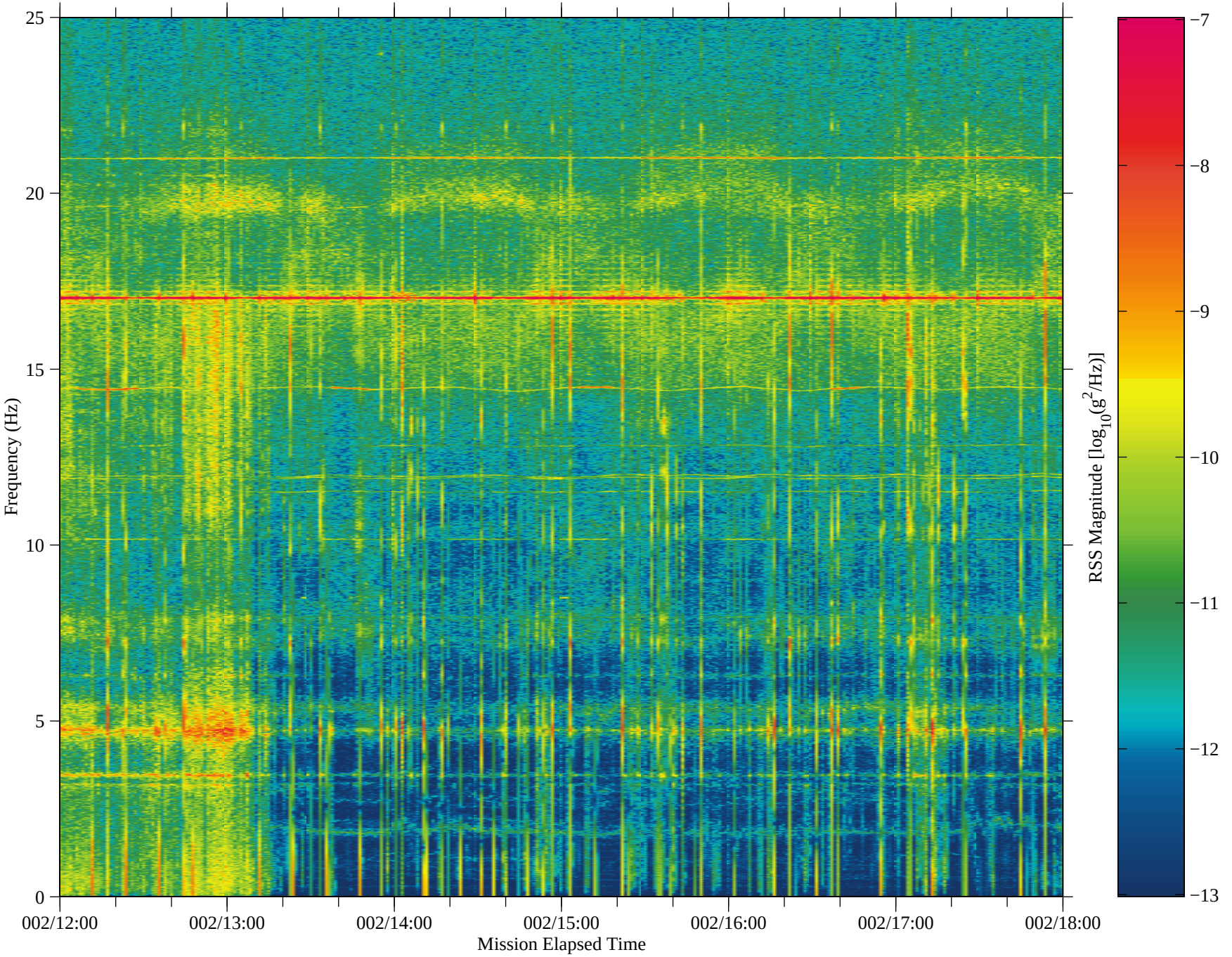

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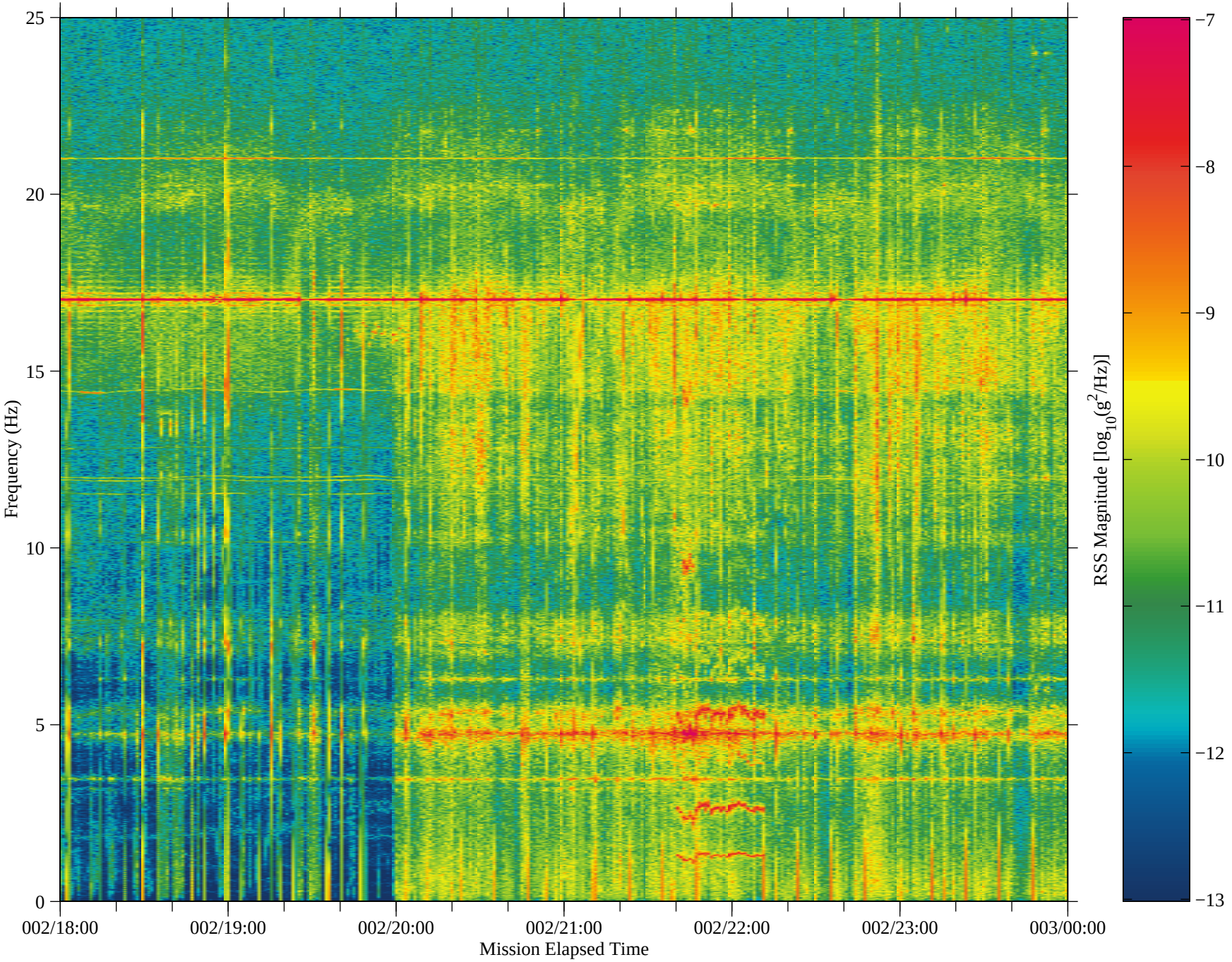

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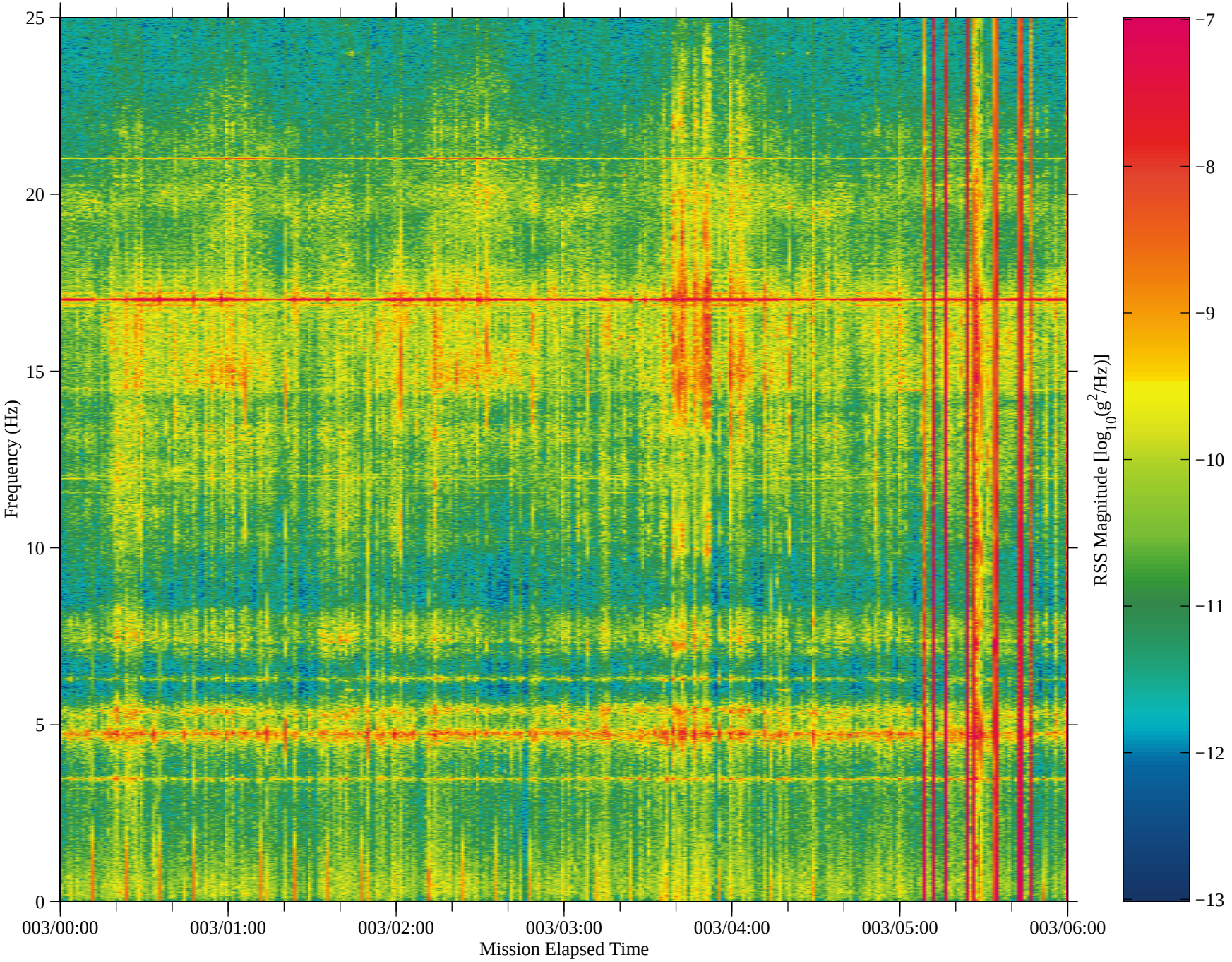

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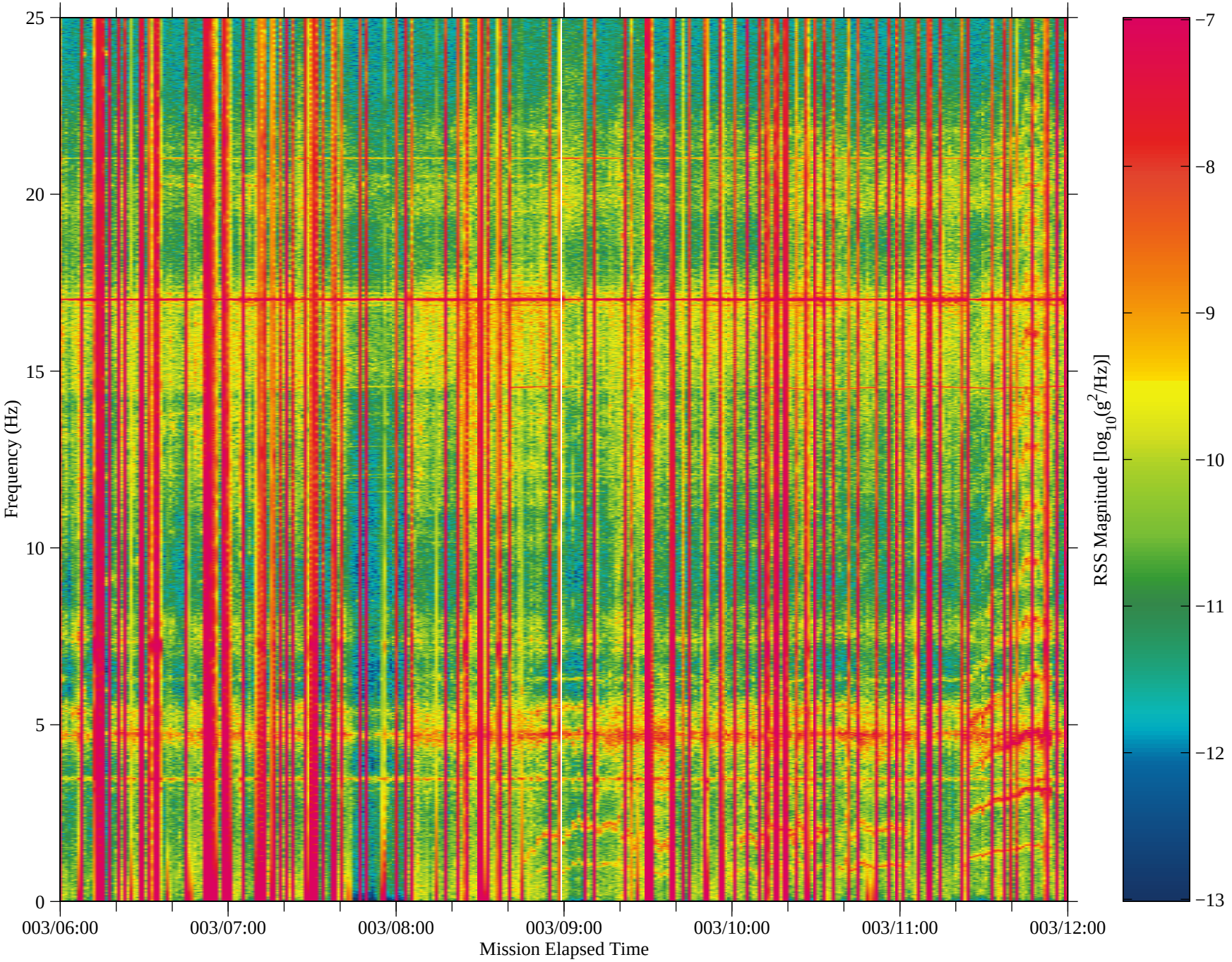

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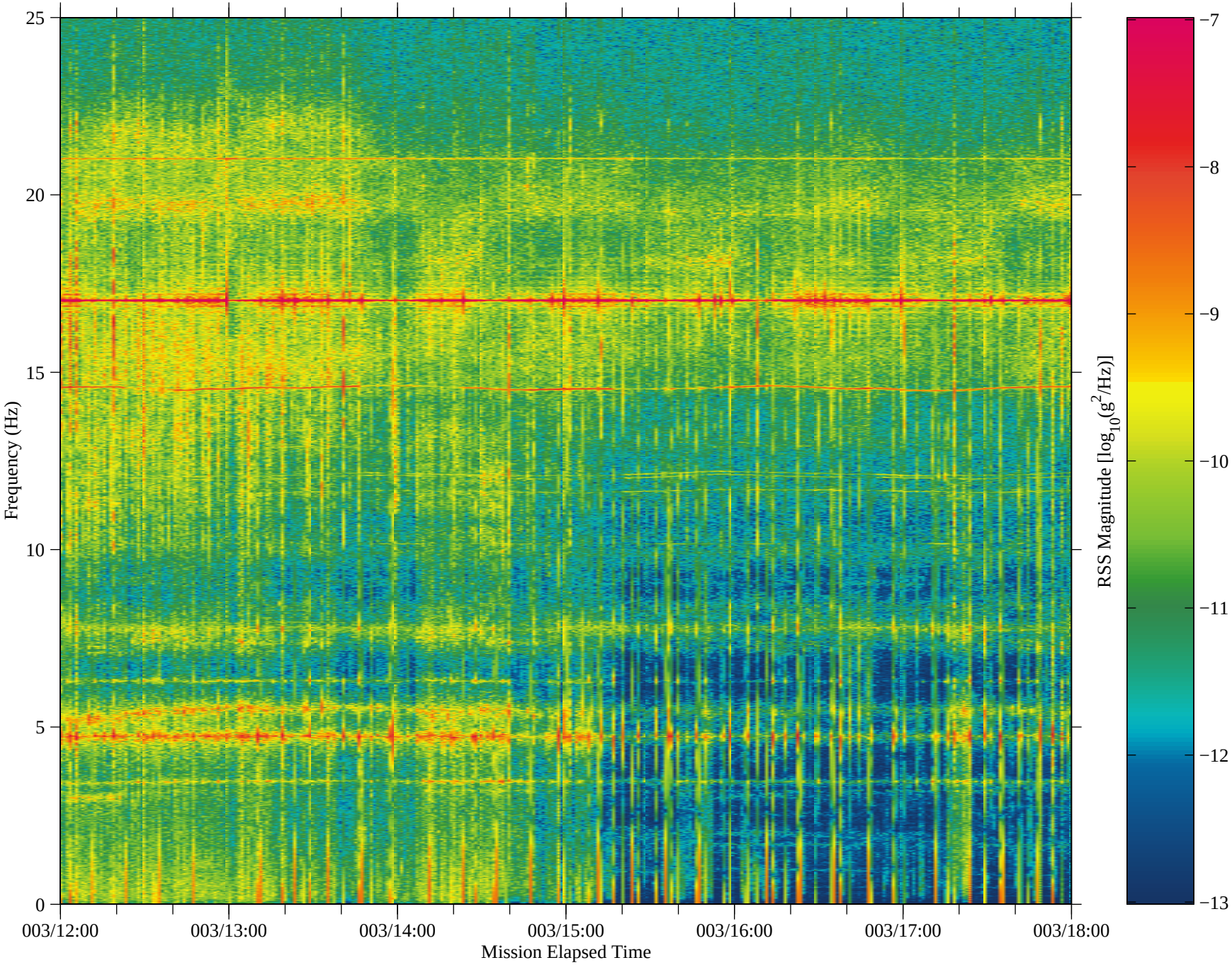

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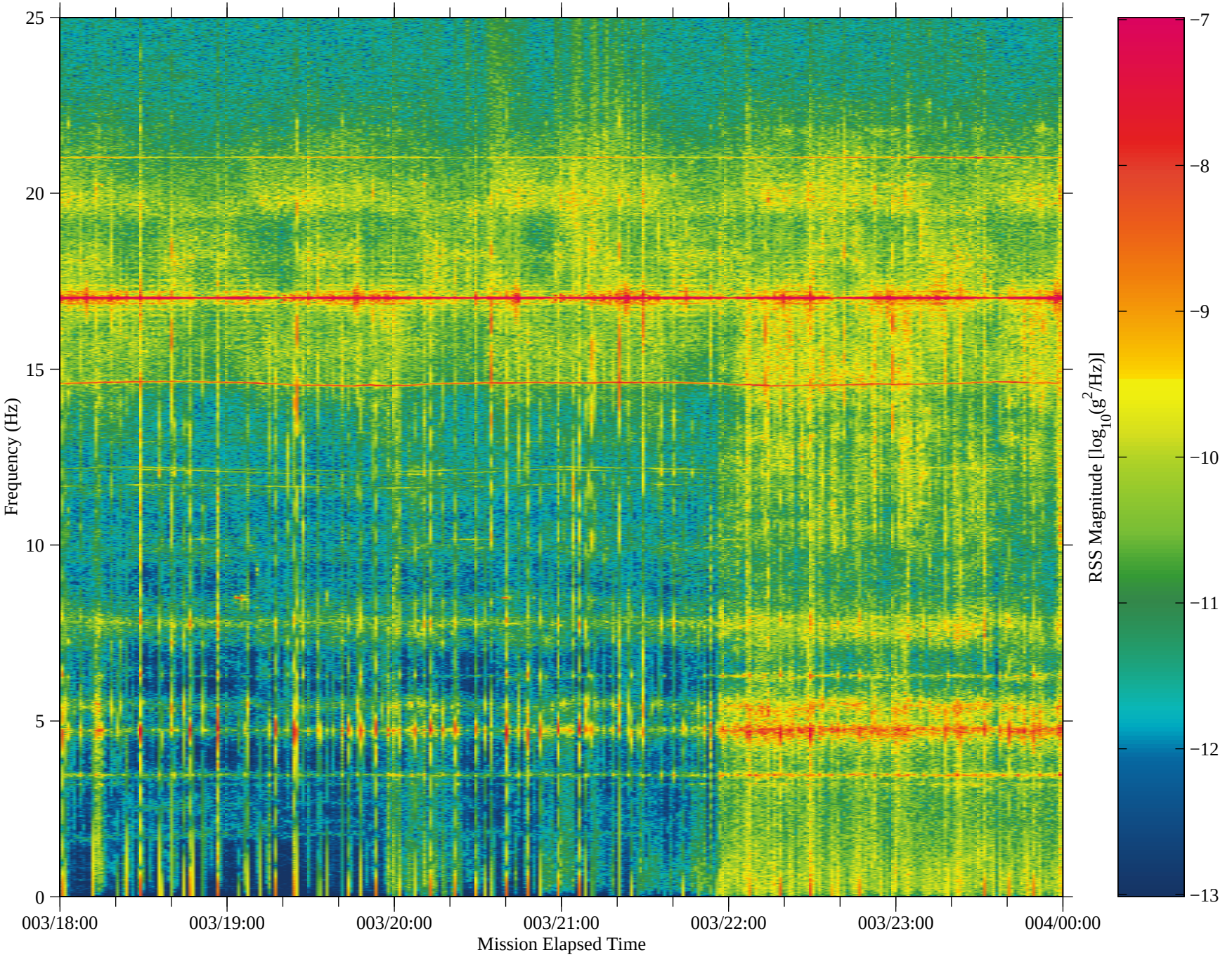

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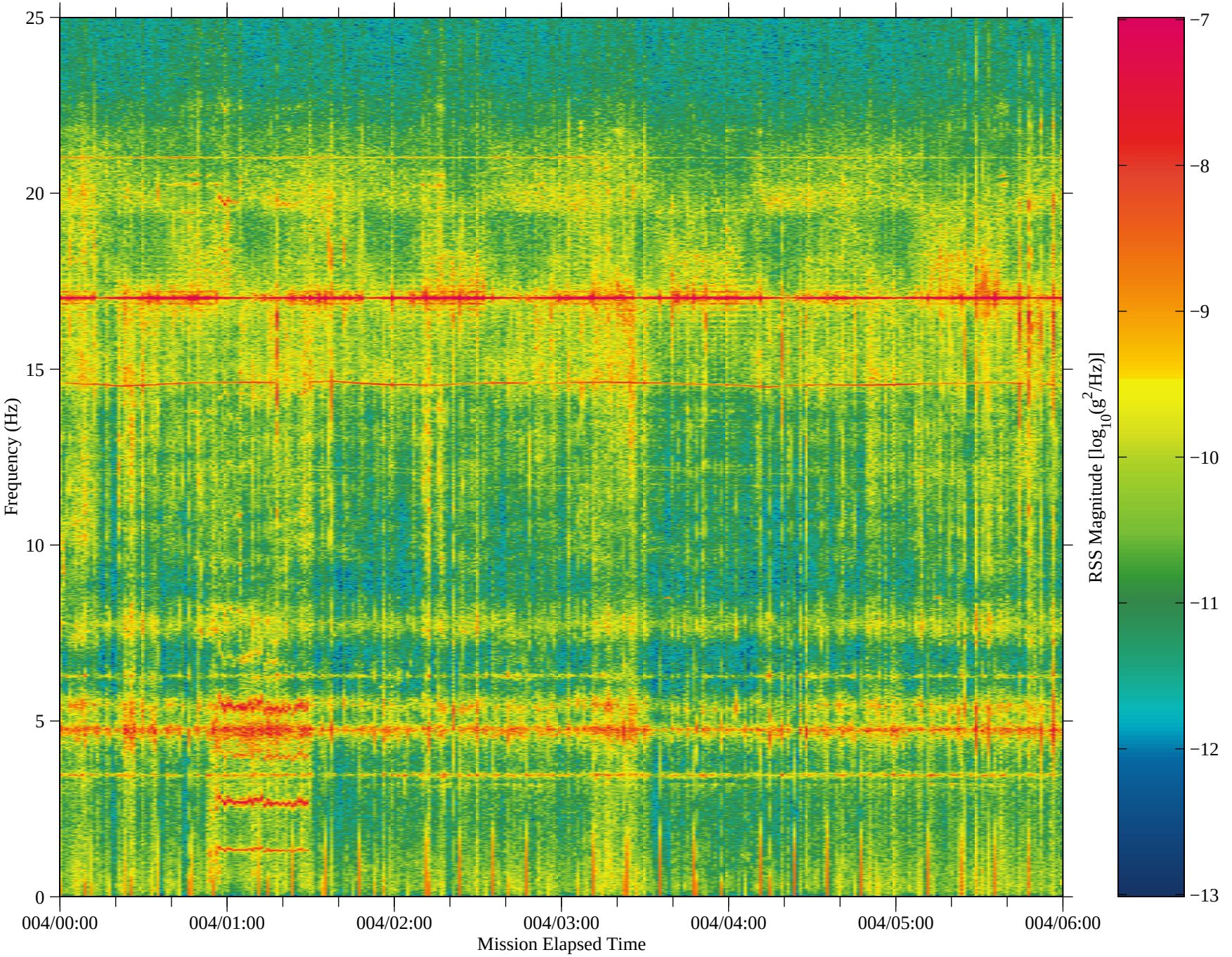

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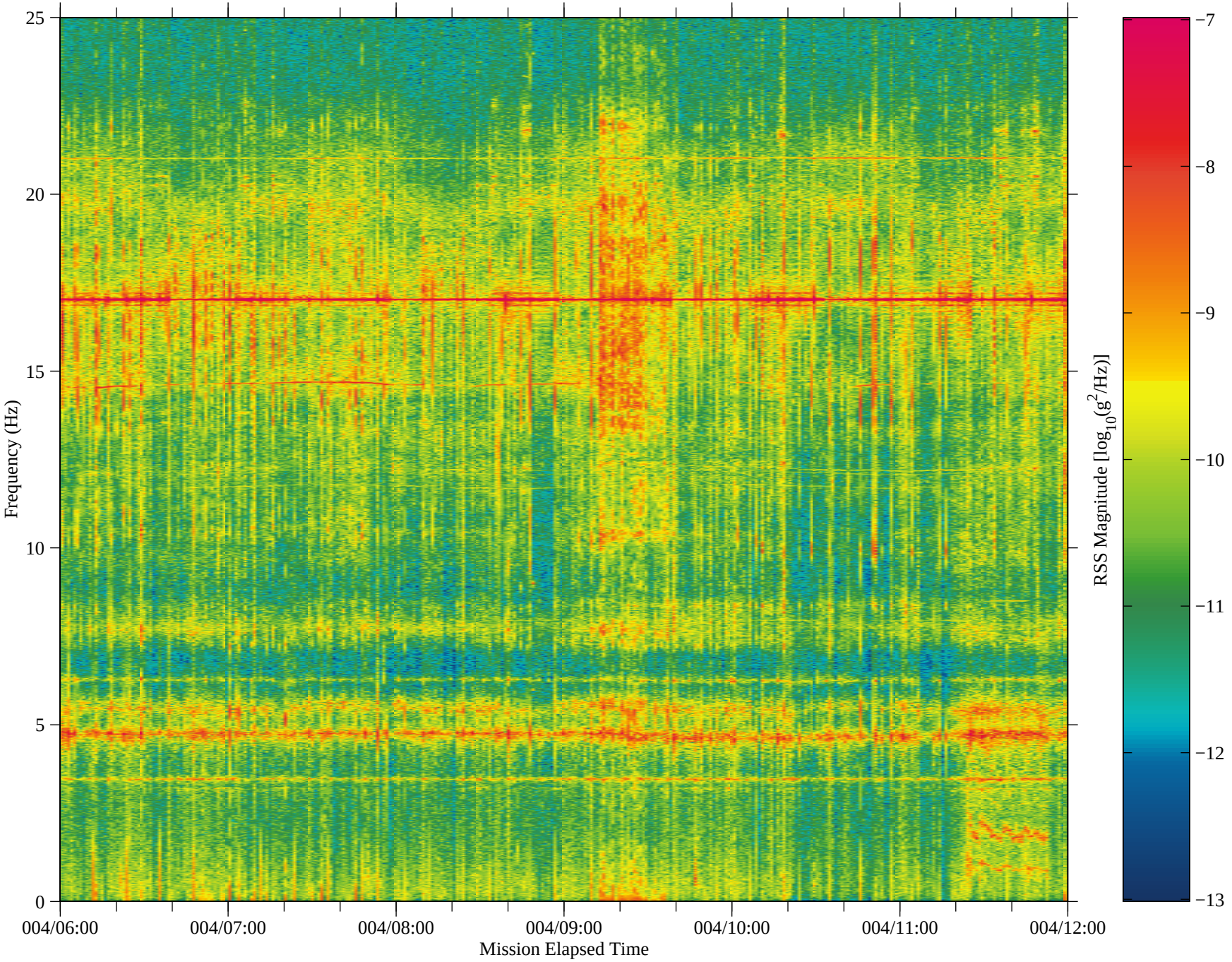

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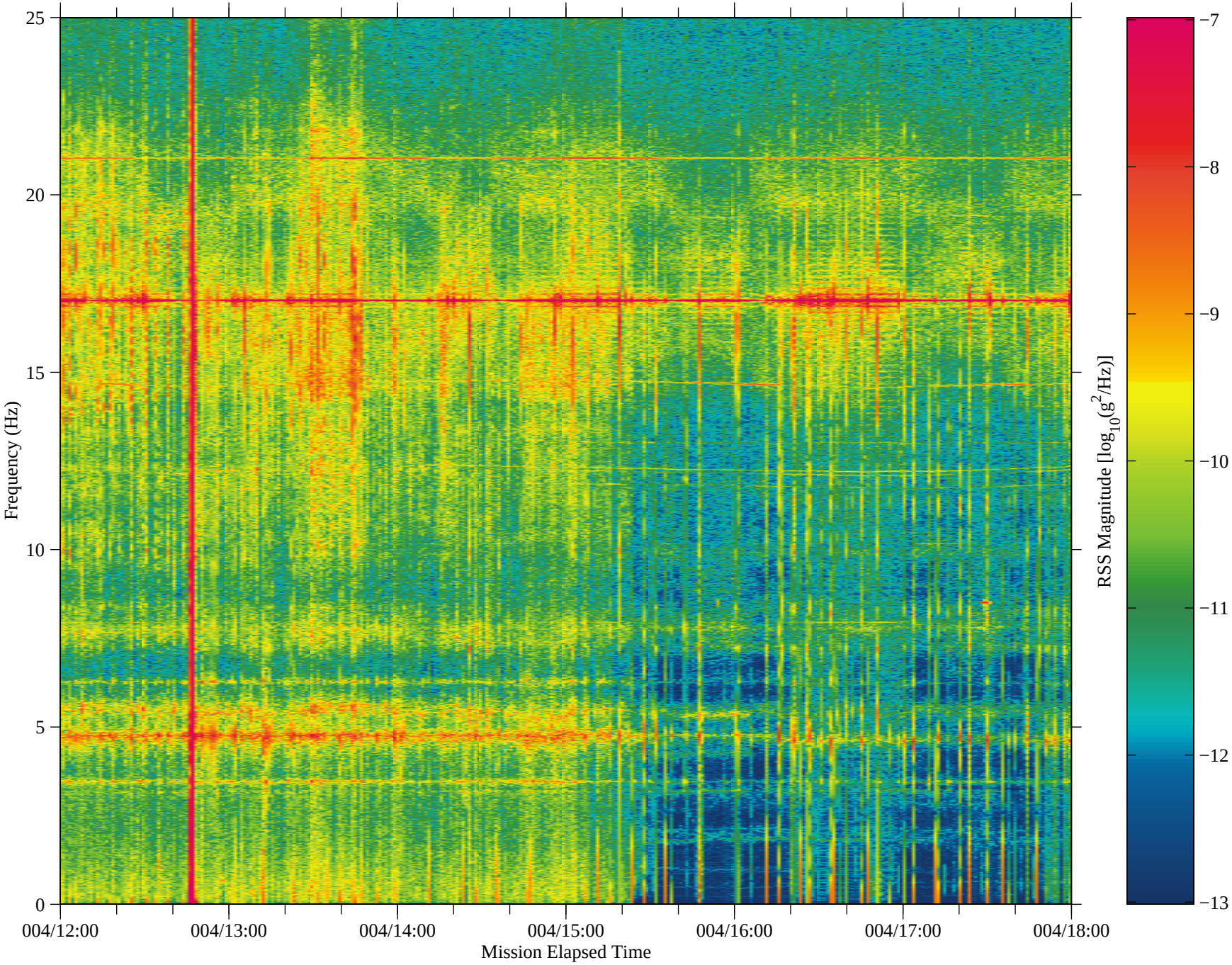

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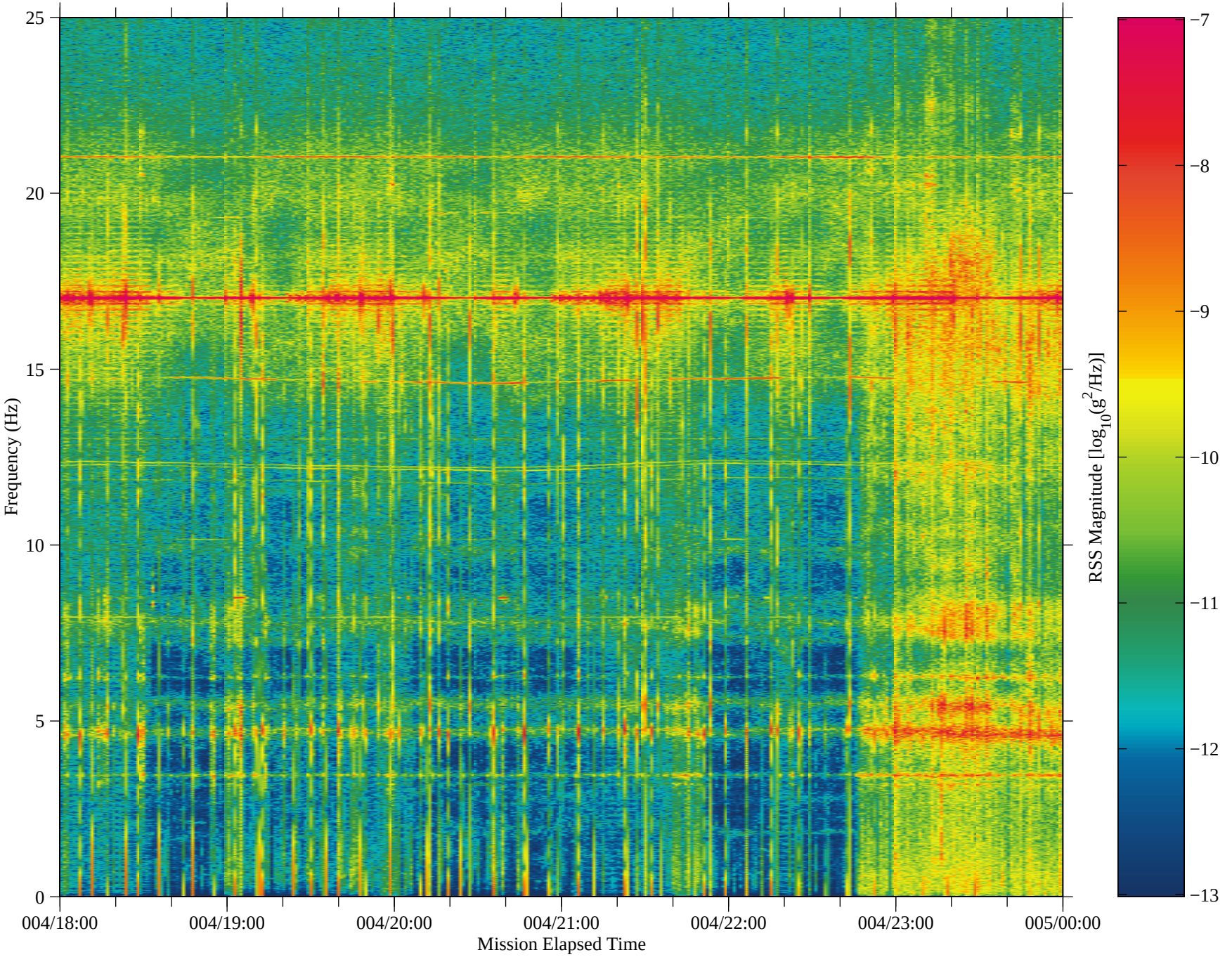

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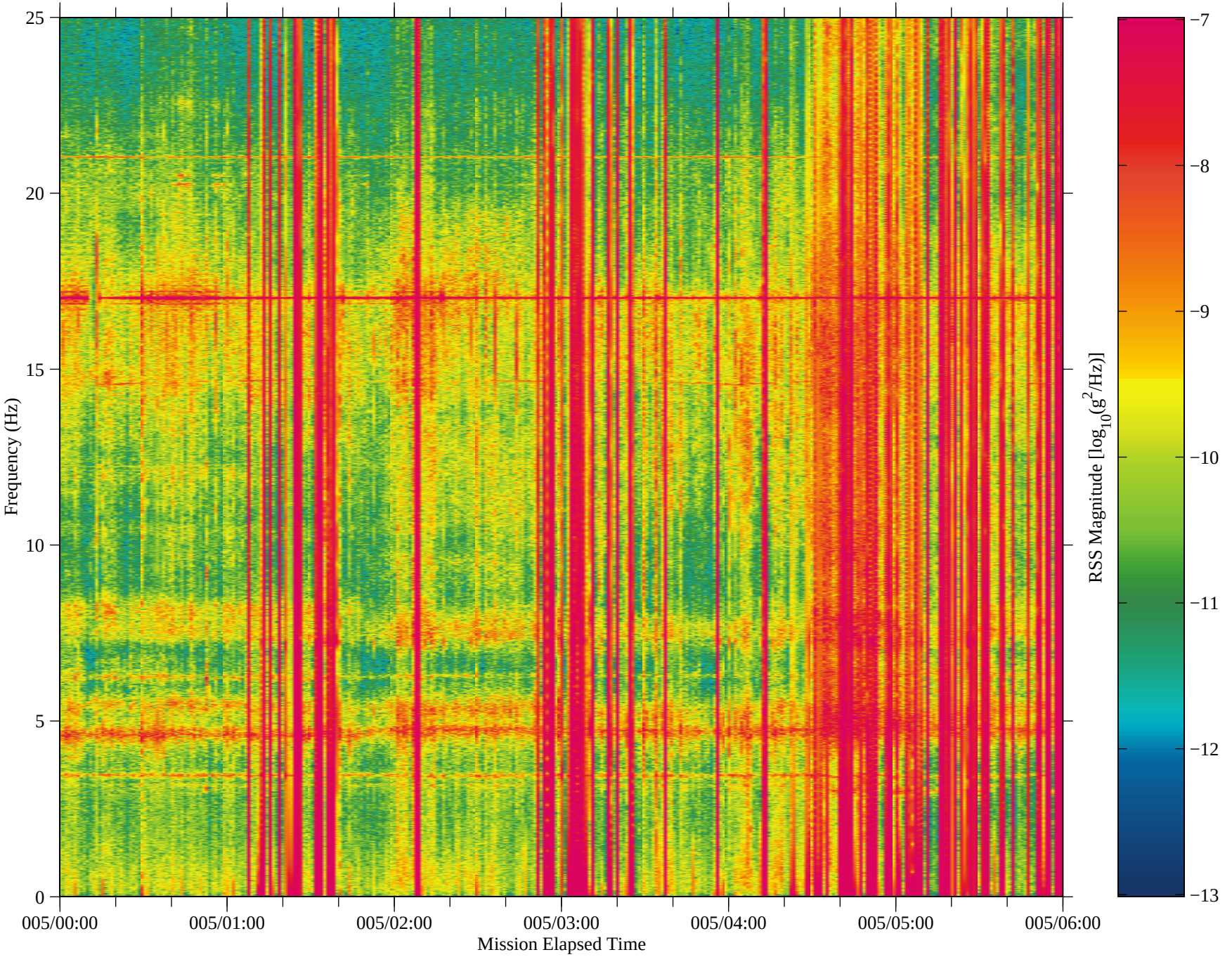

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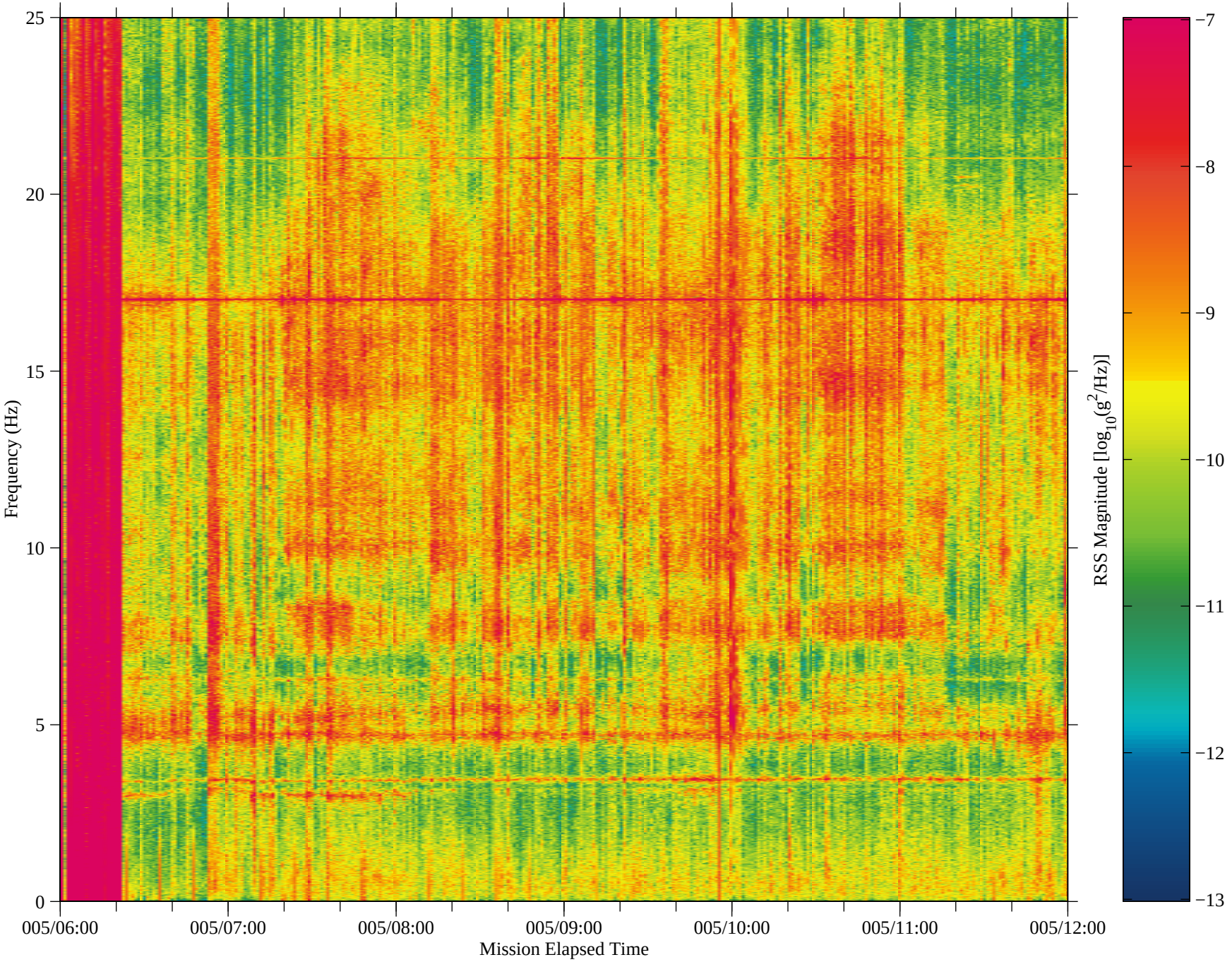

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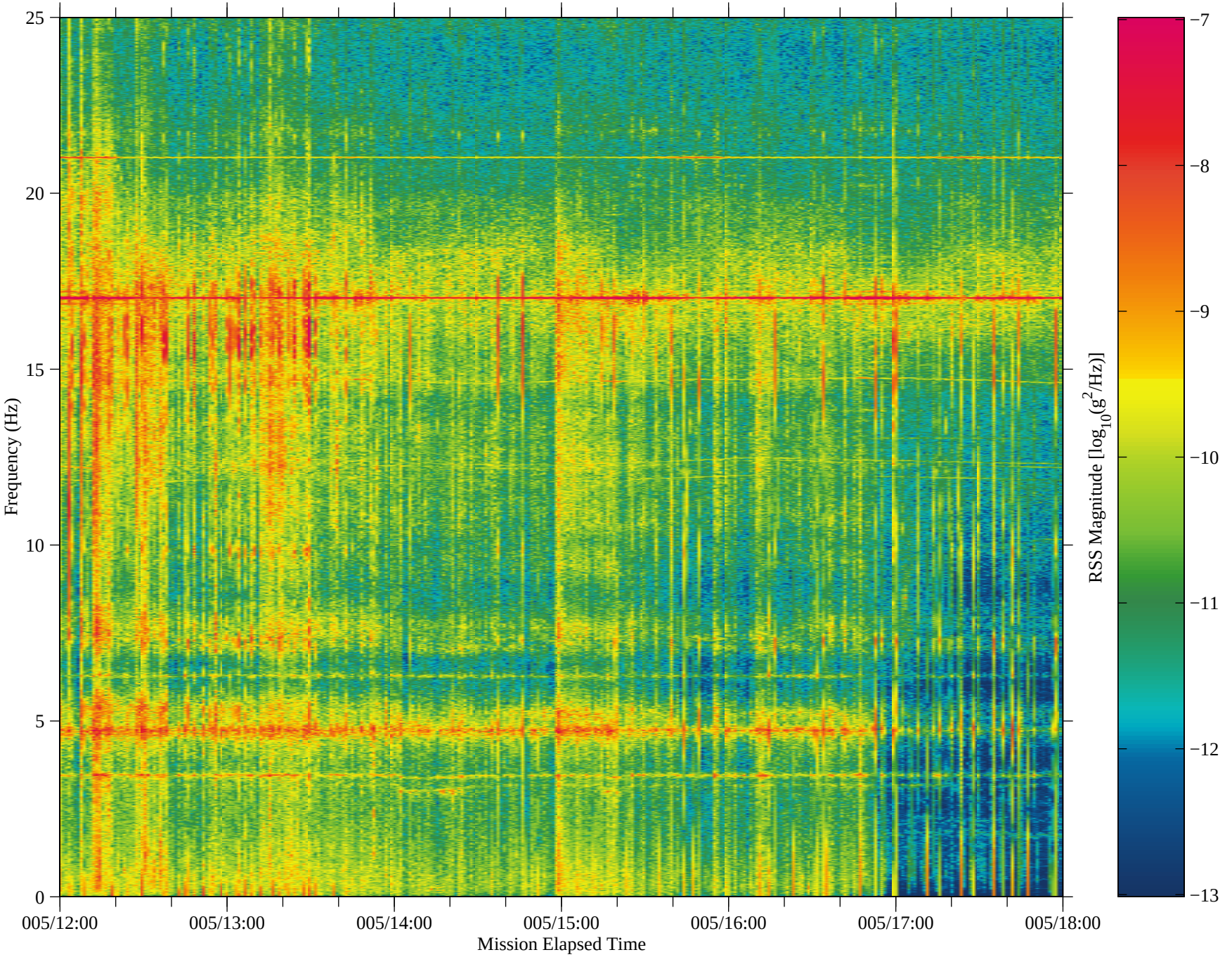

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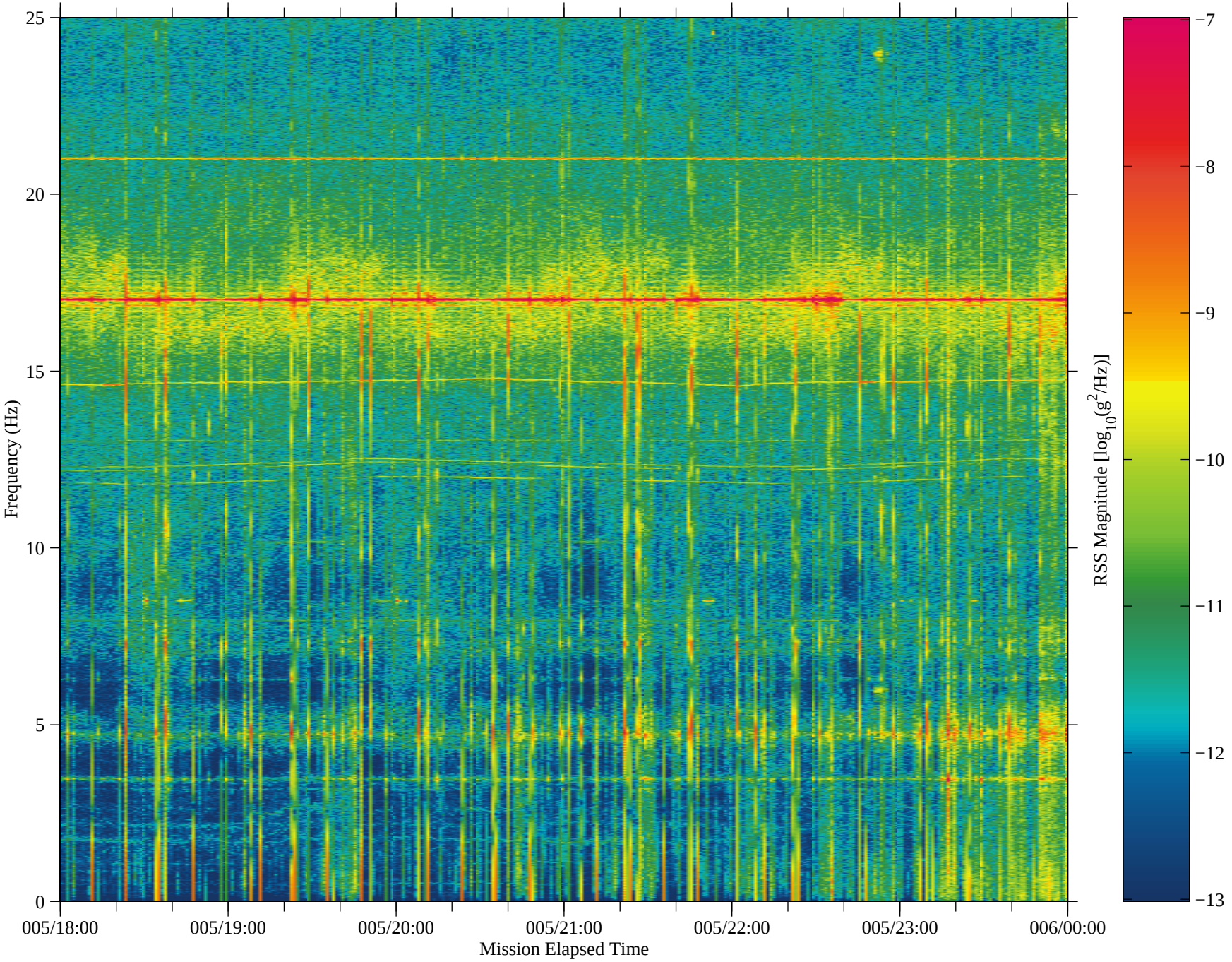

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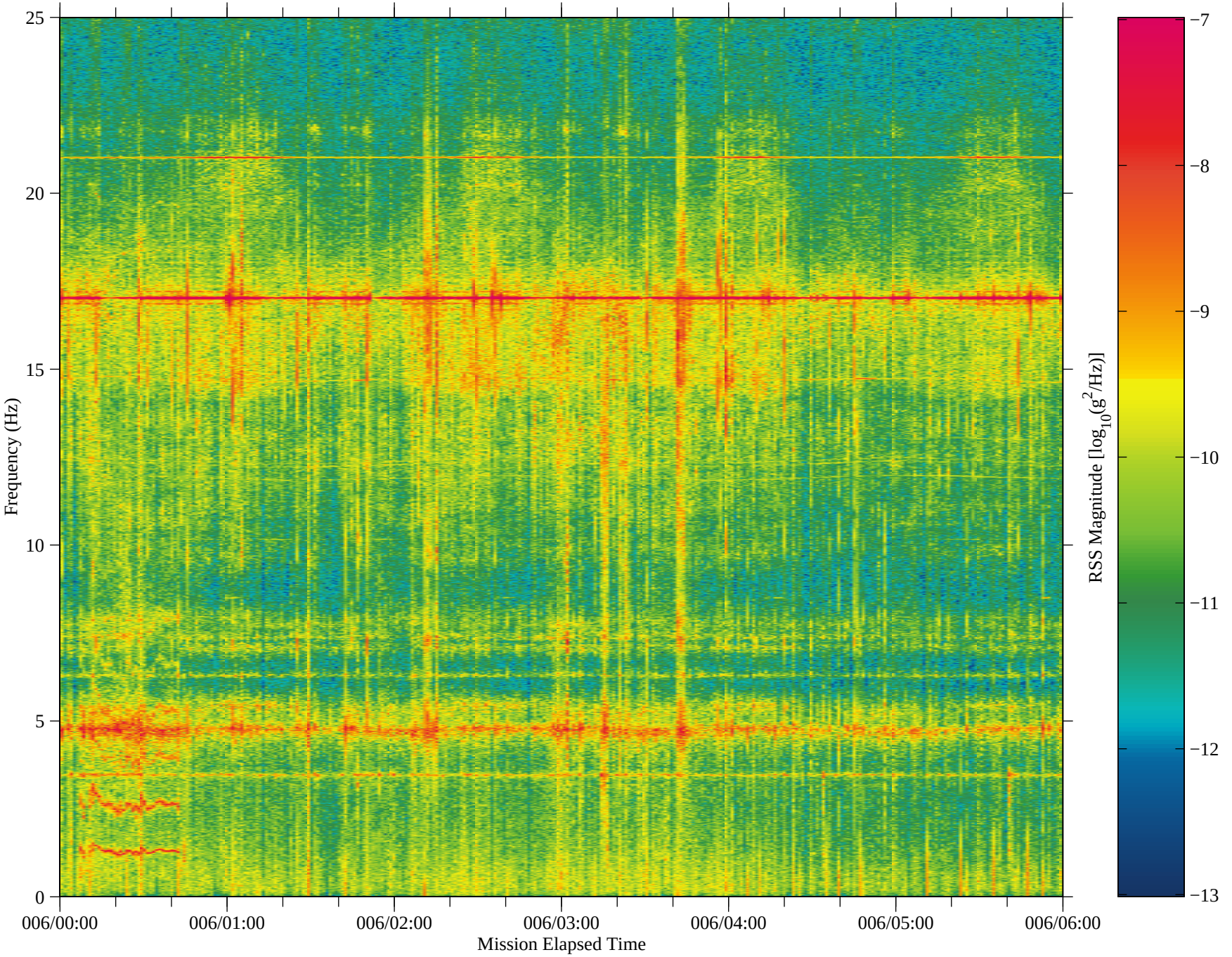

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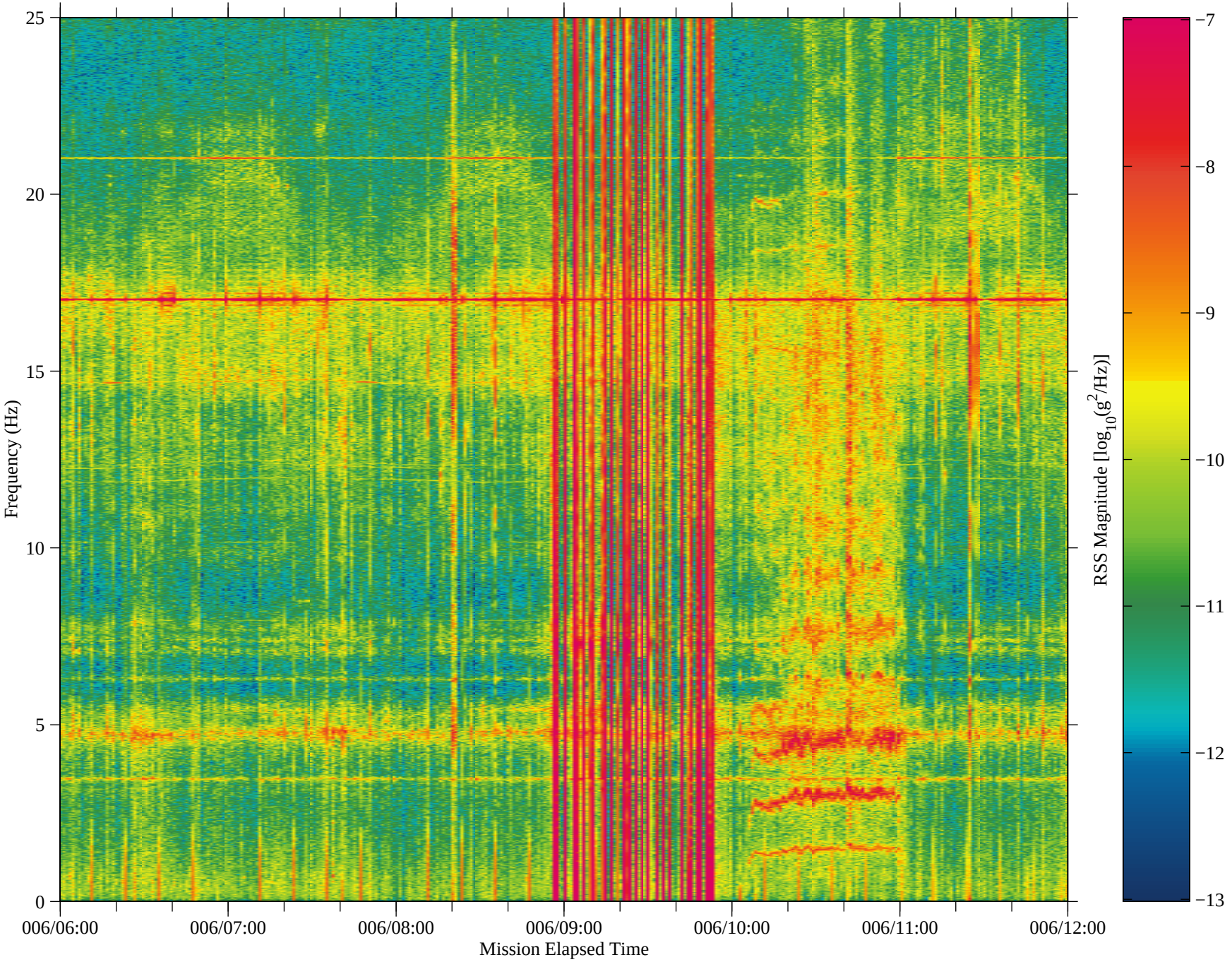

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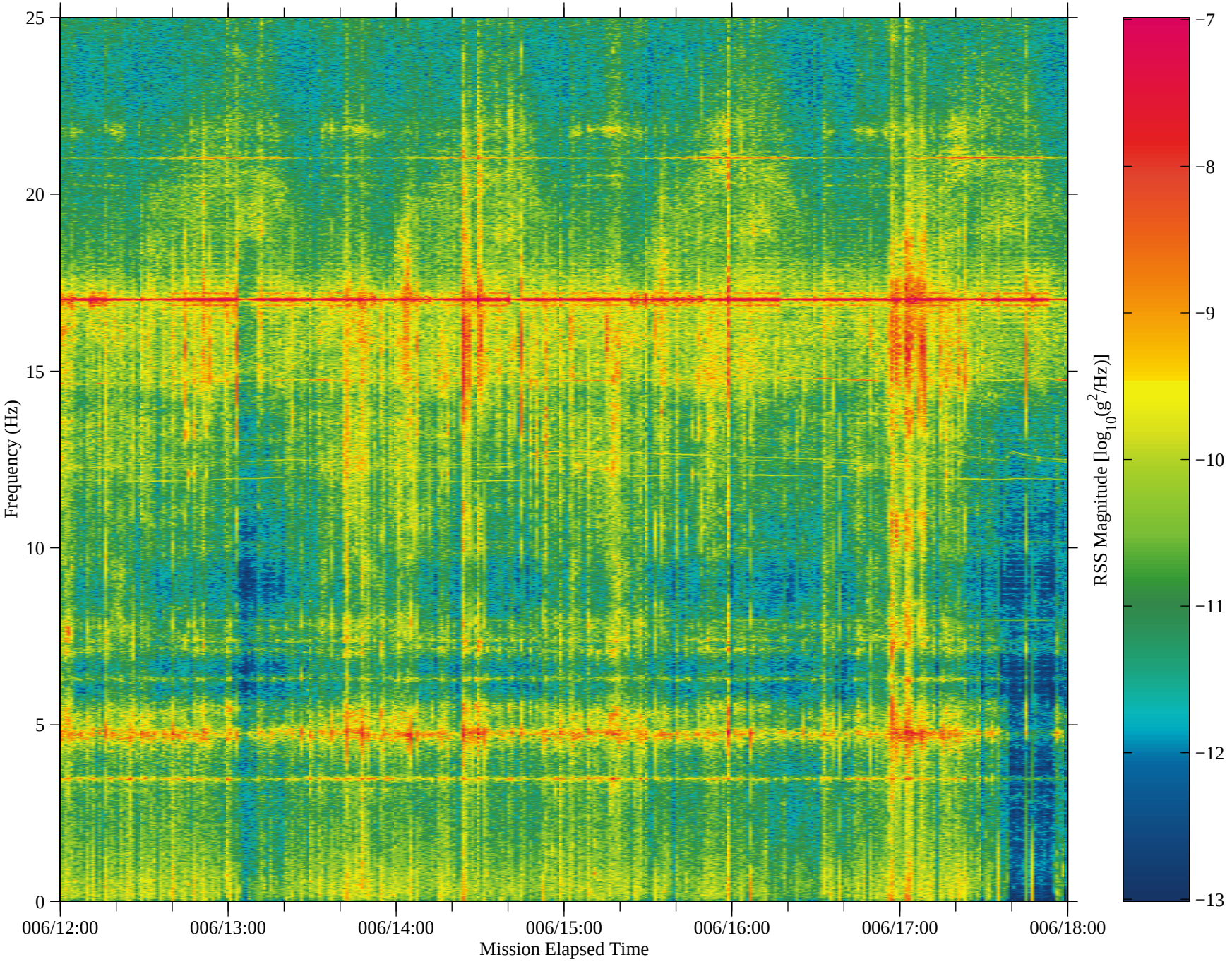

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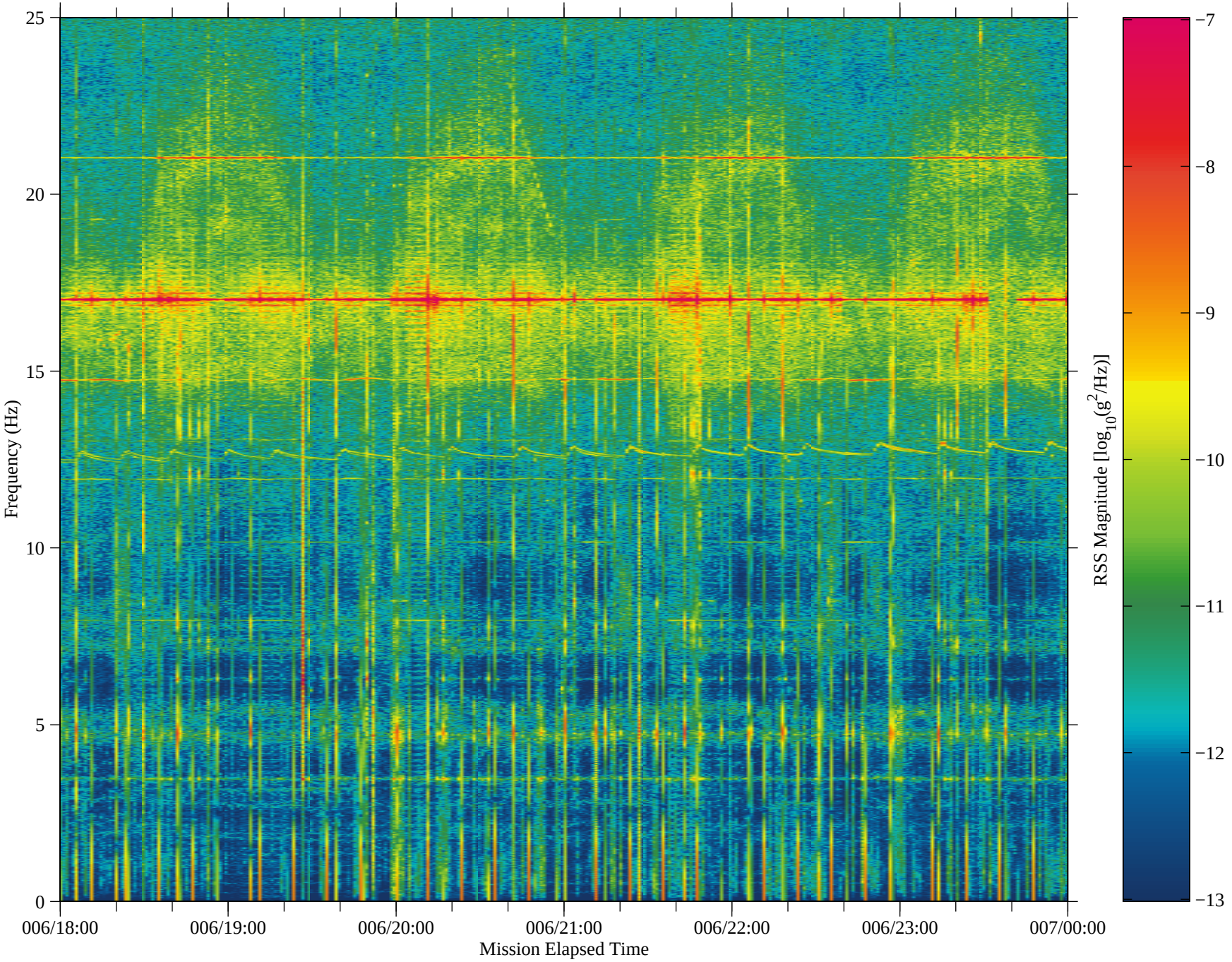

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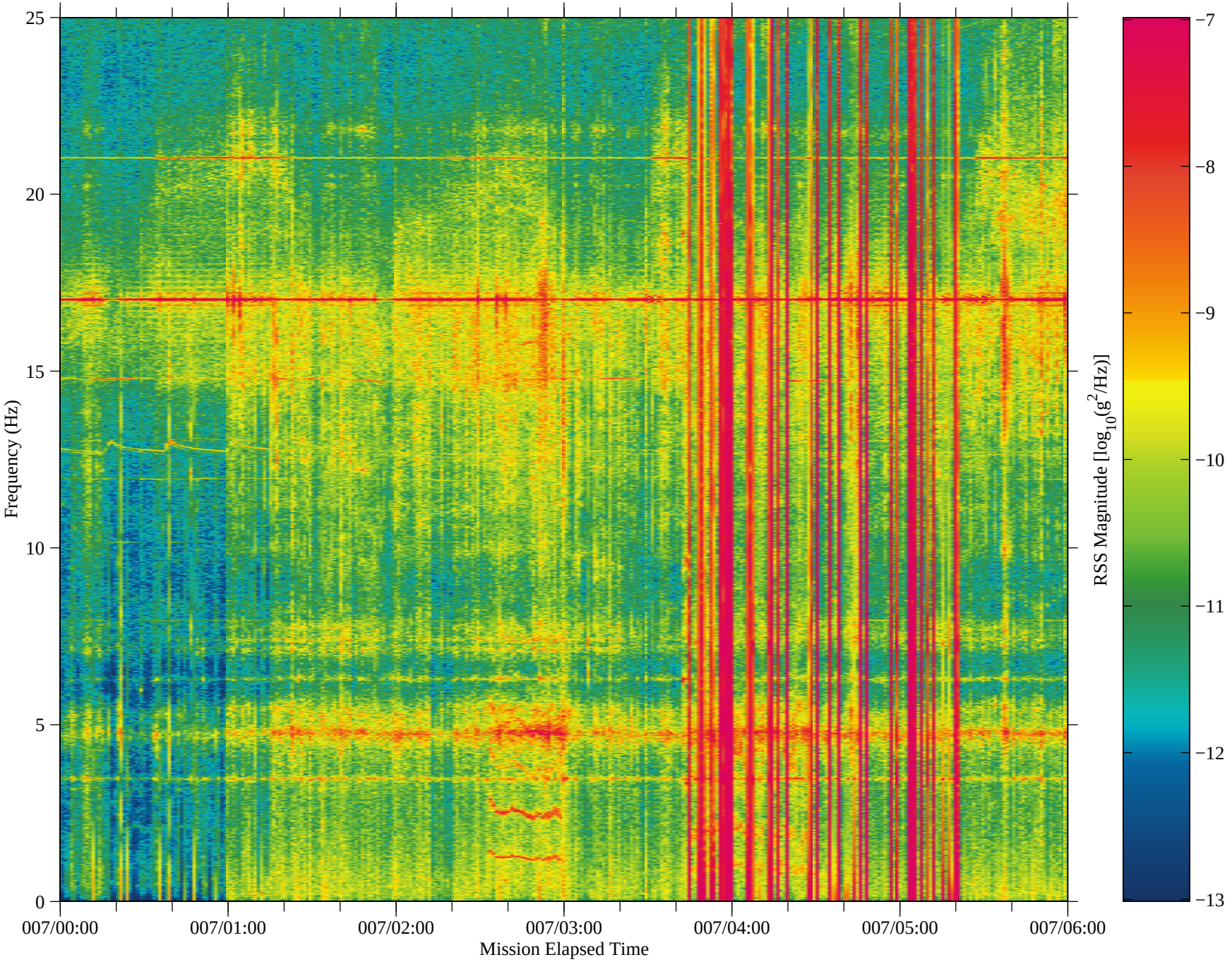

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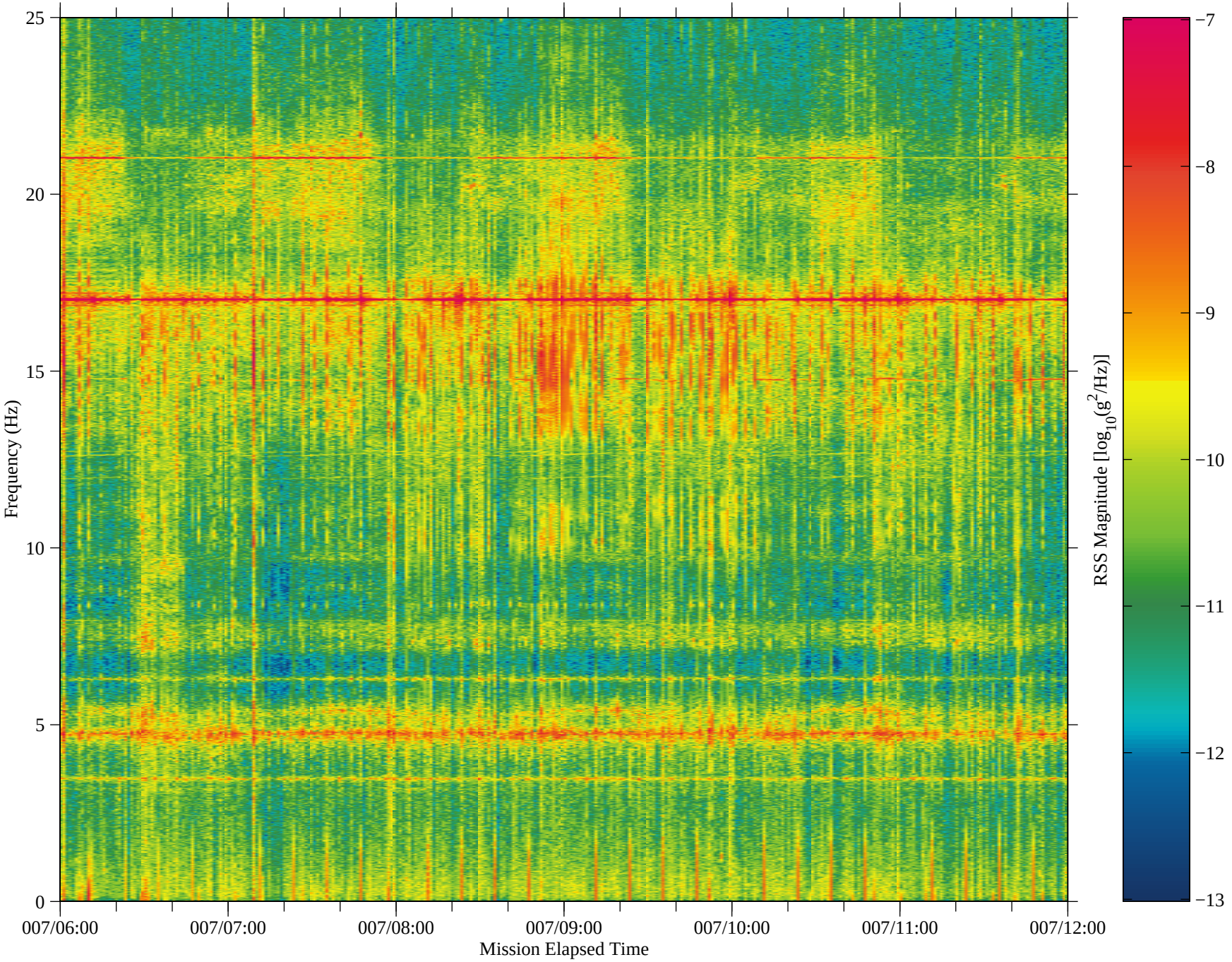

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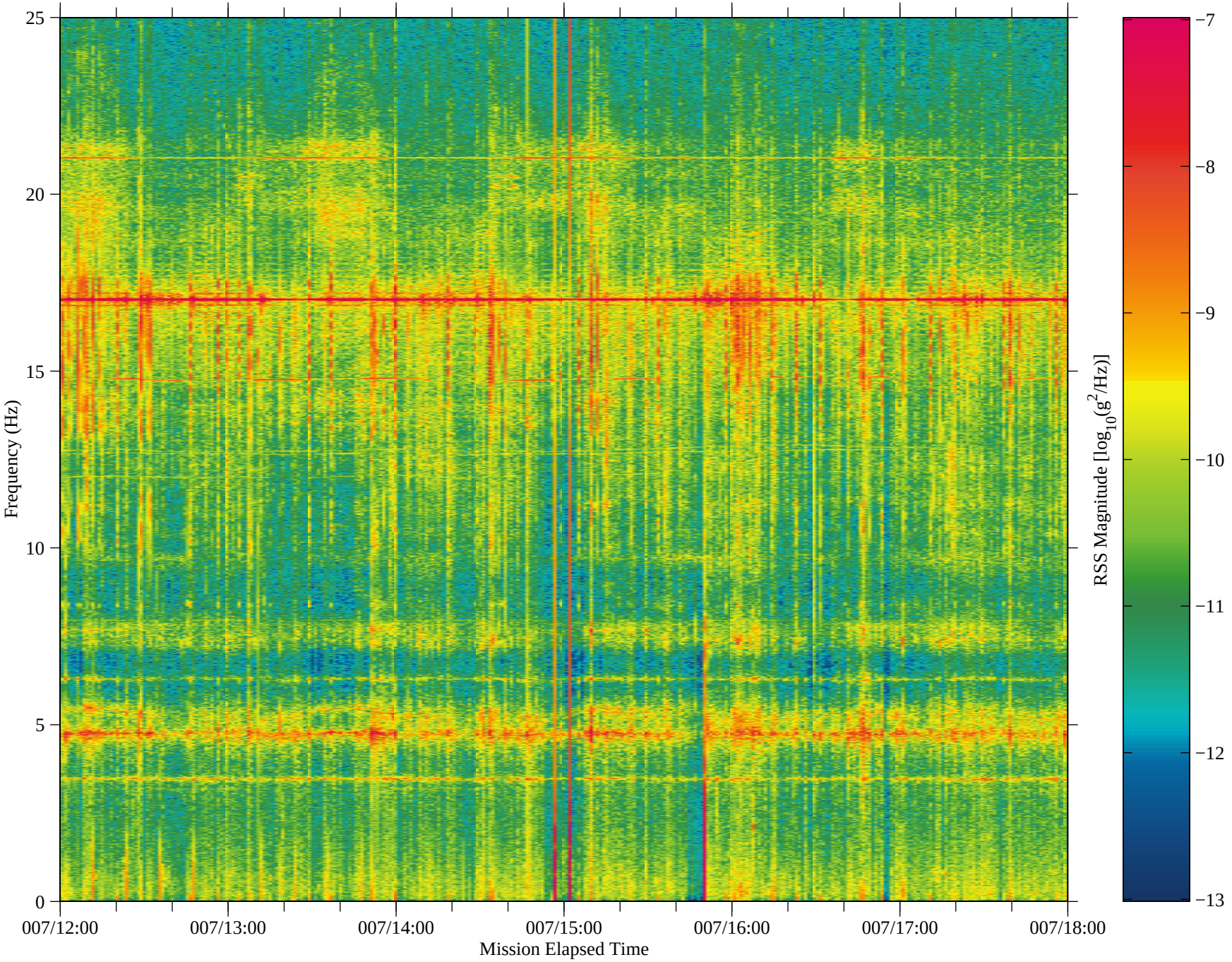

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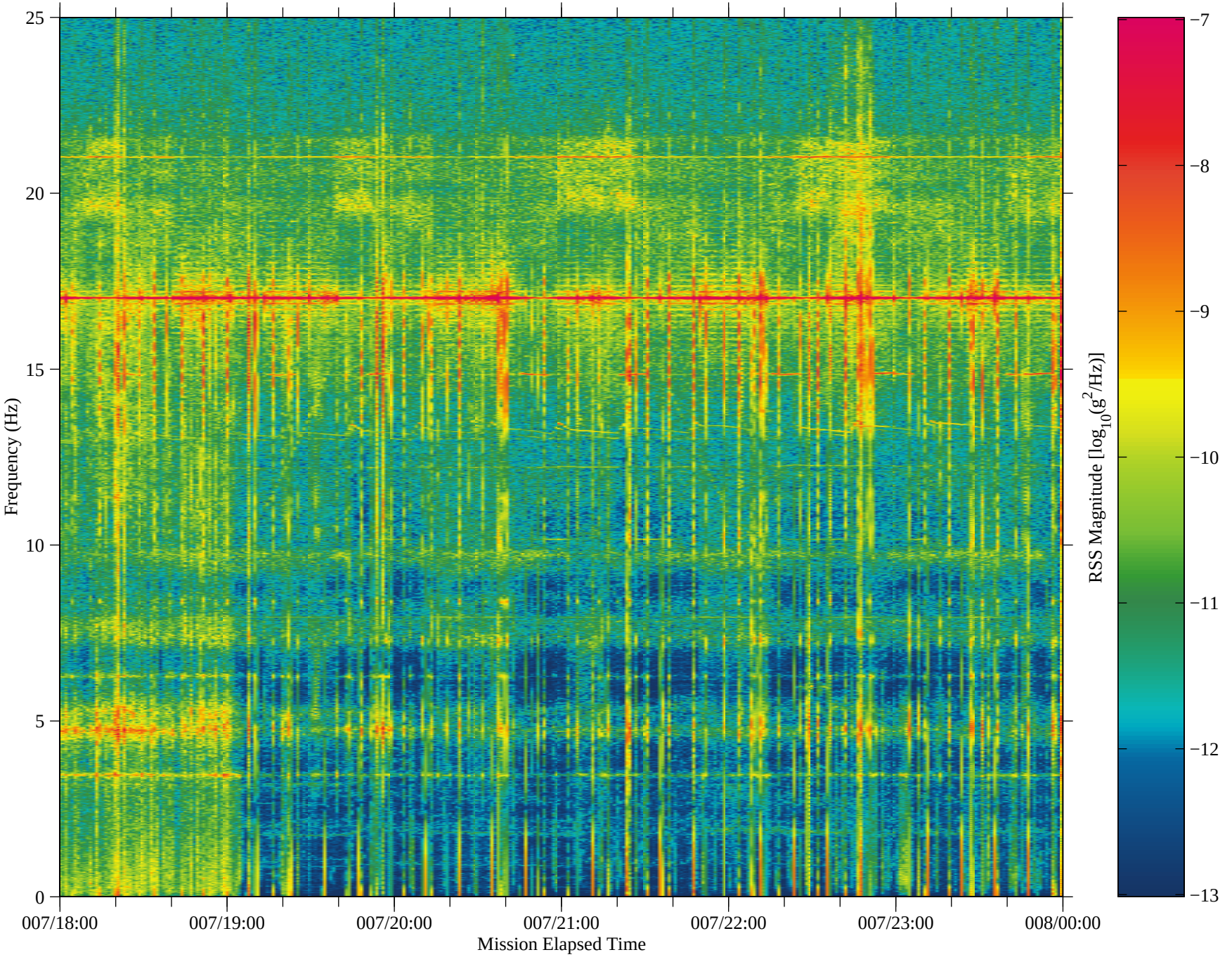

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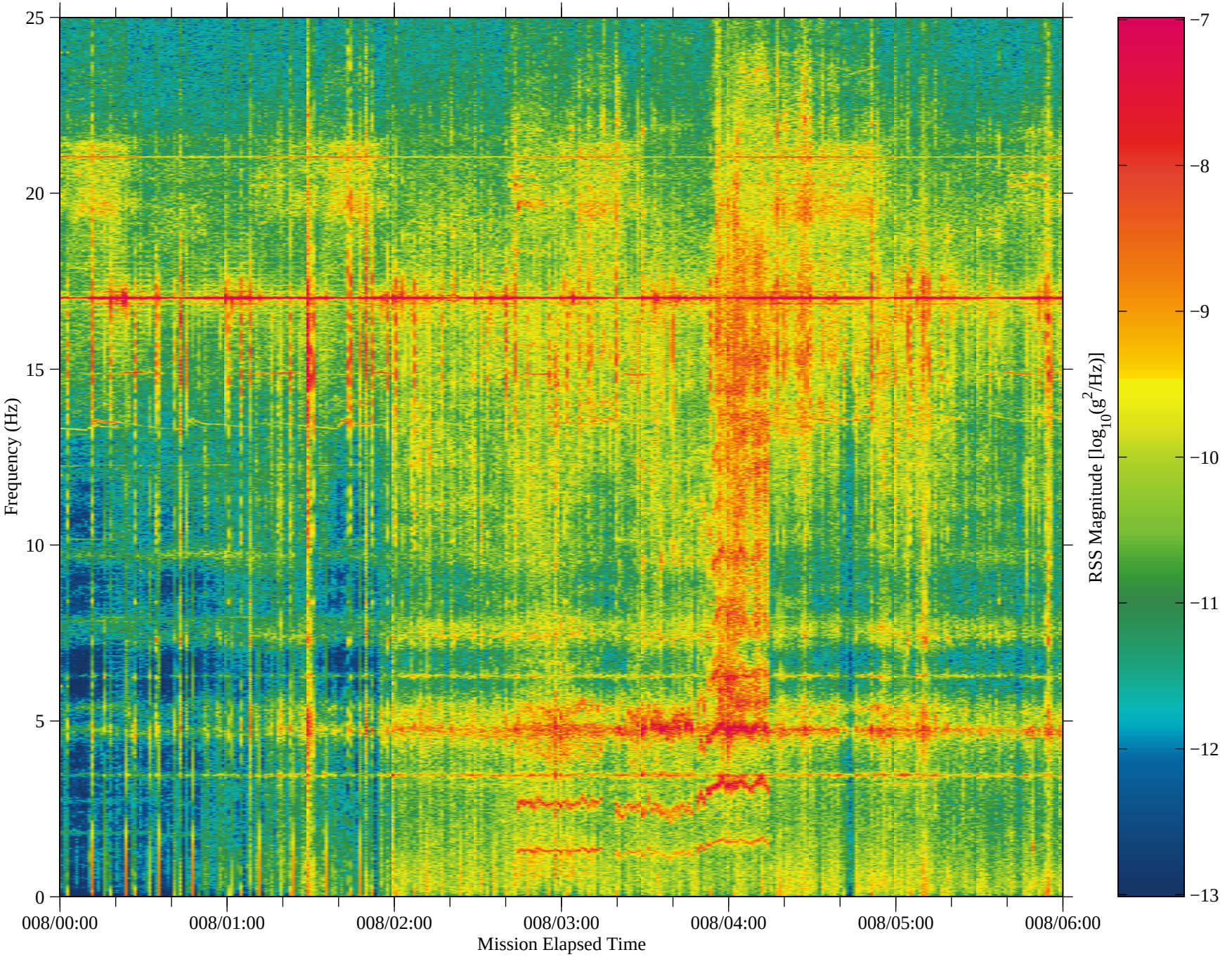

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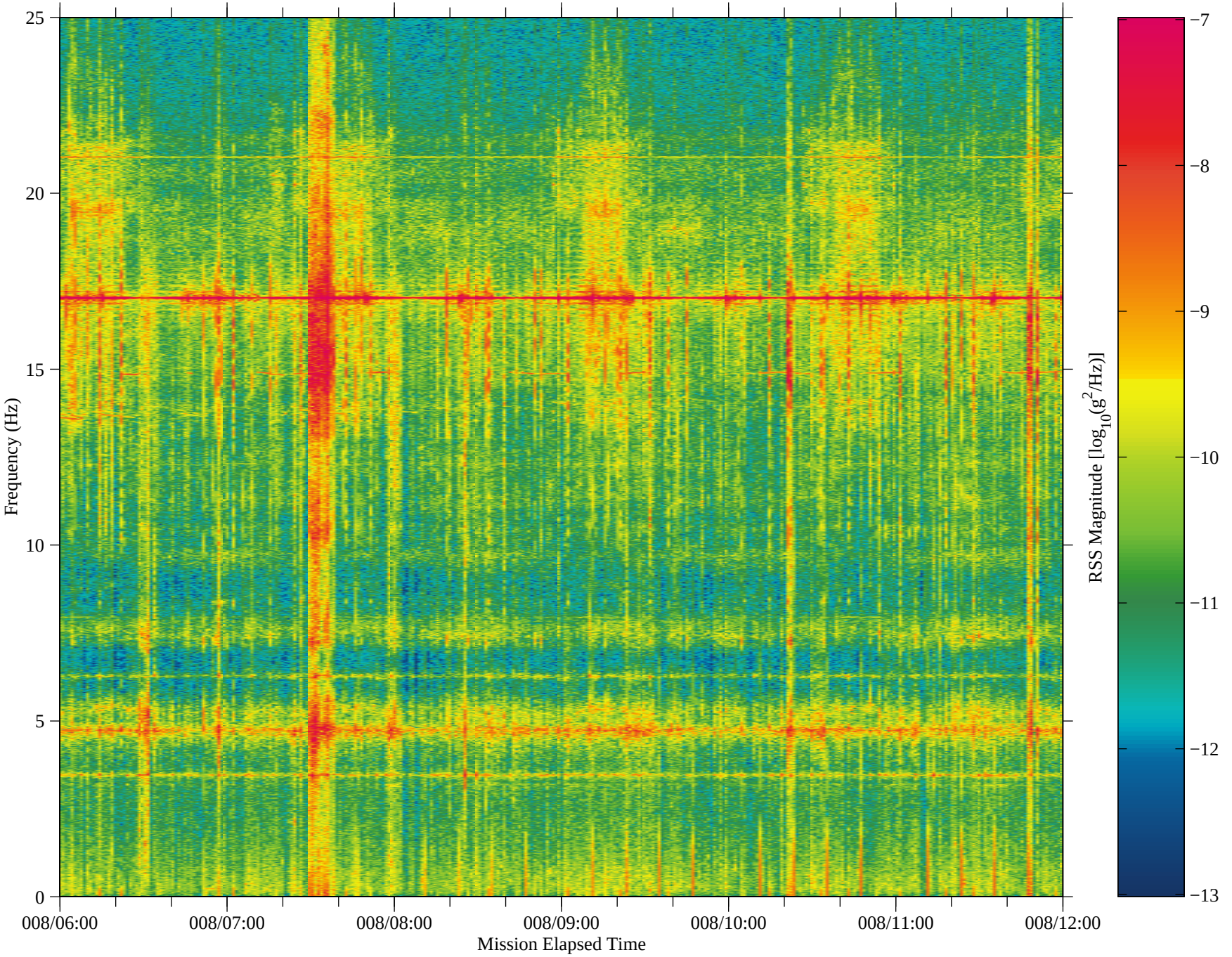

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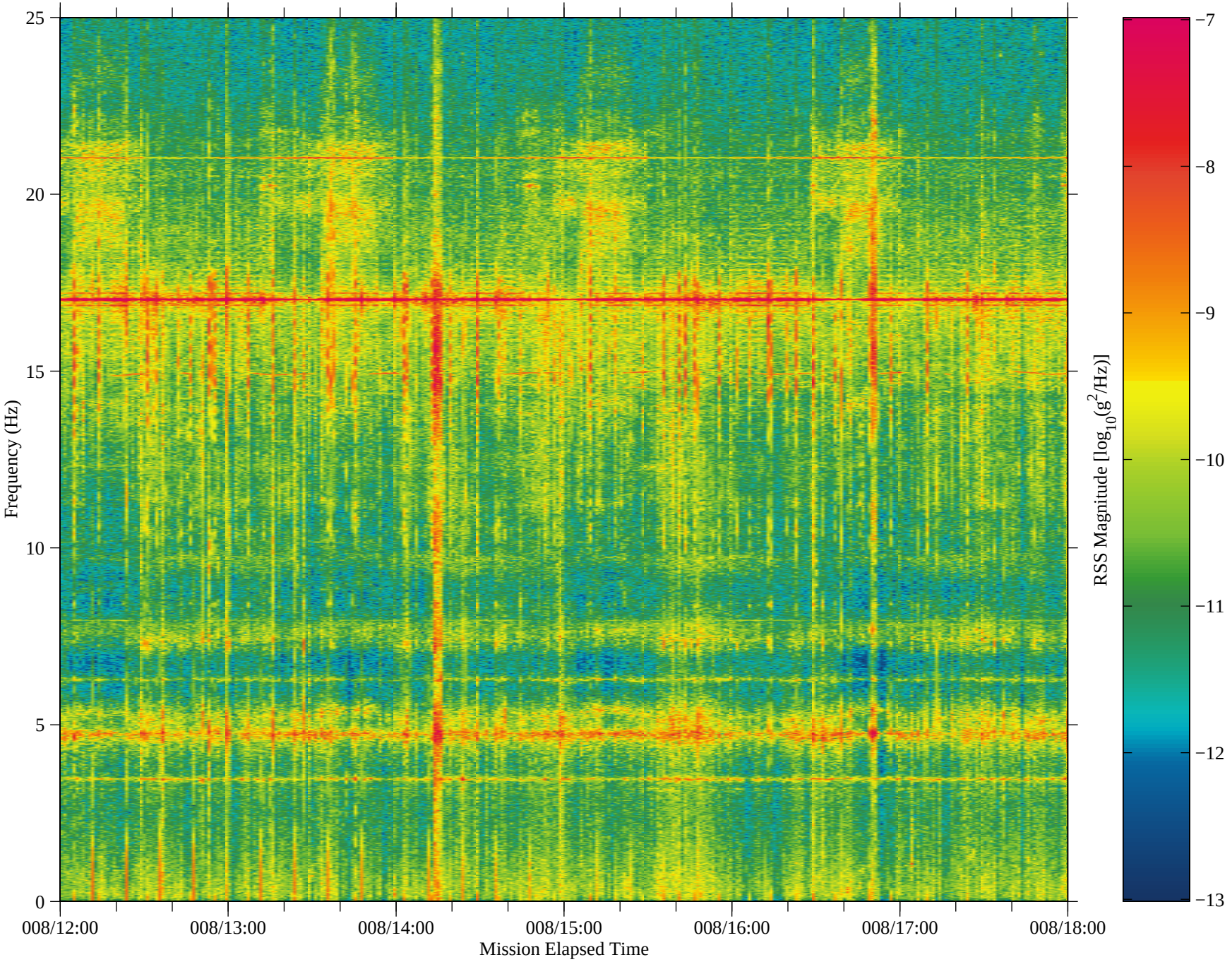

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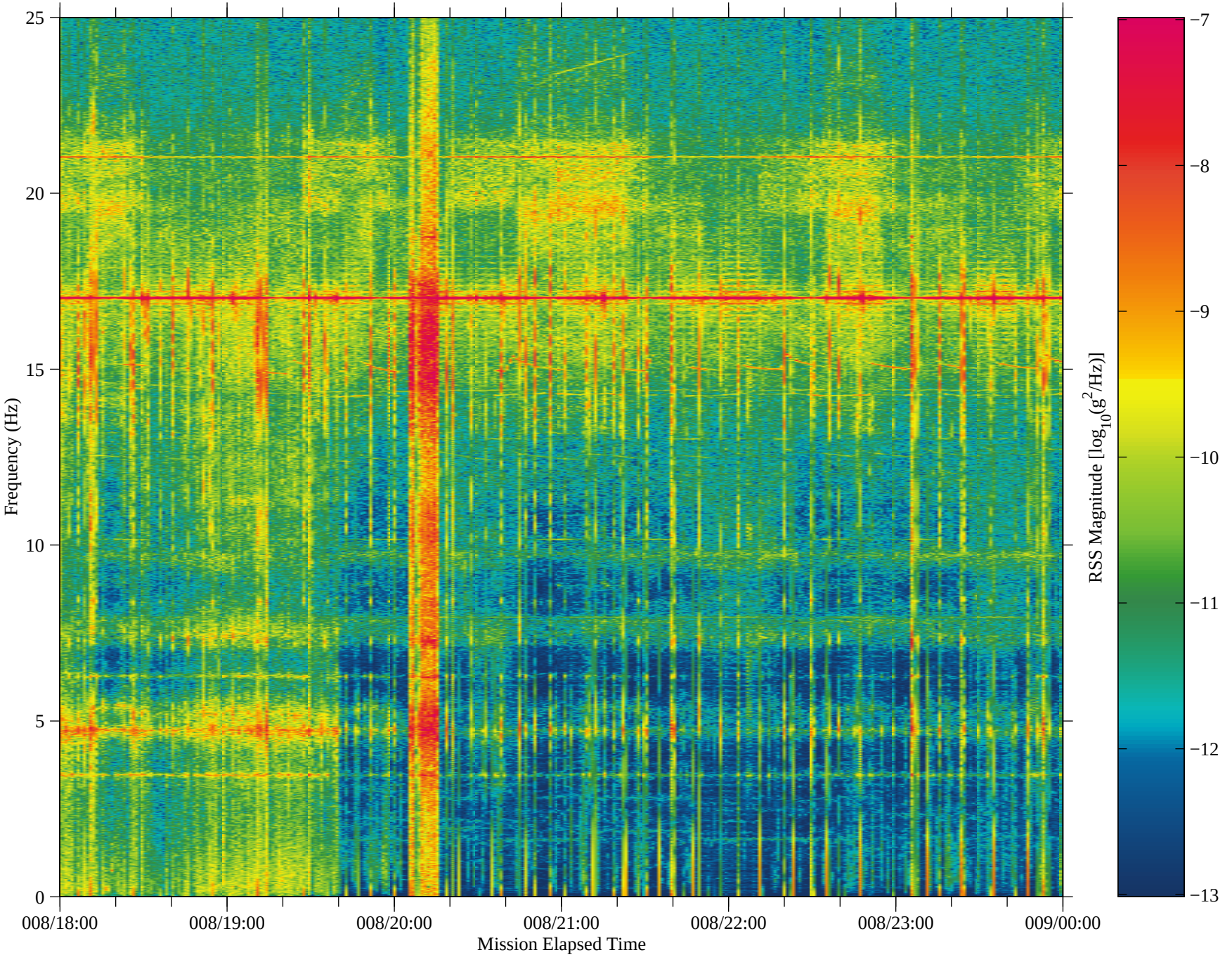

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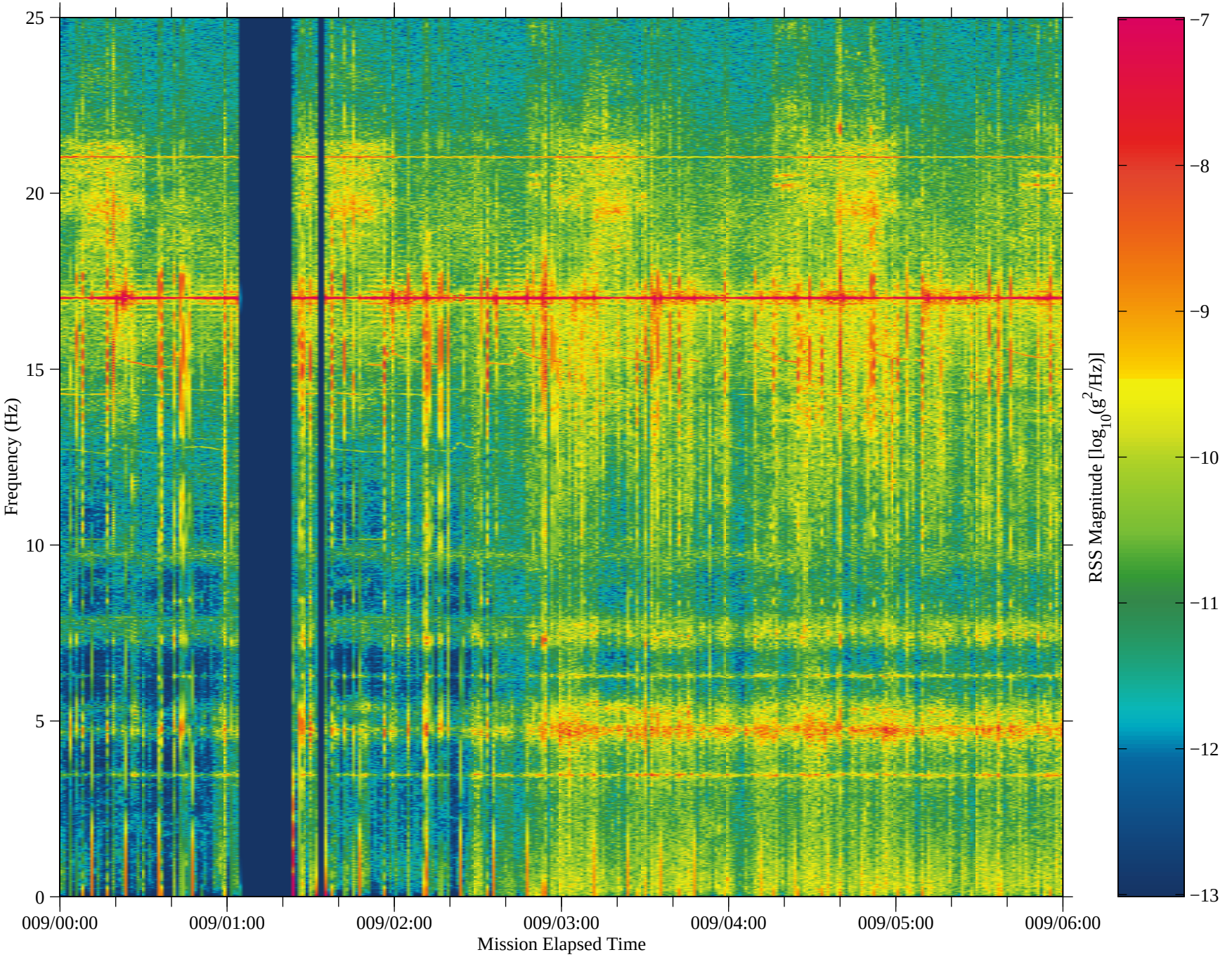

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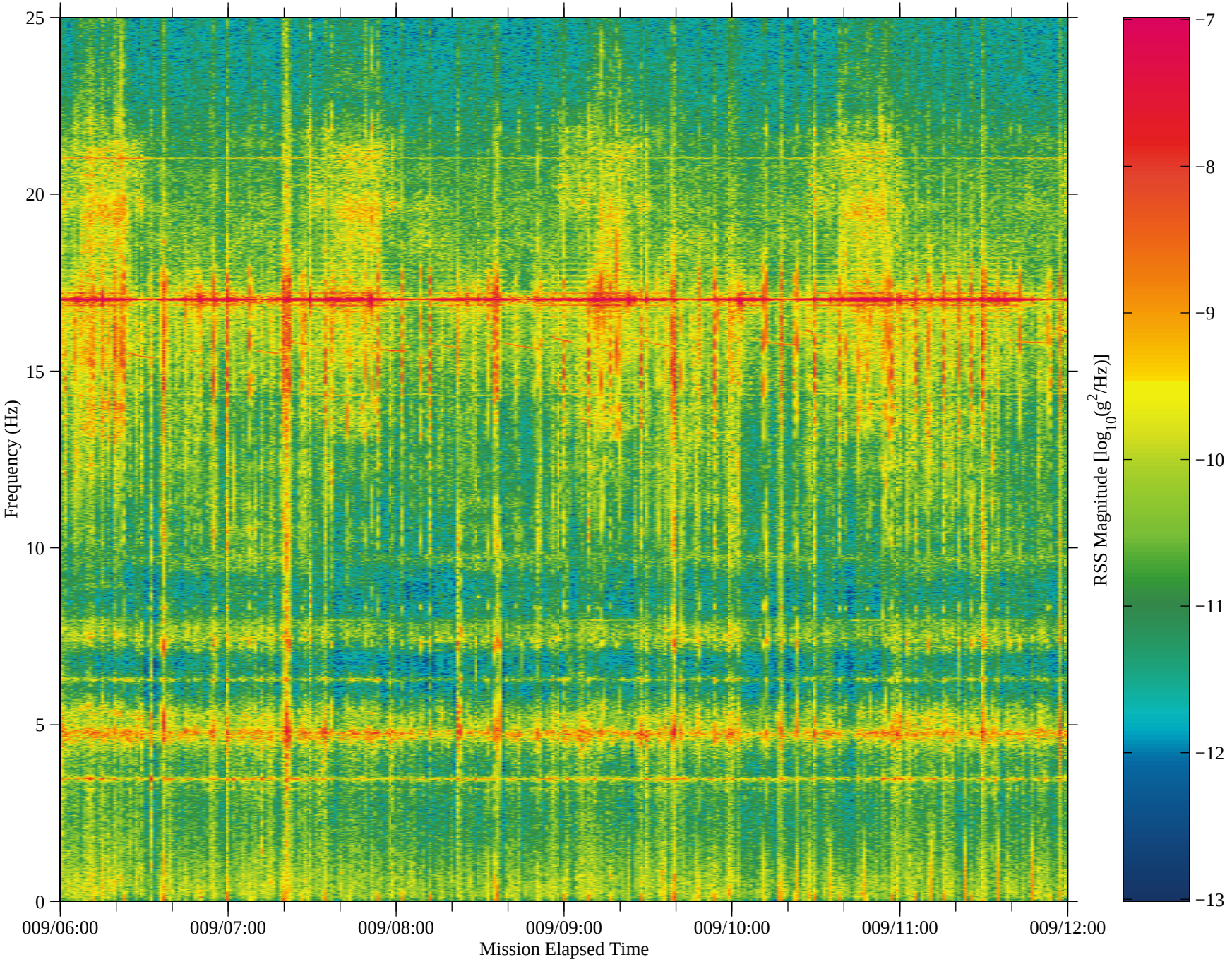

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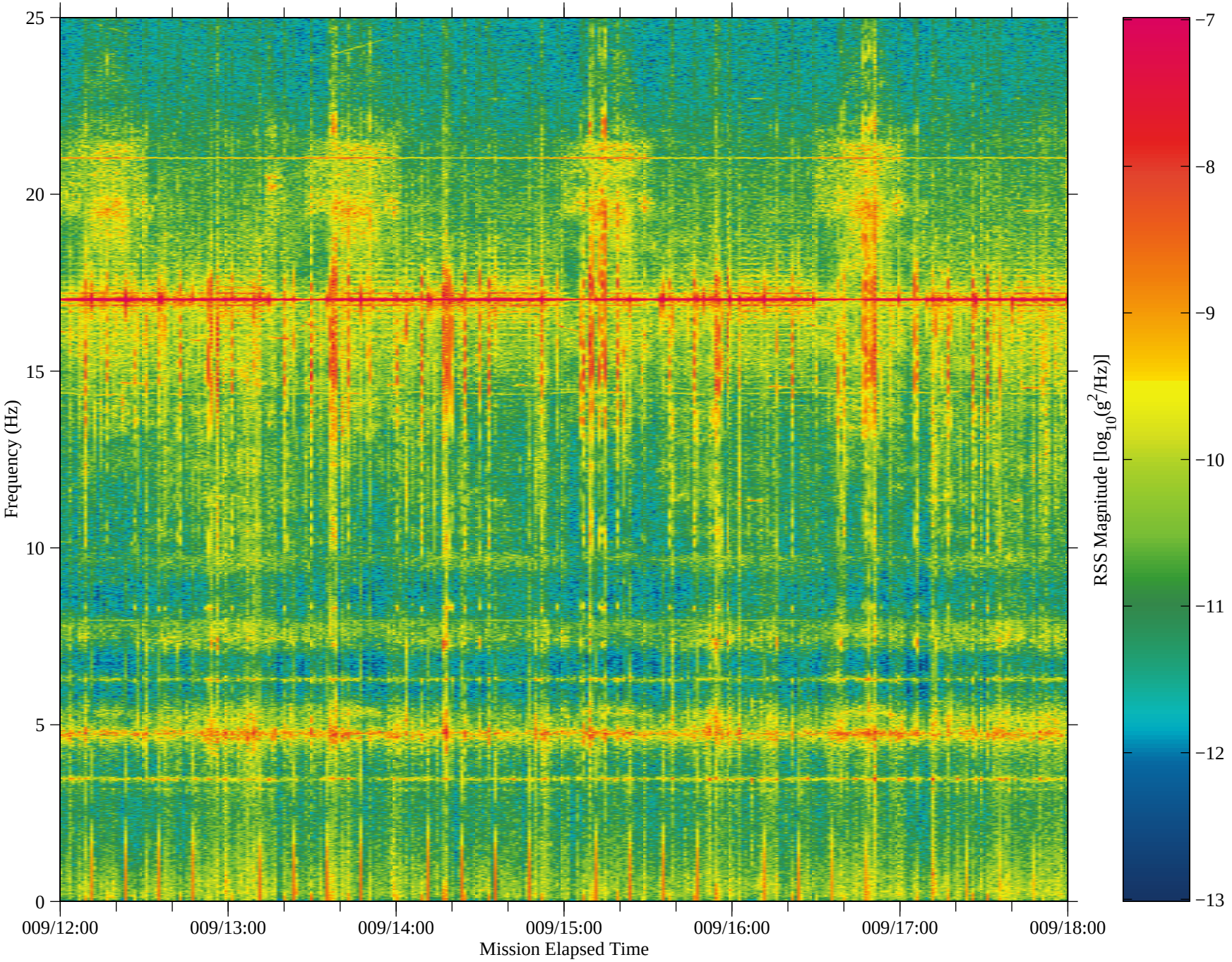

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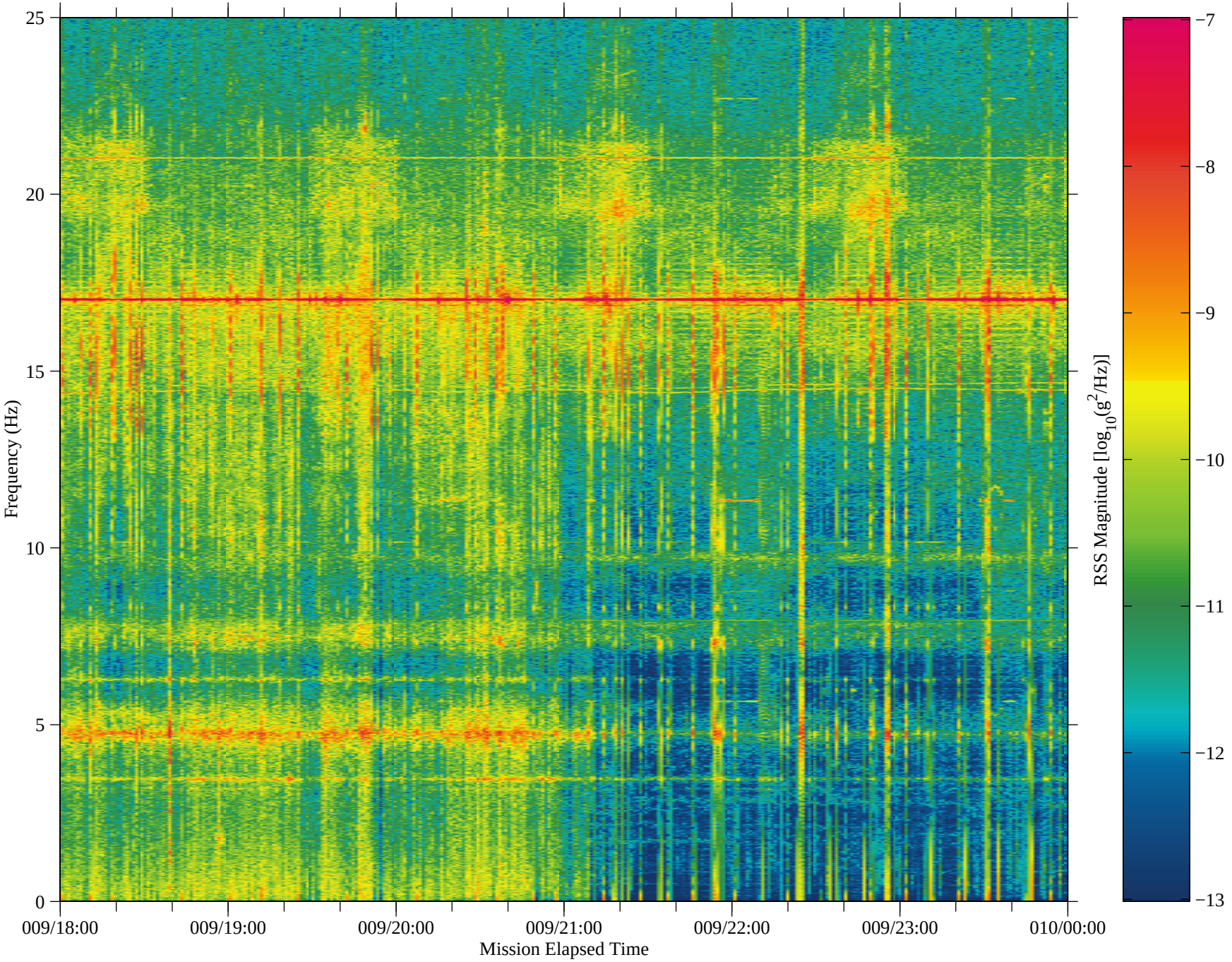

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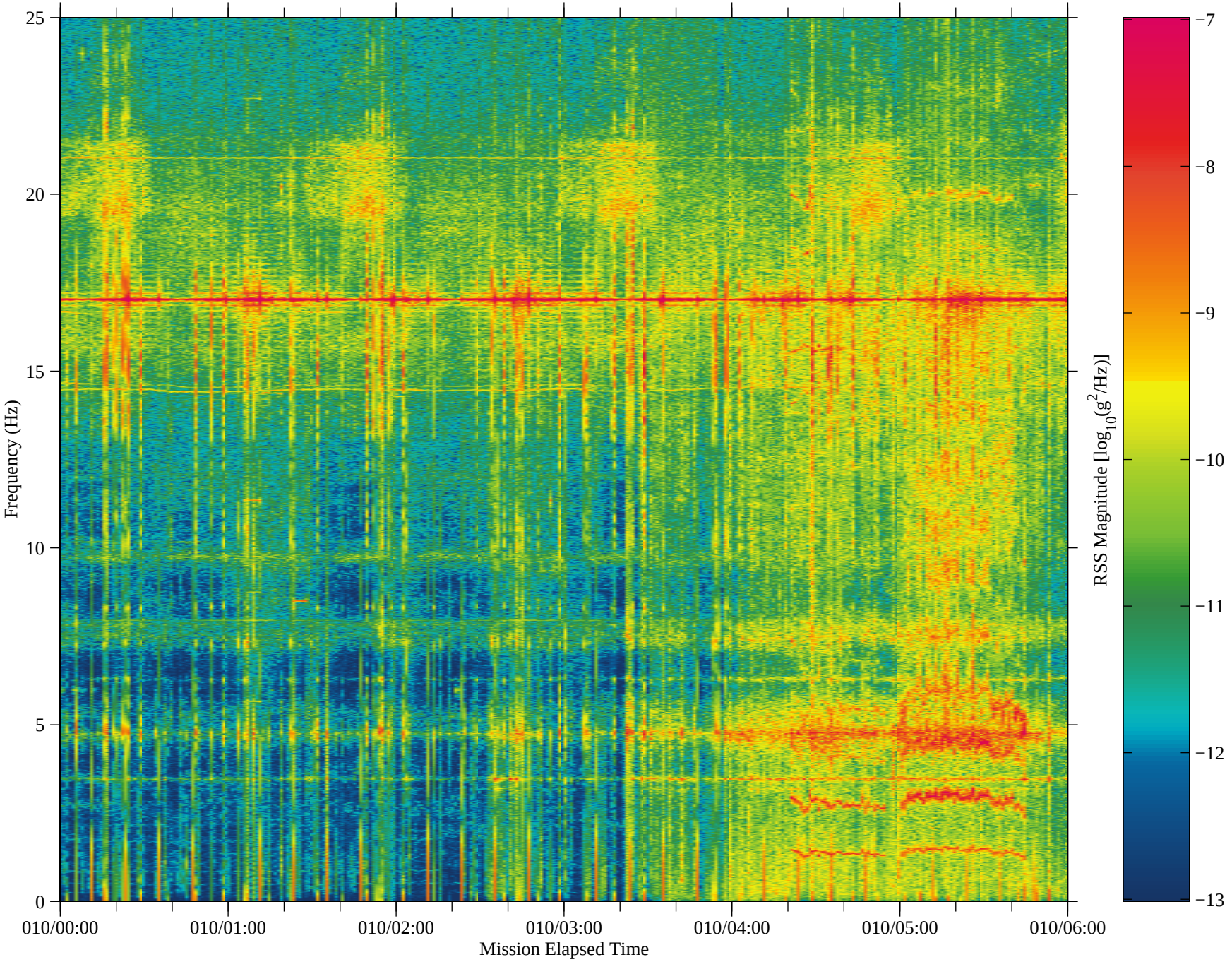

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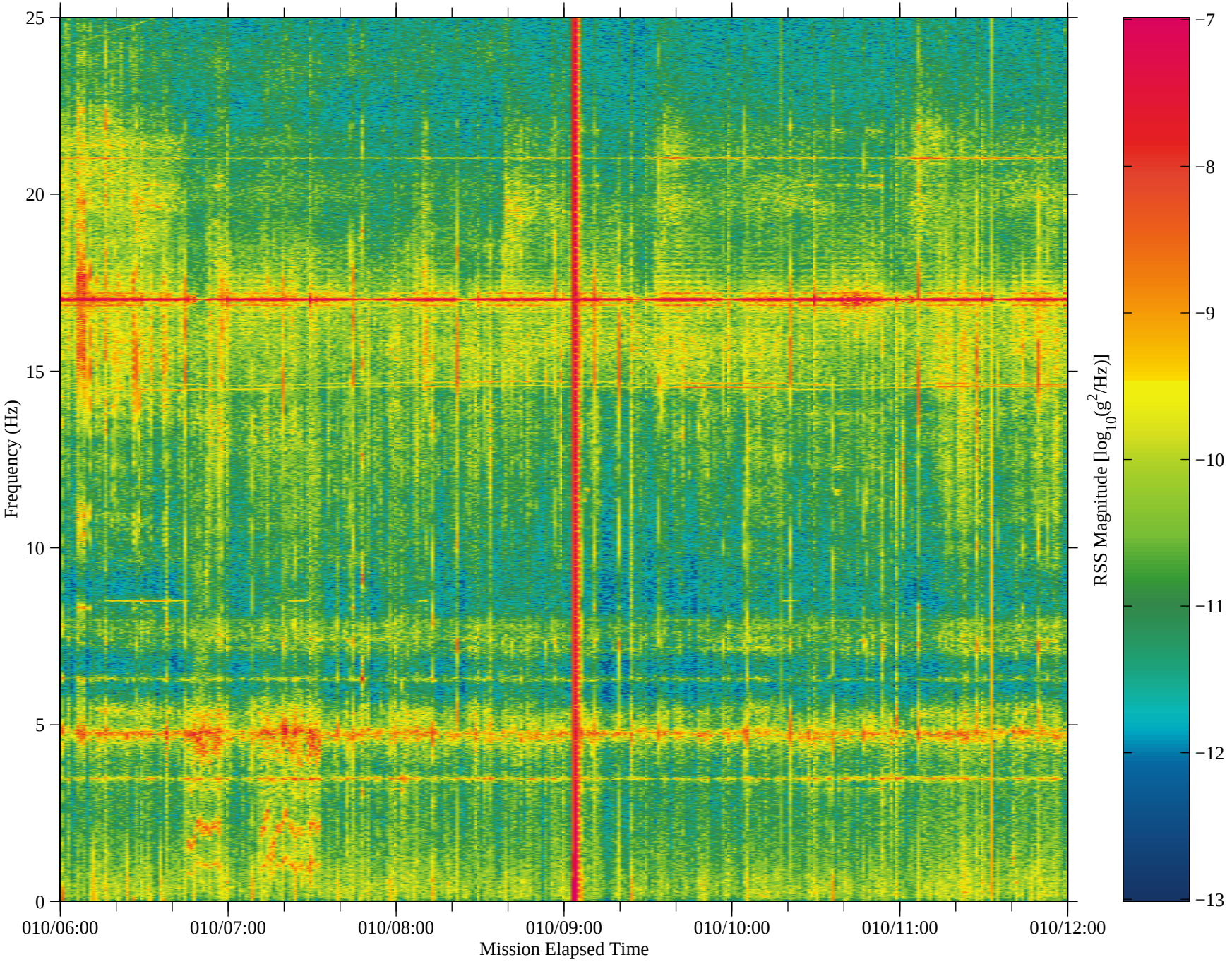

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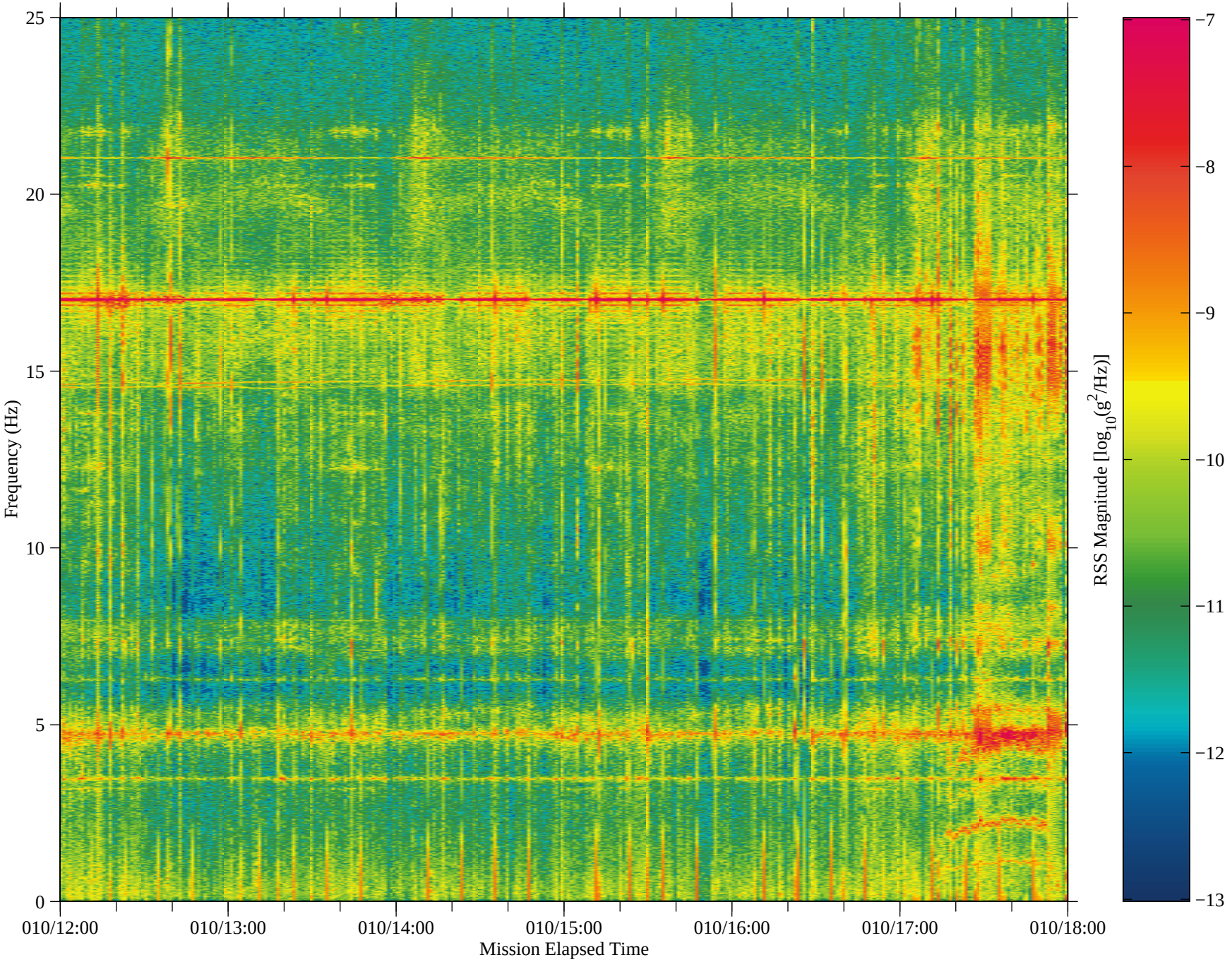

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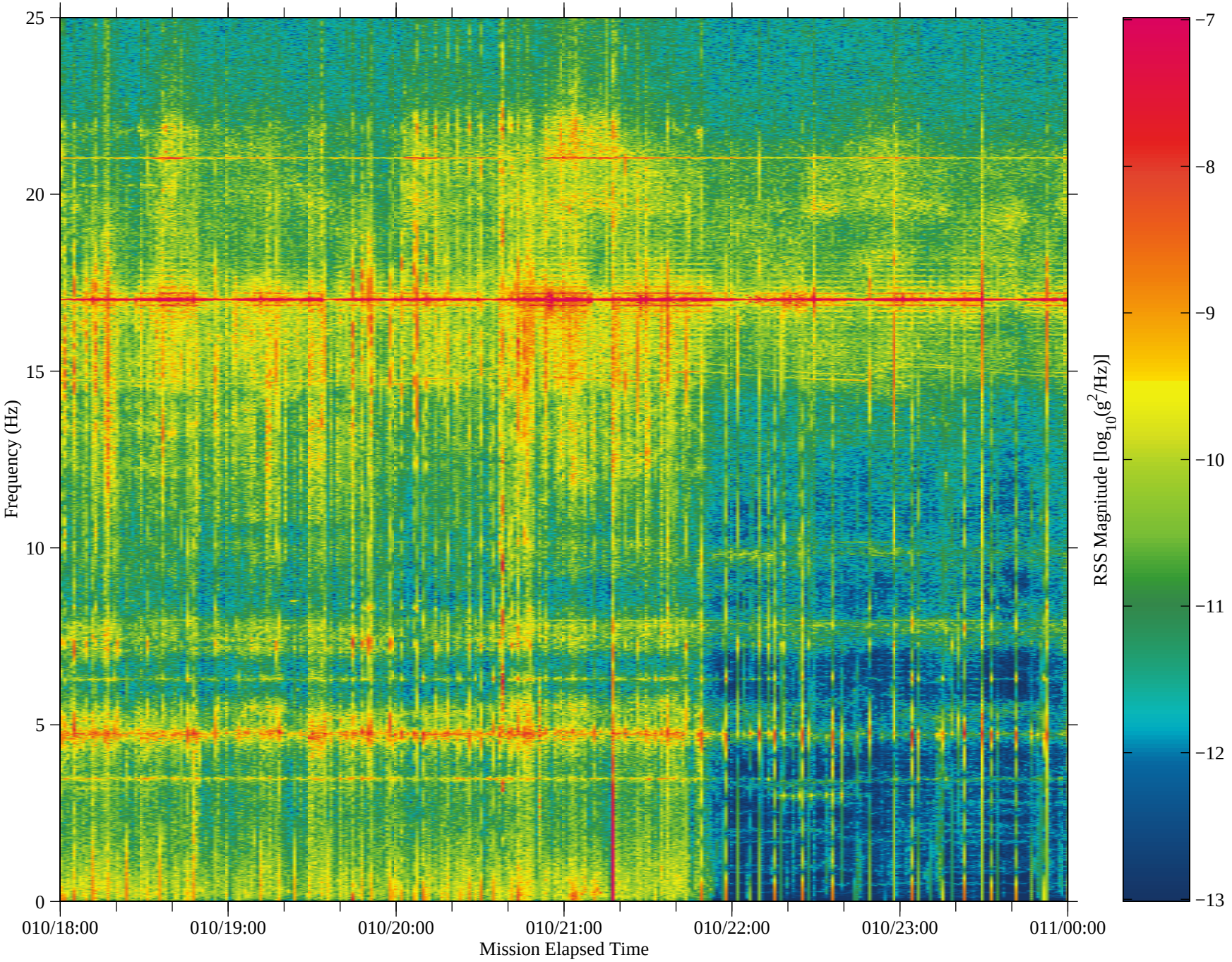

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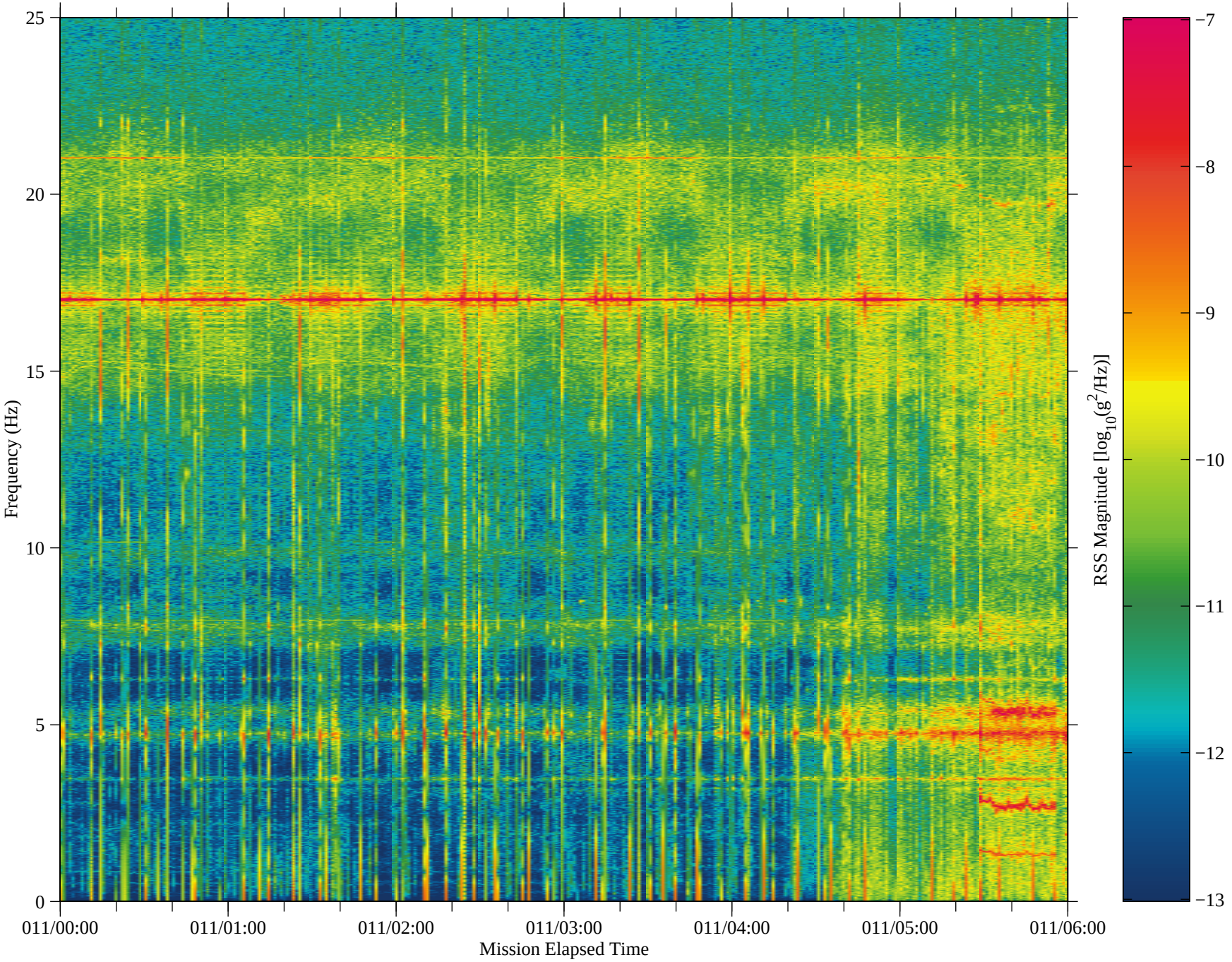

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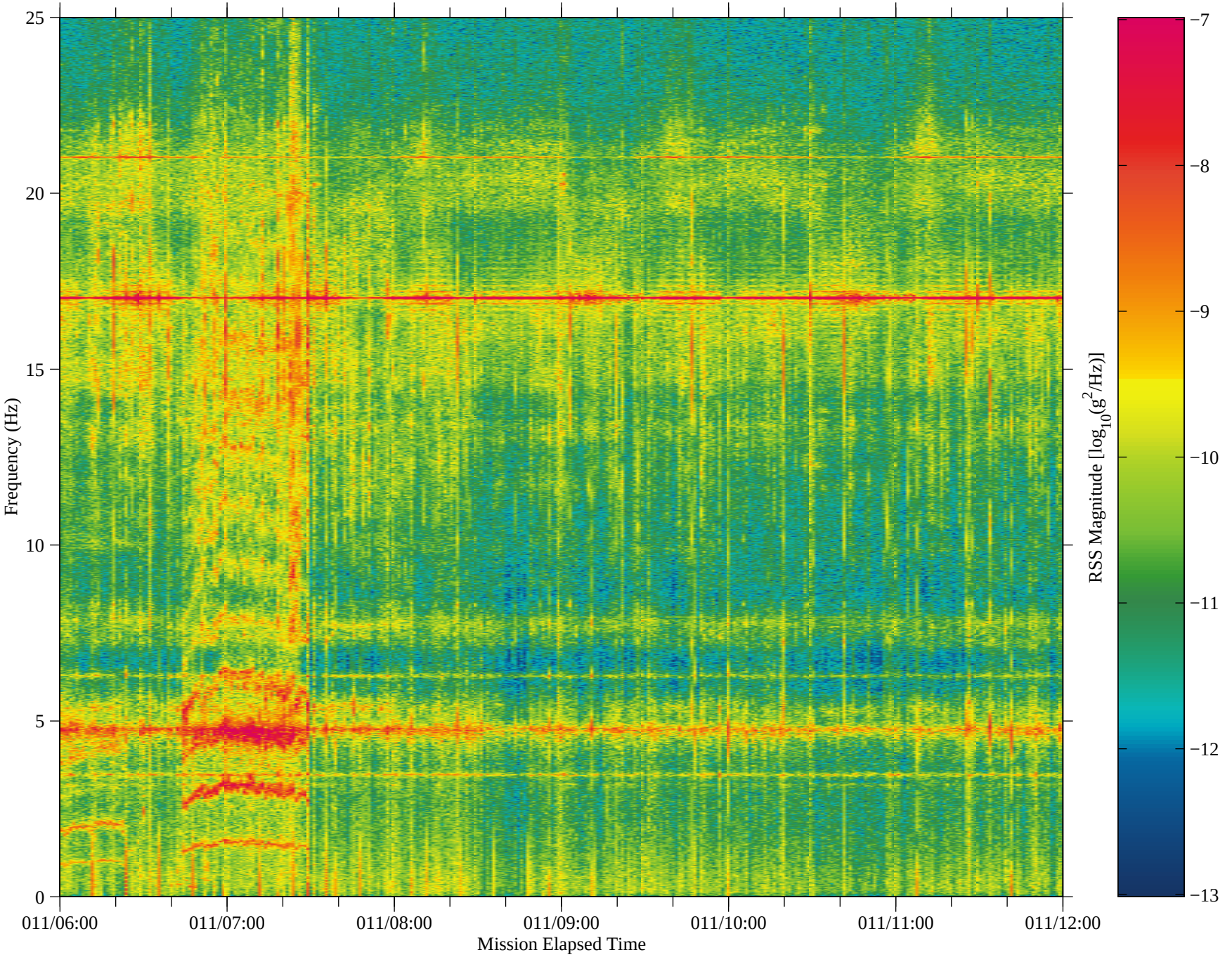

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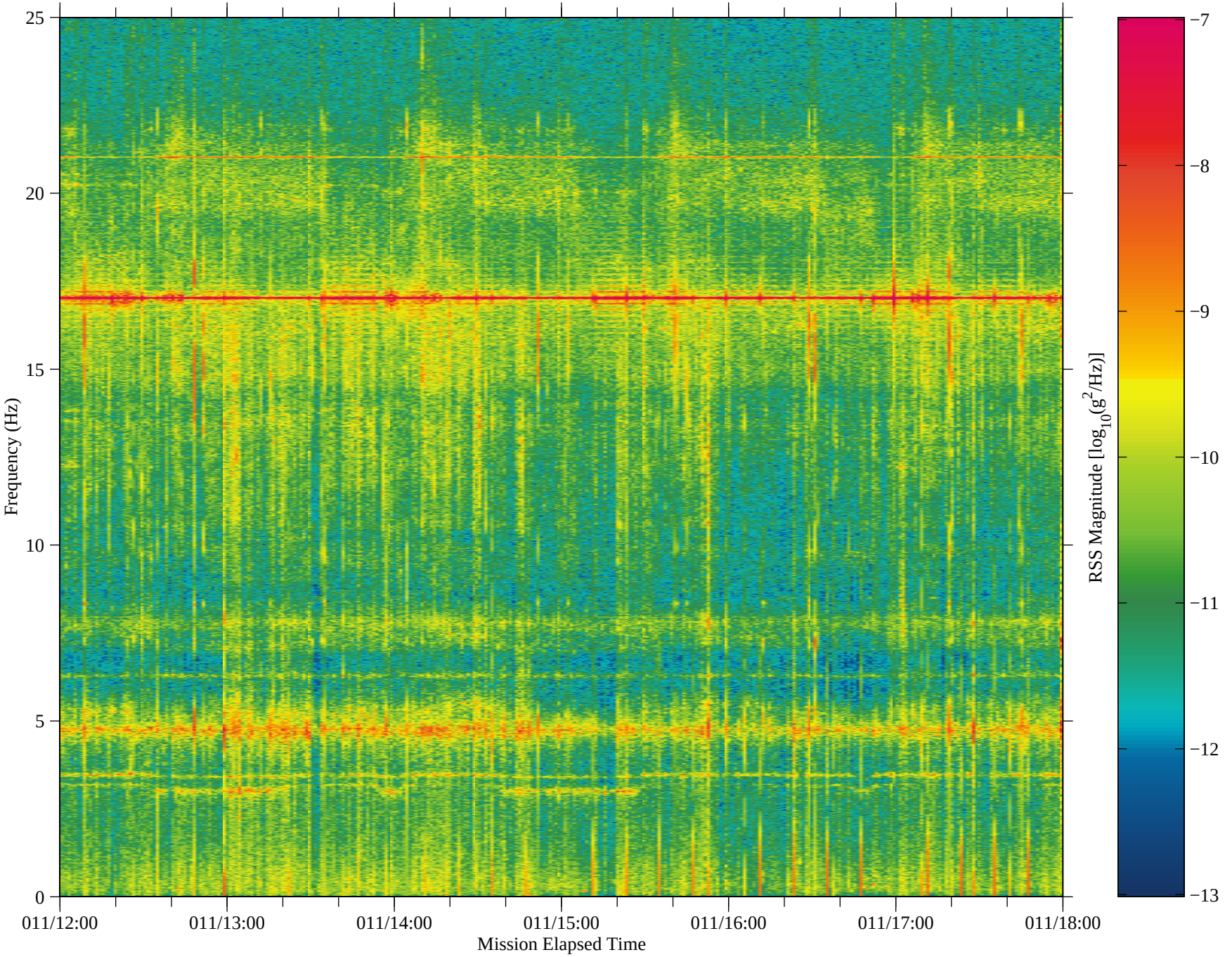

Figure 48: USMP−4, Unit F, TSH B

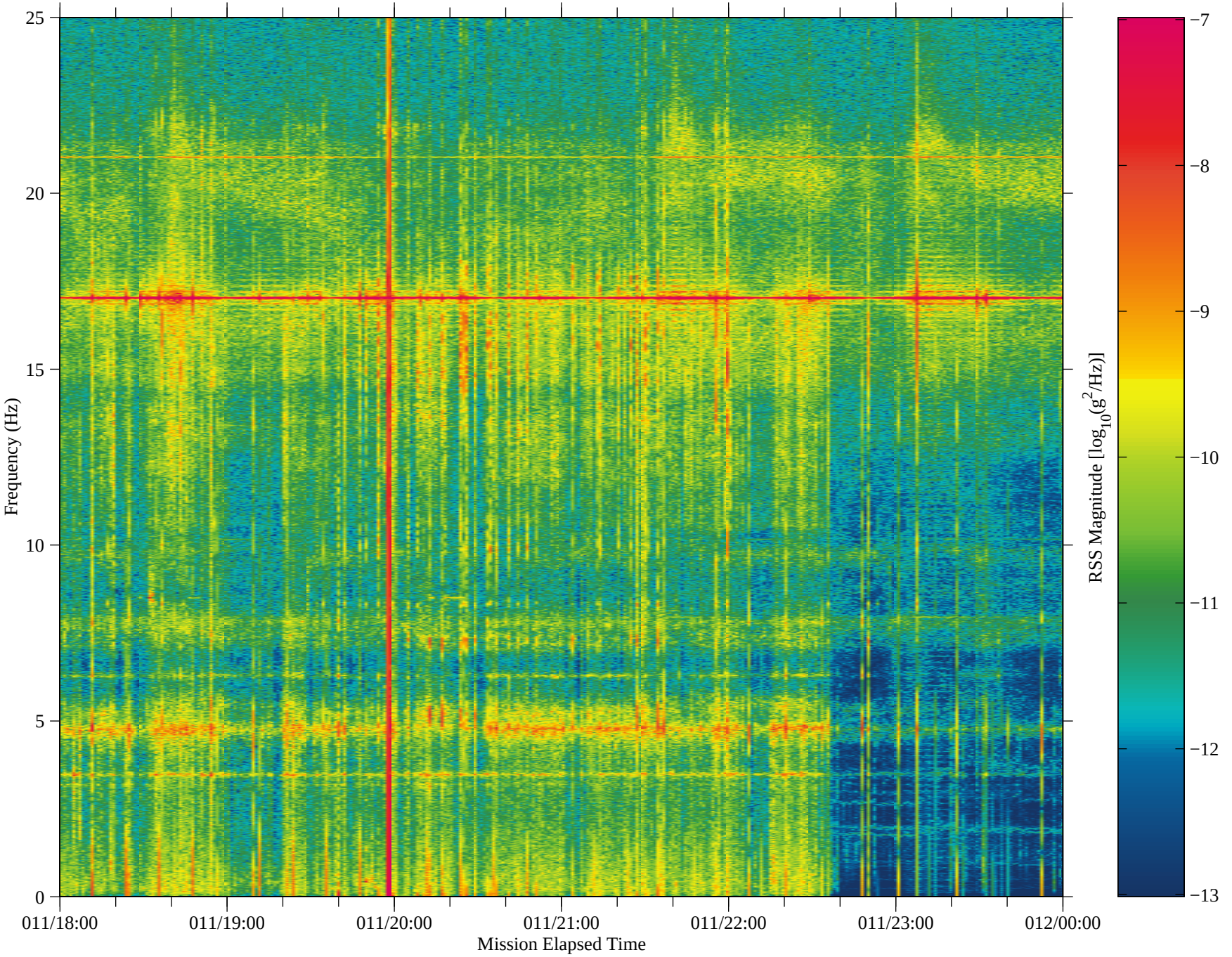

Figure 49: USMP−4, Unit F, TSH B

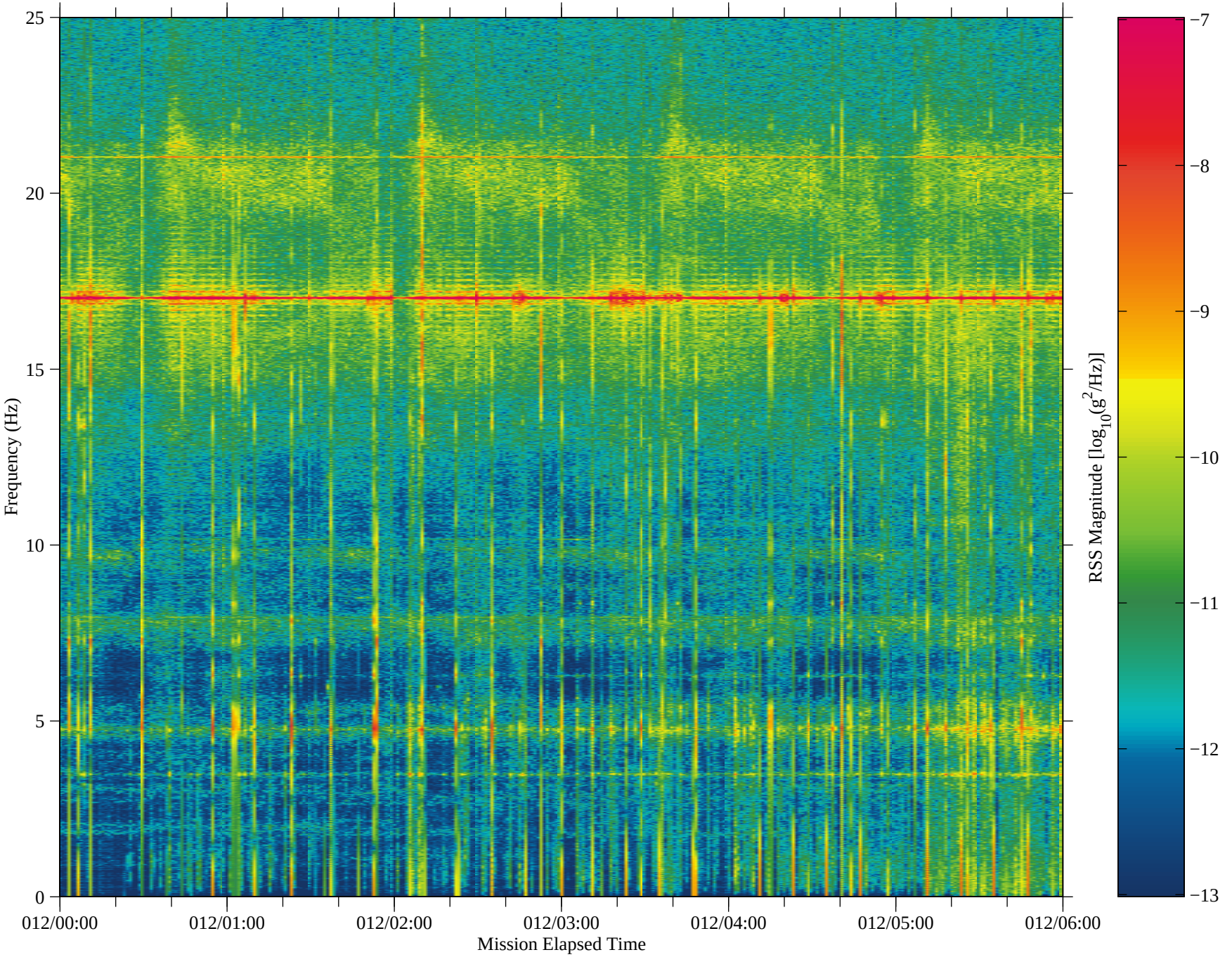

Figure 50: USMP−4, Unit F, TSH B

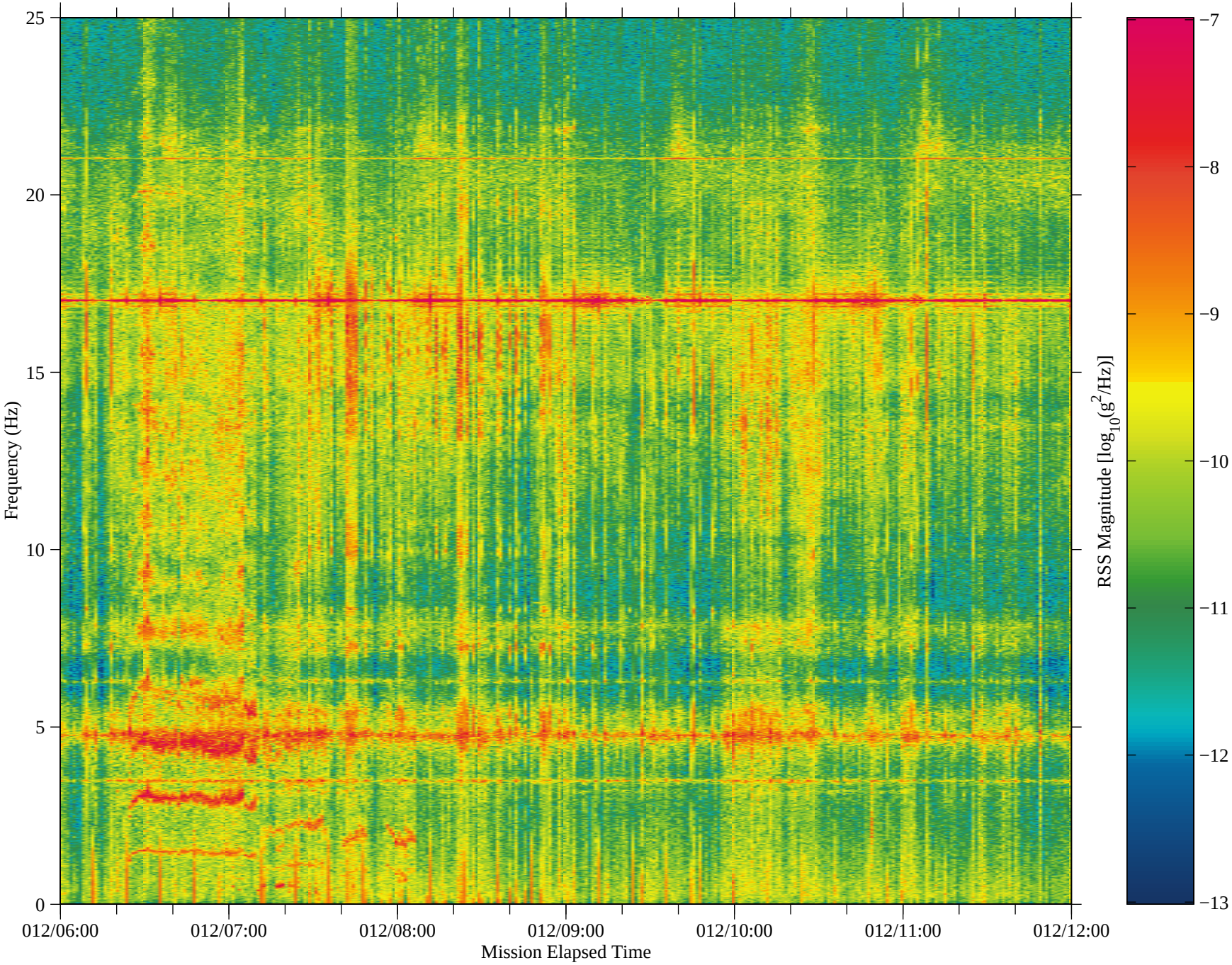

Figure 51: USMP−4, Unit F, TSH B

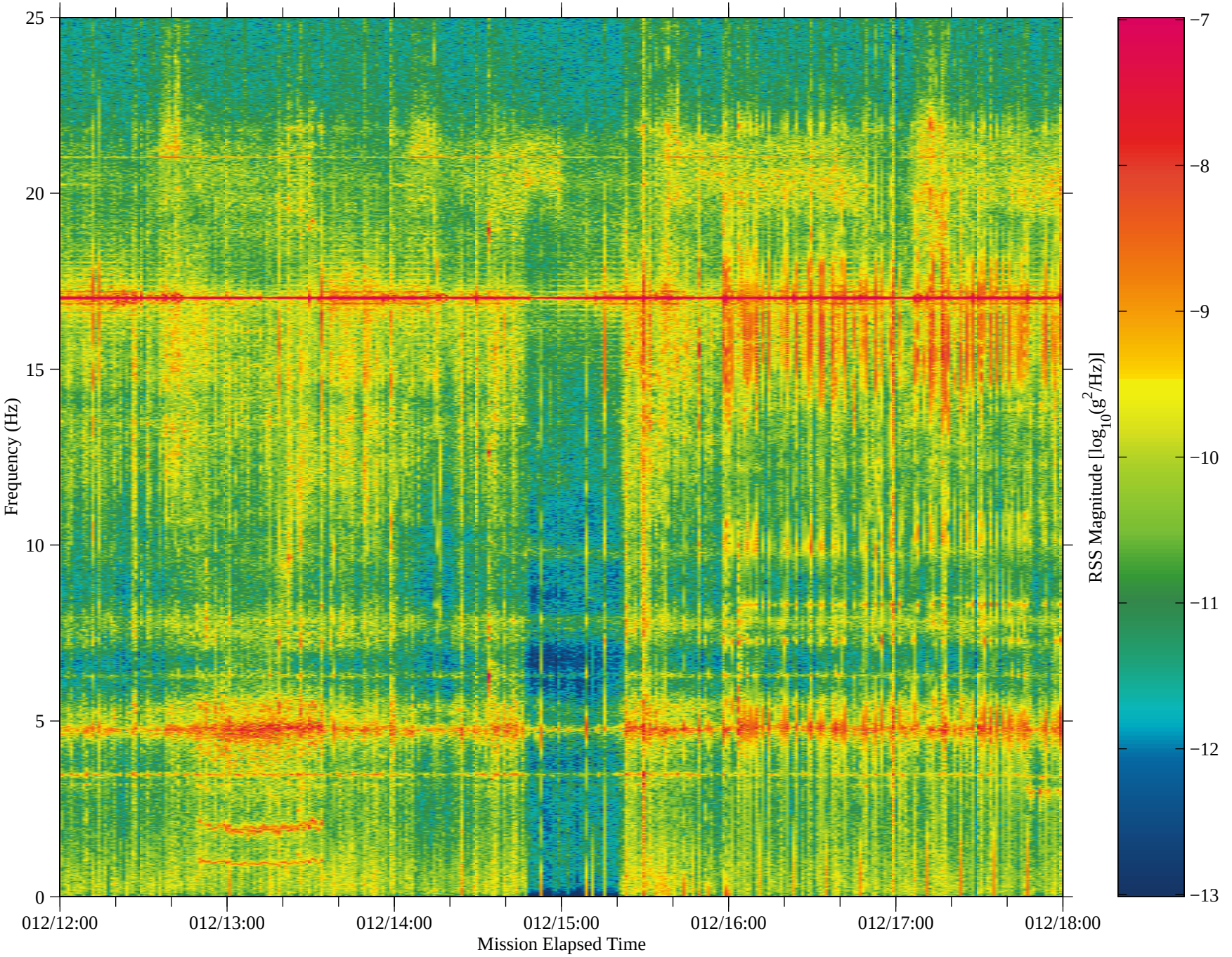

Figure 52: USMP−4, Unit F, TSH B

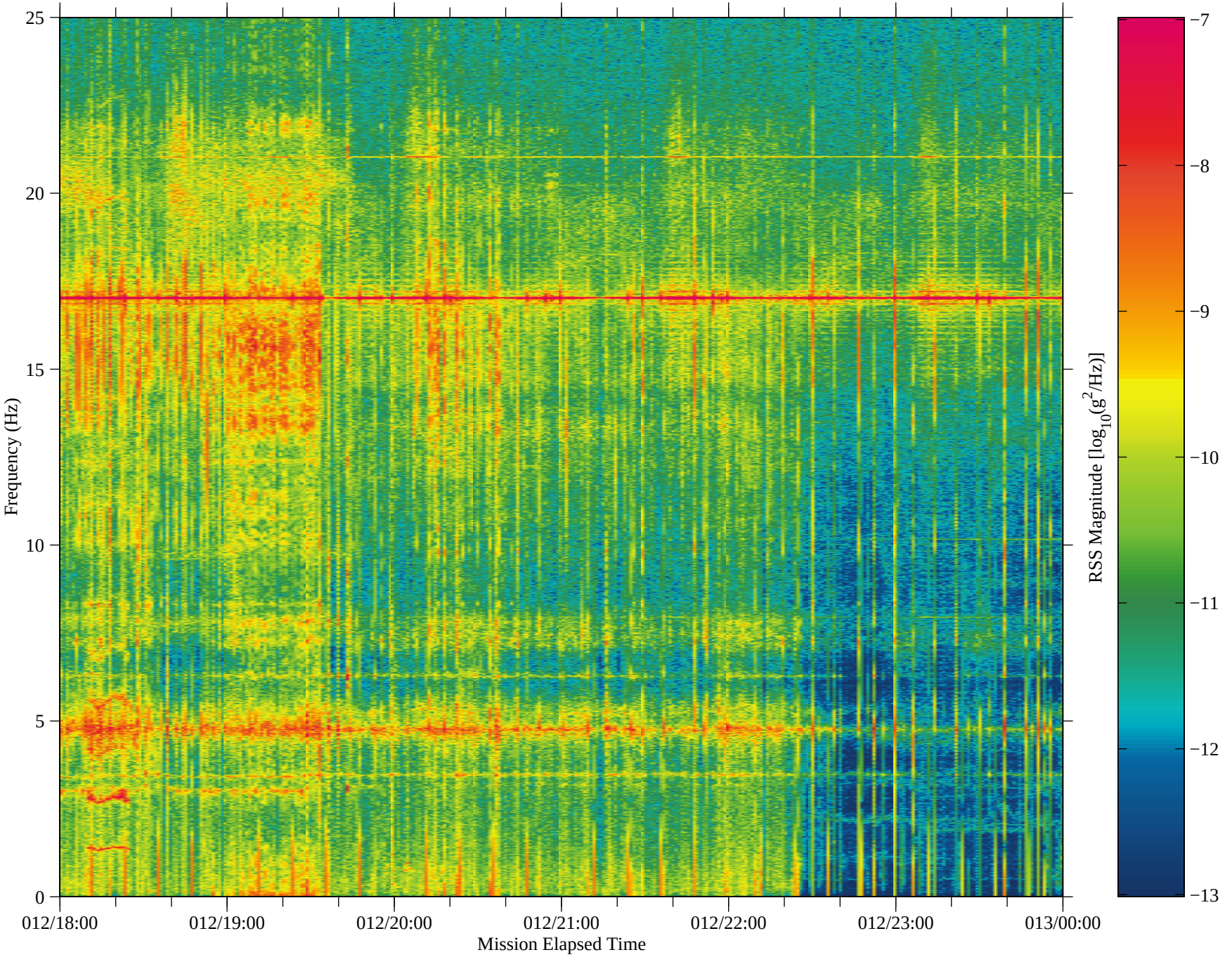

Figure 53: USMP−4, Unit F, TSH B

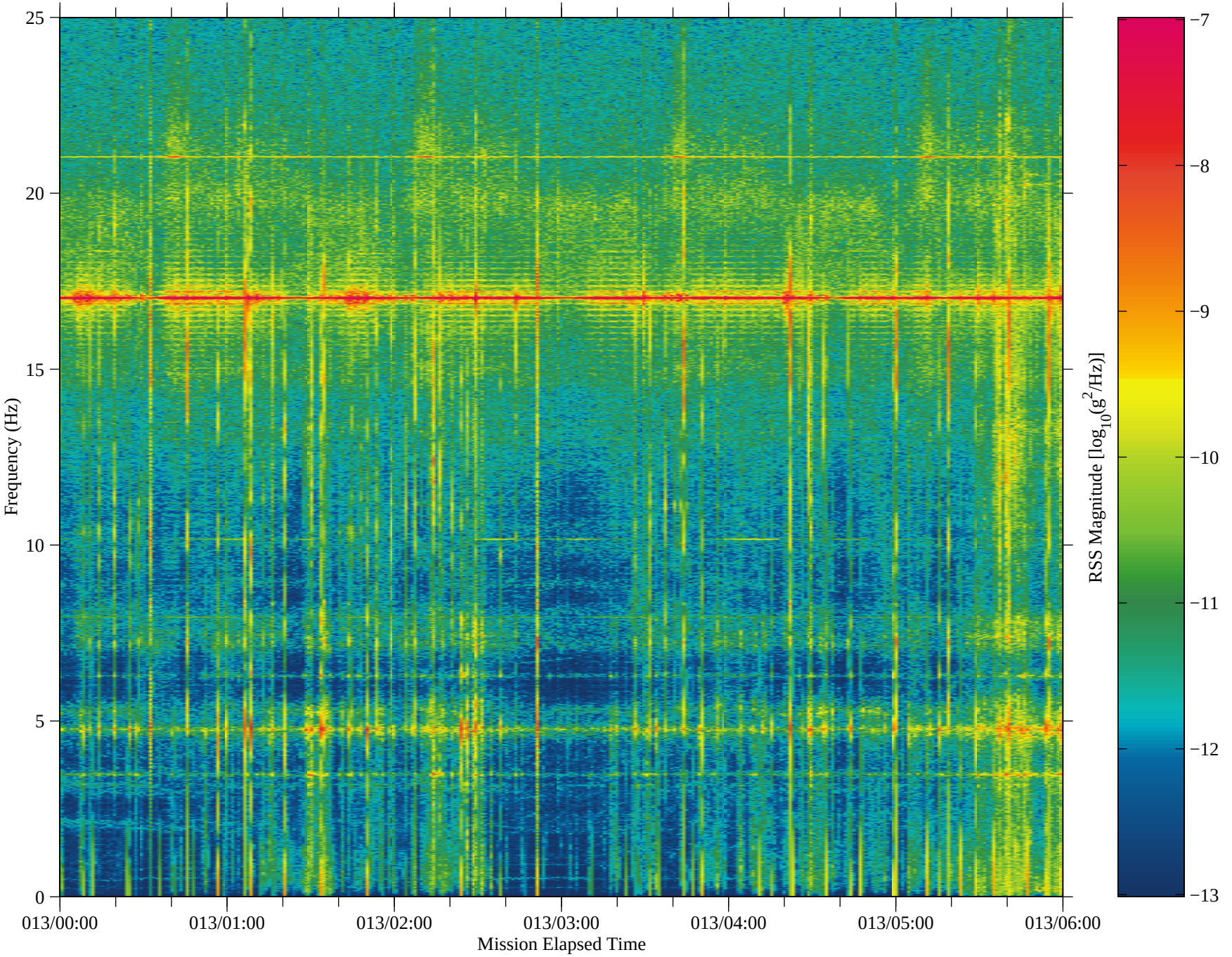

Figure 54: USMP−4, Unit F, TSH B

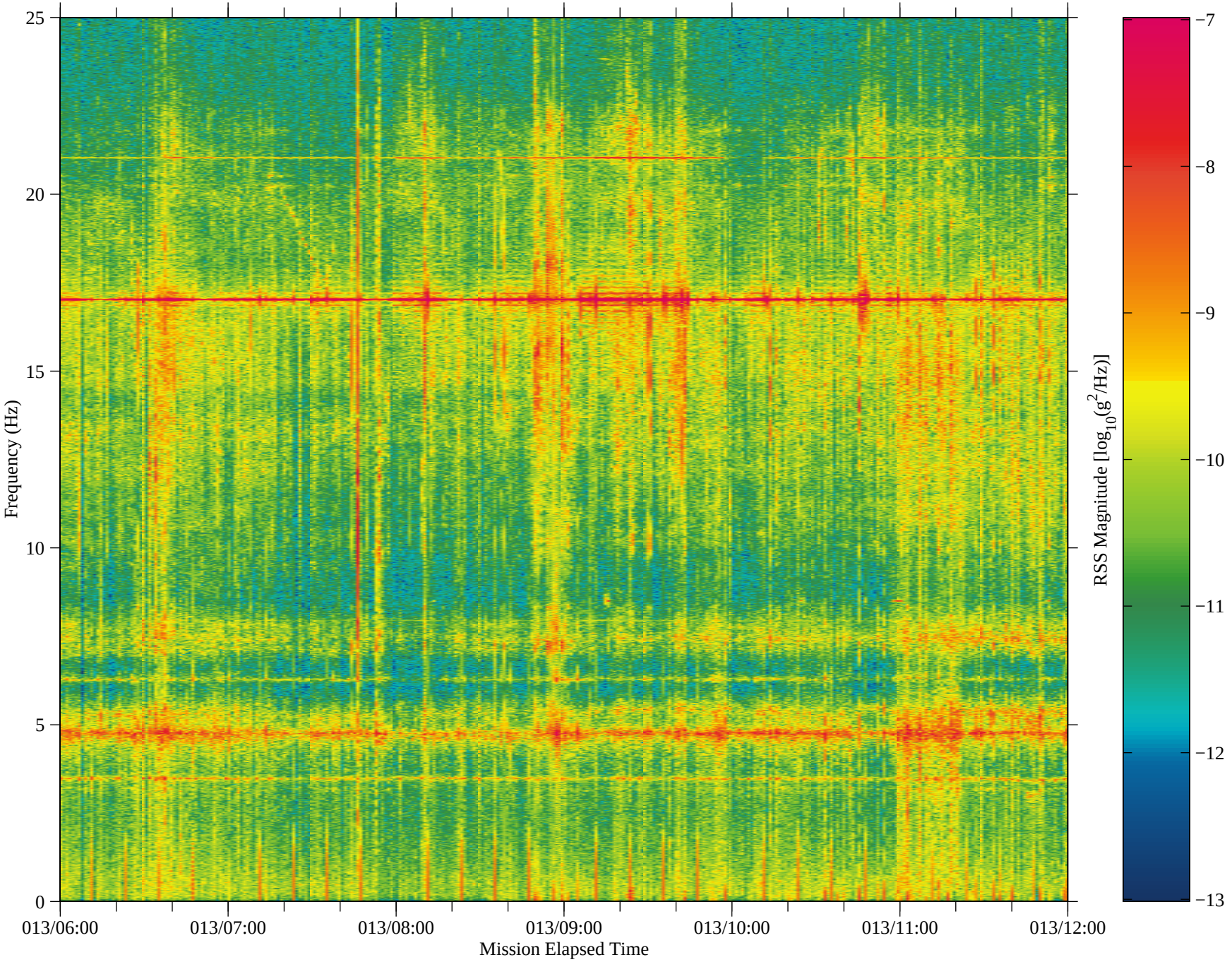

Figure 55: USMP−4, Unit F, TSH B

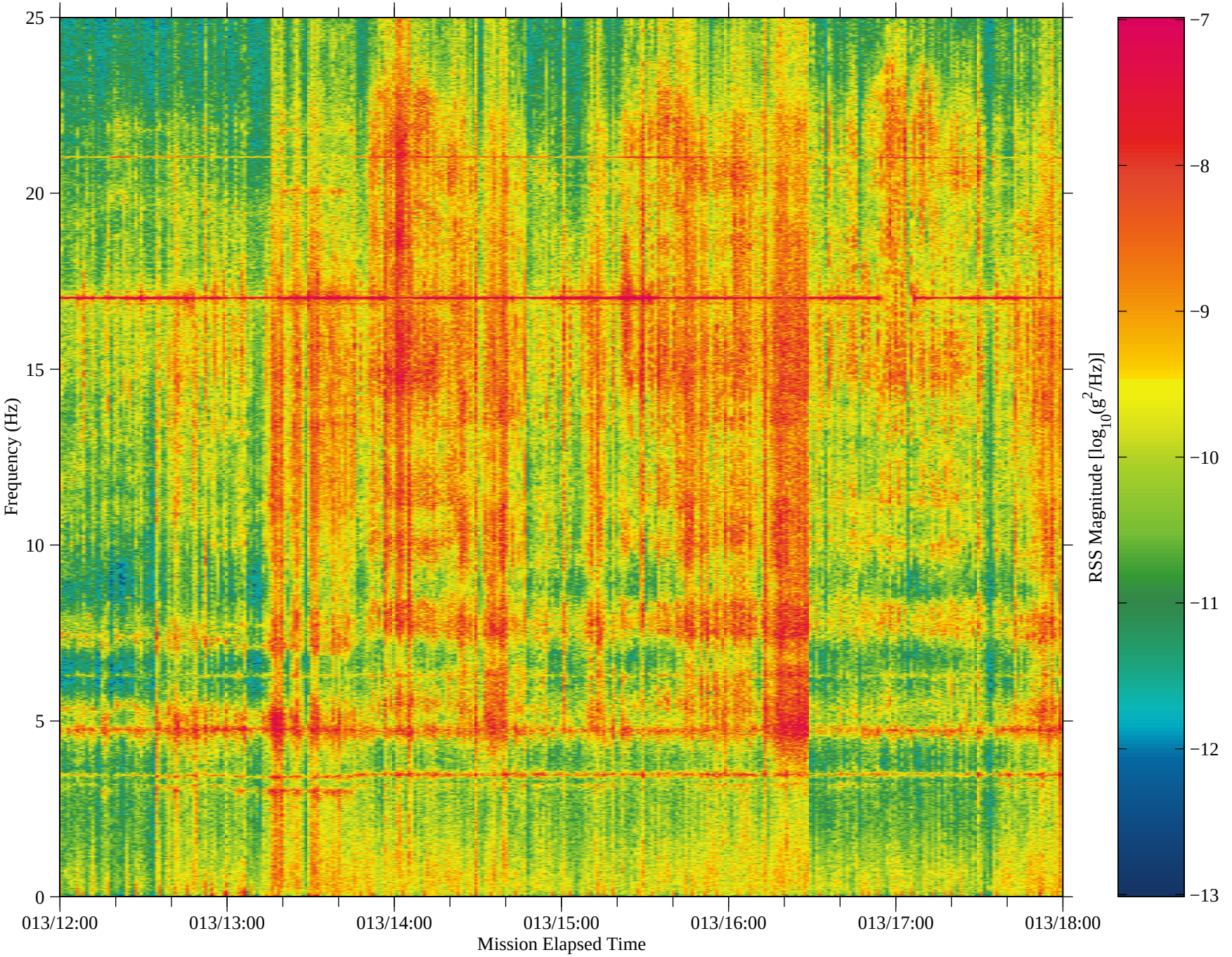

Figure 56: USMP−4, Unit F, TSH B

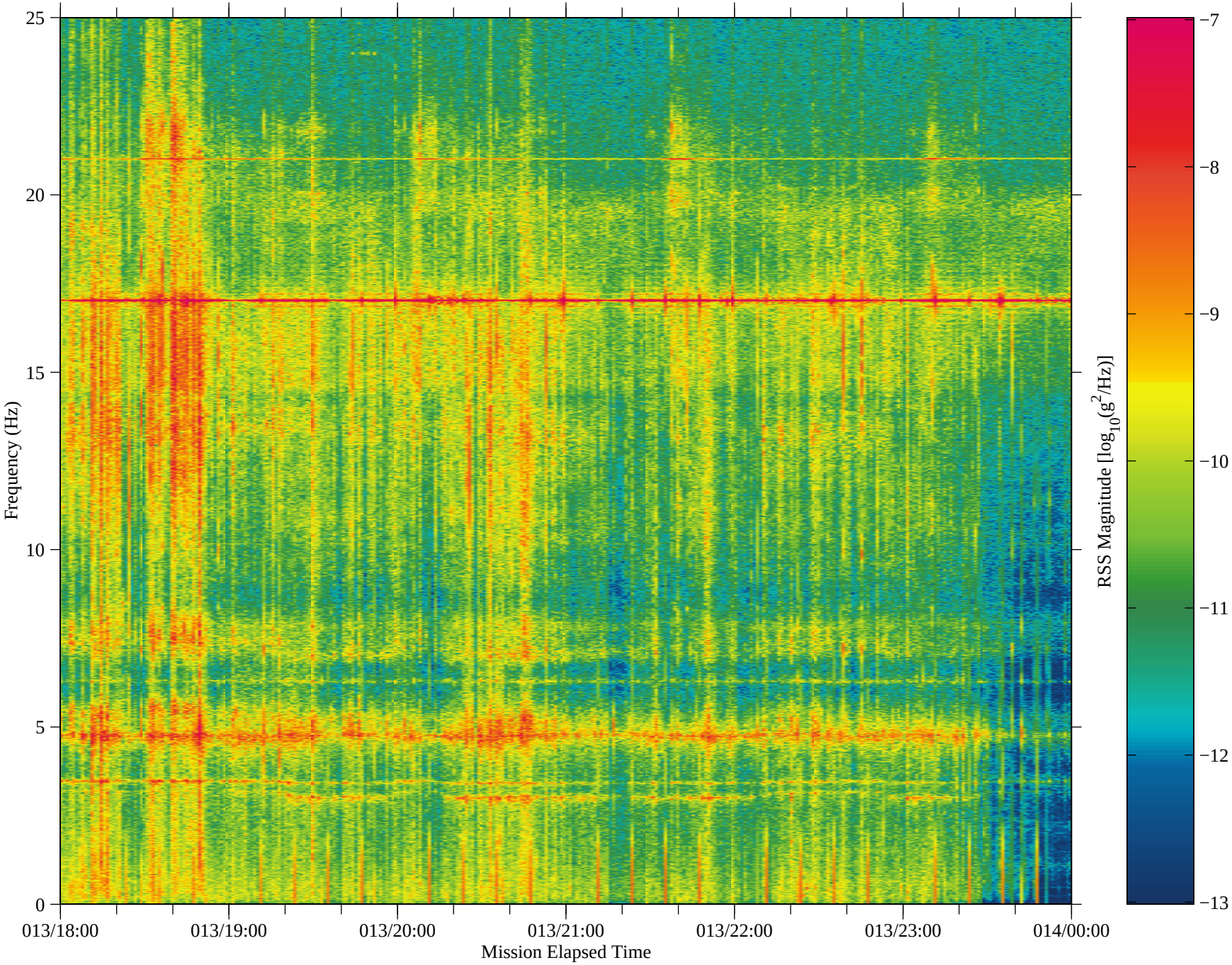

Figure 57: USMP−4, Unit F, TSH B

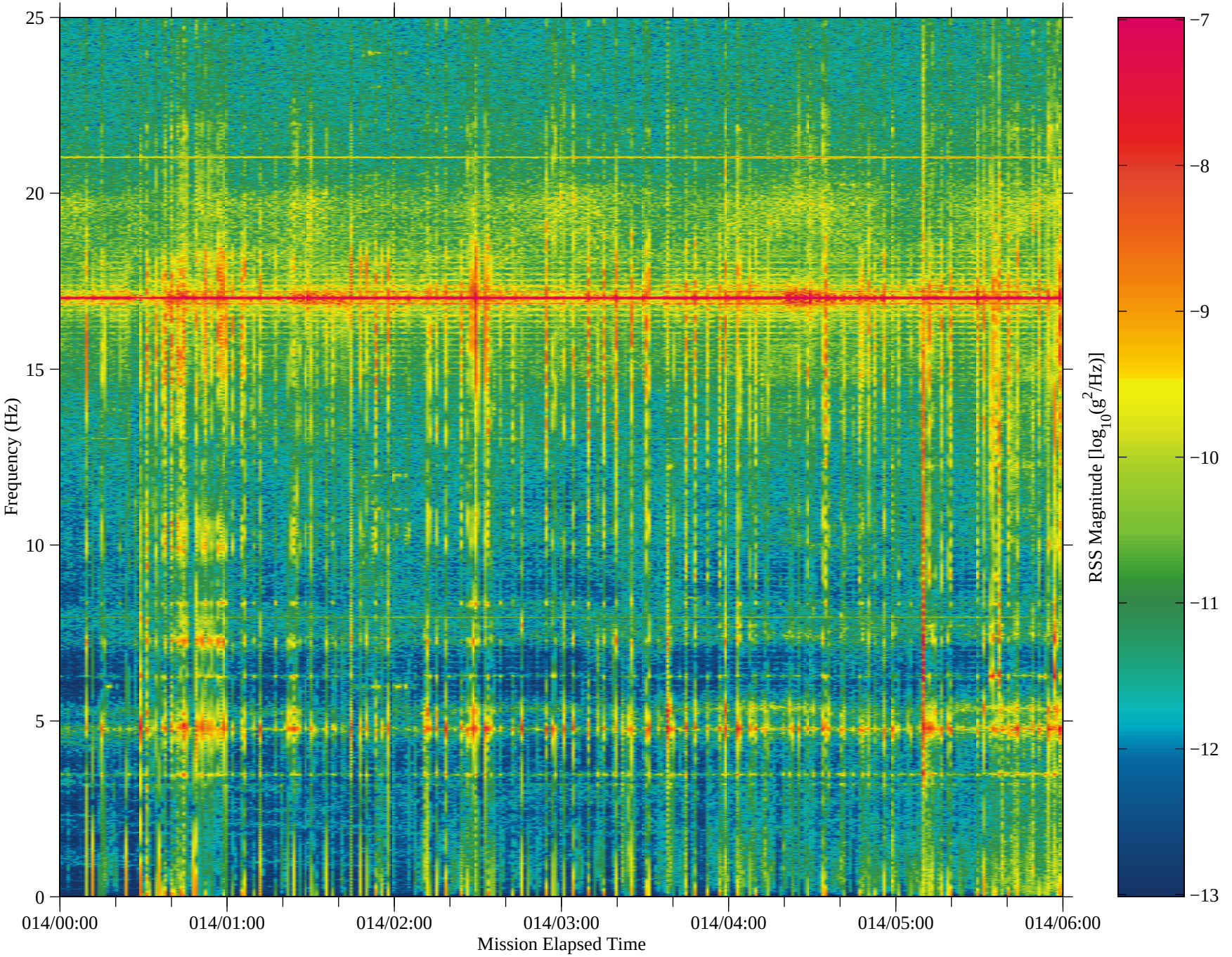

Figure 58: USMP−4, Unit F, TSH B

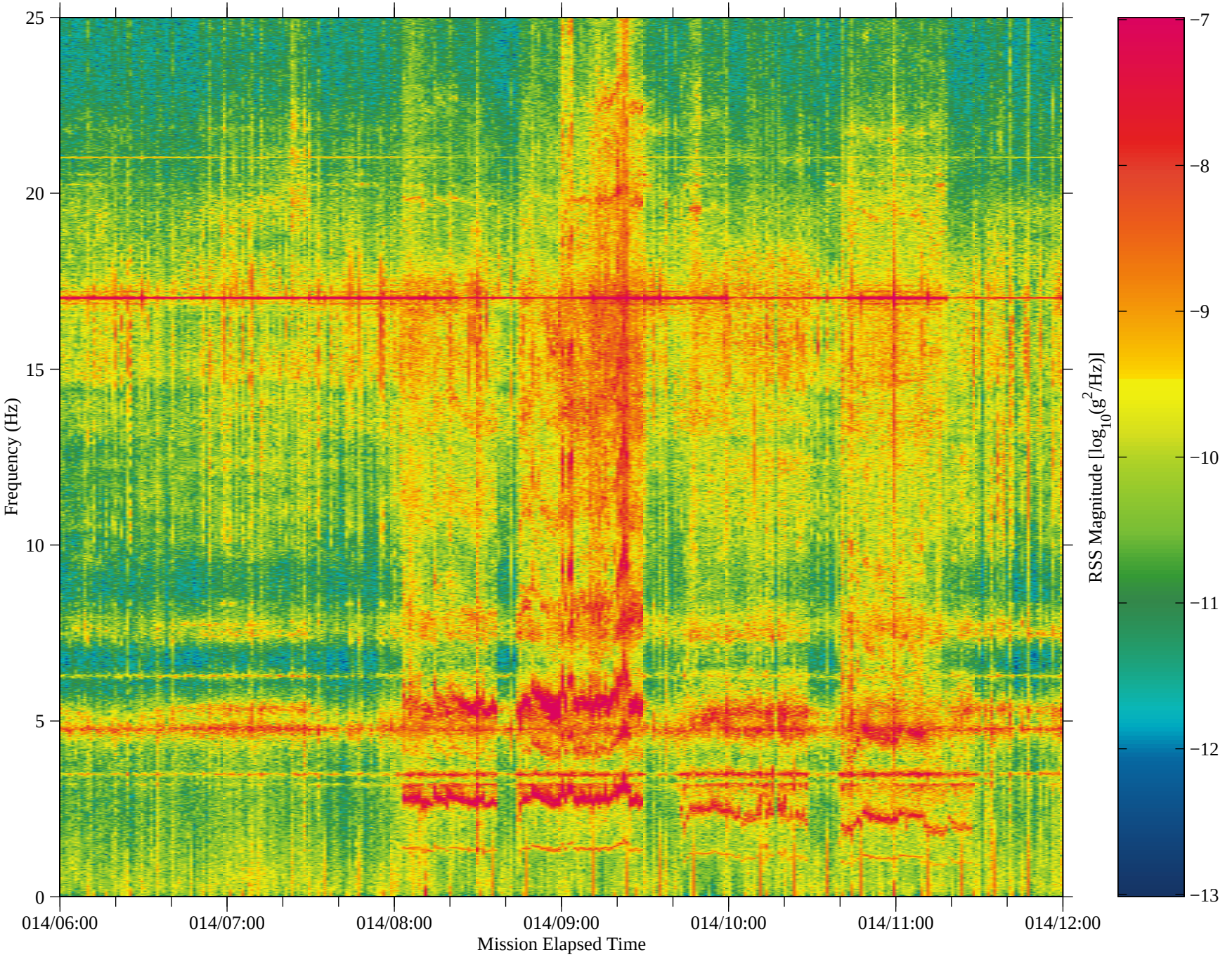

Figure 59: USMP−4, Unit F, TSH B

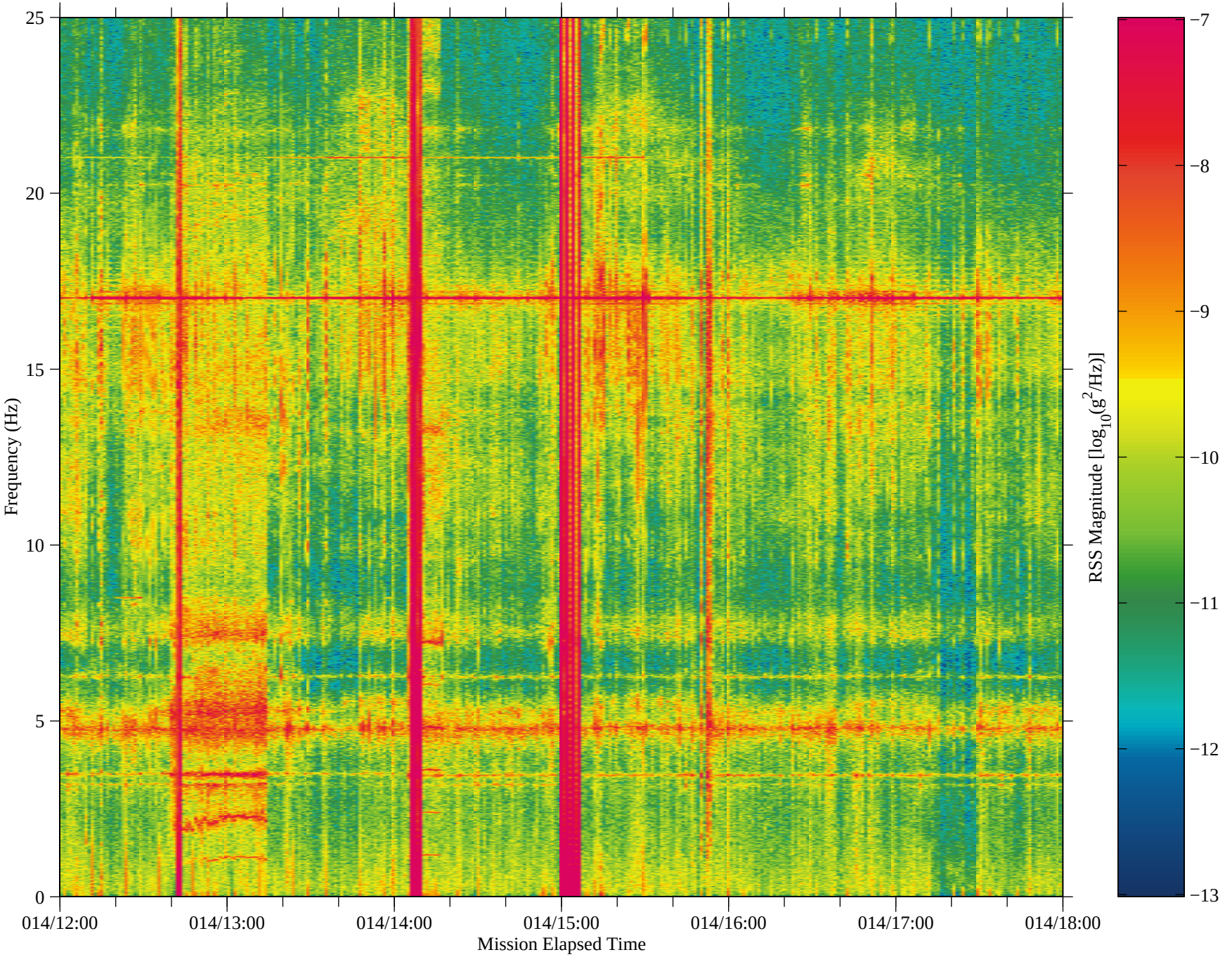

Figure 60: USMP−4, Unit F, TSH B

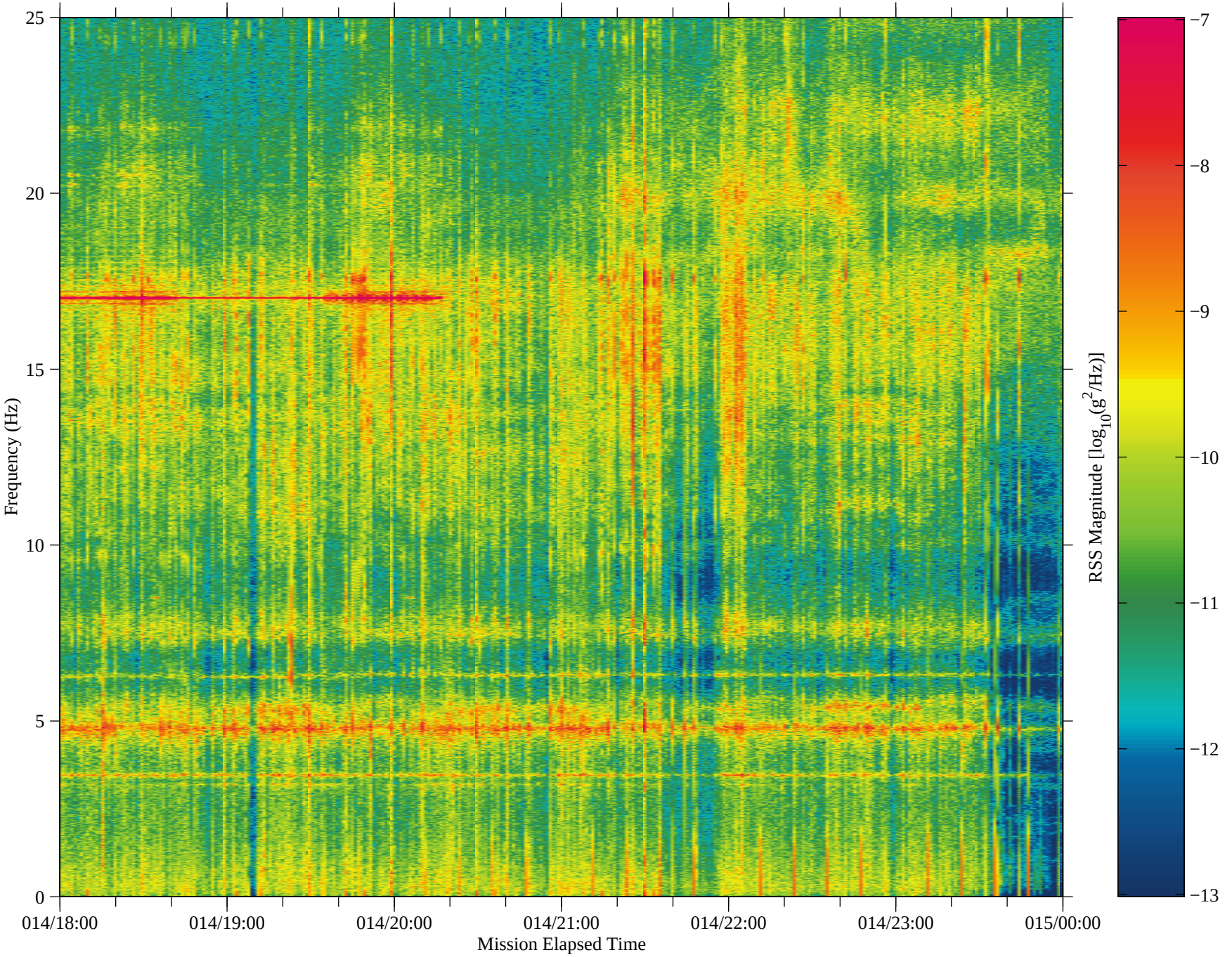

Figure 61: USMP−4, Unit F, TSH B

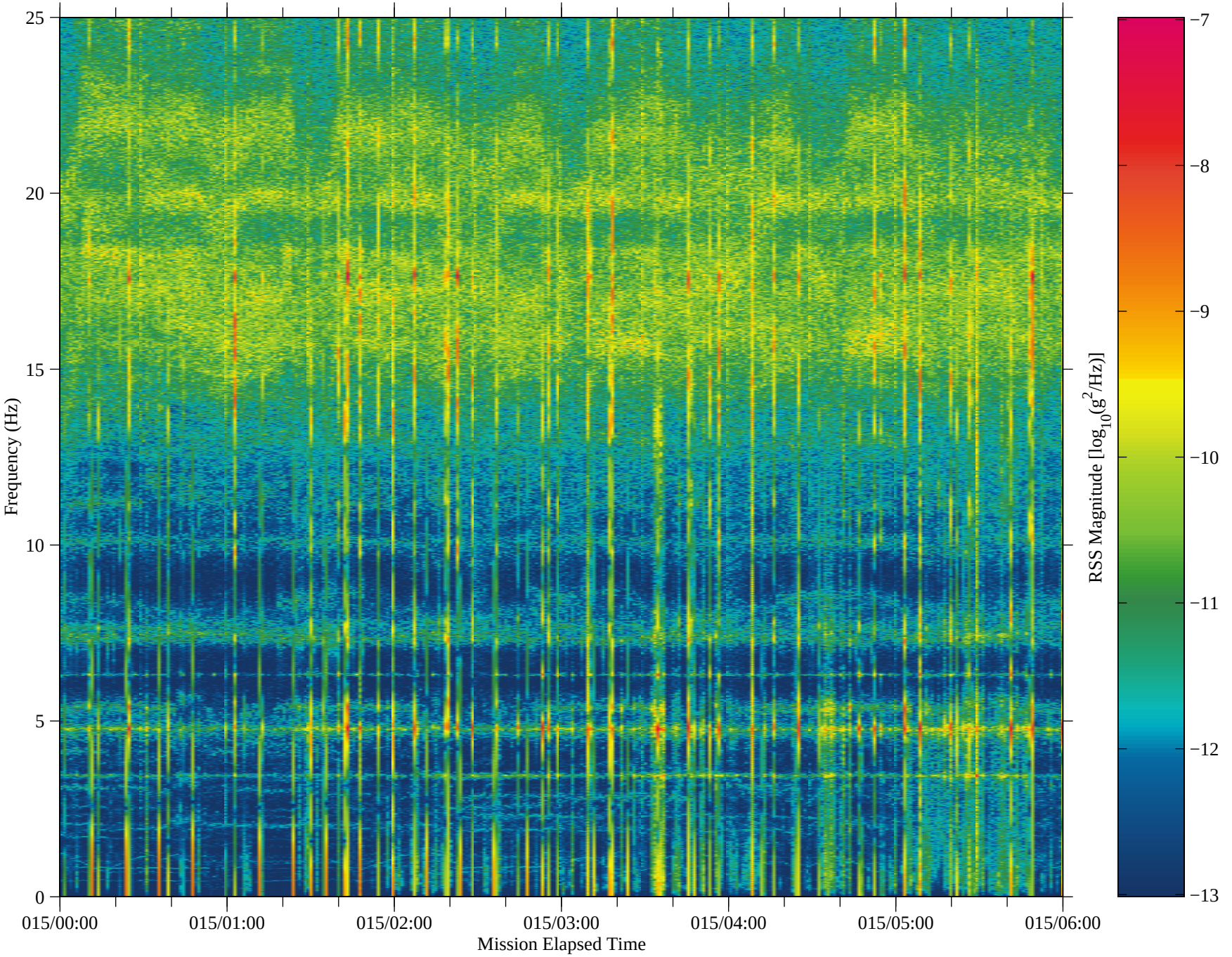
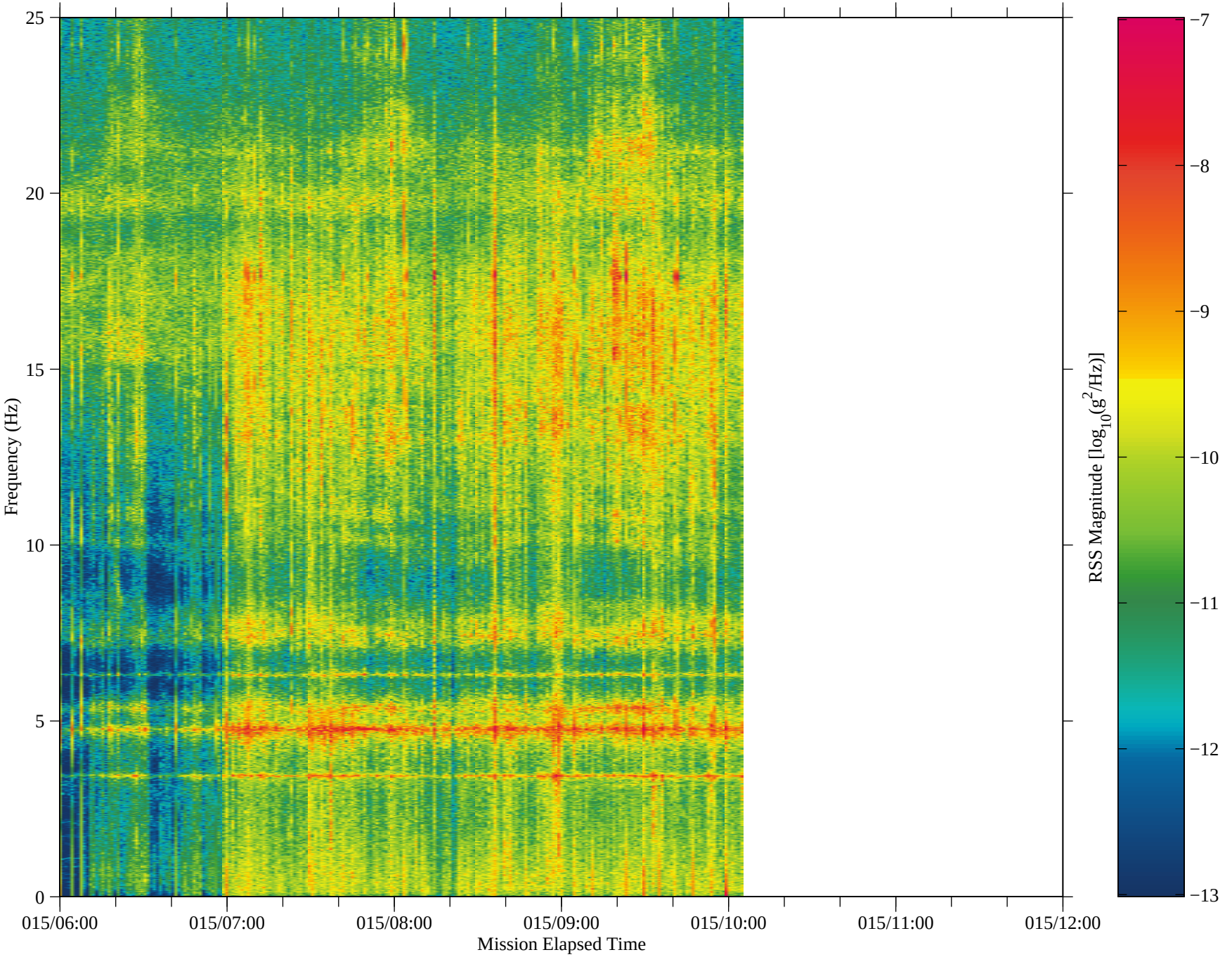
Figure 62: USMP−4, Unit F, TSH B