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Erratum: "The First CHIME/FRB Fast Radio Burst Catalog" (2021, ApJS, 257, 59)

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This erratum addresses two errors that occurred when inferring the CHIME/FRB all-sky rate of fast radio bursts (FRBs) above a fluence of 5 Jy ms at 600 MHz, with a scattering time at 600 MHz under 10 ms and dispersion measure (DM) above 100 pc cm^{-3}. Each error is just below the ≈20% level in the same direction, bringing the inferred all-sky rate down to [525 ± 30(stat.)$^{+142}_{-131}$ (sys.)] bursts sky^{-1} day^{-1}.

In the published article, we obtain selection-bias-corrected FRB property distributions for fluence (F), DM, pulse width (w), and scattering timescale at 600 MHz (τ). Afterwards, in Section 6.2, we investigate the fluence distribution of FRBs, simultaneously inferring the all-sky rate.

The first error was a bug in the code used when normalizing the observation function. Instead of normalizing by a factor of the sum of the fiducial model weights, the observation function was normalized by a factor of the total number of injected FRBs. The second error stemmed from the fact that the fiducial model weights used in the analysis did not properly exclude bursts with a scattering timescale above 10 ms at 600 MHz, a population we found was poorly constrained with CHIME/FRB observations. Thus, while we quoted a rate of FRBs below a scattering timescale of 10 ms at 600 MHz, the previously quoted rate did extrapolate to that region.

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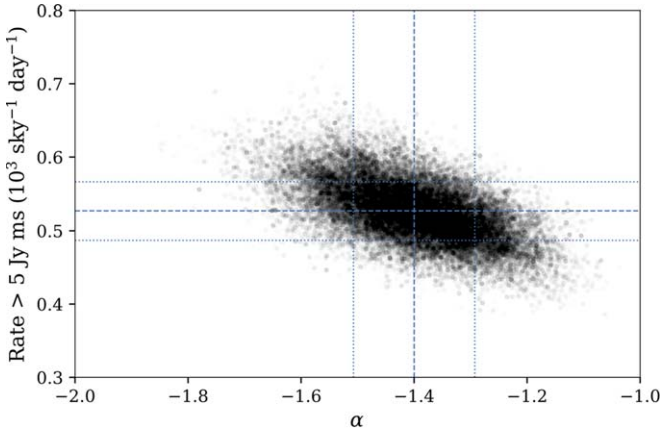

Figure 1. Markov Chain Monte Carlo samples of the posterior distributions for the all-sky rate and cumulative fluence distribution index α model parameters. The all-sky rate is for FRBs above 5 Jy ms, a DM above 100 pc cm^{-3}, and scattering timescales less than 10 ms at 600 MHz. Overlaid in dashed blue lines are the mean parameter values, and in dotted blue lines are the 1σ statistical uncertainty. Systematic uncertainties on the rate and α are not included in the distributions. The fluence distribution is still consistent with the Euclidean expectation of $\alpha = -3/2$.

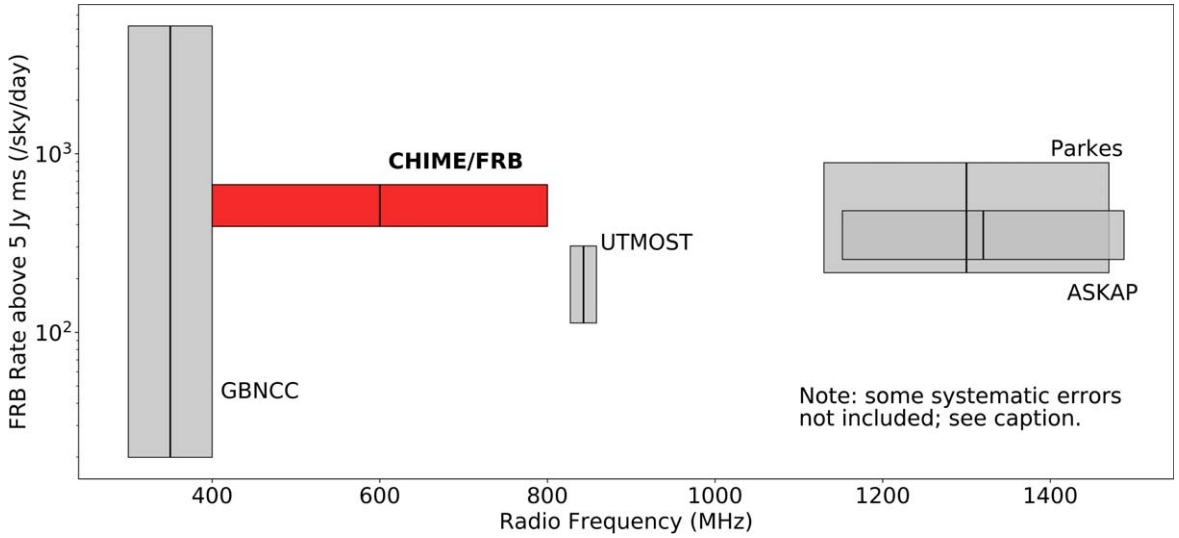

Figure 2. The updated CHIME/FRB all-sky rate plotted alongside other rate estimates. All rates are scaled (if needed) to a fluence limit of 5 Jy ms using our measured fluence index $\alpha = -1.40$, and plotted assuming a flat spectral index. Apparent discrepancies may be due to uncertainties and systematic differences from data being collected and processed by different surveys and instruments.

Above a fluence of 5 Jy ms at 600 MHz, with a scattering time at 600 MHz under 10 ms and DM above 100 pc cm^{-3}, the original quoted all-sky rate in the published article was $820 \pm 60(\text{stat.})^{+220}_{-200}(\text{sys.})$ sky^{-1} day^{-1}. After accounting for these two errors, neither of which affects our calculation of the systematic error budget, the updated all-sky rate of FRBs using the Catalog 1 sample is inferred to be $[525 \pm 30(\text{stat.})^{+142}_{-131}(\text{sys.})]$ sky^{-1} day^{-1}. The index of the source counts distribution (i.e., the slope of $\log N - \log S$) remains unchanged to any statistical significance (Figure 1).

The updated sky rate measured from our Catalog 1 sample is ≈35% lower than the erroneous sky rate measured. Thus, the interpretation of the rate is moderately, but not drastically, different than what was presented in Section 7.5 of the published article. The caveat of directly comparing our measured sky rate to others in the literature still holds due to the methods with which we accounted for instrumental effects. Nevertheless, we still present some simple comparisons. The CHIME/FRB rate is still consistent with the GBNCC rate of $3.4^{+15.4}_{-3.3} \times 10^3$ sky^{-1} day^{-1} above ∼2 Jy ms in the 300–400 MHz range (Parent et al. 2020). It is now also more consistent with the sky rate of 98^{+59}_{-39} sky^{-1} day^{-1} above a fluence of 8 Jy ms at 843 MHz reported from Molonglo/UTMOST (Farah et al. 2019), although one must still caution the interpretation of direct comparisons given the bandwidth difference between the two surveys. The updated rate is also still consistent with the sky rate of $1.7^{+1.5}_{-0.9} \times 10^3$ sky^{-1} day^{-1} above a fluence limit of 2 Jy ms at 1.4 GHz from Parkes-detected FRBs (Bhandari et al. 2018), and more consistent with the ASKAP-derived rate of 37 ± 8 sky^{-1} day^{-1} above 26 Jy ms at 1.4 GHz (Shannon et al. 2018) than it appeared before. These rates are shown in Figure 2 along with the updated CHIME/FRB all-sky rate.

The other results and conclusions in the published article are unaffected by these two errors. All other analyses contemporaneously presented are also unaffected by these errors (e.g., Josephy et al. 2021; Pleunis et al. 2021; Rafiei-Ravandi et al. 2021; Chawla et al. 2022). We look forward to further analyses and interpretations conducted using the first CHIME/FRB catalog, with the updated inferred all-sky rate.

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References

Bhandari, S., Keane, E. F., Barr, E. D., et al. 2018, MNRAS, 475, 1427
Chawla, P., Kaspi, V. M., Ransom, S. M., et al. 2022, ApJ, 927, 35
Farah, W., Flynn, C., Bailes, M., et al. 2019, MNRAS, 488, 2989
Josephy, A., Chawla, P., Curtin, A. P., et al. 2021, ApJ, 923, 2
Parent, E., Chawla, P., Kaspi, V. M., et al. 2020, ApJ, 904, 92
Pleunis, Z., Good, D. C., Kaspi, V. M., et al. 2021, ApJ, 923, 1
Rafiei-Ravandi, M., Smith, K. M., Li, D., et al. 2021, ApJ, 922, 42
Shannon, R. M., Macquart, J. P., Bannister, K. W., et al. 2018, Natur, 562, 386