

Erratum: Diffuse neutrino background from magnetorotational stellar core collapses [Phys. Rev. D **110**, 103029 (2024)]

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We report a mistake that quantitatively affects the findings presented in Secs. IV–VI of our paper. However, our conclusions remain unchanged. The neutrino luminosities for all the magnetorotational core collapse models in our work were underestimated by a constant factor (1.326). This factor arises from an error in the indexing of the radial bins in the simulation data.

We also report a digitalization error of the public data provided by the Super-Kamiokande-Gd Collaboration.

In the following, we summarize our updated results.

First, the figures showing the flavor-dependent neutrino luminosity and the time-integrated flux in Figs. 1 and 2 have been updated.

Next, accounting for the luminosity correction, if $f_{\text{MR}} \geq 0.09$ and full flavor conversion is considered for the highest local star formation rate, we find that the Super-Kamiokande-Gd upper limits would be incompatible with our DSNB model, as shown in Figs. 4 and 5.

Further, the timeline to reject the background-only hypothesis is also modified quantitatively, but JUNO could reach a 3σ local sensitivity in less than a decade. Due to the larger backgrounds, Super-Kamiokande-Gd will not be able to achieve

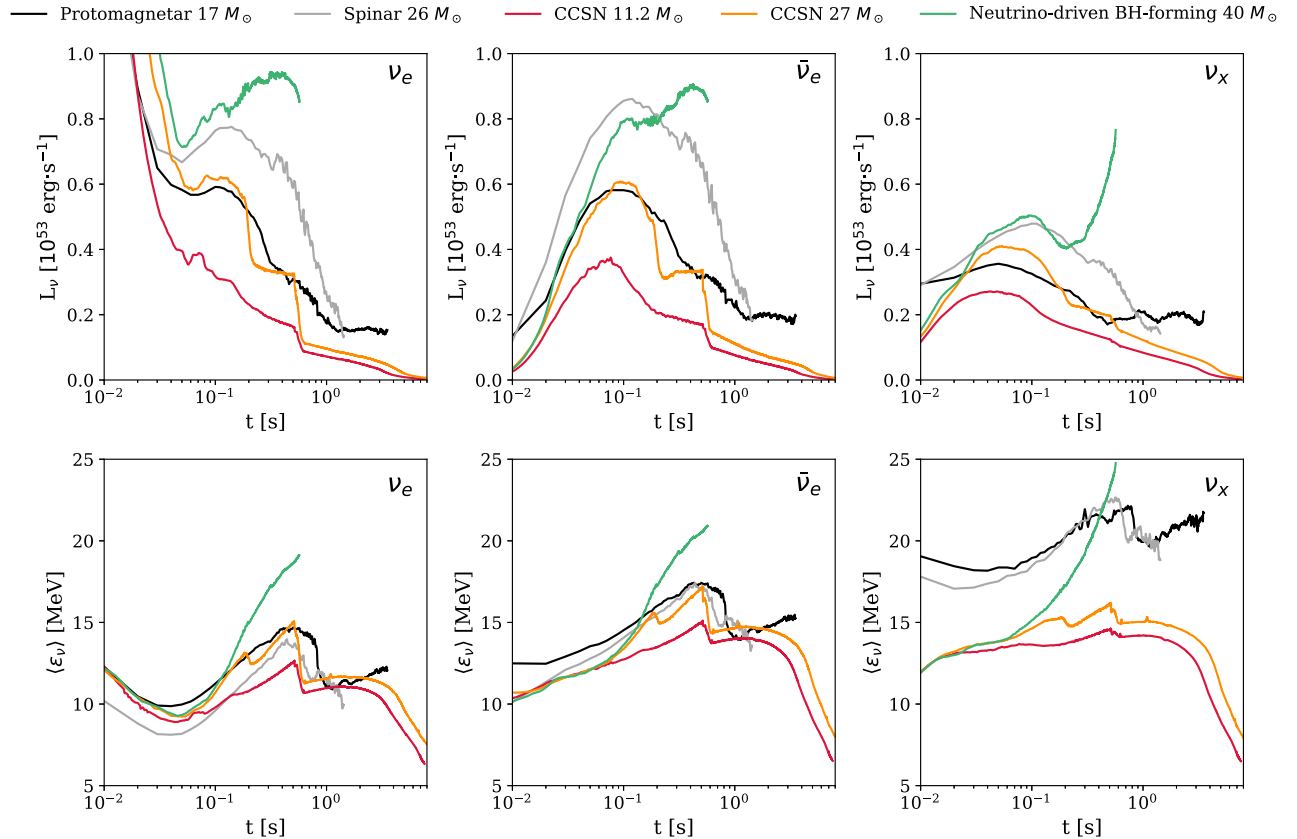


FIG. 1. The flavor-dependent neutrino luminosities of magnetorotational core collapse models have been corrected by factor 1.326.

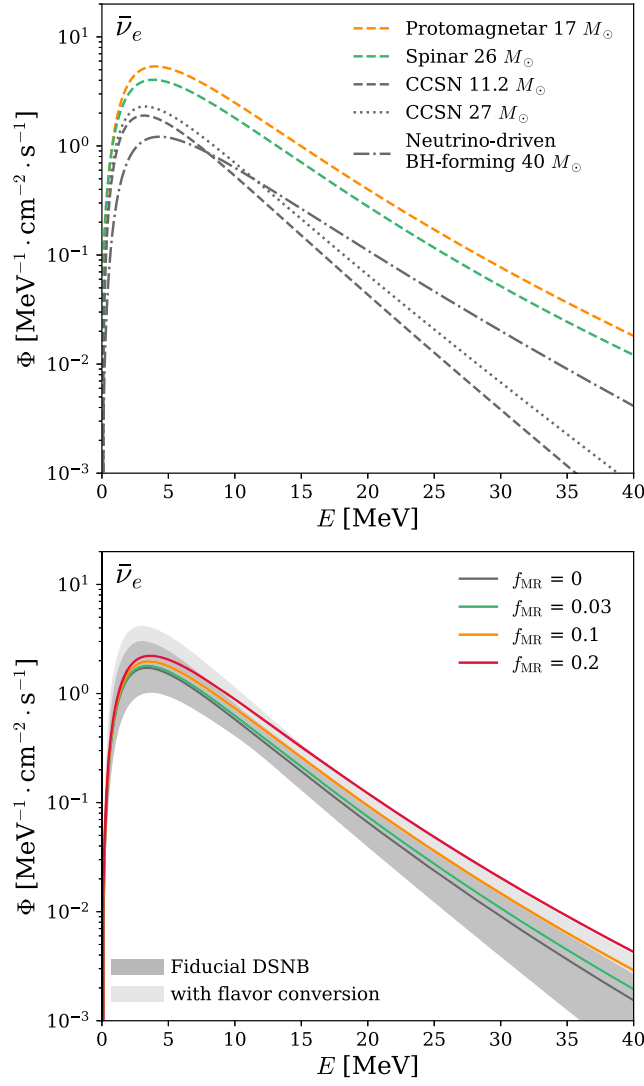


FIG. 2. The protomagnetar and spinar contributions have been updated (top panels) as well as the DSNB flux (bottom panel).

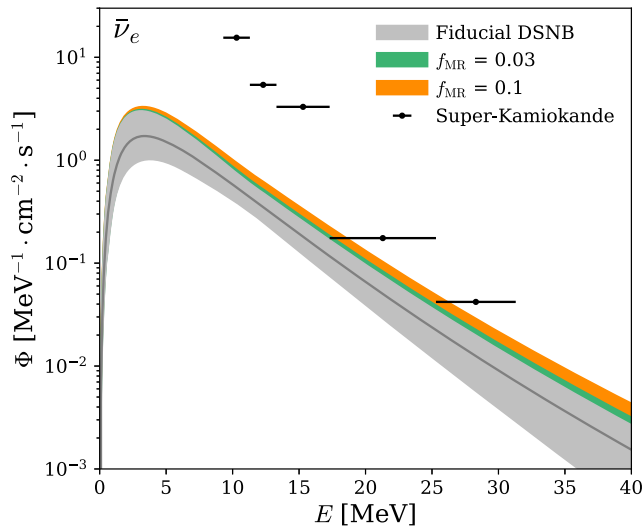


FIG. 4. DSNB predictions corrected after accounting for the factor 1.326.

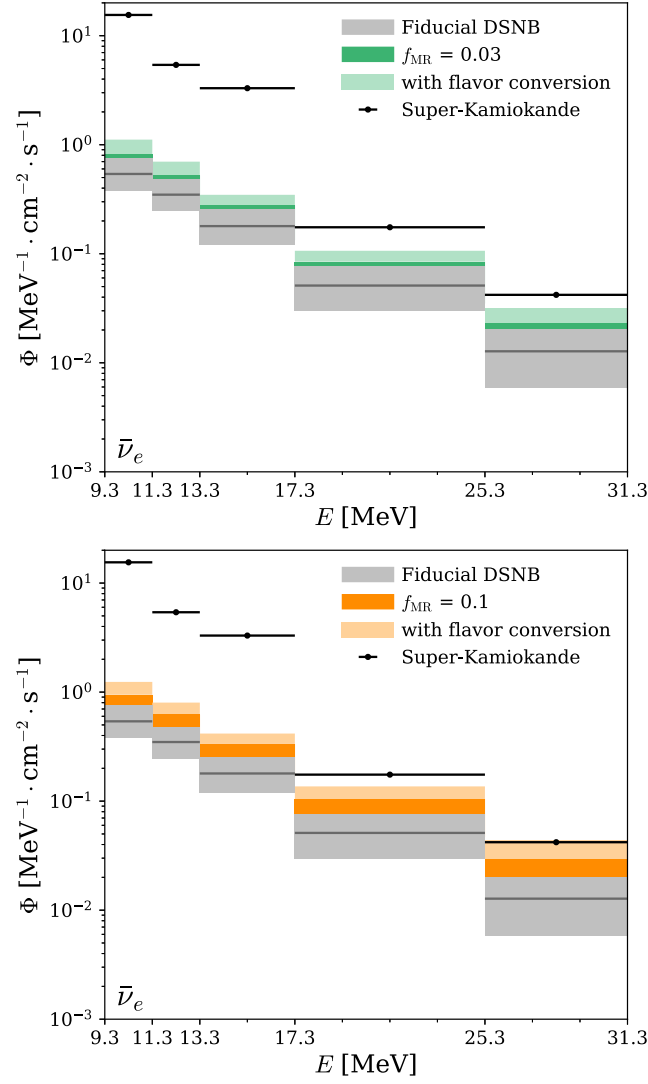


FIG. 5. A fraction of magnetorotational core-collapse of $f_{\text{MR}} = 0.1$ is excluded by Super-Kamiokande data at more than 90% CL (bottom panel).

comparable results within the next decade. However, these prospects can be improved accounting for the existing data from Super-Kamiokande (without Gd). Hence, the timeline displayed in Fig. 6 is affected, but the following statement holds true since the sensitivity is driven by JUNO: “A non-zero fraction of magnetorotational collapses could result in the DSNB detection within the next 6–8 yr or earlier.”

Also, the results regarding Hyper-Kamiokande are updated in Figs. 7 and 8. No qualitative change is found, but our constraints improve by 15%.

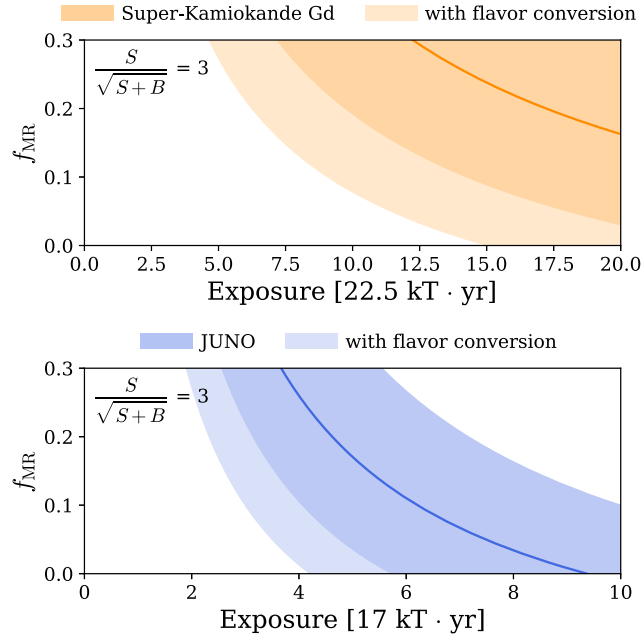


FIG. 6. The timeline for Super-Kamiokande-Gd is delayed, but the sensitivity of JUNO improves due to the larger neutrino luminosity.

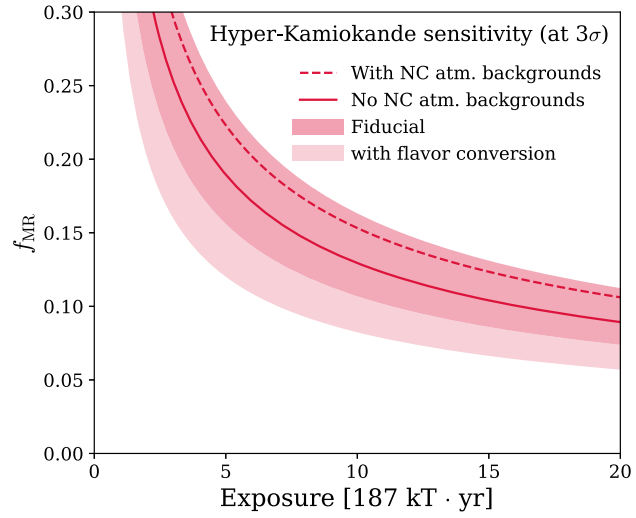


FIG. 7. The sensitivity to f_{MR} is improved approximately by 15%.

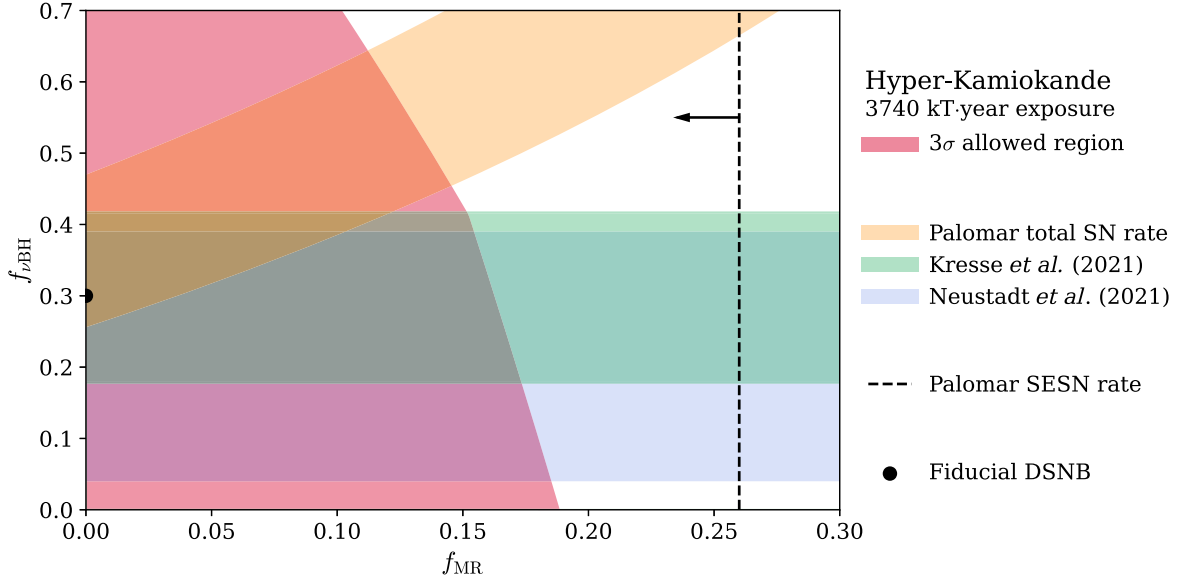


FIG. 8. The sensitivity of Hyper-Kamiokande to f_{MR} is increased up to 15%. The improvement is larger for smaller values of f_{LBH} .

TABLE II. The number of DSNB events has been updated.

Experiment	Fiducial volume [kt]	Detection efficiency	Energy window [MeV]	DSNB events ($f_{\text{MR}} = 0$) [(100 kT yr) $^{-1}$]	DSNB events ($f_{\text{MR}} = 0.1$) [(100 kT yr) $^{-1}$]	Background events [(100 kT yr) $^{-1}$]
JUNO	17	0.8	9.4–31.4	8.0	11.0	3.0
Super-K-Gd	22.5	0.55	9.4–31.4	5.2	7.2	36.1
DUNE	40	1	19.0–31.0	1.3	2.0	0.6
Hyper-K-Gd	187	0.55	9.4–31.4	5.2	7.2	18.0 (10.5 ^a)

^aThis value corresponds to the scenario in which neutral current backgrounds induced by atmospheric neutrinos are negligible.

Next, the digitalization error of the Super-Kamiokande-Gd data concerns the Super-Kamiokande-Gd signal and background. Such error led to an overestimation (underestimation) of the signal (background) rate, affecting our forecasted sensitivity. However, it does not alter our exclusion limits (based on a different analysis carried out by the Super-Kamiokande Collaboration).

Finally, for completeness, Table II has been updated.