Erratum: Hyperons and massive neutron stars: Vector repulsion and SU(3) symmetry [Phys. Rev. C 85, 065802 (2012)]

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(Received 2 June 2014; published 23 July 2014)

DOI: 10.1103/PhysRevC.90.019904 PACS number(s): 97.60.Jd, 26.60.Kp, 21.80.+a, 21.30.Fe, 99.10.Cd

In the calculations of the original article we did not take into account the contribution of the nonvanishing ϕ field when determining the scalar-meson hyperon coupling constant from the hyperon potential depths in nuclear matter at saturation,

$$U_Y^N = g_{\sigma Y}\sigma^{eq} + g_{\omega Y}\omega_0^{eq} + g_{\phi Y}\phi_0^{eq}, \qquad (1)$$

which gives a nonvanishing contribution for the cases studied beyond SU(6) symmetry to a more general SU(3) symmetry. The above expression is different compared to Eq. (9) of Ref. [1], which is only applicable in the usual case of a vanishing ϕ meson contribution, i.e., for SU(6) symmetry. The impact of the contribution from this omitted term on the scalar meson hyperon couplings is non-negligible, and it significantly affects the composition of the core as the hyperon potential depths are modified, which is in line with the findings of our previous paper [1].

Although Figs. 2 and 8 for the equation of state (EoS) and Figs. 3 and 9 for the mass-radius relation do not change qualitatively, they are however affected by the change in the scalar-meson hyperon coupling constant, which is responsible for the attractive interaction, by causing a slight softening of the EoS for low values of z and α_V and a stiffening for larger values than the SU(6) case. Consequently, the mass-radius curves also change slightly, the maximum masses for the lowest values of z and α_V change by a few percent from $M = 2.357\ M_\odot$ to $M = 2.285\ M_\odot$ for $z = 0$ and from $M = 2.360\ M_\odot$ to $M = 2.285\ M_\odot$ for $\alpha_V = 0$, and values are still beyond the observed pulsar mass limit of two solar masses. These values are in line with the recent study of Lopes and Menezes [2].

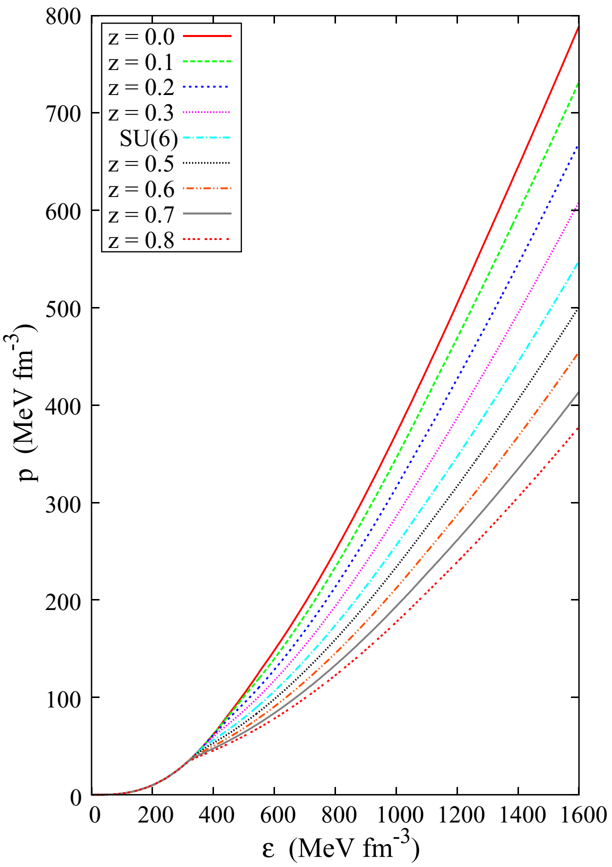

FIG. 2. (Color online) EoS for different g_8/g_1 ratios z within a nonlinear σ-ω model with an additional ϕ meson and the full baryon octet for the GM1 parameter set. The EoS get stiffer with decreasing z.

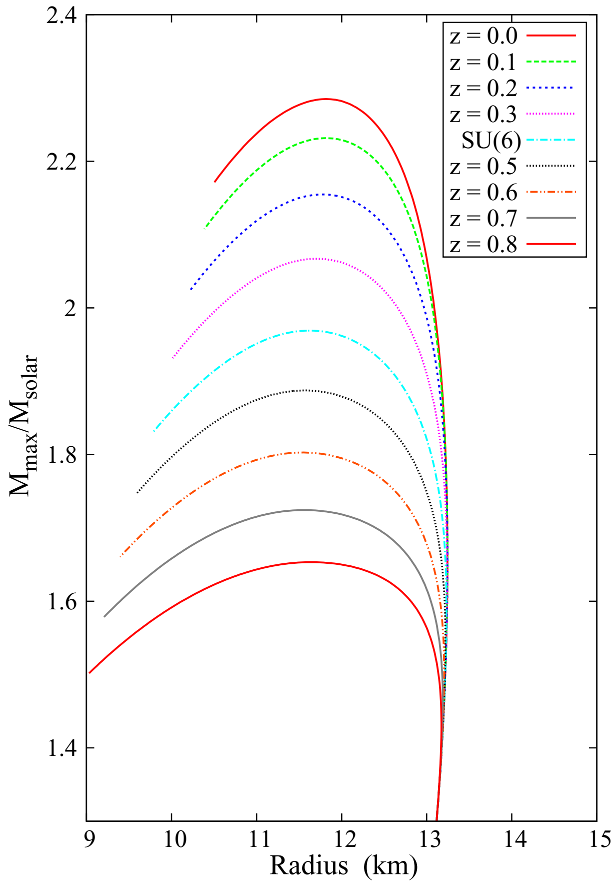

FIG. 3. (Color online) Mass-radius relations for the EoS displayed in Fig. 2. The maximum mass is obtained for the case $z = 0$ where all baryons couple to the vector mesons with equal strengths.

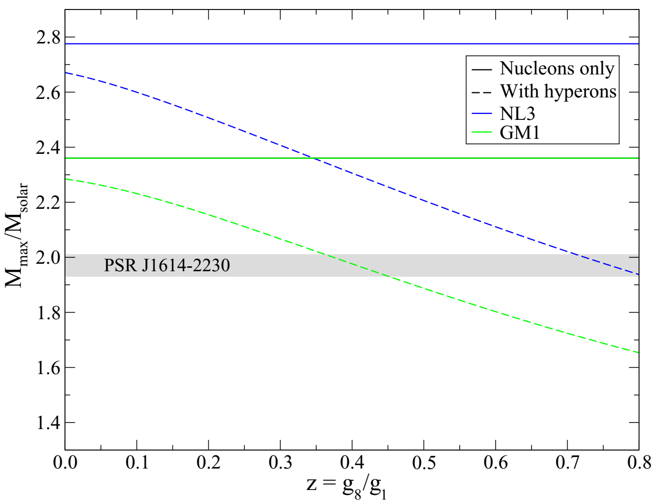

FIG. 4. (Color online) Maximum masses as functions of the g_8/g_1 ratio z for the NL3 and GM1 parameter sets. For each parametrization the case of pure nucleonic matter is also displayed.

The results for the particle fractions shown in Fig. 5 of the original article are now completely different in the revised version—the hyperon composition does not change that much anymore for different values of z, in particular for $z = 0$ there is now a considerable fraction of hyperons present in the core contrary to the findings reported in the original article. Thus the nucleonic limit is not reached for the $z = 0$ case as claimed in the original article, which is also now evident from our new Figs. 4 and 6. This finding implies that hyperons are always present in the most massive neutron star configurations, which is in agreement with Ref. [2].

Lastly, Fig. 10 for the maximum mass vs strangeness fraction is now also significantly altered, and the results cannot

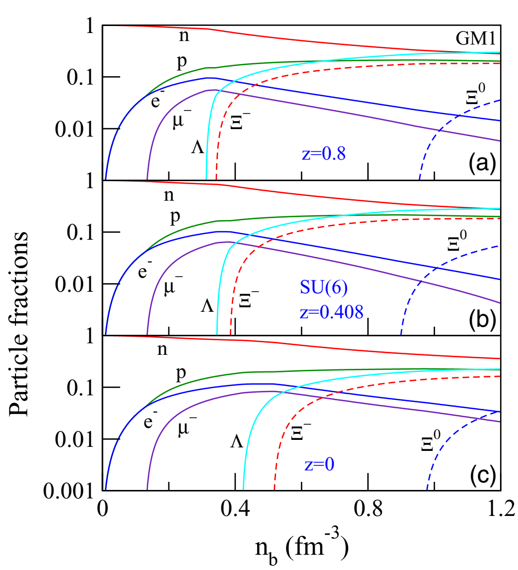

FIG. 5. (Color online) Particle fractions for the GM1 parameter set for three different values of z: (a) $z = 0.8$, (b) $z = 0.408$ that correspond to the SU(6) case, and (c) $z = 0$.

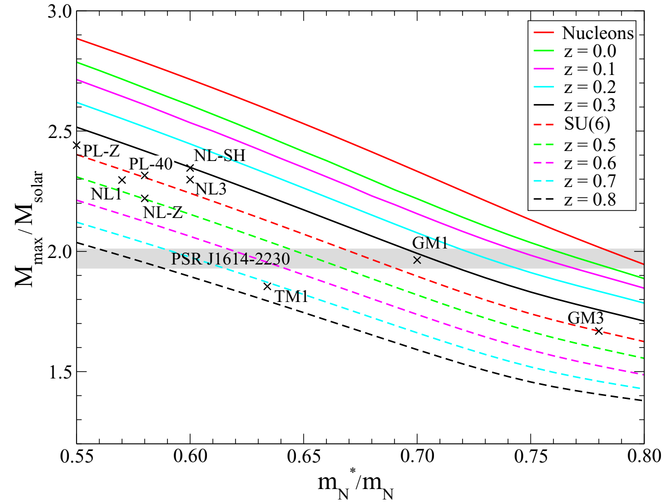

FIG. 6. (Color online) Maximum masses of hyperonic neutron stars as functions of effective nucleon mass m_N^* for different values of the g_8/g_1 ratio z. For comparison, a line for nucleonic stars and points to mark relativistic mean-field sets (e.g., TM1 and NL3) that correspond to the SU(6) case are also given.

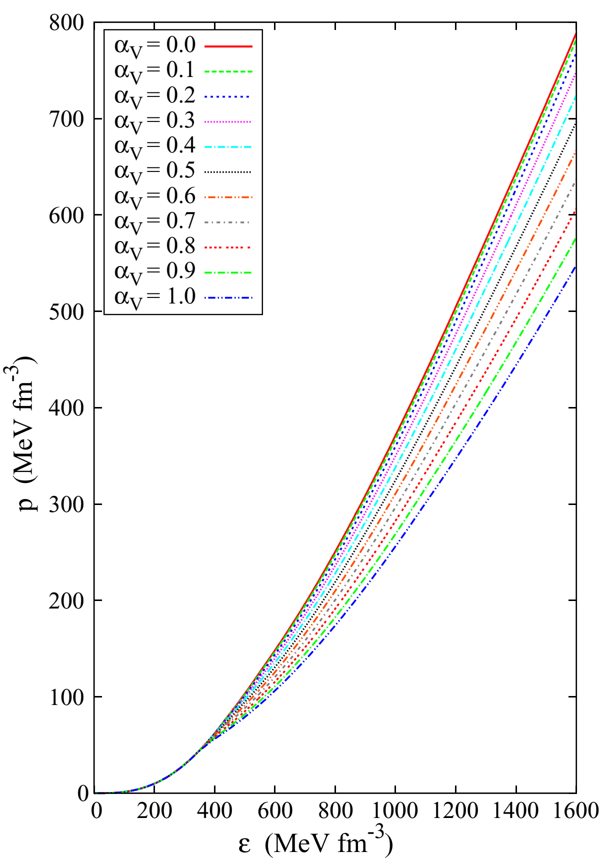

FIG. 8. (Color online) The EoS for "model $\sigma\omega\rho\phi$" in the GM1 parametrization for different values of α_V. z is fixed to its SU(6) value $z = 1/\sqrt{6}$, and ideal mixing is assumed. The EoS become stiffer with decreasing α_V.

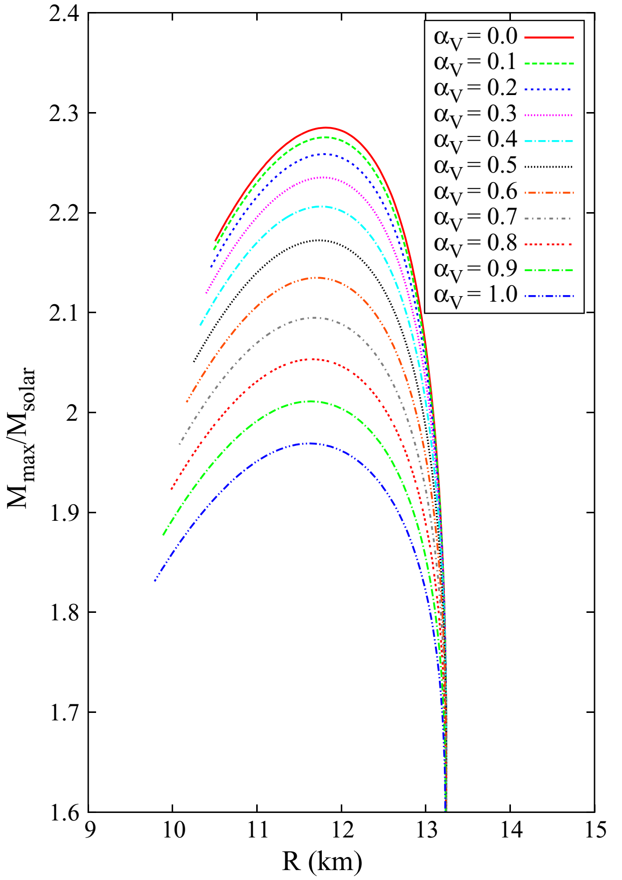

FIG. 9. (Color online) Mass-radius relations obtained from the EoS in Fig. 8.

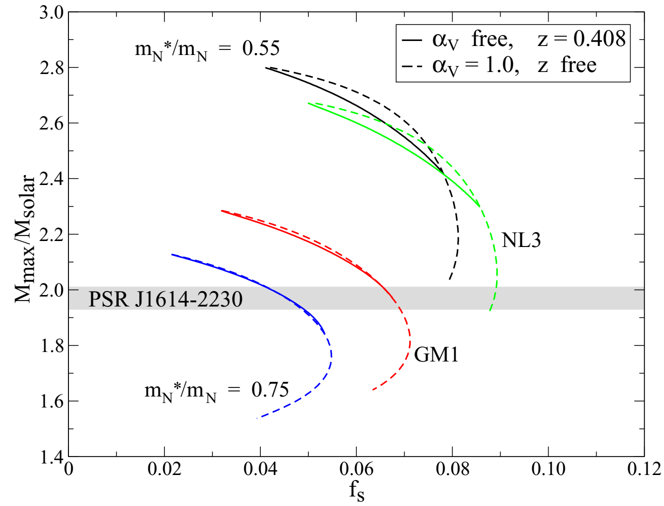

FIG. 10. (Color online) Maximum masses of neutron stars as functions of strangeness fraction f_s in the neutron star core for four different parametrizations.

be fitted anymore by the simple linear formula Eq. (15) as suggested in our original article. This fact has also been pointed out in Ref. [2]. The corrected values for the strangeness fraction are in the range of $0.021 \leqslant f_s \leqslant 0.090$ that depend on the particular parametrization.

It is interesting to note that the hyperon potential depths determine only the composition of the core, whereas it is the vector coupling constants that determine the overall stiffness of the EoS (cf. also Ref. [2]).

Figures 1 and 7, which show the vector meson hyperon coupling constants of our original article, remain unchanged.

[1] S. Weissenborn, D. Chatterjee, and J. Schaffner-Bielich, Nucl. Phys. A **881**, 62 (2012).

[2] L. L. Lopes and D. P. Menezes, Phys. Rev. C **89**, 025805 (2014).