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Is SAX J1808-3658 an hyperonic star?

We analyse the effect of the density dependence of the symmetry energy on the hyperonic content of neutron stars within a relativistic mean field description of stellar matter. For the Λ -hyperon, we consider parametrizations calibrated to Λ -hypernuclei. For the Σ and Ξ -hyperons uncertainties that reflect the present lack of experimental information on Σ and Ξ -hypernuclei are taken into account. We perform our study considering nuclear equations of state that predict two solar mass stars, and satisfy other well settled nuclearmatter properties. The effect of the presence of hyperons on the direct Urca processes and the cooling of accreting neutron stars are discussed. The density dependence of the symmetry energy affects the order of appearance of the different hyperons, which may have direct implications on the neutron star cooling as different hyperonic neutrino processes may operate at the center of massive stars. For models which allow for the direct Urca process to operate, hyperonic and purely nucleonic ones are shown to have a similar luminosity when hyperons are included in agreement with modern experimental data. It is shown that for a density dependent hadronic model constrained by experimental, theoretical and observational data, the low-luminosity of SAX J1808.4 – 3658 can only be modelled for a hyperonic NS, suggesting that hyperons could be present in its core.

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