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The crust of accreting neutron stars within simplified reaction network

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Transiently accreting neutron stars in low mass X-ray binaries are generally believed to be heated up by nuclear reactions in accreted matter during hydrostatic compression. Detailed modeling of these reactions is required for the correct interpretation of observations. We construct a simplified reaction network, which can be easily implemented and depends mainly on atomic mass tables as nuclear physics input. We show that it reproduces the results of the detailed network by Lau et al. (2018, ApJ, 859, 62) very well if one applies the same mass model. However, the composition and the heating power are shown to be sensitive to the mass table used and treatment of mass tables boundary, if one applies several of them in one simulation. In particular, the impurity parameter $Q_{\rm imp}$ at density $\rho = 2 \times 10^{12}$ g cm^{-3} can differ for a factor of few, and even increase with density increase. The profile of integrated heat release shown to be well confined between results by Fantina et al. (2018, A&A, 620, 19) and Lau et al. (2018, ApJ, 859, 62). Detailed analysis of results allows us to reveal a hint of inconsistency in implicit assumptions, which are traditionally applied in models of accreted crust. Work is supported by Russian Science Foundation (grant no. 19-12-00133).

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