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Partially accreted crusts of neutron stars

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Neutron stars in binary systems may accrete matter from their companion star ; so far, only the case of a crust fully replaced by accreted matter has been considered in detailed calculations. However if the star has only accreted a small amount of matter, the crust is not fully but only partially accreted. This could be for example the case of IGR J17480–2446. The observed decrease of its temperature after the accretion phase is the slowest of all ~ 10 objects for which such a relaxation has been monitored in X-ray and its slow rotation indicates that the accretion of matter from the companion started relatively recently. These could indicate that IGR J17480–2446 has a partially accreted crust which nuclear and thermal properties could be different from the ones of a fully accreted crust.

We propose a model of partially accreted crusts for which we follow the originally catalyzed crust as it undergoes an increase in pressure due to the above accreted material falling at the surface. We study different properties of partially accreted crust, additional energy sources and discuss differences with respect to catalyzed and fully accreted crust.

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