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Crust structure and thermal evolution of neutron stars in soft X-ray transients (Invited)

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Thermal evolution of neutron stars in soft X-ray transients (SXTs) is sensitive to neutron-star equation of state (EoS), neutrino emission rates, and structure of the neutron-star crust. Therefore, comparison of observations of quiescent thermal emission of SXTs with numerical simulations of their heating and cooling is useful for verification of theoretical models of the dense matter in neutron-star interiors. We study thermal evolution of neutron stars in SXTs using modern models of the EoS, baryon superfluidity, formation and structure of the accreted and nonaccreted crust. We test currently competing models of composition and formation of the accreted crust and deep crustal heating during accretion episodes. We also study the effects brought about by impurities embedded in the nonaccreted part of the crust, considering a finite temperature of crust annealing in a newly born neutron star. Thermal relaxation of such an impure crust after an accretion episode is compared with the relaxation of the canonical nonaccreted crust composed of the ground-state cold catalyzed matter. We check the simulations of
thermal evolution of transiently accreting neutron stars against observations of SXTs in quiescence.

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