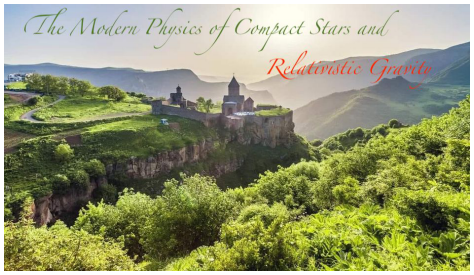

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Deep crustal heating for realistic compositions of thermonuclear ashes

Wednesday 29 September 2021 11:25 (25 minutes)

The deep crustal heating, associated with exothermal nuclear reactions, is believed to be a key parameter for describing the thermal evolution of accreting neutron stars. In this talk, we present the first thermodynamically consistent calculations of the crustal heating for realistic compositions of thermonuclear ashes. In contrast to previous studies based on the traditional approach, we account for neutron hydrostatic/diffusion (nHD) equilibrium condition imposed by superfluidity of neutrons in a major part of the inner crust and rapid diffusion in the remaining part of the inner crust. We apply a simplified reaction network to model nuclear evolution of various multi-component thermonuclear burning ashes (superburst, KEPLER, and extreme rp-process ashes) in the outer crust and calculate the deep crustal heating energy release Q, parametrized by the pressure at the outer-inner crust interface, $P_{\rm oi}$. The work of N. N. Shchechilin was supported by the Foundation for the Advancement of Theoretical Physics and Mathematics "BASIS"(grant #20-1-5-79-1). The work of M. E. Gusakov was supported by RFBR [Grant No. 19-52-12013].

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