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Heating and Cooling in Accreting Neutron Stars

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In accreting neutron stars, material in the crust undergoes complex nuclear reaction sequences that involve a broad range of nuclei ranging from stability to the neutron drip line and beyond. It was recently shown that these reactions not only heat the crust, but can also lead to efficient cooling through an Urca process that involves electron capture and beta decay between pairs of nuclei. Urca cooling and crustal heating depend sensitively on the properties of neutron rich nuclei that in many cases are only poorly known. I will review observations, models, and experimental efforts to constrain the relevant nuclear physics, and discuss the key nuclear physics questions that arise from these new effects.