

Evidence for crust cooling in the transiently accreting 11-Hz X-ray pulsar in the globular cluster Terzan 5

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The temporal heating and subsequent cooling of the crusts of transiently accreting neutron stars carries unique information about their structure and a variety of nuclear reaction processes. We report on a new Chandra Director's Discretionary Time observation of the globular cluster Terzan 5, aimed to monitor the transiently accreting 11-Hz X-ray pulsar IGR J17480-2446 after the cessation of its recent 10-week long accretion outburst. During the observation, which was performed ~ 125 days into quiescence, the source displays a thermal spectrum that fits to a neutron star atmosphere model with a temperature for an observer at infinity of $kT \sim 92$ eV. This is $\sim 10\%$ lower than found ~ 75 days earlier, yet $\sim 20\%$ higher than the quiescent base level measured prior to the recent outburst. This can be interpreted as cooling of the accretion-heated neutron star crust, and implies that crust cooling is observable after short accretion episodes. Comparison with neutron star thermal evolution simulations indicates that substantial heat must be released at shallow depth inside the neutron star, which is not accounted for in current nuclear heating models.

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