Plastic deformation as an additional heating source in transiently accreting neutron stars

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Transiently accreting neutron stars provide an unique opportunity to test neutron star models: for several of them, the surface cooling is observed in real time after an accretion episode. This cooling is associated with thermal relaxation of the crust, heated during accretion. Modeling this process touches many aspects of neutron star physics, which therefore can be tested by comparison with observations.

Such comparisons have shown that known heat sources are insufficient to explain the high temperature observed immediately after the end of accretion. To remedy this, many authors have introduced a phenomenological shallow heating source and placed constraints on its parameters. However, the nature of this source remains a mystery.

This talk considers a previously unaccounted heating mechanism associated with plastic deformation of the Coulomb crystal of atomic nuclei caused by compression of the matter during accretion. The power of this source has been calculated, but it turned out to be insufficient to explain the observations.

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