Abstract Submitted
for the HAW14 Meeting of
The American Physical Society

The Fate of Accreted Nuclei in the Neutron Star Inner Crust[1]
ALEX DEIBEL, EDWARD BROWN, Michigan State University — The crust of an accreting neutron star is expected to have a composition that is different from cold-catalyzed matter. The non-equilibrium reactions induced by the accretion of matter gradually transform the ashes of hydrogen and helium burning to neutron-rich matter in the inner crust. These reactions heat and cool the crust, and if the composition is anisotropic, they may produce a mass quadrupole. An important question, then, is how much the composition can vary in the inner crust. We examine this question by using nuclear mass models to investigate the stability of nuclei that must co-exist with degenerate electron and neutron gases. We show that there are few stable nuclei deep in the inner crust, and that the accreted inner crust does not contain equilibrium nuclei. We compare our multicomponent composition results with a full reaction network that includes finite electron and neutron capture reaction rates and pycnonuclear reactions.

[1]Joint Institute for Nuclear Astrophysics (JINA)

Alex Deibel
Michigan State University

Date submitted: 01 Jul 2014 Electronic form version 1.4