Abstract Submitted
for the APR16 Meeting of
The American Physical Society

Influence of neutrinos on r-process nucleosynthesis in black hole–neutron star mergers[1] JONAS LIPPUNER, LUKE F. ROBERTS, Caltech, MATTHEW D. DUEZ, WSU, JOSHUA A. FABER, RIT, FRANCOIS FOUCART, LBNL, JAMES C. LOMBARDI, Allegheny College, CHRISTIAN D. OTT, Caltech, MARCELO PONCE, U of Guelph — During a black hole–neutron star merger, baryonic material can be dynamically ejected. Because this ejecta is extremely neutron-rich, the r-process rapidly synthesizes heavy nuclides as the material expands and cools. This can contribute to galactic chemical evolution of the r-process elements and lead to a short-lived optical transient, called a kilonova, powered by the radioactive decay of the heavy nuclides. We use the nuclear reaction network *SkyNet* to model r-process nucleosynthesis under varying levels of neutrino irradiation by post-processing tracer particles in the ejecta of a full numerical relativity simulation of a black hole–neutron star merger. We find the ejected material robustly produces the second and third r-process peaks, whose abundances remain unchanged even for very high neutrino luminosities, due to the rapid velocities of the outflow. Nonetheless, we find that neutrinos can have an impact on the detailed abundance pattern by significantly enhancing the amount of material produced in the first peak around $A \sim 78$. Electron neutrinos are captured by neutrons to produce protons while neutron capture is occurring. These protons rapidly form low-mass seed nuclei, a fraction of which eventually ends up in the first peak after neutron capture ceases.

[1]Partially supported by NASA and NSF under AST-1205732, AST-1313091, AST-1333520, PF3-140114, PF4-150122, and PHY-1151197.

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Date submitted: 07 Jan 2016 Electronic form version 1.4