Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Multidimensional Radiative Transfer Models of Kilonovae[1] OLEG KOROBKIN, Los Alamos National Laboratory (LANL), RYAN WOLLAEGER, CHRISTOPHER FRYER, AIMEE HUNGERFORD, LANL, STEPHAN ROSSWOG, Stockholm University AlbaNova, CHRISTOPHER FONTES, MATTHEW MUMPOWER, EVE CHASE, WESLEY EVEN, JONAH MILLER, WENDELL MISCH, JONAS LIPPUNER, LANL — Observations of neutron star merger kilonovae such as the one associated with GW1708917 could be fit by a number of simulations that qualitatively agree, but can quantitatively differ (e.g. in total r-process mass) by an order of magnitude. Here we categorize kilonova ejecta into several typical morphologies motivated by numerical simulations, and apply a radiative transfer Monte Carlo code to study how the shape of the ejecta affects the emission. We find major impacts on both spectra and light curves. The peak bolometric luminosity can vary by two orders of magnitude and the timing of its peak by a factor of five. Moreover, different combinations of two-component morphologies lead to a highly diverse set of light curves. We find various radiative multicomponent effects influencing the spectra of kilonovae, such as blocking, flux redirection and double reprocessing. We identify geometry-dependent P Cygni features in late spectra that directly map to strong lines in the simulated opacity of Nd, which not only constrains the ejecta geometry but also allows the direct probing of the r-process abundances.

[1]Supported by the Laboratory-Directed Research and Development program of LANL under project number 20190021DR

Oleg Korobkin
Los Alamos National Laboratory

Date submitted: 08 Jan 2021 Electronic form version 1.4