Abstract Submitted
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Gravitational Wave Memory from Asymmetric Core-Collapse Supernovae[1] COLTER RICHARDSON, MICHELE ZANOLIN, Embry-Riddle Aeronautical University, Prescott, HAAKON ANDRESEN, Max Planck Institute for Gravitational Physics, Albert Einstein Institute, KIRANJYOT GILL, Harvard University, MAREK SZCZEPANCZYK, University of Florida, ANNOP WONG-WATHANARAT, Max Planck Institute for Astrophysics, LIGO COLLABORATION — Gravitational wave memory from core-collapse supernova is the permanent deformation of spacetime. This memory hints at asymmetries in the CCSN's explosion morphology. We introduce three models for explosion morphology: 1. A prolate (cigar shaped) explosion that forces the matter and neutrino emission to follow two jets along the positive and negative z-axis, 2. An oblate (disk shaped) explosion that forces the material emission radially in the x-y plane, and 3. A spheroidal explosion which forces the material to expand radially in all directions with parameters to control how prolate, oblate, elliptical, or spherical the explosion is. These morphologies are tested against the W15-2 CCSN model (a nonrotating 15M$\odot$ progenitor), here we define the memory at the end of the neutrino simulation. Because this example case does not have a complete memory due to the truncation of the simulation, we introduce methods to extend a GW signal to a final memory value. We also introduce a methodology to emulate the detector response of GW detectors to this permanent deformation. Finally, we investigate the possibilities for detecting memory signals in current and future GW detectors, using the coherent Wave Burst pipeline developed to detect transient GW burst signals.

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