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Gravitational wave extraction in simulations of binary black hole mergers and rotating stellar core collapse CHRISTIAN REISSWIG, Caltech — The accurate modeling of gravitational radiation is a key issue for gravitational wave astronomy. As simulation codes reach higher accuracy, systematic errors inherent in current numerical relativity wave-extraction methods become evident, and may lead to a wrong astrophysical interpretation of the data. Gravitational radiation is properly defined only at future null infinity, scri+, but in practice it is estimated from data calculated at a finite radius. We have used Cauchy-characteristic extraction (CCE) to calculate gravitational radiation at scri+ for the inspiral and merger of two equal mass non-spinning black holes. The implementation is general purpose, and can be applied to calculate the gravitational radiation, at scri+, given data at a finite radius calculated in another computation. This allows us to apply CCE in the context of general relativistic rotating stellar core collapse. We compute the gravitational waves (GWs) emitted in the core bounce phase of three representative models. Using the CCE results as a benchmark, we assess the accuracy of the quadrupole formalism, as well as various curvature-based extraction methods, for the first time applied in simulations of rotating core collapse.

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