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How far away is far enough for extracting numerical waveforms and how much do they depend on the extraction method? ENRIQUE PAZOS, NILS DORBAND, LSU-CCT, ALESSANDRO NAGAR, Politecnico di Torino, CARLOS PALENZUELA, LSU, ERIK SCHNETTER, MANUEL TIGLIO, LSU-CCT — We present a method for extracting gravitational waves from numerical spacetimes which generalizes and refines one of the standard methods based on the Regge–Wheeler–Zerilli perturbation formalism. At the analytical level, this generalization allows a much more general class of slicing conditions for the background geometry, and is thus not restricted to Schwarzschild–like coordinates. At the numerical level, our approach uses high order multi-block methods, which improve both the accuracy of our simulations and of our extraction procedure. In particular, the latter is simplified since there is no need for interpolation, and we can afford to extract accurate waves at large radii with only little additional computational effort. We then present fully nonlinear three-dimensional numerical evolutions of a distorted Schwarzschild black hole in Kerr–Schild coordinates with an odd parity perturbation and analyze the improvement we gain from our generalized wave extraction, comparing our new method to the standard one. We do so by comparing the extracted waves with one-dimensional high resolution solutions of the corresponding generalized Regge–Wheeler equation.

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