

Abstract

Black hole excision is at present the most promising approach to deal with the singularities in black hole spacetimes. The implementation of this technique is done through carefully designed algorithms that exploit the causal structure of the spacetime in the black hole region. Causal differencing has shown to be one of the promising algorithms. To date, it has only been actively implemented in the Arnowitt-Deser-Misner (ADM) and Einstein-Bianchi 3+1 formulations of the Einstein equations. Recently, an approach closely related to the ADM one, commonly referred to as “conformal ADM” (CADM) method has shown excellent results when modeling waves on flat spacetimes and black hole spacetimes where singularity avoiding slices are used to deal with the singularity. In these cases, the use of the CADM method has yielded longer evolutions and better outer boundary dependence than those obtained with the ADM one. If this success translates to the case where excision is implemented, then the CADM formulation will likely be a prime candidate for modeling generic black hole spacetimes. In the present work we investigate the applicability of causal differencing to the CADM method, presenting the equations in a convenient way for such a task. We investigate whether the causal differencing implementation already developed for the ADM system can be extended to the CADM one.