On the Foliation by Constant Spacetime Mean Curvature Surfaces for Kerr Spacetime

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Defining conserved quantities like mass, energy and momenta, or the center of mass in general relativity is far from straightforward. This is due to the lack of symmetries in generic systems in contrast to special relativity. Even in asymptotically flat spacetimes, where the metric tends to the flat metric for large radii in a sufficiently fast manner, there are plenty of different variants. While there are satisfactory definitions for mass, energy and linear momentum via the ADM-formalism, the angular momentum and center of mass of a system are more tricky. However, Anna Sakovich and Carla Cederbaum recently formulated a new definition for the center of mass for systems with certain fall-off conditions in their work, which behaves in a physically desirable fashion and remedies certain deficiencies that prior definitions had. They achieved this via the so-called asymptotic foliation by constant spacetime mean curvature surfaces (STCMC) of asymptotically Euclidean initial data sets, which we will introduce.
Moreover, we are confident that we will find a connection to the angular momentum and its source of asymptotically sufficiently flat systems via this foliation as well. For this sake we want to consider it in an asymptotically Euclidean timeslice in the Kerr spacetime, which is the simplest spacetime solving the Einstein equations with a non-trivial angular momentum, and models the exterior of a rotating body of mass.