Initial data sets for the Schwarzschild spacetime

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Abstract

In this work a characterisation of initial data sets whose development is a portion of Schwarzschild spacetime is provided. This characterisation is obtained by performing a 3+1 decomposition of a certain invariant characterisation of the Schwarzschild spacetime given in terms of concomitants of the Weyl tensor. This procedure supplies a set of necessary conditions —which can be written in terms of the electric and magnetic parts of the Weyl tensor and their concomitants—for an initial data set to be a Schwarzschild initial data set. Sufficient conditions can be obtained by appending conditions ensuring the existence of a stationary Killing vector field in the initial data development. Such conditions are known and we write them down in a manner adapted to our problem. In this way, we obtain an algorithmic procedure to check whether the development of a given initial data set is a patch of Schwarzschild spacetime. An explicit example involving time-symmetric initial data is presented.

[1]The talk will be presented by the first author (Alfonso García-Parrado Gómez-Lobo)