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Gluing and Wormholes for the Einstein constraint equations. (English) Zbl 1013.83008

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Summary: We establish a general gluing theorem for constant mean curvature solutions of the vacuum Einstein constraint equations. This allows one to take connected sums of solutions or to glue a handle (wormhole) onto any given solution. Away from this handle region, the initial data sets we produce can be made as close as desired to the original initial data sets. These constructions can be made either when the initial manifold is compact or asymptotically Euclidean or asymptotically hyperbolic, with suitable corresponding conditions on the extrinsic curvature. In the compact setting a mild nondegeneracy condition is required. In the final section of the paper, we list a number ways this construction may be used to produce new types of vacuum spacetimes.

MSC:

83C05 Einstein's equations (general structure, canonical formalism, Cauchy problems)
53Z05 Applications of differential geometry to physics

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