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On Intrinsic Flat Stability of the Positive Mass Theorem

The rigidity part of the Positive Mass Theorem states that the only asymptotically flat 3-manifold with nonnegative scalar curvature, vanishing ADM mass, and empty or compact outermost minimal boundary is the Euclidean space. It has furthermore been conjectured that a sequence of pointed asymptotically flat 3-manifolds whose ADM mass converges to zero must converge in the pointed intrinsic flat sense to Euclidean space; here we assume that the manifolds have nonnegative scalar curvature, that their boundaries are outermost minimal, and that they are centered on well chosen points which do not disappear down increasingly deep wells. The conjecture has been proven in the rotationally symmetric (by work of Lee–Sormani) and graph settings (by work of Huang–Lee–Sormani). It is also known (by work of Lee–Sormani) that the conjecture is false if intrinsic flat convergence is replaced by a stronger form of convergence. In this talk I will address a collaboration with C. Sormani regarding the conjecture in the context of geometrostatic (Brill–Lindquist) manifolds.