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Classifying toric asymptotically flat gravitational instantons

An asymptotically flat gravitational instanton is a 4d Riemannian manifold (M, g) that is complete, Ricci flat, and approaches a quotient of $\mathbb{R}^4$ with flat metric at infinity. In analogy with the classic black hole uniqueness theorem, Gibbons-Hawking and Lapedes conjectured that the two-parameter family of Kerr instantons on $\mathbb{R}^2 \times \mathbb{S}^2$ was the unique instanton invariant under a local torus action. However, Chen and Teo recently explicitly constructed a new family of such instantons on $\mathbb{CP}^2 \setminus \mathbb{S}^1$. I will discuss ongoing work on existence and uniqueness results for gravitational instantons in this class.