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Degenerations of gravitational instantons

Gravitational instantons are noncompact 4-dimensional Calabi-Yau manifolds, and there have been many recent developments in understanding their analytic and geometric properties. Depending on the end structure at infinity, gravitational instantons are divided into six types, ALE/F/G/G*/H*/H. In this talk I will talk about the connections among some of these types, showing that one type of gravitational instanton can degenerate into another type. In particular, I will talk about the following projects: (1) degenerations of ALG and ALH*, in joint work with Yu-Shen Lin and Sid Soundararajan; (2) degenerations of ALF, partly in joint work with Alia Yusaini. Several types of analysis techniques are used here, and all of these can be seen as a step towards building a global compactification of moduli spaces of all gravitational instantons.