

Quantitative geometry and singular behavior of collapsed Einstein spaces

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Abstract

In this talk, we will discuss some recent progress on understanding the singularity behaviors of collapsed Einstein manifolds. The talk consists of two primary parts.

The first part focuses on the structure theory of higher dimensional collapsed Einstein manifolds. We will introduce some new regularity theorems which essentially gives a dichotomy: either the ϵ -regularity holds on the collapsed Einstein spaces, or some quantitative topological invariant degenerates at *small but definite scales*.

In the second part, we will exhibit some discoveries of new Einstein spaces with *multi-scale* collapsing behaviors, which in effect precisely confirms the general picture of the dichotomy introduced in Part I. At the technical level, the construction requires a new gluing procedure by building singular bubble trees. The crucially new point is to create geometrically singular *neck regions* which connect different bubbles.